Stereoscopic 3D to Reduce Product Uncertainty in E-commerce

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Abstract
The context for this research is the use of stereoscopic 3D (S3D) images as a design element in an e-commerce setting with the purpose of enhancing the user experience (UX). This paper presents findings from a survey conducted on a simplified e-commerce website, presenting three different bags with images and a minimal amount of text, for users. The 45 participants were divided into two groups; one presented with 2D images as representations of the bags and the other presented with S3D images. After interacting with the website the participants were presented with a real bag in order to gather data about the perception of the bag vs. the real bag from a product uncertainty perspective. The findings indicate that S3D reduces product uncertainty and enhances UX in an online marketplace. S3D has enabled the users to get a visual product description that corresponds better with a real product.

1. Introduction
In an e-commerce setting products and buyers are separated. Buyers are unable to use all senses to experience products, due to Internet's technical limitations in replicating a product [1]. Products are represented on two-dimensional screens, but are in its natural form three-dimensional. Two-dimensional interfaces are familiar and what users expect when interacting with the Internet.

Users accrued experiences from online activities give them an idea of what to expect of websites. Users expect to find elements and functions at known places with known functionality in a specific type of website [2]. By using websites, i.e. system, and interacting with its interface users mental models evolve naturally [3]. Understanding of users mental models and expectations support designers in creating conceptual models to better match users mental models and expectations to form a usable website [3].

In this paper we recognize and stress the importance of usability [2], but usability on its own is not enough. To be successful and competitive among an ever-growing number of websites, usability is rather a prerequisite. Designers and researchers of systems need a holistic perspective of users perceptions and responses before, during and after using a system [4] to expand and extend usability. This holistic perspective can be referred to as user experience (UX), which emphasizes affective factors along with the prerequisite behavioral concerns [5].

An online business is compelled to find features that are unique for them to get a competitive advantage. "Technology affects competitive advantage if it has a significant role in determining relative cost position or differentiation [6]". In this paper attention is on information technology (IT) solutions to differentiate websites [7] to be competitive, not the design of the products, e.g. VOLVO vs. SAAB. IT is used to differentiate websites, e.g. recommender systems and personalization technologies [7], trust and visualization of products [1]. Dimoka et al. [1] stress the importance of visual product description as carrier of information for users of an e-commerce website and its role in reducing product uncertainty. Reducing the visual product uncertainty helps users in a buying decision and in an extension better meets users expectations upon delivery, thus influence the overall UX. After-purchase experiences are determinant factors for users of an e-commerce website to be a returning customer [1] [8].

The relationship between visual product description and how well it meets buyer's expectations of products upon delivery is investigated in this paper. This paper explores the potential of a specific design element, i.e. stereoscopic 3D (S3D) images, to enhance UX by reducing product uncertainty. Thus, the purpose is to investigate visual product description using 2D vs. S3D images and its implications for UX and product uncertainty. The findings in this paper is one part of an ongoing study where the overall aim is to investigate S3D as a design element in an e-commerce setting with the purpose of enhancing the user experience.
The following sections describe the points of departure, research approach, and findings from a survey conducted with 45 participants. The paper concludes with a discussion, conclusions and further research.

2. Points of departure

2.1. User Experience

In this paper a working model, figure 1, is presented in order to visually describe the underlying perspective of UX in this paper. The application of the model is twofold, i.e. to enlighten the overall UX and to structure the findings in section 4.

![Figure 1. Overall user experience](image)

The discourse about how to define UX is vivid and there are a variety of interpretations amongst researchers in different disciplines [9]. ISO 9241-210 [4] defines user experience as “person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service”. In the first note to the definition it is stressed that UX includes “all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use.” The notion of UX being affected not only in direct interaction with a product, system or service is what is being illuminated in the working model in figure 1. Henceforth the product, system or service will be referred to as the website, since that is the context of this paper.

Prior experiences influencing the interaction are placed in the box to the left in the working model. UX is according to the second note in the ISO 9241-210 [4] standard a consequence of “the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use”. By understanding users’ mental models and expectations the design can be improved to better meet users’ expectations [10]. A user or customer of an e-commerce website is more likely to be a returning customer if the visit meets the user’s mental model.

The box in the middle is concerned with UX factors during interactions with websites. The prerequisite behavioral concerns [5] of usability are extended by UX to emphasize affective factors.

The box to the right concerns how the overall user experience is influenced after the interaction with the website. Parallels can be draw to the total customer-experience model [8] where the UX extends beyond the interaction with the website. The customer-experience model includes factors such as the delivery of product, post-sales support and consumption of products and services, determinant factors for users of an e-commerce website to be a returning customer.

2.2. Product uncertainty

The Internet interface is with its two dimensions a barrier in experience physical products that, in the real world, occupy three dimensions. A space where the buyer can, e.g. kick the tires, see the true color, listen for different sounds, smell its sent or sample a taste of the product [1]. To describe a product online, in a true and accurate way, can be a challenging information task.

In a sale situation the information is not evenly distributed between the seller and the buyer, there is an information asymmetry [1][11]. In electronic markets information asymmetry is in favor of the seller. The buyer of a product has to rely on the information given by the seller via the electronic media, since physical interaction is not possible. The information asymmetry has two implications, seller uncertainty and product uncertainty [1], that the buyer has to take into consideration when purchase goods online. Research done on information asymmetry has mainly focused on reducing seller uncertainty, primarily on the sellers’ moral hazards and adverse selection. The two most common ways of reducing seller uncertainty are by reputation and trust systems [11].

The other implication of information asymmetry is product uncertainty. Seller uncertainty and product uncertainty are separated, but still affecting each other [1]. Even if there is a seller uncertainty, there can still be a purchase if the buyer considers the product uncertainty as low. Both seller uncertainty and product uncertainty has an impact on the purchase, but can be treated separately.

Product uncertainty consists of two parts, i.e. “Diagnosticity of Product Description” and “Third-Party Product Assurance” [1]. With information given from an independent third-party a buyer gets objective expert information of the product and its characteristics. Third-party product assurance is given by doing inspection of the product, producing a history report or by giving a warranty. With product description a seller offers a useful description of the product to the buyer. This is done with the help of text, multimedia and visual product description. With an image of a product the buyer can visualize the product and draw conclusions based on the information given by the image. In a visual product description, features
that are omitted in a text can be seen and the image works as a carrier of true information. To reduce product uncertainty the visual product description has to be informative, e.g. images need to be taken from different angels, be of high quality and for the buyer in an accurate number. Online product descriptions should virtually apply to all products, i.e. not only used products gain, but also new products gain from a good and thorough product description. Product uncertainty stresses the importance of images in an online electronic market. A good and thorough product description helps the buyer to be better informed of the product.

2.3. UX and product uncertainty

In figure 2, the working model introduced in figure 1 is used to place product uncertainty in the context of user experience.

![Figure 2 UX and product uncertainty](image.png)

Figure 2 UX and product uncertainty

In the study presented in this paper product uncertainty, specifically the visual product description is used to explore the importance of images in an e-commerce setting. During an online purchase, i.e. during interaction with a website, the user is restricted to the information presented on the screen. The theory of product uncertainty [1] adds to the understanding of users’ need for information and it implies the importance of accurate product description to get a satisfied user. Products need to be accurately described online to meet the buyers’ expectations upon delivery of the real product [12]. The overall UX is effected by the correspondence of the product on the website and its physical appearance, see figure 2.

2.4. Design element - 2D and S3D images

An interface is a two-dimensional flat screen e.g. TV, computer monitors, laptops, smart phones and tablets. The screen stretches out in height and in width and within this area information is presented for a user to experience in the form of text, multimedia and images. It is a two-dimensional (2D) world where depth is hard to achieve. In the last few years some 2D screens make it possible to view S3D, e.g. images, movies and games. With a stereoscopic feature it is possible to experience an illusion of depth. The illusion of depth is created within the user by combining two offset 2D images presented separately to the left and right eye of the user. This leads to a perception of depth, a third dimension, for the user. S3D has been used since the mid-19th century, for showing images and later for films. There are different techniques to present S3D material, passive or active, and most of today’s screens need viewing glasses. There are screens where glasses can be omitted, but not widely spread.

The effects of S3D on users have been thoroughly studied in e.g. image perception [13], virtual reality applications [14], video [15], S3D games [16], and 3D TV [17]. The S3D image has various effects on different users. Some experience no difficulty viewing S3D, even after hours of viewing [13], whereas others may experience difficulties. Viewing problems origin from different factors; there may be physical problems making it impossible to view a S3D image, there are individual differences, such as age and gender [17] making it harder to view a S3D image. There are also difficulties, that may occur, when viewing S3D images when it gets to; get a focus point in an image, feeling ill and dizzy and people that find it impossible to see S3D, no matter how they try. Discomfort with human’s perception of depth [18], problems with binocular depth perception [19], vergence and depth of field [20], and depth cues integration [21] have been studied and has, for a designer of systems, to be taken into consideration.

S3D makes it possible to support spatial location, size, orientation and shape of objects presented on a screen [22]. The user gets a richer description of an object presented in S3D compared to a 2D image, since the S3D image contains more information. Resolution is important in viewing experience of S3D since “human stereoscopic vision is known to be a super-acuity, it operates best under conditions where fine details are present” [23]. S3D material in high-resolution, e.g. 4K monitors, aids users to interpret a larger amount of information, compared to 2D, i.e. with a high resolution, the user can interpret details in a way similar to real world experience. Studies show that S3D may take more time to comprehend than 2D viewing, since the user experience that there is more to interpret when viewing S3D [24].

An investigation of long-term use of S3D in gaming and 3D TV shows that S3D displays increase the feeling of presence in the gaming application in a much stronger, more positive and more emotional way compared to 2D. Studies indicate high emotional involvement from users viewing S3D and a greater experience of reality [24, 25].

3. Research Approach
This paper presents findings from one part of an ongoing study. A description of the overall study is given to enrich the understanding of the part presented in this paper. The overall aim is to investigate S3D as a design element in an e-commerce setting with the purpose of enhancing the UX. However, to reach the aim of the overall study, smaller achievable steps are and will be taken. This paper constitutes one of these smaller steps.

3.1. Research site

The context for the research is e-commerce and the corporate context is retail trade. The goal for the corporation is to be a leading company in Scandinavia for developing brand concepts and new products. In this research a subsidiary responsible for a specific brand of bags is involved. Their bags are designed from a user-centered perspective with emphasis on user satisfaction and how to simplify their journeys. They want to, through this collaboration, create a website that better communicates their brand image by designing for user experience.

3.1. Research methodology

The overall study will be conducted in two main stages, where the first stage consists of investigating practice with the purpose of forming the design of an e-commerce website with stereoscopic 3D elements and to locate obstacles for using such a technology. The second stage is the implementation and evaluation of S3D in an e-commerce website.

The action research (AR) approach is suitable in this research since the situation observed has to be created in order to gather data and would not occur without the action. The intention is to change the way of image representation to enhance the UX by using S3D in an e-commerce setting, i.e. intervention as an underlying purpose [26]. AR is an iterative process, with cycles including problem diagnosis, action intervention and reflective learning [27][28]. Theory and practice, as well as researchers and practitioners are combined through change and reflection within AR [27].

3.1. Research design

Initially, unstructured interviews were conducted to gather data about the collaborating subsidiary. The purpose was to create an understanding of the underlying organizational culture and their needs regarding an e-commerce website in order to set the stage for the overall study. The present level of S3D technology in the users home or work environment is an obstacle at this point, but potential displays at retailers are feasible. Despite the present level of maturity, the S3D feature is expected to be included in almost every TV.

The next step was to involve users, in order to find out if S3D has a potential in the context of enhancing user experience. Usability testing by the think-aloud method was used for gathering of qualitative data. Think-aloud tests were conducted on a simplified website, since the focus was primarily on the impact of S3D on user experience. Images both in 2D and S3D were presented on the simplified website to enable differentiation. 12 users participated in the testing and the findings both confirm previously conducted studies regarding S3D and the added value for the user shows implications for S3D to enhance the UX.

The importance of visual product description is indicated in the following quote from the think-aloud test. The user thinks that with the help of S3D she will “be helped to make the right decision when purchase something via internet” and she goes on by saying “the product I will get home will look more in the way I expected it to look and that means that I, as a customer, will be less disappointed”. This exemplified indication is further investigated in this paper.

Findings in this paper are based on data gathered through questionnaires about visual product description in 2D and S3D. The questionnaires were constructed based on the findings in the previous step, i.e. think-aloud tests and slightly corrected after piloting. Users were asked to answer the questionnaires before, during and after interacting with the simplified website. The evaluations were facilitated, thus giving the participants a chance to get clarifications if necessary. Before the interaction they answered questions concerning user characteristics. During the interaction specific questions about the visual product description were asked. After the interaction they were presented with a physical product, i.e. one of the bags, and the participants were asked to reflect upon the visual product descriptions of that bag.

Figure 3 shows the simplified website used to present images in both 2D and 3D for the three different bags in the evaluation. There is a uniform design for the product display, but when the user clicks on the small images an enlargement is shown in either 2D or 3D.
Figure 3. Simplified website

Figure 4 represents how the image enlargements for two different bags look like, one as a 2D image and one as a S3D image. Viewing S3D requires the users to wear special glasses and one issue is that everything viewed, but the S3D material, gets blurry. At this website a large blow-up of the product image covered the whole screen and eliminated the perceived blurriness created by the 3D glasses. The only bag never displayed in 3D is the bag shown in figure 3.

Figure 4. Image enlargements

The bags used in this study are the collaborating subsidiary’s best sellers and have the same volume, similar price and characteristics in general.

4. Findings

Findings from 45 out of 50 answered questionnaires are presented in this section. One of the participants was not able to see stereoscopic images due to an eyesight disability (visually impaired) and the remaining four were used in piloting of the test.

The 45 participants were divided into two groups; one control group with exclusively 2D images, and one group with one bag shown in 2D and the rest in S3D. Henceforth the control group is referred to as the 2D group and the other group as the S3D group.

Equipment used during the evaluation was a 23-inch monitor with belonging passive 3D glasses.

4.1. Part 1 - Before

This section presents user characteristics to better understand the participants and their prior experiences of Internet. The participants’ general online activities and use of e-commerce websites, willingness to learn and accept new technology, as well as their visual capabilities are presented.

There were 22 participants in the 2D group and 23 in the S3D group, with a distribution of 12 women and 10 men and 11 women and 12 men respectively. The average age of the participants is 42, evenly distributed in both groups between 18 to 80 years.

98% of the participants use the Internet on a regular basis, at least one hour per day. The remaining 2%, i.e. one participant, stated the alternative, one or more times per week.

A vast majority of the participants has experiences from online shopping, 93%. The majority of the 2D group answered that they shopped online one or more times a year, while the majority in the S3D group answered that they shopped online at least one or more times a month.

In order to gather data about their attitudes towards technology, questions about how well experienced they are with computers and the Internet, and interest in new technology were asked. The majority of the participants are experienced users, and need assistance only on some occasions. Nearly 60% of the participants find new technology and technology development to be interesting and they learn what is needed for work and for their spare time. Nearly 30% find it to be very interesting and follow technology development with interest. The remaining participants find technology to be less interesting and see it as a necessity.

Specific questions were asked about the participants visual capabilities, since it may affect the ability to see stereoscopic presented images. Two of the original 46 were visual impaired regarding their ability to view stereoscopic presentations. One of them was withdrawn from the results thus presenting results from 45 participants. One still remains in the evaluation since the participant is part of the control group only viewing 2D images.

4.2. Part 2 - During

The participants were asked to answer the first two questions in this part, after viewing all the images of the bags. They were asked not to view the images while answering the questions since they were to reflect upon what they had seen. They had a set of 15 descriptive words at disposal to express spontaneous impressions of the bags in the first question and 11 to describe the images depicting the bags. They were given the option to answer none of the above, but no one did.

The participants were unanimous in their spontaneous impressions of the bags except from the words, volume and elegant. 61% of the S3D group chose the word volume, while 41% of the 2D group. A
similar distribution occurred with the word *elegant*, 56% in the S3D group and 41% in the 2D group.

There was unanimity regarding their spontaneous impression of the images depicting the bags as well, expect for the words *depth* and *vivid*. 61% of the S3D group chose the word *depth*, whereas 14% of the 2D group.

The next three questions were concerning how the participants experienced the visualization of the products. The participants were asked to view the images again. The three different bags are referred to as bag A, B and C, see figure 3 and 4. Bag A, was only represented in 2D, thus working as a control within the S3D group, whereas bag B and C were represented in S3D. In the 2D group all images were represented in 2D. The participants were informed that there were no differences in price, weight, or volume of the bags prior to the evaluation. The bags differ on the inside, regarding the packing depths of the bags, bag C is slightly deeper than bag A and B. The colors of the bags differ, bag B is red, whereas bag A and C are grey and black.

In the first of the three questions the participants were asked to choose a bag for a vacation trip. In the 2D group the choice of bag was evenly distributed. In the S3D group 43% wanted bag C.

In the second of the three questions the participants were asked to choose the bag they found to be most attractively represented. The majority of the 2D group, 64%, answered that there was no major differences in the presentation of the bags. The S3D group responded differently, 4% for bag A; whereas bag B got 48% and 35% answered that there was no major difference in the presentation of the bags.

In the last of the three questions the participants were asked to compare the volume of the bags. In the 2D group 45% perceived bag C as the one with the most volume and 41% perceived that there was no major difference. Once again, the S3D group responded differently. 70% perceived that bag C was the one with the most volume. Nobody chose bag B as an answer.

In question four through to nine there was two questions asked for each bag. The even number questions were, what is your spontaneous impression of the bag? The purpose is to gather data about their feelings of the bag. The odd number questions were, how do you think the image enlargements present the bag? The purpose was to capture how the participants perceive the visual product description. Both questions were measured from a five-point grading scale, where 1 excellent, 2 very good, 3 good, 4 neutral and 5 poor.

The first two figures, figure 5 and 6, present results from the 2D group i.e. the control group.

In figure 5 we present the answers from the 2D group, of the even number question. The graph shows that most of the participants spontaneously think bag A and B to be very good to good and that bag C is considered as good. Nobody has expressed the bags to be poor.

The answers from the 2D group, regarding the enlarged images are presented in figure 6. The answers are quite unanimous in that they perceive the bags to be very good presented, with C dragging a little bit behind. Nobody is negative to how the bags are presented.

The results from the S3D group, concerning the same questions, are presented in figure 7 and 8. The S3D group’s answers are not as unanimous as for the 2D group. In figure 7 the result shows that bags B and C give a better impression than bag A. Remember that bag A is presented in 2D as mentioned above. Spontaneously the participants are more positive to the images of the bags presented in S3D than the bag presented in 2D.

The enlarged image presentation, figure 8, of the bags is perceived more positively by the S3D group than the 2D group. In the S3D group there are more answers with excellent and very good about the bags presented in S3D. Bag A, presented in 2D, is perceived as very good and good. Note that one participant
ranked the S3D image enlargement as poor. This question does not have the same touch of comparability of the bags as in the previous question, they are clearly asked to focus on the image enlargements. Bag A, presented in 2D, has a curve similar to the control group’s perception of the bag in figure 6.

The following figure illustrates the role of the control group and the 2D presentation within the S3D group of bag A. In figure 9 the answers of the question what is your spontaneous impression of bag A? are presented to visualize tendencies for the two groups. The perception of bag A by the 2D group peaks at very good with a shift to the left in the figure, whereas the S3D group peaks at neutral with a shift to the right in the figure. The S3D group has been presented with S3D images of bag B and C when they are viewing images of bag A.

The overall spontaneous impressions of the bag were good to excellent on a five-point grading scale. 31% in the 2D group thought the bag was excellent compared to 51% in the 3D group. 41% of the 2D group thought the bag was very good compared to 21% in the S3D group. 4% in each group thought the bag to be poor.

The participants were also asked to rate to what extent the real bag B would suit them personally. 80% expressed that the bag would suit them to a high or very high degree. The 2D group peaks at very high with 41% and the S3D group peaks at high with 39%.

In the last four questions of the questionnaire the participants were asked to reflect upon how the physical bag corresponds to the bag presented online.

Figure 10 presents the result from the question now when you have seen and felt bag B, do you think bag B correspond to your perception of the bag from experiencing it online? The participants rated the question from 1 to 5, where 1 yes, definitely on most parts, 2 yes, but not in every aspect (could be good or bad), 3 maybe, but lots of things are different (could be good or bad) and 4 no there are a lot different (could be good or bad). The S3D group peaks at yes, definitely on most parts with 51%, whereas the 2D group peaks at yes, but not in every aspect (could be good or bad) with 50%.

In the last four questions of the questionnaire the participants were asked to reflect upon how the physical bag corresponds to the bag presented online.

4.3. Part 3 - After

After the interaction with the simplified website, the participants were presented with bag B in real life. They were now able to experience it in its physical form and compare it with the bag’s visual product description.

The results from the question what description corresponds best to your feeling of the bag right now? are presented in figure 11. The choices were, 1 it is much better in reality than it’s visual representation, 2 it is better in reality than it’s visual representation, 3 it is as expected, 4 it is not as good as it’s visual representation, and 5 it is much worse in reality than it’s visual representation. The rating by the 2D group is more or less evenly distributed over the 1, 2 and 3. The rating by the S3D group is not as unanimously, 43% have answered 3, it is as expected.
Figure 12 presents results from the question *to what extent did the images (as you remember them) assist you in getting a good perception of bag B?* The grading of the answers were, 1 to a very large extent, 2 to a large extent, 3 neither nor, 4 not much and 5 not at all. In the 2D group 72% answered 2, i.e. *to a large extent*, whereas 43% of the S3D group answered 2 and 34% answered 1, i.e. *to a very large extent*. None of the participants chose 5, i.e. *not at all*.

The final question of the questionnaire was how did you experience the volume of the real bag B compared with your perception of volume in the image enlargements online? The answers to choose from were, 1 it had much more volume in reality than it appeared online, 2 it had more volume in reality than it appeared online, 3 it was as I expected it, no more no less, 4 it had less volume in reality than it appeared online, and 5 it had much less volume in reality than it appeared online. The results from the question are presented in figure 13. The 2D group peaks at 2, i.e. *it had more volume in reality than it appeared online*, with 50%, whereas the S3D group peaks at 3, i.e. *it was as I expected it, no more no less*, with 52%.

### 5. Discussion

In this study, almost all of the participants were able to view S3D images. Of the original 46 only 2 were unable to view S3D, 4%. The number in this study is at a glance low, but counting in millions of users the actual number of users being unable to view S3D is high and an alternative to S3D is needed [17], [18], [19], [20], [21]. There are users that are going to be excluded from viewing S3D material. As a designer of e-commerce websites, this is a design implication to consider.

The participants use the Internet on a regular basis, shop online and like new technology. These prior experiences constitute the user’s mental model of what to expect of an e-commerce website. Almost all of the participants had previous experience of S3D. The introduction of S3D images in an e-commerce setting gave them a new idea of how S3D can be used and how a product can be depicted on the Internet. Their mental models have been influenced by the interaction with the website.

Both groups claimed the images of the bags to be informative but the S3D group used the word volume and elegant to a greater extent than the 2D group. S3D seems to provide the user with a richer viewing experience [25] and a better feeling of the product.

When the participants had to choose one of the three bags, without focus on image presentation, there was no significant difference between 2D and S3D. On the other hand, when the participants were asked to view the presentation of the bags and then made a choice, there was a difference. The majority in the 2D group found no major difference in the presentations of the bags, whereas 48% in the S3D group answered bag B. The S3D images gave the participants a good visual product description of the bags [1]. It helped the user to actually make a choice instead of making no choice.

70% of the S3D group picked bag C when they were asked to look at a specific function of the bags, i.e. packing depth. This indicates the possibility to increase the information in a visual product description and reduce product uncertainty [1] by S3D presentation. The participants were able to have an opinion of that special property of the product, due to the increased information that S3D images provided [24].

The participants where asked to give their spontaneous impression of the bags. The S3D group’s answers were not as unanimous as for the 2D group. Bag A, solely presented in 2D, go a low rating, whereas bag B and C, presented in S3D, were rated higher, i.e. were more attracted [25], [24].

A similar tendency was shown regarding the presentation itself. In the S3D group, bag B and C, were thought to be excellent presented by 35% and 25% respectively, and 35% expressed very good. The 2D group was more unanimous and thought the presentations to be very good and good. The participants experienced the S3D images as a better representation of the bag than in 2D. The users got an added value, indicating an enhanced UX [3] with an improved visual product description [1] by images presented in S3D.
In comparison of bag A between the groups, it was rated higher in the 2D group. One explanation of the difference in rating between the two groups might be the fact that the S3D group had experienced the two other bags in S3D and found the images of bag B and C to be more informative and a better representation.

In the last part of the evaluation, bag B was presented in its physical form to the participants and they were asked for their spontaneous impression of the real bag. Participants in both groups liked bag B. 51% graded bag B excellent in the S3D group and 31% in the 2D group. The difference between the groups can be that the S3D group had a better perception of the bag. They had a more accurate visual product description to base their rating on [1].

The participants were asked to grade bag B, not out of product presentation but if the bag would suit them, the answer was more or less the same for both groups. It did not matter if they had seen the bag in 2D or S3D. Yet, when the participants were asked if the bag matched the impression they got from viewing the images online, 51% in the S3D group top ranked the impression. The visual product description of bag B was more accurate, a difference between online and real bag existed but was not as high as for the 2D group. This indicates S3D possibilities as a tool to reduce product uncertainty [1].

The S3D group confirmed the reduction of product uncertainty, 43% answered, “it is as I expected” when they were asked to say how they felt when they had seen bag B. The 2D group was more diverse in their answers. 34% of the S3D group answered that they “to a very large extent” got help from the images in getting a good perception of bag B. The perception of volume was answered with “it was as I expected it, no more no less” by 52% of the S3D group. The S3D design element enabled users to get a visual product description, that better corresponds with a real product.

6. Conclusions

In this paper, the aim was to investigate the potential of a specific design element, S3D images, to reduce product uncertainty and its implications on UX. This has been conducted by comparing the relationship of visual product description and how well a product meets a buyer’s expectation of a product upon delivery. The findings indicate reduced product uncertainty and enhanced UX, but to draw any generalizable conclusions it needs to be further investigated.

The result indicates that S3D images provide the user with a richer viewing experience than the images shown in 2D. The users expressed that they were able to see features, functions and got a sense of presence of the product from the images presented in S3D. There were also indications that the S3D images assisted the users to make an informed choice, a choice based on the information they interpreted from the S3D image. Indications that the users preferred S3D images to 2D images were found when the results of bag A were compared.

When the users experienced the bag they had seen online, in real life, S3D seems to have reduced the gap between online experience and real life experience. There are indications that the S3D design element has enabled users to get a visual product description that better corresponds with a real product.

A reduced gap between the visual product description and the real product contributes to an enhanced UX.

Many users can see S3D, but a designer of an e-commerce interface with S3D elements needs to consider those who cannot.

7. Further research

With S3D, the gap between depicted products and real products may be reduced. This needs to be further investigated and evaluated to get a more thorough understanding [12].

Another interesting feature to investigate is the interaction with a depicted product presented online, i.e. how can I open the door to the car and how does it sound when I start the engine. These kinds of interaction need to be studied to further reduce product uncertainty and to enhance UX.

UX, usability and users mental models has to be further explored to get a thorough understanding of how the S3D feature affects UX, usability and users mental models and how designers and researchers conceptual models will adjust and capture this.

10. References


