How previous experience negates the effect of beauty on usability

The mediating effect of previous experience on the influence of beauty and usability.

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30-7-2012

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Abstract

In the past decade the effect of beauty on perceived usability has been thoroughly researched with contradicting results. While Tractinsky(2000) found a strong correlation between beauty and usability and aptly named his research 'what is beautiful is usable', others (Hassenzahl, 2004. Mahlke, 2006. Hassenzahl & Monk 2010) found no such results. In a recent meta study Hassenzahl & Monk (2010) looked into the reasons for the difference in the found results. In their research they found that previous experience could possibly mediate the effect of beauty on usability, for their participants all had at least some experience with the product prior to the experiment and a very low correlation between beauty and usability was found. This current research has looked into the effects of previous experience through means of an experiment. This experiment was conducted on 32 individuals, half with and half without experience, who tested two different, but equally usable espresso machines. The results showed that previous experience had a considerable influence on the effect of beauty on usability and completely negated any effect of beauty on usability. For the group with previous experience there was a significant effect of beauty on usability while for the group with previous experience none was found. This could mean that the effects of beauty on usability are a lot less significant than previously stated.

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1. Introduction

Beauty is becoming increasingly important in product design, products are being designed to not only be easy and pleasant to use but also to be aesthetically pleasing. Consumers are willing to pay more for 'designer products' think about designer clothes or more specifically Apple computers, mp4 players and TV's.

A good example of a product that's been made to look aesthetically pleasing are the Nespresso espresso machines, their line of espresso machines is made to look 'stylish' and 'exclusive' and in turn they are more expensive than regular espresso machines. But do users judge a book by its cover or is there more to it?

Beauty has become increasingly important in user experience research, an approach that emphasizes subjectively experienced, positive and noninstrumental outcomes of owning and using interactive products as a complement to the traditional, predominantly task-oriented approach. (Hassenzahl & Tractinsky, 2006).

In the past decade there have been multiple studies (De Angeli, Sutcliffe & Hartmann, 2006; Hassenzahl, 2008; Norman, 2004) on the effects of beauty on the perceived usability of products. The general consensus of these studies is that beauty affects the perceived usability of products.

An important question is the effect of the perceived beauty or aesthetics of a product and its perceived usability. Tractinsky, Katz and Ikar (2000) found in their suggestively named and widely recognised publication a strong correlation between ratings of beauty and ratings of usability. They named their article 'What is Beautiful Is Usable', in line with earlier research where beautiful people were also judged to be good ("what is beautiful is good"; Dion, Berscheid, & Walster, 1972). Norman (2002) states that 'To be truly beautiful, wondrous, and pleasurable, the product has to fulfill a useful function, work well, and be usable and understandable.' From this we can gather being beautiful does not necessarily make a product more usable, but it does affect the perceived usability the user has of the product. According to Norman (2002) a good design means that the beauty and usability of the product are in balance.

However, research does not always agree on the effects of beauty on usability. Unlike the research done by Tractinsky, a study conducted by Hassenzahl (2004) on the effects of different MP3 player skins showed no

correlation between the perceived beauty of the MP3 players and the perceived usability. This contradiction between findings led to a new study by Hassenzahl & Monk (2010) in which they 'try to further examine and clarify the strength and implications of the correlation between beauty and usability'. They attempted to remedy the contradictions from earlier research, which in their opinion were the result of inconsistency in method and analysis. The study however did not show any results of perceived beauty on usability. A suggestion was made that previous experience might be the cause of the lack of correlation between beauty and usability.

Besides beauty there are several attributes to a product that influence the perceived usability of a product, a layered model by Welie, van der Veer & Eliëns(1999) show that multiple factors not only influence the usability, but also each other. The effect that beauty has on usability doesn't stand on its own but is influenced by other factors that influence usability. As mentioned before previous experience possibly mediates the effect of beauty on usability.

The main focus of this research is centered around the question if previous experience mediates the effect of beauty on usability. In line with Hassenzahls suggestion the research will look into the possible mediating effect that previous experience has on the influence of perceived beauty on perceived usability. This will be done by means of an experiment in which two espresso machines are tested on their perceived beauty and perceived usability. The participants of the experiment will be chosen based on their previous experience, half of the participants will be unfamiliar with espresso machines while the other half will be frequent users.

The following question is the main research question of this study:

How does previous experience influence the effect beauty has on usability?

Before this question can be answered the question if beauty effects usability for the group with previous experience has to be answered first:

'Does beauty influence usability for users without previous experience?'

The structure of this thesis is as followed: The first part is a theoretical framework in which relevant previous research will be discussed, after which hypotheses will be formulated based on the said research. In the method part the method of the experiment will be explained, the results will then be presented and discussed. The hypotheses will be explored in light of the found data and the last chapter is the conclusion of this research with limitations and possible future research.

2. Theoretical Framework

The following chapters will examine different models of usability and will define usability and beauty. While usability is an attribute given to products that has always been seen as important and has been thoroughly researched, the effects of the aesthetics or beauty of products on this usability is a more recent trend in research. Ever since the research of Tractinsky et. al in 2000 there is a great interest in the effects of beauty on usability. Previous research on the effects of beauty on usability is summed up in Table 1.

2.1 Usability

Before going further into the research of beauty on usability the terms 'beauty' and 'usability' need to be defined. As mentioned before usability has been the focus of research for many years, ISO 9241:11 for example gives the following definition for usability:

> *'The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.'*

This definition can be seen as the most complete definition of 'usability', it includes the most important elements of designing a usable system or product; the product is specified on the users and their goals, these goals have to be achieved with effectively and the results have to be satisfactory in a specified context. Effectiveness and efficiency refers to how easy a product is in use and satisfaction refers to how enjoyable the use of a certain product is. In order for a product to be usable the product has to be pleasant to use (Nielsen, 1993).

Another important authority in the research on usability is Norman (1988), his research focuses on usability. Norman mentions usability in terms of

affordances, these affordances are strong visible cues in the design of a product that 'show' the different ways in which an object can be used. Buttons for example are used by pressing on them, knobs are used for turning. "When simple things need pictures, labels, or instructions the design has failed" (Norman, 2002).

However we use many objects every day, how do we cope with this? According to Norman (2002) we have a conceptual model which tell us if and how a device would work. We are able to run a simulation in our head when parts of the object are clear and the implications are visible. So in order to create a usable product a designer must provide a clear conceptual model which can be understood by the user, there are three aspects to this mental model:

- The Design Model
- The User's Model
- The System Image

The design model is the designer's conceptual model, the model is made with the user's model and the designer expect the user's model to be the same as the designer's model. The user's model is created with interaction through the system and the system image is the result of the physical system that is created from the design model. While the designer expects the user's model to be the same as theirs, there is no interaction between the user and the designer. The only interaction is between the system image and the user's model. If the system image is not clear and consistent the user will end up with a different modal than the designer, and thus wrong mental model.

2.2 Models of Usability

In the following part two models of usability will be discussed, first the model from Preece et al.(2002), which distinguishes between usability goals and user satisfaction the second model is a layered model of usability by Welie et al. (1999), this model pictures different attributes that can add to or take from the usability of a product.

According to Preece et al(2002) Usability can be broken down into different usability goals, the study names the following goals: *effectiveness*, *efficiency*, *safety*, *utility*, *learnability* and *memorability*. They explain each of the usability goals with a set of questions. To ensure *effectiveness* questions about how accurately and completely users can accomplish tasks have to be asked. If

looking for specific information, how well can the users get the correct information they are looking for? *Efficiency* is about how easily a user can complete a task, how quickly can a user complete a task? The *safety* usability goal refers to avoiding dangerous situations while using the system. Utility refers to the functions of the system and if these allow users to use the system the way they want to use it. *Utility* is about providing utility for both new users and more experienced users without their needs clashing. Learnability is how easy it is to learn to use the system, the goal involving *learnability* can differ greatly depending on who is supposed to use the system (experts, new users etc.). Finally memorability, this is how easy it is to remember the technology once it has been learned.

It is clear that there are multiple attributes that can add to (or taken from) the usability of a product and when designing a product the users' needs must be taken into consideration. There are many different needs between users and therefore Preece et al mention another set of goals called the '*user experience goals'* (Preece et al., 2002). They are commonly referred to as user satisfaction and are a more subjective set of goals, *Figure 1*. shows the relationship between the usability goals and the user experience goals. Most of the user experience goals are a 'mix' of two of the usability goals. Beauty, which is one of the user experience goals according to Preece et al. (2002), is an attribute that has been well researched in light of the effect it has on usability. It is considered to be a prominent factor in the judgement on usability. Unlike the usability goals not all of the user experience goals can be applied to every product and as previously stated these are more subjective and differ even more between users.

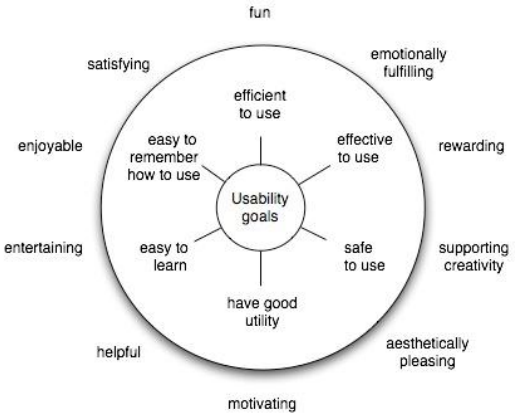

Figure 1. The relationship between usability goals and user experience goals (Preece et al. 2002).

Some of these goals reappear in the 'layered model of usability' by Welie et al. (1999). This model is displayed in Figure 2. While different attributes affect the usability of a product they also have an effect on each other, the model shows which attributes affect each other and have a positive influence on other attributes. The model is set in four layers and shows how the various attributes can aid each other. The first level is the level of usability, this level is based on the three pillars of usability from Bevan (1994) these are the same as the three earlier mentioned in the ISO quote; Efficiency, Effectiveness and Satisfaction. While the first level is quite abstract the second level, the Usage Indicators, has measurable indicators of usability and can be observed when testing the usability of a product. The next level, the means, are explained as 'heuristics' to improve the Usage Indicators and are not goals themselves. They are more like the user experience goals from Preece et al. (2002) and the means from Figure 2. can have a positive or negative effect on the Usage Indicators and are therefore not included in every product. It is interesting to see that some of the means from Welie et al. (1999) are included in the usability goals of Preece et al. (2002), clearly not all research agrees on what is important for the usability of products. The means are different for every product and should be included in the designs somewhere between 'not at all' or 'completely'. The three knowledge domains in Figure 2. are there to help determine the appropriate level of the means. The Figure is not complete but it does show that there are many attributes that have to be taken in mind when creating a usable product.

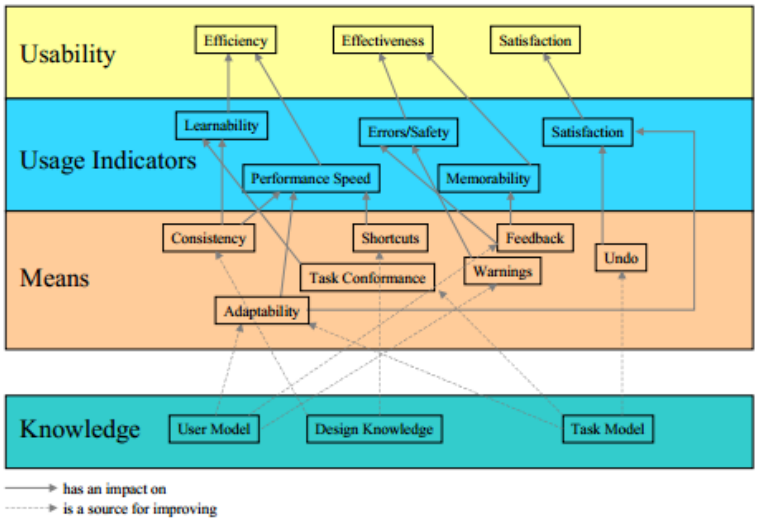

Figure 2. A layered model of usability

(Welie et al., 1999)

2.3 Beauty

While beauty is becoming more and more important in research focusing on usability it is an attribute that is hard to define. This because beauty is a subjective term; if you ask a group of people if something is beautiful you will most likely get different answers from each person. Man has been trying to define beauty since the time of the ancient Greek philosophers, Plato and Aristotle. Even after almost two thousand years we still do not have a clear understanding of what makes something beautiful. Plato was one of the first to say; 'beauty is in the eye of the beholder'. The meaning of beauty is different for everyone. The definition of beauty that will be used is Hassenzhal's (2009) definition of beauty will be used. In his paper he refers to beauty as 'a predominantly affect driven evaluative response to the visual Gestalt of an object', we find something beautiful because the way it looks makes us feel good. The beauty of a product is judged by its visual appearance, based on this appearance people might attach beauty as an attribute to the product.

While beauty has always been an important factor in paintings, sculptures and other arts, it was not until recently that it became an important factor in the design of everyday products. In *the psychology of everyday things* (2002), Norman says that designers often make the mistake of putting beauty before usability. He gives the example of Carelman's 'Coffeepot for Masochists', which is beautiful to look at but unusable, or chairs that you cannot sit on, making them unfit for the main purpose of a chair. Normans focus was on usability alone, he neglected beauty as a part of the design process and did not think it important. However, in the past decade the focus has shifted and there has been a lot of critique on the idea that aesthetics have no place in design. Even Norman himself has criticized his own statement, in his book *emotional design* (2002) he talks about how information, objects etc. can affect how people's minds work, especially the emotional part of the mind. Beauty has become an important attribute in the research of the usability of a product.

2.4 Previous Research

Figure 1 shows an overview of 15 studies reporting a relationships between beauty and usability as found in Hassenahl and Monk (2010). The results of the

studies vary from a strong correlation between beauty and usability to no correlation at all. *Figure 3*(found on next page) shows a total of 25 independent correlations between beauty and usability.

Source		Product	r	Npar (Npro)	Sampling Unit
Kurosu & Kashimura, 1995 (Beauty with ease-of-use)		ATM layouts	.59	252(26)	Product
Tractinsky, 1997 (Beauty with ease-of-use)	Study 1	ATM layouts	.92	104(26)	Product
	Study 2	ATM layouts	.83	81 (26)	Product
	Study 3	ATM layouts	.92	108(26)	Product
Tractinsky et al., 2000 (Aesthetics with ease-of-use)	Preuse	ATM layouts	.66	124(9)	Pooled
	Postuse	ATM layouts	.71	124(1)	Participant
Hassenzahl, 2001 (reanalyzed for Hassenzahl, 2004) (Beauty with pragmatic quality)		Monitors	.18	15(3)	Pooled
van Schaik & Ling, 2003 (Aesthetics with display quality)		Websites	.49	86(2)	Participant
Lavie & Tractinsky, 2004 (Classic aesthetics with usability)	Initial	Websites	.68	384(5)	Participant
	cross-validation	Websites	.78	384(5)	Participant
Hassenzahl, 2004 (Beauty with pragmatic quality)	Study 1,	MP3 player skins	.07	33(4)	Participant
	Study 2, preuse	MP3 player skins	.14	11(4)	Participant
	Study 2, postuse	MP3 player skins	.08	11(4)	Participant
Vilnai-Yavetz et al., 2005 (Aesthetics with instrumentality – ability to perform)		Office designs	.65	148(148)	Combined
Sutcliffe & De Angeli, 2005		Website	.50	25(1)	Participant
(Classical aesthetics with usability)		Website	.50	25(1)	Participant
Lindgaard et al., 2006 (Visual appeal with "clear – confusing")		Websites	.63	31(50)	Product
(Visual appeal with "simple – complex")		Websites	.10	31(50)	Product
De Angeli, Sutcliffe, & Hartmann, 2006		Website	.38	28(1)	Participant
(Classic aesthetics with usability)		Website	.49	28(1)	Participant
Cyr et al., 2006 (Design aesthetics with ease of use)		Mobile Service	.23	60(1)	Participant
Mahlke, 2006 (Ease of use with Beauty)		Digital audio players	.00	30(4)	Pooled
Hartmann et al., 2007 (Classic aesthetics with usability)		Websites	.43	43(3)	Pooled
van Schaik & Ling, 2008	Preuse	Websites	.12	111(4)	Participant
(Beauty with pragmatic quality)	Postuse	Websites	.41	111(4)	Participant

Figure 3. Overview of previous studies as found in Hassenzahl & Monk (2010)

According to Hassenzahl and Monk (2010) the variation found in Figure 3 can be due to numerous factors. The way the different studies measured beauty and

usability varied considerably. The same goes for the products used to measure the effects of beauty and usability, using different products however, is a good way to test the generalizability of the findings.

A bigger effect on the differences is the way the products and participants were treated in the reviewed studies. According to the meta study the participants were often sampled randomly while products were often selected arbitrarily to represent, for example, extreme groups.

As seen in the usability models there are many factors that influence the perceived usability of a product, these other attributes can also account for some of the variance found in the previous studies. If certain attributes which influence the usability of a product are available in one experiment and not in the other they can possibly influence the outcome of the experiment.

2.5 User Experience Model

It is clear that usability does not stand on its own and is just one attribute in the whole user experience of a product. Which brings us to Hassenzahl's model(2003), which can be found in Figure 3.

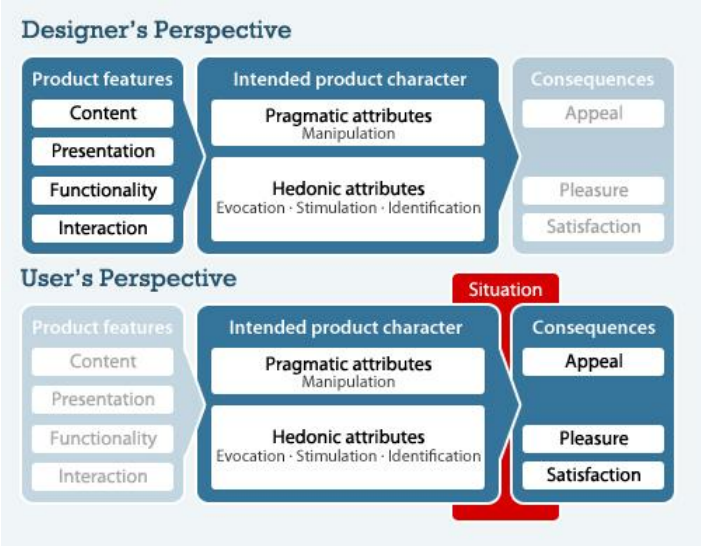

Figure 4. Hassenzahl's model of user experience (Hassenzahl, 2003)

This model assumes that a product has certain features that are chosen by a designer to convey a certain intended product 'character'. When users come in contact with a product they first create a personal product character, this is based on their initial expectations and the products functions .

This consist of pragmatic and hedonic attributes it then leads to consequences, the user judges the appeal of the product. Hassenzahl tested how the intended product characters correlate with the perceived beauty.

A conventional model based on this model was created for the meta study of Hassenzahl and Monk in 2010, this model will be further explained and can be found in Figure 5a.

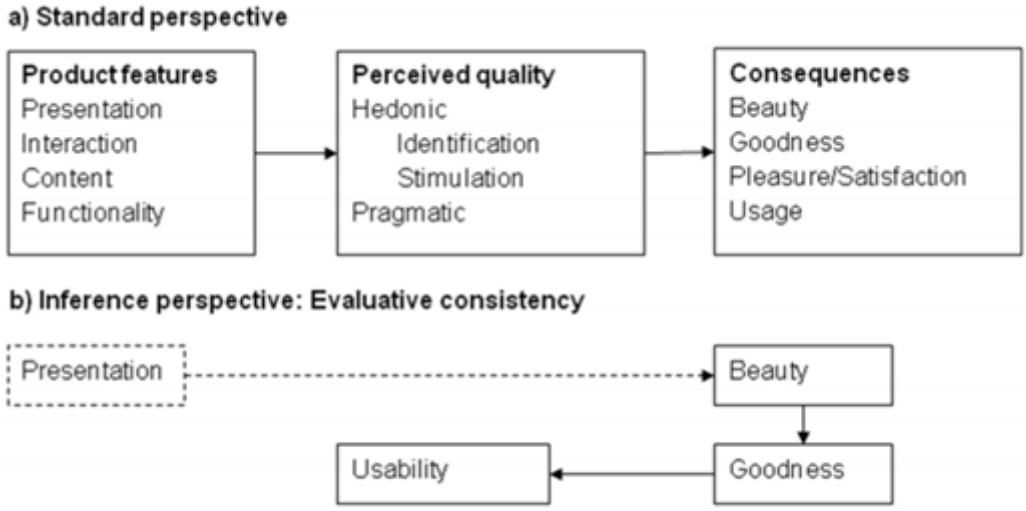

Figure 5. a) A modified version of Hassenzahl's model of user experience (Hassenzahl, 2003) b) Inference Perspective (Hassenzahl & Monk, 2010)

Product *features*, is the way products are presented, what the product does and so on. These features lead to particular product *perceptions*, such as usability, which in turn have specific *consequences,* for example how beautiful one finds a product or how it's valued. Consequences are dependent on context. Some attributes like usability or beauty can become more or less important depending on the context in which a product is used(Hassenzahl & Ullrich, 2007). Which is much like the Preece et al.(2002) model on usability, where the user experience goals are more or less important depending on the product and context.

Hassenzahl and Monk's(2010) research focused on the interplay of four distinct constructs in the model pictured in *Figure 5a:* the goodness, beauty pragmatic quality and the hedonic quality of a product. Goodness is stated to be the overall evaluation, the value of a product in a given context. Beauty is defined as "a predominantly affect-driven evaluative response to the visual Gestalt of an object" (Hassenzahl, 2008). The model pictured in 5a is however,

not the way people make the ratings of usability of a product(Hassenzahl and Monk, 2010). They were only used as a starting point for the evaluation of the data in the study.

2.6 Inference Perspective

This brings us to the other model in Figure 5b it shows the *inference perspective.* According to Hassenzahl & Monk (2010) one of the shortcomings of earlier research is that they used the model as depicted in Figure 5a, this model however is limited because it ignores the possibility of inference when information is unavailable at the moment of judgement (Kardes, Posavac & Cronley, 2004). The inference perspective assumes that when a person is confronted with the need to judge a product people may use all currently available information and will infer the unavailable. They argue that beauty is an important starting point of the inference processes because it is one of the most immediately available attributes when judging a product(Lindgaard, Fernandes, Dudek & Brown 2006). According to Hassenzahl Figure 5a is only used in situations where all information is available and can be weighted and integrated deliberately into an overall evaluation.

There are two distinct mechanisms that may be used with inference based on beauty: *evaluative consistency* (Lingle & Ostrom, 1979) and *probabilistic consistency* (Ford & Smith, 1987). *Evaluative consistency* assumes that users perceive a general value from all the attributes available to them. The unavailable attributes are then inferred from this value rather than any of the specific attributes. Accroding to Hassenzahl it seemed that the value was inferred from beauty before it spread to other, conceptually different aspects. For example in the research by Dion (1972), they claimed that 'beautiful is good', beautiful people were considered better parents even though beauty and parenting are conceptually unrelated. Figure 4b depicts an explanation of the correlation between beauty and usability. Goodness, the created value, is inferred from beauty and then usability from this goodness. According to hassenzahl goodness mediates the relationship between beauty and usability.

Probabilistic consistency assumes that individuals infer unavailable attributes directly from some specific available attribute that is thought to be conceptually linked to the unavailable attribute. In Hassenzahl & Monk (2010)

this model is falsified, showing that the relationship between beauty and usability is mediated by goodness.

Hassenzahl & Monk state that unless the user has significant previous experience the model as depicted in 5b will be used to infer usability from the overall 'beauty' and 'goodness' of a product. In the results of their research it was clear that there was no significant relationship between beauty and perceived usability. Their research was based on the inference perspective, which works well for beauty and usability seeing as beauty and usability differ in immediacy. Beauty is something that is immediately accessible, usability only comes after interacting with the product. The lack of correlation between beauty and perceived usability can possibly be explained by previous experience with the product according to Hassenzahl & Monk (2010). They assume that while groups without previous experience use model 5b, users with a reasonable amount of experience with the product fall back on the model in figure 5a, where the user has access to all the attributes of a product.

Hassenzahl & Monk's (2010) findings need to be further explored, in order to examine if previous experience with a product changes the model used by individuals when judging its usability. Previous experience with a product can possibly fill the missing attributes that new users have. This could then negate the inference of beauty to usability. The focus of this research is the mediating or even negating effect of previous experience on the way beauty effects the perceived usability.

2.7 Hypotheses

Looking at previous research three hypotheses have been formed around which this research is focused. To start there is the question of the effect of beauty on usability, a lot of the previous research found a mediating effect of beauty on usability. Hassenzahl & Monk (2010) state that this is because individuals use the inference model (as found in *Figure 4b*) to infer usability from the perceived beauty.

H1) *The beautiful espresso machine is judged to be more usable than the less beautiful espresso machine by the group without previous experience.*

H2) *There is a direct correlation between beauty and usability, beauty affects the perceived usability for the group with previous experience.*

Hassenzahl & Monk (2010) found that in their research there was no effect of beauty on the perceived usability. The possible cause of this is the previous experience of the users, all the participants had at least a small amount of previous experience with the tested websites. This experience adds to the current experience and make (almost) all attribute available to the user, which in turn made the participants use a different model than the inference model, namely the complete model depicted in figure 4a. Which leads to the third and fourth hypothesis.

H3) *Participants with previous experience do not judge the beautiful machine and the less beautiful machine to be different in usability.*

H4) *The effect of beauty on usability is mediated by previous experience.*

The third and fourth hypotheses are the main hypotheses and the focus of this research. The mediating effect is explained as changing the model the participant uses when judging the usability of a product. Note that the goal of this research is to find a mediating effect of previous experience on the effect of beauty on usability, which is pragmatic quality. The hedonic quality is of less importance but will still be taken in mind as to how pleasant the product is to use.

3. Method

The effects of beauty on usability have been thoroughly researched in the past, the main aim of this research is to discover the effect previous experience with a product has on the way beauty influences the perceived usability of this product. This was realised through an experiment.

3.1 Design

Participants

In order to reach the main aim of this research the experiment was conducted on a total of 32 participants. The participants were selected based on several habits,

all the participants had to be coffee drinkers, if they did not drink or like coffee their opinion of the coffee could influence the experiment. In order to make sure they were regular coffee drinkers the first questionnaire enquired about their coffee drinking habits. All of the participants drank coffee at least once a day. To measure the previous experience the participants were asked what different ways they had used to make coffee and what process was used the most. To make sure both groups were equal in size 16 participants were selected that used espresso machines daily and 16 participants that had rarely to never used an espresso machine before. To make sure the participants had no idea what the experiment was about the questionnaire was disguised as a survey about their eating and drinking habits. It is important that the participants did not know about the actual goal of the experiment, if they are aware of what is measured or know the goal of the research it could influence the outcome of the experiment. None of the participants in the final experiment had entered the pre-test on beauty or usability.

Independent variables

Actual Beauty

The main goal of this experiment is to research the influence of beauty on usability, in order to do so two espresso machines were used in an experiment. For there to be a possible effect of beauty on usability there had to be a significant difference in beauty for both machines. In the pre-test for beauty four espresso machines were presented in an online survey, two Siemens espresso machines and two Saeco espresso machines, these machines can be found in *Figure 6*. In the survey each machine had to be judged on its beauty, this was done on a 7 point Likert-scale, 1 being very beautiful and 7 being very ugly. The survey had 60 participants, with the following results:

Machine	Average Beauty score
Siemens 1	2.75
Siemens 2	2.91
Saeco Incanto Deluxe	3.09
Saeco Royal Professional	4.61

Table 1. Results pre-tests beauty 1 = Very Beautiful 7 = Very Ugly

Figure 6. The coffee machines used in the pre-test A= Saeco Incanto Deluxe, B = Siemens 1, C = Saeco Royal Proferssional and D= Siemens 2.

After the individual judgement on beauty the respondents were asked to list the machines in order of beauty. The results of this part of the questionnaire resembled the individual questions and showed that both Siemens and the Saeco Incanto Deluxe machine were considered far more beautiful than the Saeco Royal professional machine. The two espresso machines that were used for the experiment are the Saeco Incanto Deluxe and Saeco Royal professional machine. The reason for this is that both user interfaces of the Saeco machines were exactly the same in use, while the Siemens interface was slightly different to the Saeco machines. In order to have more control over the experiment the Saeco machines were chosen, there is less chance of usability differences and differences in taste of the coffee if you use the same brand of machines with the same coffee making process. The first independent variable is the beauty of the machines, one of the machines has to be significantly more beautiful than the other in order for the experiment to work. From now on the Saeco Royal Professional will be referred to as the less beautiful espresso machine and the Saeco Incanto Deluxe will be referred to as the beautiful espresso machine.

Actual Usability

There are many different variables to consider that influence usability, therefore usability is one of the most important variables that need to be controlled. In order for the experiment to work both machines need to be equally usable. In order to test the usability of both espresso machines another pre-test was held to measure the usability of both machines. The pre-test was done by 10 people

that had no previous experience with these kind espresso machines. Each participant had to perform five tasks on the machines with the manual at hand if they required it, these tasks are the same as listed later in the list of tasks of the main experiment. After these tasks they were handed a questionnaire(Appendix A), one after each machine and one at the end of the pre-tests.All participants were informed of the goal of the pre-test, half of the participants started with the Saeco Incanto Deluxe and the other half with Saeco Royal Professional. All participants agreed that both machines were equal in use and it was mentioned multiple times that the interfaces were *'exactly the same'.* The manuals were not required more than once for most of the participants. The results of the pre-tests can be found in Table 2.

Machine	*Beautiful_Machine*	*Less_Beautiful_Machine*
Ease of use	2.10 (.23)	2.00(.21)
Clearness of Use	2.10(.23)	2.20(.25)
Usability	2.00(.21)	2.20 (.20)

Table 2, pretest actual usability 1 = very easy/clear/usable 7 = very hard/unclear/unusable

As shown in Table 2. the means of the usability of both machines lie very close together. On the question which machine was the most usable out of the two they all agreed that they were both as usable. Note that they were all informed that the pre-test was about usability.

Previous experience

The main goal of this thesis is to look at the effects of earlier experience with a product on the way beauty influences usability, in order to do so the participants of the main experiment are divided into two groups. The first group has previous experience with the product and uses espresso machines often, the second group has none to little (once or twice) experience with espresso machines. This is the most important independent variable, without a difference in experience there is no possible effect of this experience on the way beauty influences usability.

Dependent variables

Perceived Beauty

In the pre-test for beauty the beauty of both machines was tested and it was established that the Saeco Incanto Deluxe machine was more beautiful than that Saeco Royal Professional machine. There are many factors to beauty and there no real way to define it, therefore it is important to consider the perceived beauty of the espresso machines in the experiment. It is possible that certain factors are overlooked in the experiment changing the perceived beauty of the espresso machines. This could get in the way of the experiment, if there is no difference in beauty, there is no possible influence of it on the perceived usability. It is important that the perceived beauty of the espresso machines is measured in the experiment.

Perceived Usability

The main variable of this research is the perceived usability of both espresso machines. In order to see if there is a significant difference between the perceived usability of both espresso machines this variable has to be measured carefully. If this is not done well there is no effect of beauty on usability and no way to measure if earlier experience influences the way beauty effects usability. In order to measure this variable there are two questions about the individual usability of each machine and three in the compared usability of the machines. These will show us both the individual score of the perceived usability and the compared score. The questions about compared usability are both a test and a safety net, if there is an individual difference between the perceived usability of both machines there should be a difference in the compared usability as well. If there is no difference between the perceived usability on the individual tests there is still a chance that when comparing the beautiful with the less beautiful machine the usability is judged differently. Chapter 3.4 Regarding the experimental set-up will look into the questions used to measure the perceived usability.

3.2 Stimuli

The two different stimuli are the two espresso machines. One being aesthetically pleasing or beautiful, while the other is less aesthetically pleasing or beautiful.

The Less beautiful espresso machine was even considered to be very ugly by some of participants of the pre-test.

Figure 7. Beautiful espresso machine

Figure 8. Less Beautiful Espresso Machine

3.3 Procedure

The participants of the experiment were asked to perform five tasks on each espresso machine after which they had to make a cup of coffee and taste it. They were asked to evaluate both the coffee and the coffee machine in a questionnaire, both machines were rated on beauty, usability, taste of the coffee and willingness to purchase. Only beauty and usability were relevant for the research, the other questions were to distract the participants of the actual goal of the experiment.

The experiment was held in a controlled lab environment to control the variables as much as possible, pictures of the experiment can be found in appendix G. Both espresso machines were separated at all times and the participants did not get to see the espresso machines together. After performing the tasks on the espresso machines the participants were lead back to a different room to taste the coffee and fill out the questionnaires.

The participants were divided into four groups, the first group was a group with experience and started with the beautiful espresso machine, the second group was a group with experience and started with the less beautiful espresso machine. The third group was a group without previous experience and started

with the beautiful espresso machine, the fourth group was again a group without experience and started with the less beautiful espresso machine. This was done to reduce the possible influence of the order in which the machines were used on the experiment.

The questionnaires were taken from an earlier experiment about the effects of beauty on usability and modified with questions about previous experience with espresso machines. The questionnaires enquired about the taste of the coffee, the previous experience with the espresso machines, the usability of the espresso machines, the beauty of the espresso machines and the willingness to purchase the espresso machines. In order to measure the usability two questions about usability were asked, the first enquired about the ease of use (effectiveness and efficiency) and the second enquired about the satisfaction (pleasing to use). The mean of both questions was used to create a new usability variable.

Before the experiment started the pre-test questionnaire was handed to the participants to make sure that all of the participants were coffee drinkers(Appendix A). The second and third questionnaire are identical and were given to the participants after they finished their coffee(Appendix B and C). The fourth and last questionnaire was given after they finished the third questionnaire(Appendix D). The fourth questionnaire asks the participants to compare both machines on the taste of the coffee, the usability, the beauty and the willingness to purchase. After the experiments were done the data of the experiments were manually entered into a SPSS data file.

Both espresso machines were filled with the same kind of beans, the participants did not know this and thought they were testing different kind of beans. The beans used were the Espresso D'Italia beans, these are normal beans with a nice and full coffee taste. The reason for choosing normal espresso beans is that the taste is not too distinct from normal espresso giving the participants the idea that they are testing beans in the same kind of category. If the taste is too different from normal espresso there is a chance that regular coffee drinkers notice that they both taste very different from what they usually drink. The experiment leader made sure there was a minimum of 15 minutes between each tasting to make sure the first tasting and task did not influence the second one.

To make sure there were no distractions during the experiment all possible distracting factors were removed from the test rooms and the participants were asked to turn their mobile phones off.

The participants were informed about the experiment in advance, they were told that they were going to taste the coffee from both espresso machines and had to set up the machines beforehand. To help them with their tasks on the espresso machine the participants were given a small part of the manual of the espresso machines. In this part of the manual the functions of each button was explained and it also explained how to browse through the menu and select certain options.

The participants were given five tasks on each espresso machine(Full list of tasks can be found in the *List of tasks* part of the method), first they were asked to look at the menu and carefully study the display. After this the participant would start with the first task, all tasks were given by the experiment leader. When the tasks were finished they were asked to make a small cup of coffee and then return to the main room. The reason for the multiple tasks is the inference perspective, different attributes like beauty and usability might differ in immediacy. By making sure the users spend a reasonable amount of time with both machines this experiment tries to reduce the effect of the inference perspective. During the experiment the participants were allowed to ask questions, but questions about usability were not answered and the participants were encouraged to find the answers themselves. They were told that if they had any questions about the questionnaire they should ask to make sure the questionnaires were filled in correctly.

List of tasks

- Participant enters the controlled lab area and is guided to the main table. The table is empty except for the first questionnaire and possible needs when the participant is drinking coffee, which consists of a spoon, milk and sugar.
- It was made sure the room was empty of any distractions, no phones, no television or any other possible distractions from the experiment.
- The participants were instructed on what to do during the experiment. They were told that it was a coffee tasting test. They were informed that they would have to make the coffee themselves and set up the devices as

well. After this they were asked to fill in the first questionnaire (Appendix A), once they were finished they returned the questionnaire.

- Once the participants were done with the first questionnaire they were lead to a different room in which the first espresso machine was set up.
- They were told briefly what was to be expected of them and were given a small manual that explained the different buttons on the espresso machine. They were asked to take a good look at the display and were then given a list of five tasks to perform on the espresso machine. All the tasks consisted of changing certain settings in the menu, Temperature, the strength of the coffee, the strength of the water and to turn the water filter off.
- First task was to change temperature of the coffee from low to high.
- The second task was to turn the water filter off, it was set on the on setting.
- The third task was to change the strength of the coffee from low to high.
- The fourth tasks was to change the water strength from 1 to 3.
- The fifth and last task was to turn "voorwellen" on.
- After these tasks were done they were asked to make a small cup of coffee. Once the coffee was made they were lead back into the main room where they were given time to drink their coffee. There was milk or sugar available if they required some. During this time there was usually a short conversation about anything unrelated to the experiment.
- Once the participant had drunk the coffee they were asked to fill in questionnaire 2a (Appendix B), when finished the questionnaire was returned to the experiment leader.
- In order to neutralise their taste the participants were given a cold glass of water.
- The procedure with the first espresso machine was repeated with the second espresso machine. This was done in a different room than the last espresso machine to make sure they would not see both of them together. The experiment leader made sure there were at least 15 minutes between finishing the first cup of coffee and starting on the second espresso machine. After making the coffee the participant was lead back to the main room again where the coffee was drunk.

- When the coffee from the second espresso machine was finished the participant filled in questionnaire 2b (Appendix C), the finished questionnaire was returned to the experiment leader.
- After finishing questionnaire 2b they were given questionnaire 3 (Appendix D), in this questionnaire they were asked to compare both espresso machines.
- The experiment was finished the participants were thanked. After all the relevant questionnaires had been completed.

3.4 Preparing data

After the questionnaires were filled in the data was entered into SPSS statistics 17.0. The first questionnaire was not entered into SPSS because it served as a filter to make sure that the participant was actually someone that drank coffee. The first thing that was entered was the version of the experiment (A or B, depending on which machine the participant used first). For questionnaire 2a and 2b the data of the following questions was entered: 1, 3, 4, 5, 7, 9, 12. Of Questionnaire 3 the data of the following questions was entered:1, 3, 5, 7, 9, 11.

After receiving all of the data four new variables were created. On the Likert scale answer the following transition from questionnaire to SPSS was handled:

A = 1

B = 2

C = 3

D = 4

E = 5

F = 6

G = 7

Missing value = 9

Usability_Beautiful_Machine. This is the usability of the more beautiful espresso machine and is the mean of question 5 and 7 on questionnaire 2 for the beautiful espresso machine.

Usability_Less_Beautiful_Machine. This is the usability of the less beautiful espresso machine and is the mean of question 5 and 7 on questionnaire 2 for the less beautiful espresso machine.

Preferred_Machine_Usability. This is the compared usability from questionnaire 3, it is the mean of questions 5, 7 and 9 from this questionnaire.

Prev_exp. This variable was to create two groups of previous experience, one with a lot and the other group with hardly any to none. This variable was created by changing the answers from question 3 from questionnaire 2 into new variables. Answers 1-3 were given the new value of 1, which meant previous experience. Answers 4 and 5 were given the new value of 2, which meant the participants had little to none previous experience.

Usability_Beautiful_Machine, Usability_Less_Beautiful_Machine and Preferred_Machine_Usability were all entered with two decimals, the other data was entered with 0 decimals.

In questionnaire 3 the beautiful espresso machine was machine 1, which related to the answer a on the comparing questions. The less beautiful espresso machine was machine 2, which was answer b on the questionnaire. If they thought both machines were equally usable the answer was C.

To research if there was any correlation between the judgment of beauty and usability four new variables were created. *Beauty_prev_exp*, *Usability_prev_exp, Beauty_no_prev_exp* and *Usability_no_prev_exp*. These are the complete paired scores regarding beauty and usability for both groups of experience. They do not take the different machines in mind because they were judged to be equally usable in the pre-test.

4. Results

The prepared data derived from the experiment has been subjected to several tests, in the first part of this chapter the tests are explained. The second part of this chapter show the results of these tests.

A paired samples t-test has been performed on the experiment data to compare the means of variables of the two groups of experience. The t-test is used in order to see if there is a statistically significantly difference between the way both espresso machines are judged on their perceived beauty and perceived

usability. The analysed dependant variables are the perceived usability and perceived beauty of both espresso machines. The t-test for the perceived usability is the main test, while the t-test on beauty is to make sure the espresso machines do differ in beauty. For the paired sample t-test the file has been split into two groups based on previous experience. This was done so the possible differences between both groups could be researched.

In order to measure the consistency of the paired samples t-tests results at least 50% of the participants have to score the usability and beauty of espresso machine 1(the beautiful espresso machine) higher than those of espresso machine 2(the less beautiful espresso machine). This test is run to make sure that the statistically different variables are not created by a small part of the participants only. In order to measure if this consistency is significantly different the following formula given by Toetsende statistiek: *basistechnieken* by Carel van Wijk (2000) has been used:

α =.01 : minimal amount = .5(N+1) +1.163$\sqrt{N}$

The value this formula gives is the amount of readings that have to be consistent with the direction of the result of the formula. With a reliability level of .01 the amount of participant that have to react in the same way as the measured result is. .5*(16+1) +1.163$\sqrt{16}$ = 13.5. So at least 14 participants have to react in the same way for the results to be significantly consistent. Because there has to be a difference in usability for there to be an effect we use a strict approach on the difference in the measured effect. This means that any equal measurements are considered inconsistent(instead of naming half consistent and the other half inconsistent).

The null hypothesis: H0: $\mu 1 \leq \mu 2$ is tested against the alternative hypothesis: Ha: $\mu 1 > \mu 2$ in order to test if there is a statistically significant difference between both observations.

For the comparison between *Compared_Beauty* and *Compared_Usability* a different formula from Toetsende statistiek: *basistechnieken* by Carel van Wijk (2000) has been used:

α =.05 : minimal amount = .5(N+1) +0.823$\sqrt{N}$ (11.18)

This different formula for consistency has been used because for *Preferred_Machine_Beauty* and *Preferred_Machine_Usability* only the difference is tested and not the direction. With a reliability level of .05 the amount of participant that have to react in the same way as the measured result is. $.5*(16+1) +0.823\sqrt{16} = 11.79$. So at least 12 participants have to react in the same way for the results to be significantly consistent.

The null hypothesis: H0: $\mu1 = \mu2$ is tested against the alternative hypothesis: Ha: $\mu1 \neq \mu2$ in order to test if there is a statistically significant difference between both observations.

An independent samples t-test has been run to measure if there are statistically significant differences for both groups of experience, the test is used on the mean of the usability questions for each machine and for the beauty questions of each machine. This to ensure there is no statistically significant difference between the judgement of beauty between both groups. It is also run on the comparison questions to examine if there is a possible difference in the comparison of beauty and usability of both machines between the two groups of experience.

The independent samples t-test has also been run on the two different versions of the experiment in relation to the judgement on usability of both machines(Half of The group with previous experience started with the beautiful espresso machine and the other half started with the less beautiful espresso machine). This has been done in order to find out if there is any statistically significant difference between both groups.

For the independent samples t-test analysis the R^2 was calculated using the following formula:

$$R^2 = (t^2-1) / (t^2 + N1 + N2 -1)$$

This formula has been taken from Toetsende statistiek: *basistechnieken* by Carel van Wijk(2000). R^2 calculates the proportion of variability in the data set that is accounted for by the statistical model. The Levene test has been run to make sure there are no statistically significant differences between the variances of the variables.

The last test that has been run is the Pearson correlation test, this test is used to see if there is a relationship between two variables and if this

relationship is positive or negative. The statistical significance of this correlation will also be tested.

No chi-square test was run, the results of this test would be unreliable. This because if a number of cells have an expected frequency less than 5 the assumptions made by a chi-square test would be violated, and it would not be possible to make any inferences from the statistics. The expected count of 100% of the cells in the chi-square test was less than 5, making a chi-square test unreliable. Therefore no chi-square test was performed.

4.1 Descriptive data

4.1.1 *Participants*

The experiment was conducted on a total of 32 participants, the average age of the participants was 38 with a minimum of 20 and a maximum of 55. The average age of the participants in the group with previous experience was 39, with a minimum of 21 and a maximum of 55. The average age in the group without previous experience was 37, with a minimum of 20 and a maximum of 54.

4.1.2 Beauty and Usability

There were two questions about the usability of each espresso machine, the mean of both questions was taken to create two new variables, *Usability_Beautiful_Machine* and *Usability_Less_Beautiful_Machine.* Table 2 shows the mean and standard deviation of the results .

	group with previous experience	group without previous experience
Beauty_Beautiful_Machine	2.37(.72)	2.44(.73)
Usability_Beautiful_Machine	2.34(.70)	2.44(.75)
Beauty_Less_Beautiful_Machine	4.75 (1.18)	4.75(1.13)
Usability_Less_Beautiful_Machine	2.63 (.56)	3.44(.73)

Tab 2. Means of beauty and usability (Standard deviation between brackets)

Figure 9 and *Figure 10* display the means of beauty and usability in both groups. Both the table and graphs show that at first sight there is little difference in the judgement of beauty between both groups. On the individual scores both groups judge the beautiful espresso machine to be more beautiful than the less beautiful

one. There is however, a greater difference between the judgement of usability of both machines for the group without previous experience than there is for the group with previous experience.

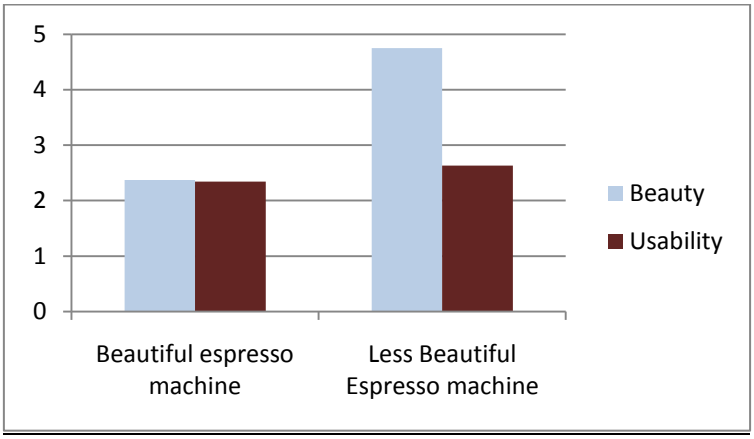

Fig 9. The group with previous experience on the beauty and usability of both machines. (1 = very beautiful and very usable, 7 = very ugly and very unusable.)

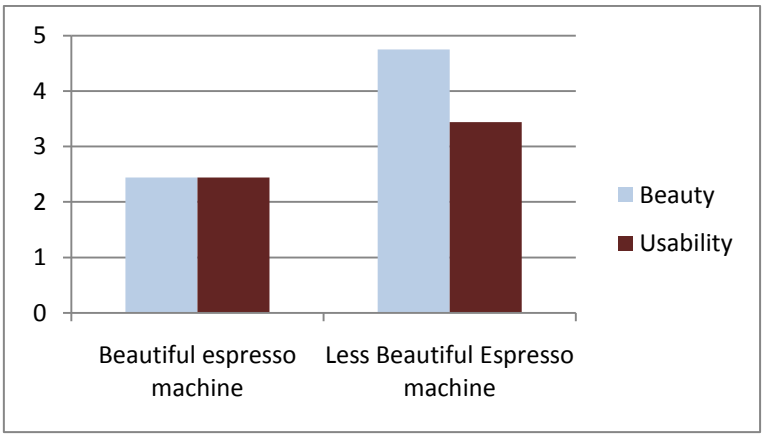

Fig 10. The group without previous experience on the beauty and usability of both machines. (1 = very beautiful and very usable, 7 = very ugly and very unusable.)

The frequency table in Appendix E shows the answers that were given on the *Preferred_Machine_Usability* Questions, these were combined to form the means of the *Preferred_Machine_Usability.* In the group with previous experience 29,1% of the participants answered the question which machine was the most usable with espresso machine 1. 66,7% answered they found them equal in use and 4,2% answered one of the questions with device 2. In the group without previous experience 83,3% answered with machine 1. This data does not tell us anything on its own but it's necessary for interpreting the means and standard deviations on the beauty and usability in questionnaire 3.

In table 3 the median and standard deviation of the compared questionnaire are displayed. Both groups strongly favour the first espresso machine, the group without previous experience favours the first machine as well when it comes to usability. The median of the group with previous experience is 2,38, the frequency data shows that the reason for this is that some still favour machine 1, but most favour both of the machines. The median also supports this, the median for the group previous experience on the usability questions is 3 while the median for The group without previous experience is 1.

Variables	The group with previous experience	The group without previous experience
Preferred_Machine_Beauty	1.13(.50)	1.19(.54)
Preferred_Machine_Usabilty	2.38(.57)	1.23(.50)

Table 3. Table on mean of Usability and Beauty in comparison(standard deviation between brackets)

Figure 11. is a graphical representation of the results. The graph shows the difference between both groups of experience on their choice of which was the most usable device.

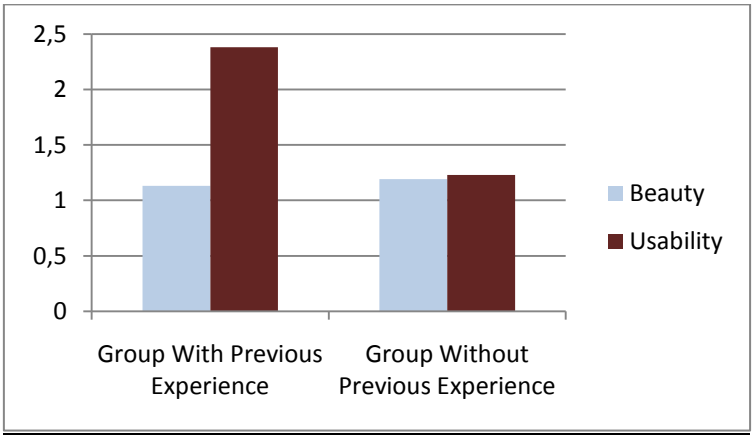

Figure 11. Usability and beauty in comparison.
(1 = Beautiful Espresso Machine, 2 =Ugly Espresso Machine, 3 =- Both machines)

Purchase

The participants were asked if they would purchase the machines individually and after judging both machines which machine they would buy without taking

money into account. They also had to option to not buy either of them. *Table 4* is a frequency table with the answers to the questions for each of the machines and the question which one they would purchase of the two machines.

Variables Group with previous experience	Yes	Maybe	No	Total
Purchase_Beautiful_Machine	10	5	1	16
Purchase_Less_Beautiful_Machine	1	3	12	16
Group without previous experience				
Purchase_Beautiful_Machine	11	2	3	16
Purchase_Less_Beautiful_Machine	0	3	13	16

Table 4. Frequency Table on purchase for the beautiful espresso machine and the les beautiful espresso machine.

Variables Group with previous experience	Beautiful Machine	Less Beautiful Machine	Both	Neither	No Opinion
Preferred_Machine_Purchase	12	0	0	3	1
Group without previous experience					
Preferred_Machine_Purchase	14	0	0	2	0

Table 5. Frequency Table on preferred machine purchase

The frequency tables in 4 and 5 show that both groups would buy the beautiful machine and not the less beautiful machine. The interesting part is that they name the beauty as main reason as to why they would buy the machine. There is hardly any mention of usability or even the taste of coffee. One participant even preferred the taste of the coffee from the less beautiful machine but still chose to buy the first machine because of its beauty.

4.2 Different versions

There were two different versions of the experiment, version 1 started with the beautiful espresso machine, version 2 with the less beautiful one. Descriptive data can be found in *Table 4* and *Table 5*.

Variables	Started with Beautiful Machine	Started With less Beautiful Machine
Usability_Beautiful_Machine	2.75(.60)	1.94(.56)
Usability_Less_Beautiful_Machine	2.75(.65)	2.50(.46)
Preferred_Machine_Usability	2.33(.50)	2.41(.66)

Table 4. Different versions on usability in the group with previous experience (standard deviation between brackets)

Table 4 shows the means and standard deviations of the judgement on usability for both versions for the group that had previous experience. The table reads that for the group with previous experience all means except the mean for *Usablity_Beautiful_Machine* lie close together. The group that started with the beautiful espresso machine judged the machine slightly less usable than the group that started with the less beautiful espresso machine.

Variables	Started with Beautiful Machine	Started with Less Beautiful Machine
Usability_Beautiful_Machine	2.63(.79)	2.25(.71)
Usability_Less_Beautiful_Machine	3.19(.46)	3.69(.88)
Preferred_Machine_Usability	1.29(.55)	1.17(.47)

Table 5. Different versions on usability in the group without previous experience (standard deviation between brackets)

Table 5 shows the means and standard deviations on the judgement of usability for both versions for the group without previous experience. The table reads that for the group without previous experience all the means lie relatively close together. There does not seem to be a difference between both groups.

Variables Group with previous experience	Levene test	t	df	P	R^2
Version and *Beauty_Beautiful_Machine*	.751	.00	14	1	-
Version and *Beauty_Less_Beautiful_Machine*	.393	-.41	14	.69	-
Version and Preferred_Machine_Beauty	.035*	1	7	.35	-
Version and *Usability_Beautiful_Machine*	.647	2.80	14	.05	.29
Version and *Usability_Less_Beautiful_Machine*	.438	.88	14	.39	-
Version and *Preferred_Machine_Usability*	.624	.49	14	.63	-
Group without previous experience					
Version and *Beauty_Beautiful_Machine*	.006	.96	9.17	.63	-
Version and *Beauty_Less_Beautiful_Machine*	.231	.00	14	1	-
Version and Preferred_Machine_Beauty	.003	1	7	.20	-
Version and *Usability_Beautiful_Machine*	.466	1	14	.334	-
Version and *Usability_Less_Beautiful_Machine*	.114	-1.42	14	.18	-
Version and *Preferred_Machine_Usability*	.379	.88	14	.94	-

Table 6. Levene test and Independent samples t-test, (α =.05)

The results of the independent t-tests that have been run on the influence of the different versions of the tests on the different variables can be seen in table 6. The tests were run on the results of the group with and the group without previous experience. There was no statistically significant difference between the versions, except for the group with previous experience's judgement on the usability of the beautiful espresso machine. Version 2, which had the less beautiful espresso machine first judged the beautiful espresso machine slightly more usable (chapter 4.2). A possible reason for this difference is the expertise of the users, by using one machine they might have learned how to better use

the other. This effect was not taken into account in the results of this research seeing as this effect was not present by the other the group with previous experienced other machine and is probably due to the size of this experiment.

4.3 Beauty of both machines

Figure 4 and *Figure 5* showed a great difference in the perceived beauty of both machines. Both groups seemed to judge the beautiful espresso machine to be much more beautiful than the less beautiful espresso machine. To ensure this difference is statistically significant two different t-test have been run, a paired sample t-test to compare the beauty scores of both machines and an independent samples t-test to make sure it was the same for both groups. The tests have also been run on the question where both machines were compared.

Variables	t	df	P	consistency
Group with previous experience				
Beauty_Beautiful_Machine and Beauty_Less_Beautiful_Machine	9.27	15	<.05	16/16
Group without previous experience				
Beauty_Beautiful_Machine and Beauty_Less_Beautiful_Machine	8.58	15	<.05	15/16

Table 7. paired samples t-test, (α =.05)

Variables	Levene test	t	df	P	R^2
Prev_exp and *Beauty_Beautiful_Machine*	.954	-.24	30	.081	-
prev_exp and Beauty_Less_Beautiful_Machine	.501	.00	30	1	-
prev_exp and Preferred_Machine_Beauty	.544	-.34	30	.717	-

Table 8. Levene test and independent samples t-test, (α =.05)

The results of the t-tests can be found in table 7 and 8, these results show that there is a significant difference between the way the participants of the experiment perceived the beauty of the beautiful machine and the beauty of the less beautiful machine. The participants found the beautiful machine to be more aesthetically pleasing than the less beautiful machine.

The results show that for the group with previous experience the mean of the beautiful espresso machine was 2.37 with a standard deviation of .72, on average the beautiful espresso machine was perceived to be somewhere between beautiful and moderately beautiful. The mean of the less beautiful espresso machine was 4.75 with a standard deviation of 1.18, on average the less beautiful espresso machine was believed to be moderately ugly.

For the group without previous experience the mean of the beautiful espresso machine was 2.44 with a standard deviation of .73, on average the group without experience judged the beautiful espresso machine to be somewhere between beautiful and moderately beautiful. The less beautiful espresso machine had a mean of 4.75 with a standard deviation of 1.13, on average the less beautiful espresso machine was believed to be moderately ugly.

Both the group with and the group without previous experience judged the beautiful espresso machine to be more beautiful than the less beautiful espresso machine. This is confirmed by the compared test, where the group with previous experience had a mean of 1.13 with a standard deviation of .50 and the group without previous experience had a mean of 1.19(.54), showing that both groups favour the beautiful espresso machine when comparing both machines on this attribute.

The results of the paired sample t-test showed that the difference in judgement of beauty of both espresso machines was also statistically significant, the null hypotheses were rejected. For the group with previous experience 16 participants judged the beautiful espresso machine to be more beautiful and for the group without previous experience 15 participants judged the beautiful espresso machine more beautiful than the less beautiful one. Making the results of both groups statistically consistent.

The independent samples t-test read that there was no statistically significant difference between both groups of experience and their judgement on the beauty of the beautiful and less beautiful espresso machine. This was again confirmed by the comparison test where both groups did not answer statistically significantly different. The null hypotheses were not rejected. Both groups judged the coffee machines equally on their beauty.

The beautiful espresso machine has been found more beautiful than the espresso machine by all participants of the experiment, only one participant judged them to be equally beautiful in the comparison question. A few attributes

were given as reason as to why they judged the machine beautiful or ugly. Most participants judged the less beautiful machine to be too big, too squared and didn't like the colours. The same reasons were given for their judgement on the beauty of beautiful coffee machine, the participants liked its compactness, the colour and the smoothness of the design.

One of the participants said 'it's a matter of taste' when asked why he preferred the beautiful espresso machine over the less beautiful one, which is in line with the idea that beauty is subjective and possibly different for every person. However, there seem to be certain guidelines by which these espresso machines were judged on their beauty. Looking at the responses there are three variables that seem to be used as a 'standard' to judge the machines on their beauty and if they did not meet the minimum expectations the machine was considered less beautiful. While irrelevant for this research it might be interesting to look into the generalization of beauty guidelines for products in future research.

4.4 Usability of both machines

Figure 4 and *Figure 5* show that for the group without previous experience there is a difference between the perceived beauty of both machines, there does not seem to be a difference for the group with previous experience. In order to see if these observations are statistically significant a paired sample t-test between the usability of both machines has been run for each group. To test the results of this t-test an independent samples t-test has been run between previous experience and the usability of the machines.

Variables Group with previous experience	t	df	P	consistency
Usability_Beautiful_Machine and Usability_Less_Beautiful_Machine	1.95	15	.07	-
Group without previous experience				
Usability_Beautiful_Machine and Usability_Less_Beautiful_Machine	-4.22	15	<.05	14/16

Table 9. paired samples t-test, (α =.05)

Variables	Levene test	t	df	P	R^2
Prev_exp and *Usability_Beautiful_Machine*	.847	-.37	30	.72	-
prev_exp and Usability_Less_Beautiful_Machine	.383	-3.53	30	<.05	.27
prev_exp and Usability_Machine_Beauty	.887	6.06	30	<.05	.52

Table 10. Levene test and independent samples t-test, (α =.05)

The results of the test shown in *Table 9* show that the group with previous experience did not perceive the usability of both machines to be different from each other. Unlike the group with previous experience, the group with previous experience judged the two machines to be different in usability. The beautiful espresso machine was judged to be more usable than the less beautiful espresso machine.

In table 10 the results show that there is a difference in the judgement on the usability of the less beautiful machine between the two groups of experience and that there also is a difference their choice of which machine is the most usable. They both judged the first machine the same on usability. While the group with previous experience does not seem to be affected by the beauty of the machines there seems to be an effect of beauty on usability for the group without previous experience with the product. Previous experience explains a large difference in the variance of the judgement of the usability of the less beautiful espresso machine and the preferred machine usability wise.

There is a clear difference between the difference in usability for both groups between both espresso machines. The group with previous experience judged the beautiful espresso machine and the less beautiful espresso machine to be equally usable. The group without previous experience however, judged the beautiful espresso machine to be more usable than the less beautiful espresso machine.

4.5 Effect of beauty on usability

After establishing the difference in beauty of both machines and the difference in usability for the group without previous experience a t-test on the *Preferred_Machine_Beauty* and *Preferred_Machine_Usabilty* has been run. This test was run in order to see if there was a difference between the machine the

participants judged to be most beautiful and the machine they judged to be the most usable. A Pearson Correlation has also been run to see if there is a direct correlation between the judgement on beauty and usability. This test is firstly run on the individual machines, after which it is run the complete scores on beauty and usability of both groups.

Variables	t	df	P	consistency
Group with previous experience				
Preferred_Machine_Beauty and Preferred_Machine_Usability	-6.54	15	<.05	15/16*
Group without previous experience				
Preferred_Machine_Beauty and *Preferred_Machine_Usability*	-4.36	15	.67	-

Table 11. paired samples t-test, (α =.05)

*The consistency here entails that if one machine is judged the most beautiful and both are considered equally usable or the other espresso machine is considered more usable there is a consistent effect. From the 16 participants 15 judged espresso machine 1 to be more beautiful than Espresso machine 2, 14 out of 16 did not find the beautiful machine the most useable one. The result is therefore statistically consistent.

The results as seen in table 11 show that the group with previous experience did not choose the beautiful machine as the most usable machine, 14 of the participants judged the beautiful machine and the less beautiful machine to be equally usable. However, the group without previous experience judged the beautiful espresso machine also to be the most usable espresso machine. In order to examine if the perceived beauty has a direct effect on the perceived usability of the espresso machine a Pearson correlation test has been run.

Variables Group with previous experience	r	p	R^2
Beauty_Beautiful_Machine and Usability_Beautiful_Machine	.323	.22	-
Beauty_Less_Beautiful_Machine and Usability_Less_Beautiful_Machine	.100	.71	-
Preferred_Machine_Beauty and Preferred_Machine_Usability	-.020	.94	-
Group without previous experience			
Beauty_Beautiful_Machine and Usability_Beautiful_Machine	.115	.67	-
Beauty_Less_Beautiful_Machine and Usability_Less_Beautiful_Machine	.224	.40	-
Preferred_Machine_Beauty and Preferred_Machine_Usability	.734	<.01	.54

Table 12. Pearson correlation, (α =.01)

The results in *Table 12* show that there is no direct correlation between the perceived beauty and perceived usability of each machine individually. For the group without previous experience there is however, a strong positive correlation between the machine they judged to be the most beautiful and the machine they judged to be the most usable. Because the scores on perceived beauty and perceived beauty are so close together for the individual machines the test has also been run on all the scores of beauty and usability for each group of experience. The results of this test can be found in *Table 13*.

Variables Group with previous experience	r	p	R^2
Beauty_prev_exp and *Usability_prev_exp*	.286	.72	-
Group without previous experience			
Beauty_no_prev_exp and Usability_no_prev_exp	.538	<.01	.29

Table 13. Pearson correlation, (α =.01)

These correlations show that for the group without previous experience there is no effect of the scores on perceived beauty on the scores on the perceived usability of the machines. For the group without previous experience there is a moderately strong effect of the perceived beauty on the perceived usability. For inexperienced users there is an effect of perceived beauty on perceived usability.

4.6 Effect of earlier experience

The previous tests have shown great differences on the effect of beauty on usability between both groups of experience. In order to test if earlier experience affects the influence of beauty on usability a Pearson correlation has been run between previous experience and the judged Usability of both machines and the question where both machines were compared on their usability.

Variables Group with previous experience	r	p	R^2
Prev_exp and Usability_Beautiful_Machine	.067	.72	-
Prev_exp and Usability_Less_Beautiful_Machine	.542	<.01	.30
Prev_exp and Preferred_Machine_Usability	-.742	<.01	.55

Table 14. Pearson correlation, (α =.01)

In chapter 4.2 it was established that both groups judged both machine equally in beauty, previous experience had no effect on beauty. The results of the Pearson correlation show that for the beautiful espresso machine both groups of experience judged the machine to be equal in its usability. On the less beautiful machine however, there is a direct correlation between earlier experience and the judgement on its usability. The group without previous experience judged the less beautiful espresso machine to be less usable than the group with previous experience. The same effect can be seen by the question where the participants had to choose the most usable machine, previous experience had a direct effect on which machine was judged to be most usable.

The Pearson correlation showed a moderate positive correlation between previous experience and the judgement on the usability of the less beautiful

espresso machine. Previous experience accounted for a large part (30%) in the variance of the usability. The group with experience judged the less beautiful espresso machine to be more usable than the group without any experience. The compared test showed a strong negative correlation between previous experience and the choice of the most usable machine. This correlation shows that the group with previous experience was more likely to choose machine 2 or both machines as the most usable one.

The last test run to see if the result is consistent is a Pearson correlation on the complete results of the group with previous experience. This test showed that the correlation between the perceived beauty and the perceived usability where not statistically significant for the group with previous experience.

While the group with previous experience judged both machines to be equally usable, the group without previous experience found the beautiful machine to be more usable than the less beautiful machine. Previous experience weakened the effect beauty has on the perceived usability of a product. The group with previous experience judged both machines to be equally usable even though the beautiful espresso machine was judged to be more beautiful than the less beautiful espresso machine.

All results support the claim that previous experience has an effect on the way beauty affects the usability of a machine. While both groups judged both machines in the same way of beauty the group with previous experience did not report any difference in the usability of both machines. Multiple participants with previous experience mentioned that the machines both worked the same and were both simple and easy to use.

4.7 Taste of coffee

While both machines used the same kind of coffee, the participants were asked to rate the coffee they just tasted. The results of the perceived taste can be seen in *Table 15* and *Figure 12*.

Variables	The group with previous experience	The group without previous experience
Taste_Beautful_Machine	2.44(.63)	1.87(.62)
Taste_Less_Beautfiul_Machine	2.56 (.63)	2.62(.72)

Tab 15. Table on mean the taste of the coffee (standard deviation between brackets)

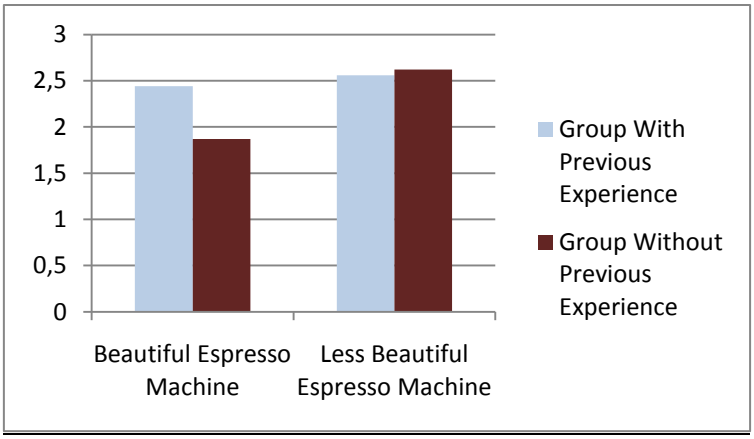

Figure 12. The taste of the coffee for both machines. (1 = very tasty, 7 = very untasty)

These result show that the beauty of the machine possibly influences the perceived taste of the coffee. In order to see if there is a difference in the taste of the coffee for both machines a t-test has been run, the results of this T-test can be found in *Table 16.*

Variables Group with previous experience	t	df	P	consistency
Taste_Beautfiul_Machine and Taste_Less_Beautifu_Machine	-.49	15	.63	-
Group without previous experience				
Taste_Beautfiul_Machine and Taste_Less_Beautifu_Machine	-3.50	15	<.05	10/16

table 16. paired samples t-test, (α =.05)

The results show that while the group with previous experience judged the taste of the coffee to be the same, the group without previous experience judged the taste of the coffee made with the more beautiful espresso machine to be better. 10 out of 16 participants from the group without previous experience judged the coffee of the beautiful machine to be more tasty. The perceived beauty of the espresso machines seems to have an influence on the perceived taste of the coffee.

Another t-test has been run between *Preferred_Machine_Beauty* and *Preferred_Machine_Taste* to see if there if the machine that was judged to be the most usable also was judged to make the tastiest coffee, the results can be found in *Table 17.*

Variables Group with previous experience	t	df	P	consistency
Preferred_Machine_Beauty and Preferred_Machine_Taste	-5.08	15	<.05	12/16
Group without previous experience				
Preferred_Machine_Beauty and *Preferred_Machine_Taste*	-1.15	15	.27	-

Table 17. paired samples t-test, (α =.05)

The results show that while the group with previous experience did not judge the most beautiful machine to make the tastiest coffee, the group with previous experience did perceive the beautiful machine to make tastier coffee. 12 out of 16 participants with previous experience did not judge the machine that was the most beautiful to make better coffee. The perceived beauty of the espresso machine seems to influence the perceived taste of the coffee.

4.8 Hypotheses

H1) *The beautiful espresso machine is judged to be more usable than the less beautiful espresso machine by the group without previous experience.*

Confirmed, the group without previous experience judged the beautiful espresso machine to be more usable than the less beautiful espresso machine.

H2) *There is a direct correlation between beauty and usability, beauty affects the perceived usability for the group without previous experience.*

Confirmed, the results show a direct correlation between the perceived beauty and the perceived usability of the espresso machine for the group without previous experience. The correlation found was moderately strong and explained 30%(a large part) of the variance in usability.

H3) *Participants with previous experience do not judge the beautiful machine and the less beautiful machine to be different in usability.*

Confirmed, the results showed that the group with previous experience did not judge the usability of both machines to be different, while they did judge the

beautiful espresso machine to be more beautiful than the less beautiful espresso machine.

H4) *The effect of beauty on usability is mediated by previous experience.*
Confirmed, the group with previous experience judged the usability differently than the group without previous experience. Beauty did not seem to have any effect on the perceived usability of the group with previous experience.

5. Discussion

The aim of this research was to research if there was a mediating effect of previous experience on the influence of perceived beauty on perceived usability. The results showed that previous experience mediated and even completely negated the effect beauty has on the perceived usability.

5.1 Beauty

The beautiful espresso machine has been found more beautiful than the less beautiuful espresso machine by all participants of the experiment, only one participant judged them to be equally beautiful in the comparison question. It was interesting to see that only a few attributes were given as reason as to why they judged a machine to be beautiful or ugly. Most participants judged the less beautiful machine to be too big, too squared and didn't like the colours. The same reasons were given for their judgement on the beauty of beautiful coffee machine, the participants liked its compactness, the colour and the smoothness of the design.

One of the participants said 'it's a matter of taste' when asked why he preferred the beautiful espresso machine over the less beautiful one, which is in line with the idea that beauty is subjective and possibly different for every person. However, there seem to be certain guidelines by which these espresso machines were judged on their beauty. Looking at the responses there are three variables that seem to be used as a 'standard' to judge the machines on their beauty and if they did not meet the minimum expectations the machine was considered less beautiful. While irrelevant for this research it might be interesting to look into the generalization of beauty guidelines for products in future research.

5.2 Usability

As with beauty there were few reasons given as to why one of the machines is more usable than the other. One participant claims that the buttons of the less beautiful espresso machine are less clear than the buttons of the beautiful espresso machine because they are round. Other claims were that it was easier to browse through the menu of the beautiful espresso machine or that the menu worked more intuitively. Even though both machines use the same interface with the same icons to browse through the same kind of menu.

The participants did not give a clear reason as to why the beautiful machine was more usable and the question as to why one machine was more usable than the other was often left blank. There seems to be a subconscious reason that made them judge the beautiful espresso machine as more usable than the less beautiful espresso machine. In the next chapter the possible effect beauty has on usability will be looked into

5.3 Beauty and Usability

A direct correlation was found between beauty and pragmatic quality (usability) for the group without previous experience. These findings are in line with previous research from, for example Tractinsky (1997, 2000), Lindgaard et al.(2006) and Hartmann (2007) where a direct correlation between beauty and pragmatic quality was found. The current research supports the claim that beauty has a direct effect on pragmatic quality, at least for individuals without previous experience with the product. This unlike what was stated Hassenzahl & Monks (2010) research, where no strong direct correlation between beauty and usability was found. Hassenzahl argued that beauty inferred some kind of 'goodness' which in turn inferred 'usability'. In this study however it seems that beauty directly influences usability, the judgment of beauty correlated strongly with pragmatic quality (usability). Through an aesthetically pleasing design the user possibly assumes a certain quality or 'goodness' of the product, which in turn infers a certain usability. The current study therefore agrees with the model as pictures in figure 4b.

However, it is important to keep in mind that Tractinsky's statement that '*what is beautiful is usable'* in his equally named research in 2000 is not completely true. While there is a direct correlation between beauty and usability, a machine which has the attribute 'beautiful' is not necessarily usable. In the

pre-test both machines were judged to be equally usable before the beauty was taken in mind. The usability of the beautiful espresso machine is therefore not a direct result of the beauty of the machine. The less beautiful espresso machine was also in no way judged to be unusable, it was only judged to be less usable than it's beautiful counterpart. While beauty is still an important factor that adds to the overall quality of a product, it should not stand above usability in the design process. An aesthetically pleasing design should be used to enhance the perceived usability of a product and if designed right it can add to the overall user experience of a product. If the beauty of a product stands in the way of its usability however, the 'beautiful' design can take away from usability as well.

5.4 Previous Experience

Hassenzahl & Monk (2010) assumed that users without previous experience use a different model than users with previous experience with the product. While users with experience have access to almost all attributes of a product, users without previous experience do not. In this current research it was found that users with previous experience did indeed judge the usability of the espresso machines in a different way than the users without previous experience. For the group with a reasonable amount of previous experience the perceived beauty did not have any effect on the perceived usability of the espresso machines.

The effect of previous experience found in this current research could possibly explain some of the variance found in table 1. Take for example Hassenzahl's research on the MP3-player skins(2004), MP3 players are widely used and one can assume that the participants of that research had a decent amount of previous experience with MP3 players. This previous experience in turn negated any effect of beauty on usability because a full set of attributes was available to the user.

Hassenzahl & Monk (2010) however, stated that the 'brief' hands on previous experience could possibly be the reason for the change in models used to judge the usability of the websites in their research. In this current research however no effect was found between the different versions, this means that the hands on experience the participants had with the first machine did not affect the judgment of the usability of the second machine. Thus while Hassenzahl & Monk (2010) mention that a brief amount of previous experience is enough to mediate

or negate the effect of beauty on usability, this research has shown that a longer 'hands-on' experience is possibly needed before it negates the effect of beauty on usability.

Previous experience also gives the user the opportunity to compare the current product with previously used products in the same category. Participants mentioned their previous used products in the questionnaire, comparing the usability of the current machine with the ones they previously used. It seems as though comparing the attributes of the current machine with the attributes of the previously used ones can in turn add or take from the perceived usability of the machine. Previous experience does not only change the way attributes are rated, but it adds external influences from other, similar products that individuals have previously used.

The model as depicted in figure 1a, which assumes that a user takes most of the attributes in mind when judging a product seems to be a correct model used by the experienced participants. What this model lacks however is the influence of the previous products and how this influence mediates the perceived usability, beauty and the effect of the beauty on the perceived usability. If for example the user has previous experience with a product that was not beautiful and was not very usable the participant could be biased by the previous experience with this product. The user does not judge the attributes of the product on its own but also compares them with the attributes of the previously used products.

5.5 Usability Models

In the theoretical framework two models of usability were introduced, like previous research this research has again shown that the model by Welie et al. (1999) is incomplete. The model by Preece at al. (2002) however, does give a good representation on the different attributes that can take from or ad to the perceived usability and user experience.

5.6 Other interesting finds

While not significant for this research it was interesting to see that from the 32 participants only one chose to buy the less beautiful espresso machine while 26 chose to buy the more beautiful espresso machine. Five participants were

undecided on which one to buy or would not buy either. The reasons given for their choice of purchase was, to no surprise, the design of the product, the aesthetics. They did not buy it because it was easier to use, or because it made better coffee. One of the participants preferred the coffee from the ugly espresso machine but still chose for the beautiful machine. For marketing purpose it might be interesting to see if beauty really is really that important of a variable when deciding which product to use, even after using different products.

As can be seen in the results there also was a significant difference in the perceived taste of coffee for users without previous experience. This supports the claim that beauty infers some kind of 'goodness' which is then used to fill in and influence other attributes of a machine. The machine was perceived to be beautiful and therefore seen as a better machine as a whole, which in turn led the participants believe it made better coffee. The users with previous experience however did not seem to judge the coffee to taste any different which supports the claim they have a more complete image of the product, and use all attributes to judge the machine as a whole.

5.7 Limitations

While this research has found a significant effect of beauty on usability and found a mediating effect of previous experience there are certain limitations to this research. First there is the size of this experiment, there were two groups of experience and two versions of the experiment. Each order in which the espresso machines were used was only done by eight users for each group of experience. The size could possibly have influenced the results of this research.

It is impossible to control the actual experience of the experienced users, while some might be familiar with the espresso machines others are possible more skilled in using the interface. The learning ability and general expertise were also uncontrolled, for this kind of research this is impossible.

A possible solution for this might be a longitudinal research, where participants are picked on their expertise and learnability, possibly IQ or study. Where one group uses a new product for several months and the other group does not. This is the only way to completely control the previous experience variable.

6. Conclusion and future research

In order to answer the main question of this research the question on the influence of beauty on usability has to be answered first, '*Does beauty influence usability for users without previous experience?*' From this research we can conclude that there is an effect of beauty on usability for users without a reasonable amount of previous experience. This group judged the beautiful espresso machine to be more usable than the less beautiful one and a significant effect of beauty on usability has been found. This effect is caused by the inference perspective, the user infers a certain amount of goodness and therefore usability from the beauty of the product.

The group with a reasonable amount of previous experience however, did not perceive the beautiful machine to be more usable than the less beautiful one. This brings us to the main question: '*How does previous experience influence the effect beauty has on usability?*' The results of the experiment conclude that previous experience has a significant influence on how beauty affects the perceived usability of a product. While inexperienced users judged the most beautiful espresso machine to be the most usable the experienced user group judged both espresso machines to be equal in use. Earlier experience seems to completely negate the positive effect beauty has on usability, more experienced users are not so easily 'fooled' by aesthetically pleasing features of a product. This because they have access to more and possibly all attributes from their previous experience. The previously used products and the opinion the users have of these previously used products can also possibly influence the way the usability of a product is perceived. Unlike what Tractinsky(2000) says, what is beautiful is not immediately usable, there are more important factors to be considered before the beauty of a product.

This research is far from conclusive, the size of the experiment and the machines used could have influenced the results. Focus of future research could be to try and control the amount of previous experience and expertise of users to make sure variances in experience and expertise do not affect the results of the research. It would also be interesting to conduct the same experiment with different products to see if the results found in this research are applicable to other products as well.

The effects of previous experience should be explored further as well, for example on how previous experience affects the overall quality of a product and

further research is needed on the effects of these previous products on the tested product. The users judgement of the previously used product possibly has an effect on the way the current product is judged.

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Appendix A

Pre-test actual usability

First questionnaire (Done for both machines once)

1. How easy were the tasks you just had to perfrom?
    a. Very easy
    b. Easy
    c. reasonably easy
    d. not easy but not hard
    e. reasonably hard
    f. hard
    g. very hard

2. How clear were the tasks you just had to perfrom?
    a. Very clear
    b. Clear
    c. Reasonably Clear
    d. not Clear but not Unclear
    e. reasonably unclear
    f. unclear
    g. very unclear

3. How usable do you find this espresso machine?
    a. very usable
    b. usable
    c. reasonably usable
    d. not usable not unusable
    e. reasonably unusable
    f. unusable
    g. very unusable

Second Questionnaire

1. Which Machine was the easiest to use?
    a. First Machine
    b. Second Machine
    c. Both the same

2. Which machine was the most clear in its use?
    a. First Machine
    b. Second Machine
    c. Both the same

3. Which machine was the most usable?
    a. First machine
    b. Second Machine
    c. Both the same

Appendix B

Questionnaire 1

Naam:

Leeftijd:

1. Hoe vaak eet u brood?
    a. Dagelijks
    b. meerdere keren per maand
    c. Af en toe
    d. Ik eet geen brood

2. Hoe vaak drinkt u koffie?
    a. Meerdere keren per dag
    b. Eens per dag
    c. Een aantal keer per week
    d. Af en toe
    e. Ik drink geen koffie

3. Hoe vaak drinkt u thee?
    a. Meerdere keren per dag
    b. Eens per dag
    c. Een aantal keer per week
    d. af en toe
    e. Ik drink geen thee

4. Hoe vaak drinkt u vruchtensap?
    a. Meerderen keren per dag
    b. Eens per dag
    c. Een aantal keer per week
    d. Af en toe
    e. Ik drink geen vruchtensap

5. Als je brood eet, heeft u daarbij weleens één van de onderstaande apparaten gebruikt?
    a. Broodrooster
    b. Tosti-apparaat
    c. Grill
    d. Oven
    e. Anders, namelijk: …

6. Als u koffie drinkt, welke methode gebruik u dan het meest om koffie te maken?
    a. Instant-koffie (poeder vermengd met water)
    b. Senseo
    c. Koffiezet apparaat
    d. Espresso-apparaat
    e. Anders, namelijk: …

7. Als u koffie drinkt, welke methode heeft u dan weleens gebruikt om koffie te maken?
    a. Instant-koffie (poeder vermengd met water)
    b. Senseo
    c. Koffiezet apparaat
    d. Espresso-apparaat
    e. Anders, namelijk: …

8. Als u thee drinkt, welke methode gebruikt u dan het meest om thee te maken?
    a. Met theezakje
    b. Losse thee in een thee-ei of zakje
    c. Senseo
    d. Anders, namelijk: …

9. Als u thee drinkt, welke methoden heft u dan weleens gebruikt om thee te maken
    a. Met theezakje
    b. Losse thee in een thee-ei of zakje
    c. Senseo
    d. Anders, namelijk: …

10. Als u vruchtensap drinkt, welke methode gebruikt u dan het meest om het te maken?
    a. Kant-en-klaar uit een pak of fles
    b. Met een handpres
    c. Met een sapcentrifuge
    d. Met een electrische handpers
    e. Anders, namelijk:

11. Als u vruchtensap drinkt, welke methoden heeft u dan weleens gebruikt om vruchtensap te maken?
    a. Kant-en-klaar uit een pak of fles
    b. Met een handpres
    c. Met een sapcentrifuge
    d. Met een electrische handpers
    e. Anders, namelijk: …

Appendix C

Questionnaire 2a

Naam:

1. Hoe vond u de smaak van de koffie die u net heeft gezet?
    a. Erg smakelijk
    b. Smakelijk
    c. Redelijk smakelijk
    d. Niet smakelijk maar ook niet onsmakelijk
    e. Redelijk onsmakelijk
    f. Onsmakelijk
    g. Erg onsmakelijk

2. Waarom vind u dit?

    ….

3. Heeft u dit soort koffiezet apparaat al eerder gebruikt?
    a. dagelijks
    b. Vaak
    c. Soms
    d. heel soms
    e. nooit

4. Was dat:
    a. Hetzelfde apparaat
    b. Hetzelfde merk
    c. Ander merk
    d. Anders, namelijk: ….

5. Hoe duidelijk was het hoe u dit koffiezet apparaat moest gebruiken?

a. Erg duidelijk
b. Duidelijk
c. Redelijk duidelijk
d. Niet duidelijk maar ook niet onduidelijk
e. Redelijk onduidelijk
f. Onduidelijk
g. Erg onduidelijk

6. Waarom vind u dit?

….

7. Hoe prettig was dit koffiezet apparaat in gebuik?
    a. Erg prettig
    b. Prettig
    c. Redelijk prettig
    d. Niet prettig maar ook niet onprettig
    e. Redelijk onprettig
    f. Onprettig
    g. Erg onprettig

8. Waarom vind je dit?

.....

9. Wat vind u van het ontwerp van het koffiezet apparaat?
    a. Erg mooi
    b. mooi
    c. redelijk mooi
    d. niet mooi maar ook niet lelijk
    e. redelijk lelijk
    f. lelijk
    g. erg lelijk

10. Waarom vind u dit?

    ….

11. Heeft dit koffiezet apparaat minpunten?

    ...

12. Zou u zonder dat u de prijs nu in overweging neemt, overwegen dit koffiezet apparaat aan te schaffen?
    a. Ja
    b. Weet ik nog niet
    c. Nee

13. Waarom?

    ….

14. Heeft u nog opmerkingen over dit koffiezet apparaat of het koffiezetten ermee?

    …

Appendix D

Questionnaire 2b

Naam:

1. Hoe vond u de smaak van de koffie die u net heeft gezet?
    a. Erg smakelijk
    b. Smakelijk
    c. Redelijk smakelijk
    d. Niet smakelijk maar ook niet onsmakelijk
    e. Redelijk onsmakelijk
    f. Onsmakelijk
    g. Erg onsmakelijk

2. Waarom vind u dit?

    ….

3. Heeft u dit soort koffiezet apparaat al eerder gebruikt?
    a. dagelijks
    b. Vaak
    c. Soms
    d. heel soms
    e. nooit

4. Was dat:
    a. Hetzelfde apparaat
    b. Hetzelfde merk
    c. Ander merk
    d. Anders, namelijk: ….

5. Hoe duidelijk was het hoe u dit koffiezet apparaat moest gebruiken?
    a. Erg duidelijk

b. Duidelijk
c. Redelijk duidelijk
d. Niet duidelijk maar ook niet onduidelijk
e. Redelijk onduidelijk
f. Onduidelijk
g. Erg onduidelijk

6. Waarom vindt u dit?

….

7. Hoe prettig was dit koffiezet apparaat in gebruik?
    a. Erg prettig
    b. Prettig
    c. Redelijk prettig
    d. Niet prettig maar ook niet onprettig
    e. Redelijk onprettig
    f. Onprettig
    g. Erg onprettig

8. Waarom vindt u dit?

.....

9. Wat vindt u van het ontwerp van het koffiezet apparaat?
    a. Erg mooi

b. mooi
c. redelijk mooi
d. niet mooi maar ook niet lelijk
e. redelijk lelijk
f. lelijk
g. erg lelijk

10. Waarom vindt u dit?

….

11. Heeft dit koffiezet apparaat minpunten?

...

12. Zou u zonder dat u de prijs nu in overweging neemt, overwegen dit koffiezet apparaat aan te schaffen?
    a. Ja
    b. Weet ik nog niet
    c. Nee

13. Waarom?

….

14. Heeft u nog opmerkingen over dit koffiezet apparaat of het koffiezetten ermee?

…

Appendix E

Questionnaire 3

Naam:

Het apparaat dat u als eerste gebruikte is apparaat 1

Het apparaat dat u als tweede gebruikte is apparaat 2

1. Welke koffie vond u het smakelijkst?
    a. Koffie gemaakt met apparaat 1
    b. Koffie gemaakt met apparaat 2
    c. Allebei even (on)smakelijk
    d. Geen mening

2. Waarom vindt u dit?

    ….

3. Bij welk apparaat was het het meest duidelijk hoe deze gebruikt moest worden?

    a. Apparaat 1
    b. Apparaat 2
    c. Beide Apparaten
    d. Geen mening

4. Waarom vindt u dit?

    ….

5. Welk apparaat vond u het prettigst in het gebruik?
    a. Apparaat 1
    b. Apparaat 2
    c. Allebei even (on)prettig
    d. Geen mening
6. Waarom vindt u dit?

….

7. Welk apparaat was het makkelijkst in gebruik?
    a. Apparaat 1
    b. Apparaat 2
    c. Allebei even (on)prettig
    d. Geen mening

8. Waarom vindt u dit?

….

9. Welk apparaat vind u het mooist?
    a. Apparaat 1
    b. Apparaat 2
    c. Allebei even mooi/lelijk
    d. Geen mening

10. Waarom vindt u dit?

….

11. Als u de prijs niet in overweging neemt welk apparaat zou u dan aanschaffen?
    a. Apparaat 1
    b. Apparaat 2
    c. Allebei
    d. Allebei niet
    e. Geen mening

12. Waarom vindt u dit?

…..

13. Heeft u verder nog opmerkingen met betrekking tot beide apparaten?

….

Appendix F.

Frequency table *Preferred_Machine_Usability*

Combined frequency table on Preferred_Machine_Usabilitya, Preferred_Machine_Usabilityb and Preferred_Machine_Usabilityc

Answer	**The group with previous experience**	**The group without previous experience**
A. Apparaat 1	14 (29,1)	40 (83,3)
B. Apparaat 2	2 (4,2)	5 (10,4)
C. Allebei even (on)prettig	32 (66,7)	3 (6,3)
Total	48 (100)	48 (100)

Apparaat 1 = Beautiful Machine, Apparaat 2= Less beautiful machine, allbei = both (percentage between brackets)

Appendix G

Pictures of the experiment(description below the images).
Participants showed on pictures have given their consent to use the below pictures.

Room in which participants drank coffee.

Table where participants drank coffee

Coffee cups

Surface and espresso machine

Participants during the experiment

Participant drinking coffee