

PRODUCT STIGMATIVITY

UNDERSTANDING, MEASURING AND MANAGING PRODUCT-RELATED STIGMA

KRISTOF VAES

PRODUCT STIGMATIVITY

Understanding, Measuring and Managing Product-Related Stigma

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Artesis University College Antwerp and the University of Antwerp made important contributions to the work described in this dissertation

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CHAPTER 1 INTRODUCTION

The 'Innovation by Design competition', organized by Fast Company in the fall of 2013, drew more than 1,200 entries from a wide variety of designers. An analysis of contributions revealed that four big trends are shaping the next wave of design innovation. The second trend was called 'Destigmatize affliction' and it neatly frames the relevance of our research in the current Zeitgeist:

"Many well-meaning inventions fail – not because they aren't helpful, but because they aren't appealing. To improve day-to-day hardship, designers must do what cold, clinical solutions do not: treat those in need as regular customers, whose emotions drive decisions."

Imagine that you're walking through the local shopping mall, wearing a dust mask. How would you feel? Apart from your own discomfort, you might also experience social unease from the people around you. As they approach, you might observe their anxiety, laughs, or frowns. As they pass, you might feel how they keep their distance from you. It is not hard to imagine that the emotional experiences generated by this situation will strongly influence your well-being and social acceptance.

Many of the products intended to relieve us from discomforting or unsafe situations and many medical and assistive devices are experienced as unpleasant and uncomfortable. In addition, use of these products often results in negative, judgmental reactions from bystanders. This dissertation hopes to provide insight in and a better understanding of the factors that shape the experiences of users and those who surround them. Furthermore, we have developed a set of tools that enables designers to relieve users of the social stress related to using these products. These tools strive to go beyond the physical adaptation between user and product to inspire products that support the user's personal and social well-being.

In other words, this dissertation hopes to assist designers in making better products for those who are forced to use products they need, but do not like?

1.1. The phenomenon: product-related stigma

It is a foggy day in the city. On the news people are alerted to high concentrations of fine dust. A little girl with respiratory problems rides to school wearing her dust mask. As she passes other people she notices that they are staring at her and that they react with reservation and discomfort. Maybe it's the 'look' of the dust mask that sends out unfavorable signs. Ultimately it was the designer who conceived the mask who should have foreseen these reactions. Why can't the designer make a mask that does not make me stand out?

Wearing a dust mask in public, outside of its usual context, presents significant challenges for its wearer. People who use or wear assistive, protective or medical devices are often confronted with subtle, clearly visible or even invisible reactions. Some of these recurrent and distressing experiences include: the frustration of having to wear or use a product that damages one's self-esteem, the relief when a passer-by did not notice one's assistive, protective or medical device, and the desire to be perceived as normal.

Distressing experiences can arise during an unprepared encounter between, on the one hand, users and their stigma-eliciting products, and, on the other, the people around them and the society they live in. The effects and impact of these experiences are the result of the aesthetic and functional aspects of the product itself, the individual experiencing the stigma, the observing bystanders and the cultural context in which the situation is set.

Designers have an operative role in this process. They determine the visual appearance of the product and balance technological, economic and practical constraints with social and personal values and desires. The causal chain of events that is illustrated in figure 1.1 depicts the essence of product-related stigma and its various stakeholders.



Figure 1.1. The causal chain of events that the user of a stigma-eliciting product is confronted with.

With the insights and tools in this dissertation we hope to assist the designer in conceiving a dust mask while being aware of the social process of the unhappy child in the story above. We focus on the acceptance and desirability of the unaccepted and undesired product. Alternatively, as Scharp (2007) states clearly, 'The need for products to convey positive emotions and avoid negative ones is critical to product success.'

1.1.1. What is product-related stigma?

In social psychology there is a large body of work on stigma. Although much has been written on how people are rejected because of traits they may or may not have control over, our dissertation focuses on those instances in which a product is the causal factor of social rejection or stigma. Figure 1.2 shows two youngsters with stigmatic conditions. In both cases the social reaction of bystanders reflects the underlying stigma. In the case of the dust mask this reaction is related to the product. Due to the process of product-related stigma, a user that was unconstrained by any stigma may engender stigmatic reactions because of the product he or she has to use, regardless of whether this usage is voluntarily or forced. This is interesting for designers because they are in a position to manipulate the product's appearance in such a way that these reactions can be avoided.



Figure 1.2. Social stigma can be product-caused or not product-caused. Product-related stigma occurs when the product is the causal factor of social rejection or stigma.

Due to their appearance, and enforced by existing stereotypes, people can link a product's appearance or certain visual features to an existing social stigma, resulting in a stigma-eliciting product. Consequently, product-related stigma is confined to a product's meaning and significance. While a Rolex watch might suggest meaning associations with high social status, in the same way a wheelchair might activate preconceived and undesirable associations with impairment and vulnerability. In return, product-related stigma can initiate a stigmatization process in which people (bystanders in various contexts) externalize these stigma meanings, making them perceptible to the product user. As such, when aspects of users and their products are perceived and evaluated as socially undesirable, stigma will reveal itself in the bystanders – not in the user.

When a product with specific visual features has the potential to elicit stigma, it is not the stigma which is present in the product as such, but only the capacity to elicit stigma. The immediate situation and the culture in which the interaction is situated greatly affect the actual eliciting of this stigma potential and the force of its impact. For example, a gun needs to be handled with care by all those who interact with it. The gun not only poses a physical threat, but also evokes psychological stress in bystanders. Visibly carrying a gun can be a symbol of authority and power. Consequently, people may

for example feel protected in the vicinity of a police officer. However, this association can instantly turn into panic as soon as the gun leaves the hand of a responsible person.

1.1.2. What is product stigmaticity?

We introduce the term ‘product stigmaticity’, in order to encompass the investigation of stigma elicited by products. Product stigmaticity can be considered to be the counterpart of ‘pleasurable design’, a term used to capture all potential benefits and pleasurable aspects that a product can provide in interaction with its user. Situated at the opposite end of the spectrum, product stigmaticity encompasses all aspects, effects and consequences of a product-related stigmatization process. As such, product stigmaticity comprises product-related stigma attribution, stigma appraisal, reactions to stigma, outcomes of stigma and the evolution of product-related stigma over time.

1.1.3. What are stigma-eliciting products?

Not all products have the same chances and assets when they are launched. Due to their appearance, and enforced by existing stereotypes, protective, assistive or medical devices can become burdened with stigma-sensitivity.

An invisible hearing aid or a prosthetic leg that is covered by clothing will not attract people’s attention. As soon as it becomes visible to bystanders, the interaction changes. Hence, visibility is an important factor. This dissertation will cover those products that are visibly worn or used in close proximity to the human body, where they are perceived and evaluated by people in the immediate vicinity.

Some stigma-sensitive products carry a long history of rejection while others become questionable or undesirable as soon as they move out of their intended context. We distinguish three product categories that include many examples of stigma-eliciting products: protective, assistive and medical devices.

- **Protective devices:** The first category includes all products that are intended to free us from discomforting or unsafe situations. These are protective devices such as dust masks, hearing protectors, etc.
- **Medical and assistive devices:** The second category addresses products that assist or complement the human body and promote user independence in daily tasks: assistive devices such as wheelchairs, crutches and prosthetics. They are developed to fix or mend that what is damaged, or to supply that which is missing. Related, yet overlapping are the medical devices that are used for monitoring, treatment or revalidation. Many of these medical and

assistive devices are burdened with a symbolic and social deficit, despite the fact that they are a necessity to their users. Somehow society views the users of these devices as being impaired. These medical or assistive devices are typically expected and tolerated within the clinical context of a hospital. Once they are taken out in public, users often feel marginalized and ashamed of their reliance on these devices. Daily use in public can burden them with social stress and social rejection.

People with clinical or engineering backgrounds conceive most of the products targeted by our research. All too often the focus is placed solely on technology, functionality, and basic usability, such as the avoidance of physical or cognitive discomfort.

As well as the two fundamental categories that we explore in this dissertation, we should also be aware of technological change and the impact of countless other products that are semantically linked to the body. There are those products that use or need the body as a part of its interface. The computerized 'Google Glasses', for example, are able to layer digital information over the real world and to make first-person photographic and video recordings. In the following decades much more technology-driven products will become a complement to our bodies. These products will not only stretch the boundaries of our capabilities, but they also give rise to new and unfamiliar body-near artifacts that may or may not be socially accepted and approved of. Many of these products will be worn voluntarily.

Our research targets those products that are obliged or indispensable for their user, and yet fail to appeal. If we compare a hearing aid to a Bluetooth headset, this might clarify the distinction. Both products are worn in and around the ear. The hearing aid is clearly intended for medical use and indispensable to its user, whereas the Bluetooth headset is worn voluntarily and used to transmit speech or music from mobile telephones or music players.

1.1.4. How can the designer contribute beyond functionality?

Designers are in a position to conceive products that can balance technological, economic and practical constraints with the ever-growing importance of emotional user desires. In our research the most essential emotional desire is the avoidance of negative sensations and emotions during a human-product interaction. However, designers should strive to surpass this scope and strive for products that engender positive meanings for their users, elicit positive feedback from bystanders and complement and support cultural values.

When designing products, many aspects have to be taken into account: material use, fabrication, usability, practicality, and ergonomic factors, among others. As such, product designers and design education have primarily

focused on the user's urgent and objective needs, such as functionality, usability and safety. Although it is connected to the previous list, there is one factor that deserves more attention from designers: the experiential factor. The experiential factor encompasses the emotional reactions to products, including all the potential emotional benefits they can deliver.

The users targeted by our research often face temporary or permanent disabilities, physical impairments, or perilous and unhealthy situations that oblige them to use these products. Although there exist examples to the contrary, many of the current protective, assistive, and medical devices are socially undesirable, uncomfortable and perceived by their users as unpleasant. With a focus on functionality and physical characteristics at the expense of emotional, social and aesthetic aspects, they do not succeed in expressing and supporting their users' concerns, identities and lifestyles. In other words, although their protective, assistive and medical aspect may increase the user's quality of life, they do not always increase their social well-being.

In their interaction with products, today's consumers seek more than functional gratification. In fact, they search for meaning, for something that can touch their subjective or collective 'sense'. In recent years this social dimension has started to gain interest and designers are now aiming to understand and fulfill the human motivations and aspirations related to products.

The following example sets the tone for what designers could contribute on an emotional and social level. Most walking canes do little to inspire the self-confidence of those who use them. They are often cold, clinical and impersonal items of utility. The company Top & Derby produces walking canes and recognized the need for a more personal approach. Their slogan neatly reflects the ambition of our research: "Why carry a cane, when you can wear it." The slogan resonates the duality of how designers can perceive a cane's phase of use. The verb 'to wear' sends out positive associations and refers to a competent user who radiates confidence due to his fashion item. The verb 'to carry' is more neutral and refers purely to the product's functional aspects. As such, 'to carry' only reaches the usability level, whereas 'to wear' extends to the personal level, delivering feelings of pride that will positively influence the users social image and well-being.

Design discourse employs the term 'user' to refer to the person who interacts with the product in its phase of use. The connotation can also be stretched towards 'the wearer', 'the consumer' or even 'bystanders'. Throughout the book we primarily adopt the terms 'users' and 'wearers' and they never refer to bystanders. Bystanders are those who interact with the user or wearer in the immediate situation and often in a visual way.

The term 'user' places a strong focus on product use and functional aspects. However, as described above, we intend to go further. By adopting the term 'wearer', when appropriate, we acknowledge the social and fashion dimension. Fashion is a strong social phenomenon and expresses individual and cultural aspirations. When appropriate, we will therefore adopt the term 'wearer' for products that can actually be worn: dust masks, prosthetics, helmets, etc. When conveying generic information we will employ 'user', in order to conform to design literature.

1.2. The aim of this work – Questions and methods

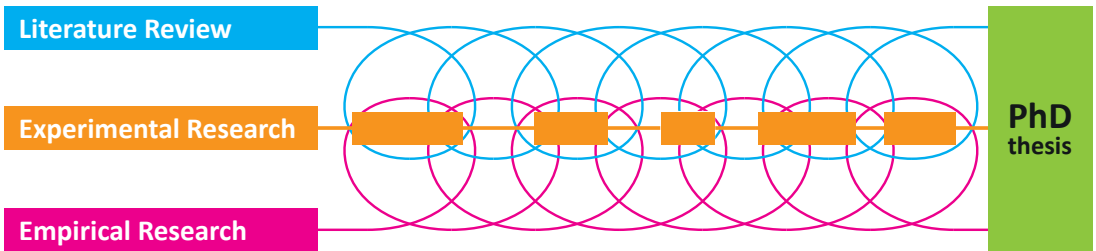
Our research has three fundamental aspirations or goals: to understand, to measure, and to manage the product-related stigma process. The phenomenon of product-related stigma will be identified and explored in a realistic interaction context. Theory and models clarify and interpret the unfolding of the process, and suggest strategies to alleviate the effects of the product-related stigma process. To enable this research we developed methods, tools and models.

Our research questions were answered through efforts in three intertwining areas, each with its respective methods: a literature review, experimental research, and empirical research (visually depicted in figure 1.3). For each research question, a combination of methods from those three areas was used and the insights and results continually cross-fertilized each other. In figure 1.3 we represent the experimental research as our central track. On this track we explored the phenomenon of product-related stigma, both in the lab and in the field. Two spiral tracks continually dive into and out of the experimental research track. On one side we position the literature review track delivering theoretical insights, and on the other we locate the empirical research activities carried out with students and designers.

For the reader's sake, we chose to present our findings in a logical manner, not a chronological one. For example, the consolidation that is attained by the end of the literature review (Chapter 2) was not available when we started the experiments (Chapter 3). Additionally, the answers to the goals and questions are not exclusively conveyed in one specific chapter. Chapter 2, for example, structures the literature review and contributes to all research goals.

Towards the end of our research the empirical research track gained more importance. Our focus and reflections on the richness of the actual situation contributed to the build-up of theory and supported the continuity and efficiency of our experiments and explorations. The empirical research track delivered substantial input towards the refinement of the designer-tools, presented in Chapters 4 and 5.

Method



Goals & questions

Methods

Covered in

<p>Understanding product-related stigma: How does this process unfold? Who are the stakeholders? How can we determine pitfalls and requirements early on in the process?</p>	<ul style="list-style-type: none"> Collecting and analyzing theory and literature Designer workshops on the appraisal of product-related stigma & reflection 	<p>Chapter 4 (Chapter 2)</p>
<p>Measuring product-related stigma: Does a product elicit stigma in a specific context? Can we measure the 'degree' of stigma that is attached to a product?</p>	<ul style="list-style-type: none"> Collecting and analyzing theory and literature Observational and behavioural research techniques Database of stigma-eliciting products + analysis 	<p>Chapter 3 (Chapter 2)</p>
<p>Managing product-related stigma: Which design strategies can be used to alleviate product-related stigma and its effects?</p>	<ul style="list-style-type: none"> Collecting and analyzing theory and literature Generating design concepts with students Designer workshops on the interventions to alleviate the effects of product-related stigma & reflection 	<p>Chapter 5 (Chapter 2)</p>

Timing

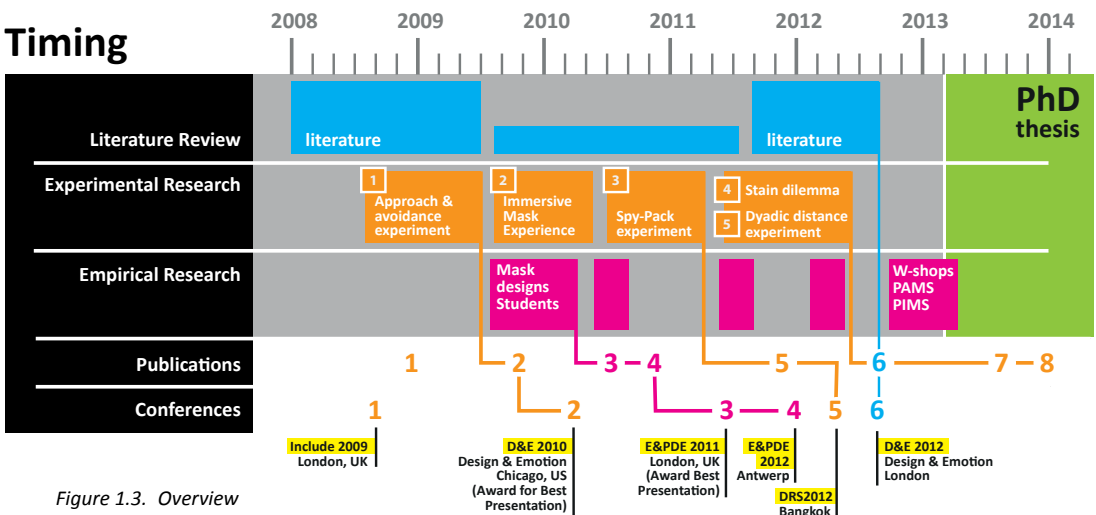


Figure 1.3. Overview of the PhD process: methods, research goals & questions, and timing.

1.2.1. Understanding product-related stigma (Chapters 2 & 4)

The research challenge

What causes product-related stigma and how can it be explained? In answer to the first part of the question, we explored the factors responsible for eliciting positive and negative experiences in people's encounters with products. The second part of the question is answered in Chapter 4, which aims to explain and operationalize how the product-related stigma process unfolds and how the various stakeholders contribute.

The resulting 'Product Appraisal Model for Stigma' (PAMS) deconstructs the product-related stigma process and exposes the different layers of meaning attribution and appraisal in human-product interactions. The PAMS is presented as a tangible designer tool. Applied to a certain product, a completed PAMS will manifest the stigma specific sensitivities, conflicts, and challenges that designers need to take into account during their design effort.

The PAMS can be interpreted as the 'unveiler' of product-related stigma, preparing the designer for the next step, in which PRS can be measured and stigma-reducing design interventions seek to 'heal' the product of its stigmatizing content.

An empathic mindset is needed to successfully apply the PAMS. This state and attitude of heightened sensitivity is especially required when designers are faced with the conception of products whose use they themselves have little experience with, as is the case for protective, assistive or medical devices. In Chapter 2, we briefly propose how improved designer empathy and direct contact with users and their social reality may enhance cognitive and emotional processing at higher needs and intelligence levels.

The method

Literature review in the fields of social psychology and design research was used to reveal relevant theories and models that could expose the causes and effects of product-related stigma. These theories and models were adapted and operationalized for designers and aim at gaining a deeper understanding of the product-related stigma process. The underpinning of our research is set out in Chapter 2 where the identity threat model of Major (2005) is used as a stepping-stone to structure the stigmatization process.

We selected the Appraisal Theory of Desmet and Hekkert (2007) to provide the cornerstone of our first operational model. The Appraisal Theory links user experiences and evaluations to objects and contexts. It distinguishes three types of appraisal and relates them to three product stimulus components.

The PAMS is an extension of the Appraisal theory. The PAMS reaches beyond the product user and his or her product and introduces two additional stakeholders that are crucial in the assessment of product-related stigma: the appraisals of bystanders and those of the cultural context. As such, the PAMS invites designers to navigate through the types of product-meaning attribution, as appraised by three context levels or stakeholders: users, bystanders, and culture. Their appraisals are directed towards three product stimulus components: product perception, product use, and the consequences of product use. Matching these factors resulted in 27 questions to which the answers are gathered in three matrices. The questions were inspired by the Appraisal Theory (Desmet and Hekkert, 2007), adapted through literature, and derived from empirical and experimental findings. Further selection and refinement was accomplished in two designer workshops at the University of Antwerp and the Technical University of Delft.

1.2.2. Measuring product-related stigma (Chapter 3)

The research challenge

Let us return to our initial example: imagine that you are walking through the local shopping mall, wearing a dust mask. Apart from your own discomfort, you might also experience social unease in the people around you. As they approach, you might observe their anxiety, laughs, or frowns. As they pass, you might feel how they keep their distance from you. Reactions elicited by these unprepared encounters are at the basis of our second set of research questions.

- Does the use of protective, assistive, or medical devices engender unfavorable reactions in bystanders, amounting to product-related stigma?
- Can a designer determine if a product or design concept is ‘burdened’ with product-related stigma, and if so, can it be quantified?

In answer to these questions we searched for techniques that could objectively assess the ‘degree’ of product-related stigma that is attached to existing products as well as new concepts. Designers will not only value this insight during their creative process, it can also help them to justify design decisions with quantitative data. Quantitative measuring of PRS can assist in assessing which product properties have influenced certain reactions and to what extent subsequent improvements have been successful.

The method

The subjective appraisals of both users and bystanders are responsible for the wide variety of emotional and behavioral responses to product-related stigma. It was our aim to rule out this subjectivity and introduce a technique

that would enable designers to objectively evaluate their design interventions. Prior to our exploration in behavioral research we considered the use of questionnaires, self-report and physiological measurement techniques.

Social psychology and design research suggest several parameters that could be appropriate to operationalize product-related stigma. The literature describes physiological parameters quantifying the anxiety or stress accompanying the use of a stigma-related product, such as: cardiovascular responses (heart rate), galvanic skin response, blood pressure, social distance, visual attention and facial expression.

To decide which techniques are appropriate for our research, we specified the following requirements:

- The technique has to register and quantify the reactions of bystanders
- The technique has to capture the intensity of the unprepared encounter between a bystander and the user of a stigma-eliciting product.
- The technique is to be affordable and straightforward, allowing it to be used by design teams.

Early on in our research it became apparent that a focus on the thoughts and feelings of the product user might not be the most efficient strategy to determine the 'degree' of product-related stigma. Our experimental explorations target the overt reactions of bystanders, a specific form of public or social stigma that remained the focus throughout all our experiments and explorations.

As we progressed in our explorations and experiments we moved from lab conditions towards controlled indoor environments and finally real life outdoor encounters.

In our search for a straightforward technique that could be used by designers, we eliminated setups that introduced individual subjectivity, substantial medical know-how or complex measuring devices on participants. The parameters of visual attention and interpersonal distance did present enough potential, so they were explored in the five experiments that are described in Chapter 3.

Experimental explorations and experiments

- Our first exploration was executed at the social psychology department of the University of Padua, Italy. The **'Approach and Avoidance experiment'** explores the initial reflex reactions of bystanders that occur within the first second. The experiment was set in a lab environment and captures reflex reactions towards pictures of people with or without dust masks, presented on a screen.
- The second exploration was aimed at investigating the actual unprepared encounter between mask users and bystanders in a real-life setting. During the **'Immersive Mask experience'** 60 design student were sent out into the city to walk around wearing white dust masks. Their experiences and reports on the behavioral reactions of bystanders delivered important initial insights and clearly demonstrated that dust-masks are easily perceived and do engender reactions in bystanders.
- The previous exploration evidenced that the reactions of bystanders were observed and 'felt' by all participants and that they distressed them. The biggest contribution of the **'Spy Pack exploration'** is that it allowed us to observe and study a real-life and unprepared encounter in a controlled indoor environment. By analyzing the images of eight cameras we investigated the staring and walking behavior of passers-by and evaluated parameters such as moment of visual perception, interpersonal distance and 'looking back' for their relevance. A useful result of the 'Spy Pack exploration' was the confirmation that at least two parameters proved to be comprehensive, measurable and valuable for further exploration: the moment of visual perception and the interpersonal distance.
- The fourth experiment was called the **'Dyadic Distance experiment'** and it focused on deviations in the walking path of passers-by, quantified by the parameter of interpersonal distance. The experiment was set in real-life outdoor situations, and accurately measured the shortest interpersonal distance between a passer-by and a mask wearer, by means of an ultrasonic sensor.
- The final experiment was called **'The Stain Dilemma experiment'** and was a simplified variation of the 'Dyadic Distance experiment'. This experiment required a minimal setup and focused on the walking path of the bystanders as they pass the mask wearer. By placing a physical obstruction in their walking path, passers-by are forced to walk around the obstruction or in between the obstruction and the mask wearer. The researcher only had to count the instances in which these reactions occur.

1.2.3. Managing product-related stigma (Chapter 5)

The research challenge

How can we make sure that designers take on their semantic responsibility and manage the product-related stigma process? After the PAMS has exposed the stigma-specific design challenges, designers can be inspired with design recommendations to alleviate the effects of product-related stigma.

The 'Product Intervention Model for Stigma' (PIMS) comprises a set of 17 stigma-alleviating design interventions that have grown and matured as our research progressed.

The design interventions are grouped into three 'intervention' areas. The interventions not only impact the product, but also empower the user or reshape societal and cultural factors. A first set of 13 interventions encourages the designer to reshape the meaning of a product away from negative associations. A second set of interventions stretches the solution space towards user empowerment. Two interventions inspire designers to emancipate users from their position of passive victims to active challengers. In a final area, we situate two interventions that enable the designer to reshape the social and cultural contexts in which products are launched and perceived. The two interventions are not primarily focused on the product, but they group all efforts that produce fundamental changes in cultural attitudes and beliefs.

The PIMS professes to be an operational and valid framework of design interventions. It complements existing design-ideation tools and can be applied to a broad range of stigma-sensitive products. The design interventions are presented in a compact and consistent manner, facilitating overview and comparison. To address the requirements of the creative process, the PIMS interventions are presented as a card set, specifically aimed at designers.

The method

The integration of the literature review with experimental and empirical findings provided the basis for the PIMS interventions. We limited our tool to 17 interventions after collecting and analyzing a database of over 300 stigma-eliciting products and concepts. The database comprises existing products, conceptual product proposals, as well as concepts conceived during experimental and educational workshops. We started by comparing effective and less or non-effective stigma-related design solutions. The stigma-alleviating aspects that arose were translated into an initial set of promising design interventions. During the course of our research this set expanded up to the moment where all new product cases could be classified within a specific strategy. The resulting set was compacted into 17

manageable and promising interventions that we deemed relevant for our destigmatizing design approach. The comprehensibility and manageability of the interventions was refined in two designer workshops at the University of Antwerp and the Technical University of Delft.

The various interventions are presented in a compact and consistent style, facilitating overview and comparison. Additionally, they intend to inspire designers and suggest a general design direction. We chose to exemplify the various interventions with product examples that will stick to the visual mind of designers

1.3. How to read this book

Although it is possible to scan through the book and gather useful insights, each chapter builds on the concepts that we previously covered. The various chapters will present the consolidated knowledge and findings for the three ingredients we discussed earlier. We suggest that you read the book from start to finish. This is a short summary of the chapters that are covered:

Chapter 1 - Introduction

In Chapter 1, we introduce our research topic and its concepts. We explain the concept of product-related stigma and the three challenges that our PhD research addresses.

Chapter 2 – Literature Review

Chapter 2 discusses the concept of stigma in social psychology and covers the literature that was used for our theory building. By the end of this chapter, the reader should understand the basic concepts of social stigma and its parallels in design literature.

Chapter 3 – Experimental Studies

In Chapter 3 we examine how we can ‘measure’ product-related stigma. In five experiments we explore how we can interpret and ‘quantify’ the behavioral reactions of bystanders. To conclude, this chapter summarizes the consolidated findings from our experimental and empirical research and provides suggestions for further exploration.

Chapter 4 – PAMS: context and appraisal

This chapter provides a better understanding of the importance of the product context and the appraisals of those who interact with the product. We introduce the ‘Product Appraisal Model for Stigma’ (PAMS), a framework for addressing the various layers of appraisal by the people that take part in a human-product interaction. Based on existing models, the PAMS model delivers a set of stigma-specific design challenges that should complement the design brief of a stigma-sensitive design challenge.

Chapter 5 – PIMS: design interventions

Chapter 5 features the ‘Product Intervention Model for Stigma’ (PIMS), a set of 17 design interventions that can be used to alleviate the effects of product-related stigma. This chapter will exemplify how stigma-free product design has been successfully applied across different products and design concepts.

How to read the book as a designer:

The operational tools PAMS and PIMS are presented in Chapters 4 and 5

If you are interested in the experimental approach that designers can use, we suggest focusing on experiments 2 (Immersive Experience), 4 (Dyadic Distance experiment) and 5 (Stain Dilemma) in Chapter 3. These experiments can help to rank or compare design proposals. We recommend to execute them in this order

- Immersive Experience: Go out, experience and observe
- Stain Dilemma: A straightforward experiment to gather quantitative data
- Dyadic Distance: If more accurate data are required.

CHAPTER 2 LITERATURE REVIEW

This chapter presents the literature that structured our theory building and inspired our experimental and empirical research. Because product-related stigma occurs in social contexts involving a stigma-eliciting product, its user and those who surround him or her, we reviewed literature in design research as well as social psychology. Both fields have contributed vital insights into what influences stigma, as well as factors and models for our stigma-free design approach.

As it is our aim to contribute to the design literature on products and stigma, we initiated our search in design literature, more specifically in Inclusive Design, Product Semantics and Human-Centered Design. Although mainly anecdotal, the term 'stigma' does pop up in design literature. In the field of Inclusive Design referral to the term is most common, and it complements the field's principle aim of developing products that can be used equally well by people of any age or ability. The field of Human-Centered Design aspires positive human-product experiences and mainly focuses on the pleasurable side of design. Although our own aspiration lie beyond the relief of negative experiences, this field did provide interesting models and insights to elevate products above the alleviation of social discomfort.

In the second part of our literature review we explain why we choose the term 'stigma' and how we have delineate it in our research. Although the term 'stigma' touches on several disciplines, it is a broadly studied concept in social psychology. The experience of stigma is common among human beings (Crandall, 2000). Everybody has experienced some degree of stigmatization at some point in their lives, be it a feeling of isolation, alienation, exclusion, or embarrassment resulting from being different in some way. 'Being different' can be linked to various conditions, including race, age, gender, bodily deformations, and accompanying people as well as products. Even minor imperfections such as a messy hairdo that unwillingly attracts attention could be the cause of social unease. In our review we searched for the areas in which social psychology could contribute to our understanding of product-related stigma. Next to providing insights into the process of stigma, the social psychology literature also reports on research on the acceptance of assistive devices.

A review of both research fields clearly revealed two actors who shape the process of product-related stigma: one that 'receives' the stigma or the stigmatized, and one who 'attributes' the stigma or the stigmatizer. We structured the literature accordingly and zoom in on the perceptive, attitudinal and behavioral elements that impact these two actors.

In paragraph 2.5 we switch our focus towards the designer. In order to understand and manage the product-related stigma process, designers need to be mindful of the experiences of both the stigmatizer and the stigmatized. An empathic understanding and the right mindset will enable designers to understand, communicate and act properly.

2.1. Situating ‘Product-Related Stigma’ in design literature

Product-related stigma considers stigma-charged interactions and conflicts between products, users, bystanders and cultural factors. The design literature approaches these specific interactions from several perspectives. In the next paragraphs we present the areas in design literature that either conceptualizes or provide grips for balancing these product-related stigma interactions.

We start by investigating the world of Inclusive Design. This area provided us with valuable product cases and design research. In their quest to provide products that support the whole population in maintaining independence and extending life quality, the area of Inclusive Design shares our ethical point of view. Researchers in this field do touch on the subject of product-related stigma, but with a special focus on universally usable products, environments, and services. However, the insights of the Inclusive Design researchers often coincided with or complemented our research.

The next area we reviewed is the area of Product Semantics, an area that we borrowed concepts from in order to think and write about product meaning.

Attempts to structure human-product interactions into theoretical frameworks have been made in the area of Human-Centered Design or Design and Emotion.

When using the term ‘design research’ we do not exclusively refer to research that aims at developing domain-specific knowledge within any professional field of design. The concept of design research extends beyond these boundaries and includes research activities that are embedded within the design process itself. As such, ‘design research’ does not only involve the research that designers conduct, but all research activities that strive to understand and enhance design processes and practices.

2.1.1. Inclusive Design

A great deal of literature related to the topic of product-related stigma can be found in the areas of Inclusive or Universal Design, which are often considered to be interchangeable approaches. Product-related stigma mainly occurs to people who are forced to use products which are neglected by designers. Target groups that depend on assistive or medical devices, like the elderly or disabled, for example, are often overlooked by popular design practice.

By adopting the principles of Inclusive Design, a term typically used in the United Kingdom (Goodman, Dong, & Langdon, 2006), practitioners strive for ‘inclusiveness’ in their design solutions. Inclusive Design strives to maximize the market potential of products by ensuring that a maximum amount of

people can use them. Inclusive Design takes into account the changing nature of ageing, disability and the technological skills necessary to participate fully in modern society. Inclusive Design principles aim at developing environments, services, information technology and products that can be used equally well by people of any age or ability.

There are many arguments in favour of adopting inclusive design. From an ethical point of view, providing products that support the whole population in maintaining independence and extending quality life is clearly a moral imperative. Socially we can argue that by adopting these principles, the designer takes into account the changing nature of ageing, disability and technological skills necessary to participate fully in modern society.

There is even a self-interest argument, by adopting inclusive design practices now; we not only help the current older generation. Ultimately, we all benefit, as the products we need when we get older will already be available. Roger Coleman beautifully coined the concept of 'designing for our future selves'. (Coleman, 1993)

Successful Inclusive Design contends that the single most important component in any system is the user. Apart from their aim to provide a more accessible or universal design solution, they also wish to go beyond an understanding of the users' functional needs. As such, the field of Inclusive Design shares a mutual goal with our research: to conceive products that deliver the convenience of an accessibly and universally designed creation without the perceived stigma.

Keates and Clarkson (2004) stress that Inclusive Design, like stigma-free design, is not a bolt-on activity that can be addressed at the end of the design process. Instead, it needs to be a core activity, as tightly integrated in the design as quality is. To know your users, their needs and aspirations, and to provide a design solution for them is not only vital for successful inclusive design, but also for good design in general. However, most designers never even get to meet a user, let alone that they get to know them. Understanding and empathizing with the user is a vital factor and we will address this topic in more detail at the end of this chapter.

The work of Patricia Moore has been a great inspiration for our research. With the social project that Moore (1985) describes in her book *Disguised*, she wanted to get a better understanding of what it means to be a senior citizen. Her project became an excellent example of how bad product design (including buildings, vehicles and transport infrastructure) can exclude people with age-related impairments. Aged 26, Patricia Moore was working as an industrial designer at the New York firm Raymond Loewy. From 1979 to 1982, she dressed up as an elderly lady and experienced the day-to-day reality of how life is for an 80-year-old woman. Her disguise went beyond superficial make-up and included glasses that blurred her vision, a brace, wrapped

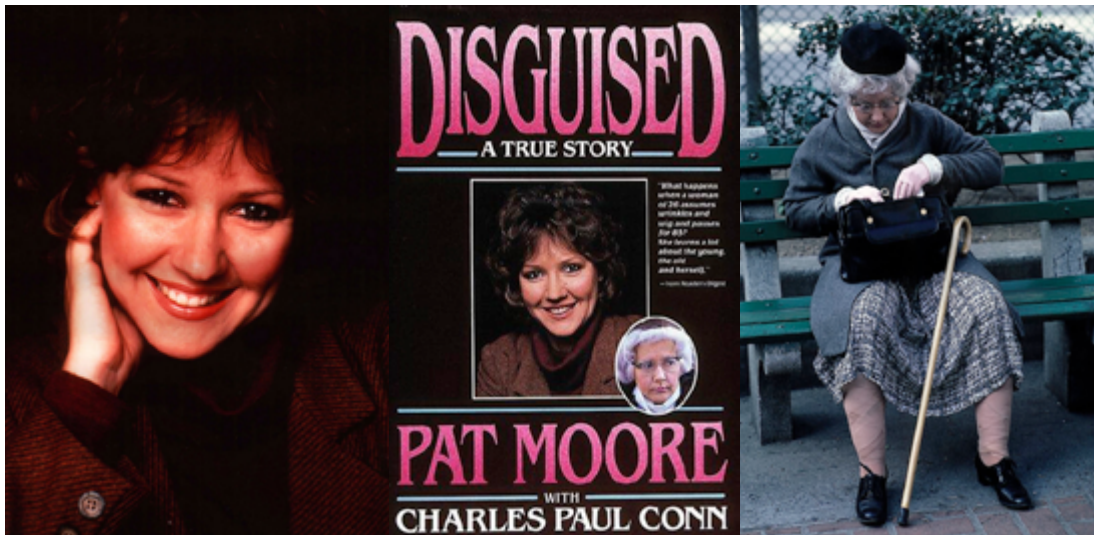


Figure 2.1. Patricia Moore as a young designer and disguised as an 80-year-old lady.

bandages around her torso (to bring about a hunched over posture), plugged up ears, and uneven shoes that forced her to walk with a stick. She took on these disguises to attract social stigma, which made her the first designer to extensively discuss stigma and social rejection.

Her relationship with bystander culture was incredibly powerful. People beat her up, didn't help her, insulted her or, to the contrary, were very friendly. Her adventures were elaborate design research experiments, involving stigma and bystander reactions. Her experiences, good and bad, were all based on the reactions of bystanders. As such she provided proof of the power and significance of bystanders reactions in human-product interactions. Her work became an extra motivation for our own research focus on bystander reactions.

Universal design emerged from the field of architecture in the late 1960s and was coined by the architect Ronald L. Mace. Universal design started as an approach in which the design of the built environment should be as 'barrier-free' as possible, enabling the widest possible spectrum of people to access it. The available guidance for universal architectural design far surpasses what is available for universal product design (McAdams & Kostovic, 2011).

Later on, the concept of universal design was broadened by The Centre for Universal Design at North Carolina State University as "the design of products to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Mace, 1985). Typically, accessible design tends to result in separate facilities for individuals with disabilities (e.g., ramps and toilet stalls) while universal design provides a single solution accommodating all people. Ideally, application of universal design principles would result in aesthetically pleasing devices or solutions that are seamless in design (Covington, 1998).

Parallel research tracks in the field of Inclusive Design

Various design researchers and practitioners in the field of Inclusive Design have contributed to our understanding of product-related stigma.

The book 'Design meets disability', written by Graham Pullin (2009), has been an inspiration from the beginning. As a medical engineer and design consultant, the author presents a thorough exploration of the cultural, stylistic and fashion trends that influence the acceptance of objects that overcome 'disability'. In the first section of the book 'Initial Tensions', Pullin addresses the tensions between the medical community and the design community. The second section 'Meetings with Designers' presents a series of interviews and (imaginary and real) pairings of designers with product for impairment.

In her doctoral research, Susanne Jacobsen addresses how young adults with physical disabilities experience the use of assistive products, and the assumed stigma associated with these products. In one article, she explored means for overcoming the stigma associated with assistive devices (Jacobson 2010). She derived three categories: disguising the stigmatizing features, turning attention from the stigmatizing features to other features, and transforming stigmatizing features into features that convey prestige or status.

Renato Bispo and Vasco Branco (2008-2009), two Portuguese design researchers, wrote a series of papers related to the understanding of stigma associated with products and the repercussions of their use on the self-image of their users. Bispo and Branco suggest the use of contradictory symbols to manipulate the stigmatizing dimension of objects. These contradictory symbolic elements may unsettle preconceived perceptions of disability and generate a new social image for people with disability.

Glyn Stockton (2009) wrote a paper on stigma and how designers can address negative associations in product design. Stockton briefly documented the following methods of de-stigmatisation through: education, technology, the application of mainstream characteristics, the adoption of stigmatised characteristics, functional desire, alteration of ritual, disassociation, and association.

2.1.2. Product Semantics

Complementary to the field of Inclusive Design, and concerned with the development of the universally usable product, the field of Product Semantics studies the meaning engendered by that same product. Product Semantics poses that products are carriers of meaning and it provided us with the necessary concepts to communicate about that meaning.

Product Semantics is the field in which designers strive to gain an understanding of the ways in which visible product features can communicate additional meaning to users and their surroundings. These features can relate to the product's looks, certain usage rituals or even cultural product stereotypes. The sum of these intentional and unintentional 'meaning' features are also referred to as the semantic qualities of a product. A product that is endowed with semantic qualities should be understandable, intuitive and engaging. Semantic product qualities can inform a user and those around him about the products':

- **Identity:** what is the object (i.e. a respiratory mask – visually recognizable as such)
- **Character:** what kind of mask is it (i.e. a half face mask or a full-face mask)
- **Affordance:** what benefits does the object give (afford) me? (i.e. protection from pollutants)
- **Operation:** how do I use it? (proper use can be clearly communicated within the product shape; no need for labels of instructions for example.)

A guide cane for blind people for example is an assistive product, which has clear benefits and operational qualities for its user. Its primary function is to improve user mobility by enabling the detection of objects or obstacles in the walking path (affordance). An important semantic quality of the blind cane is to alert others of the bearer's visual impairment. By virtue of its contrasting white color and universally recognizable shape (identity and character), it bears important semantic qualities that identify its user and radiate outwards towards its social surroundings.

Wikström (1996) confirms this insight and states that products tell us something about themselves and in certain cases also about the people who own them. Through its design and function, a product expresses values. Bystanders interpret and assess the importance of these values in relation to a social context, resulting in acceptance or rejection, liking or disliking. Through their semantic content and expression products can create positive or negative perceptions, emotions, values and associations in individual users or observing bystanders. These statements confirm that an understanding of the semantic qualities of a product must go beyond its 'styling' and must relate to the relationship between, on the one hand, the user and the product, and, on the other, the importance that objects assume in their social context.

In this overall process of meaning giving, Umberto Eco (1978) distinguishes between the process of communication and that of signification for any given product. The communication process relates to the meaning that is 'inserted' by the designer with the intention to transmit a specific message. The signification process refers to the significance that others give to that product. It can be interpreted as a cultural process uncontrolled by the designer. It is crucial for designers to understand that products always communicate and can never be contextually neutral.

Monö (1997) defines four semantic functions that products can communicate through their 'gestalt' (i.e. the totality of colour, material, surface structure, taste, sound, appearance and function as a whole). These semantic functions provide the designer with the possibility to communicate a clear message through the product and make it comprehensible within a certain context:

- **to describe:** the product gestalt can describe the product's purpose and function, i.e. define its task, way of use, handling, etc.;
- **to express:** the product gestalt can express product properties, such as value, quality, lightness, softness, etc.;
- **to signal:** the product gestalt can trigger users to react in a specific way, for example to be careful and to be precise in their work;
- **to identify:** the product gestalt can identify:
 - product purpose, i.e. similarity, origin, nature and product area;
 - connection with a system, brand, product family, product range, etc.

We can conclude that our research is rooted in the field of Product Semantics, which provides us with the concepts that enable us to think and write about product meaning. However, Product Semantics examines human-product interactions from the perspective of the product. The last field of the design literature that we explored was that of Human-Centered Design, an area where the user and his or her experiences play a central role.

2.1.3. Human-Centered Design / Design and Emotion

It is a small step from Product Semantics to its counterpart, which is concerned with human-product experiences and the emotional content of design. In recent years the emotional impact of products on the positive side of the acceptance spectrum has been widely studied and the aim of designers in this field has been described as 'designing pleasurable products', 'emotional design' or 'experience design'.

Contemporary product development goes beyond finding innovative ideas and designing well-shaped functional products. Consumption societies have become oversaturated markets. According to the theory of product phases (Eger, 2004) and as defined in Maslow's hierarchy of needs (Maslow, 1970), the greater part of the population in western societies have their basic needs fulfilled. Affective, emotional, social and other abstract product attributes are becoming more important.

Marzano (1998) states that products can be seen as living objects with which people have relationships. Products are objects that can make people happy or angry, proud or ashamed, secure or anxious. Products can empower, infuriate or delight - they have personality. People also have personalities, accompanied by hopes, fears, dreams and aspirations. These are likely to affect the way that people respond to and interact with products.

The focus on Human-Centered Design as a discipline within the field of product development, anticipates on these changing user-product attitudes. Redström (2006) aptly states: "If design used to be a matter of physical form, its subject the material object, it now increasingly seems to be about users and their experiences". Different authors point to complementing ideas on how to implement affect and emotion in product design (see figure 2.2).

Norman (2004) states that the emotional side of design might be more critical to a product's success than its practical elements. According to him, a user-product interaction demonstrates three emotional processing levels: the visceral level, the behavioral level and the reflective level. The visceral level encompasses the first instinctive reaction to visual and other sensory aspects of a product. It involves the sensory system and has no connection with a reflection on the situation or interaction with the product. The second level of cognitive processing is the behavioral level. This level is related to the use of products and covers all interactions between the product and the user. The reflective level can be seen as what the person 'thinks' of an object, and is therefore strongly affected by conscious considerations and reflections on past experiences. Although products should perform well on all three levels, our research focuses on the visceral and reflective processing levels in the human-product interaction.

Jordan (1997), who is best known for his pleasure theory, refers to three types of product benefits: hedonic benefits or sensory and aesthetic pleasures, emotional benefits or effects on users' emotions, and practical benefits that result from the completion of tasks. His 'four-pleasures' model distinguishes four 'pleasures' related to the use or possession of a product: physio-pleasure, pleasures evoked by one or more of the five senses; psycho-pleasure, related to people's cognitive and emotional reactions; socio-pleasure, related to the social relationships and communication that a product enables or disables; and ideo-pleasures, related to people's values, tastes and aspirations. The desire to avoid stigmatization can be interpreted as a 'social need' pleasure (Jordan, 2000).

Jordan (1996) also studies displeasure in product use. In one of his studies, users were asked to select a product that was 'displeasurable' to them. Users reported on the properties that made the product 'displeasurable' and the subsequent emotions and feelings that they aroused in them. Lack of usability, poor performance, lack of reliability and poor aesthetics were the main factors associated with 'displeasurable' products. Associated feelings aroused were annoyance/irritation, anxiety/insecurity, contempt and exasperation. It is important to understand that products themselves are not 'displeasurable'. The 'displeasurable' feelings and emotional responses associated with the human-product interaction are our primary concern. The assistive, protective and medical products addressed by our research potentially elicit these 'displeasurable' emotional responses, and as such we would like to put forward our research on 'Product Stigmaticity' as a counterpart of pleasurable design.

In the same line of thought, Desmet (2002) commented on the parallels between inter-human relationships and human-product relationships: "Just as there are different types of relationships between people, there are different types of relationships between people and products. When we use products, we experience complex social and emotional responses that are no different from the responses we experience when we interact with real people in the real world". With their appraisal theory, Desmet and Hekkert (2002) aim at understanding the process in which emotions towards products are evoked on a cognitive level. In the appraisal process, prior to the emotional reaction, people evaluate whether an object or event is beneficial or harmful to one or several of their concerns. A pleasant emotion is elicited when the stimulus is assessed as fulfilling one's concerns, and an unpleasant emotion when the stimulus is not beneficial or harmful. A particular emotion towards a product is therefore always the combination of a stimulus and the concerns and expectations of people.

Figure 2.2 illustrates similarities and differences between the various design-models that we have considered when building our theory. At the basis of most models we find factors that shape the human-product interaction. The table is broken down into two sections. The top section describes aspects

related to the product stimulus components, or the levels on which the product can impact the human-product interaction. The lower section outlines the human goals that have to be met by the product.

Analyzing the models, it soon becomes clear that various authors regard similar elements to be active in the human-product interaction process. While examining the various models and their nuances, it is important to realize that product-related stigma can impact on all levels presented in figure 2.2. Stigma can arise from any product stimulus level and can have an impact on any of the described human concerns.

This table provided us with the overview needed to select those theories that were relevant for future reference. For our future framework we searched for a model that could link the various product interaction components to human concerns, or types of human appraisal. Because it distinguishes three types of human appraisal that seamlessly link with three product stimulus components, we selected the Appraisal Theory of Desmet and Hekkert (2007) as a basis. Although other models do mention comparable aspects and terms, our most important motif for selecting the appraisal theory is the way in which it links human experiences to objects. In most design models, the stimulus components or types of appraisal only relate to the experiences of the user. In Chapter 4 we will expand the appraisal theory to include the various contexts in which the interactions can be set. To fully apprehend the human behavioral process, users (and influencing stakeholders) need to be placed in their relation and interaction with products and in relation to the ever-present context that shapes the final meaning-content of the interaction.

	Information	Value	Affordance
Aspects related to product stimulus components			
Product perspectives/ Differentiations	Aesthetics How does the product look & feel?	Function What is the product purpose? Product benefits?	Interaction How does the user interact with the product?
Product stimulus levels	Perception	Cognition	Use
Behavioral sequences Krippendorff (2006)	Sensing	Meaning	Acting
Appraisal in relation to product stimulus components (Desmet, 2002)	Non instrumental interaction component (perceptions)	Non-physical interaction component (consequences)	Instrumental interaction component (use)
Aspects related to human concerns			
Types of product benefits (Jordan, 2000)	Hedonic benefits Sensory and aesthetic pleasures	Emotional benefits Effects on user's emotions	Practical benefits Result from the completion of tasks
Appraisal in relation to human concerns (Desmet, 2002)	Sensory perception appraisal in view of human attitudes	Cognitive interpretation appraisal in view of human standards	Physical action appraisal in view of goals
Design Goals (Sanders, 1992)	Desirable Aesthetically appealing	Usable Capacity to be understood, learned & utilized	Useful Accomplishes what it was designed for
Levels of Processing (Norman, 2004)	Visceral Aesthetic and tactile qualities	Reflective Self-image, personal satisfaction, memories	Behavioral Effectiveness and ease of use

Figure 2.2. Similarities between different design models that point to complementing ideas on how to implement affect and emotion in product design.

2.2. Stigma in social psychology

Stigma is all about how people perceive one another; as such, it's a concept that belongs to the field of social psychology. As stated earlier, stigma is about labeling people as 'being different', a condition that can be linked to race, age, gender, bodily deformations, and accompanying people or products. We chose the term 'stigma' because it refers to concepts such as stereotypes and prejudice. People stereotype other people, just like products can stereotype people. Likewise, the term stigma is employed to relate to symbols or marks of shame, a quite literal link to our topic of product-related stigma.

Stigma also refers to people's interpretation of something that usually does not represent the truth. As such the term concurs with our research interest in people's subjective appreciation of product users and their stigma-eliciting products. Social psychology provides us with a vast range of experiments aimed at observing and measuring the essential components of stigma processes.

The following review documents how stigma is conceptualized and defined, examines the reasons why people are stigmatized, and concludes by introducing identity threat perspectives as they are used in social psychology.

2.2.1. Conceptualizing stigma

In the last 10 years, interest in the concept of stigma has grown throughout the social sciences and design research. Stigma is an important topic that bridges many disciplines, including sociology, clinical psychology, social psychology, and public health. In our literature review we discovered sociologists and psychologists who have expanded on the definition of stigma and added determining factors to the phenomenon of product-related stigma.

Numerous sources in the literature on stigma refer back to Goffman's definition (1963). He defined stigma as 'an attribute or a mark that is deeply discrediting'. He argues that, from a situation point of view, stigma is always set in a specific socio-societal context where stigma-attributes discriminate or discredit people and reduce their chances in life.

Goffman (1963) distinguishes three types of stigmatization, i.e. three types of attributions or 'marks' that can lead to discreditation:

- **'Tribal identities'**: e.g. race, gender, religion, nationality, etc.;
- **'Blemishes of individual character'**: e.g. mental illness, addiction, history of incarceration, etc.;
- **'Abominations of the body'**: e.g.; physical disabilities or deformities.

Closely related to these categories of stigmatizing attributes three categories of exclusion can be distinguished. In order to avoid the potential pitfalls that accompany living in group, humans have developed cognitive adaptations that cause them to exclude (stigmatize) people who possess, or are believed to possess, certain attributes. Such attributes can give rise to one of these three categories of exclusion:

- They can be a **poor partner for social exchange** (e.g., a convict);
- They might carry **parasitic infection** (e.g., a physical deformity);
- They are **member of an out-group** who can be exploited for in-group gain (Kurzban & Leary 2001; see also Neuberg et al. 2000, Park et al. 2003).

These distinctions objectively display the three 'faces' of stigma. We believe that product-related stigma can be added to this list, as it concerns situations in which products generate negative marks in relation to their user. Goffman's (1963:59) phrase "stigma symbols are contrary to prestige symbols" easily translates into "stigma-eliciting products are contrary to prestige products".

Jones et al. (1984) define stigma as a 'mark' that links a person to undesirable characteristics. If we place the term 'mark' in a design perspective and situate it in a social context, it can refer to the semantic dimension of the stigma process. The 'mark' can be seen as the product, the sign or symbol that is communicated outwards, interpreted by others, and bestowed on its user. As such the 'mark' becomes part of a person's social identity.

Crocker et al. (1998) elaborate on Goffman's theory and stress the importance of the social context. They argue that "the single defining feature of social stigma is that stigmatized individuals possess, or are believed to possess some attribute, or characteristic, that conveys a social identity that is devalued in a particular social context". Furthermore, most stigma scholars regard stigma as a social construction, i.e. a label attached by society and point to variability across time and cultures in regard to which attributes, behaviors, or groups are stigmatized (Crocker et al. 1998, Jones et al. 1984).

In all of these expansions of the stigma definition, the start of the process seems to be sensory perception. The stigma stimulus needs to be 'noticed' before any attribution or appraisal can be made. Before the product is noticed, it needs to be in the proximity of its user, in order for it to be linked to its user. For this reason we can call them body-near stigma-eliciting products. An invisible hearing aid will not attract people's attention. Product-related stigma only occurs when it is perceived by one of the senses. Visibility is an important factor in the stigma experience and the interaction alters as soon as an unfavorable product, linked to or in interaction with its user, becomes visible to bystanders. Besides vision, other senses may also be triggered. Sensory perceptions that can influence the product-related stigma process relate to the smell, feel, sound and taste of the user and/or product e.g. bad breathe, tactile feel of a prosthetic hand, or irritating product noises.

Product-related stigma has been addressed in social psychology, in relation to the use and acceptance of assistive technology. Cioffi (2002) notes that public use of assistive devices activates cognitive, social, and motivational forces that align a person's self-views with those of others. Apart from the impact on its surroundings, stigmatized users can be confronted with a heightened sense of attention and evaluation engendered by the apparent use of their stigma-eliciting product. People who feel that they are under greater scrutiny in social settings may feel that their behavior is more public and that it potentially contrasts with strongly held collectivist cultural values. This collectivism may be particularly problematic for Euro-Americans who typically attach great value on independence and individualism (Cioffi, 2002).

This particular process of stigmatization can be exemplified with assistive technology usage by people with acquired disabilities later in life, often resulting in the abandonment of such devices (Brickfield, 1984; Luborsky, 1993; Zimmer & Chappell, 1999). For example, elderly people with disabilities may choose not to use assistive technology that is not routinely used by the general population, such as wheelchairs or walkers. Using these products might communicate the message to others that they are vulnerable, or create social barriers (Lebbon & Boess, 1998; Luborsky, 1993; Polgar, 2002). By extension, people of any age can feel stigmatized by devices that signal loss of function (Parette, 2004).

Up until now we have situated factors, attributions or marks that feed or drive the stigma process. What happens in the next phase, when meaning is attributed to that which is seen or sensed?

Leary and Schreindorfer (1998) present an answer to our question, stating that "the essence of stigmatizing appears to be interpersonal disassociation". People are stigmatized to the extent that they possess 'characteristics' that lead others to avoid, reject, or ban them. The referenced authors in this paragraph describe the stigmatization process from the acting point of view, as a process in which those who surround the individual project the attributed characteristics.

We conclude by stating our working definition and frame the term 'stigma' as:

- ...A perceivable 'mark', often visible
- ...belonging to an individual or group of people
- ...situated in a particular social context
- ...that violates standards, and/or induces aversive emotions in others
- ...and leads to interpersonal disassociation: rejection, avoidance, ...

Positive use of stigma

Stigma and product-related stigma is not always negatively perceived by the stigmatized. Some subcultures use it to define themselves, either using the stigma as a strong affirmation of cultural identity or as a reaction against the mainstream. Subcultures that use stigma as a means of identification and unification include any community that professes to be proud of their stigmatized status, despite the negative connotation it may generally have, e.g. Gay Pride, Black Empowerment Movement, etc. The stigma that is rejected by the mainstream becomes appropriated as a badge of pride (Stockton, 2009).

In the case of product-related stigma the wearer or user of a particular stigma-eliciting product might purposely seek to be part of a stereotype that is known to provoke or agitate societal standards. From the perspective of these product users, their stigma, and the reactions they cause others to have can actually be 'enjoyed'. A heavily pierced person might be exemplary of this. Certain political or religious symbols and extreme fashion can have a comparable effect. However in this work we focus on the negative aspects of stigma.

2.2.2. Identity threat perspectives in social psychology

Out of the numerous leads that we found in social psychology literature, we focused on social stigma and its impact on a person's identity. Major's identity threat theory (2005) provides a great starting point for building our theory. The theory of Major defines stigma in terms of a person's 'social identity' and the subsequent importance of specific social contexts. The model takes a top-down perspective, from the stigmatizing bystanders and their cultural influences, towards the stigmatized user. The model helps to explain the tremendous variability across people, groups, and situations in responding to stigma. Additionally, the identity threat theory of Major (2005) reveals parallel context approaches in the social sciences that complement design research literature. For all of these reasons, Major's identity threat model will be used as a stepping-stone to organize and review recent literature on stigma.

Figure 2.3 exposes the different phases and elements of a social stigma and its impact on an individual, describing the phenomena of stigma from an insider's perspective. Major's model demonstrates that the possession of a consensually devalued social identity (a stigma) increases people's exposure to potentially stressful situations which can threaten the value of their identity. As depicted in figure 2.3, the process starts from the situational input variables that are imposed on individuals (A, B, and C), followed by how they appraise that situation (box D), how they respond to the social stigma (Boxes E and F); and the possible outcomes it has on them (box G).

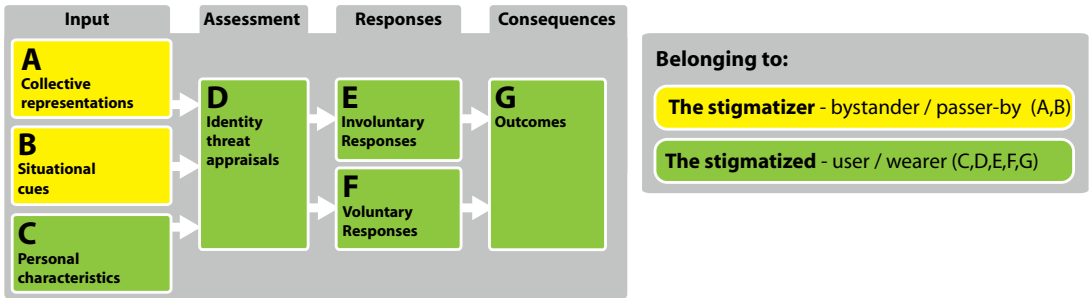


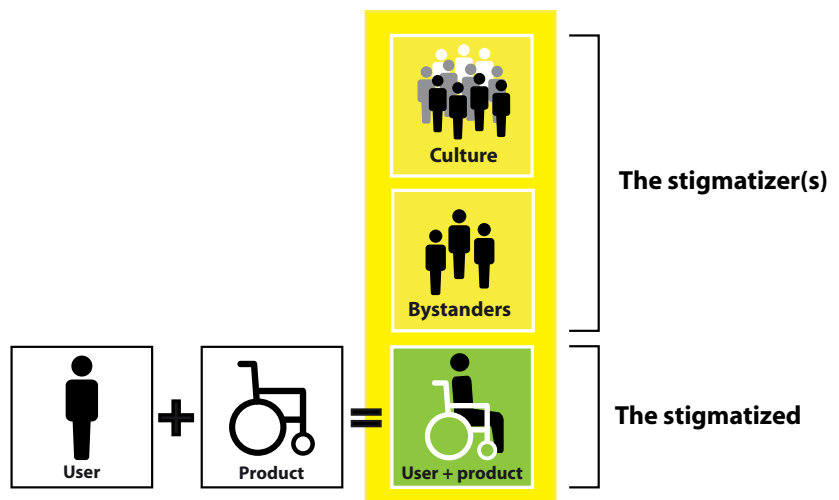
Figure 2.3. The different phases of a social stigma process and its impact on the individual's identity. The elements belonging to the stigmatizer are marked in yellow, those belonging to the stigmatized in green. (Adapted from Major (2005,) the identity threat model)

Although it is not depicted, this model is recursive. Involuntary and voluntary responses to identity threat may provide feedback that affects objective circumstances as well as subjective appraisals of those circumstances. These may reduce or worsen the effects of stigma.

In figures 2.3 and 2.4 we marked elements in green and yellow. The yellow elements belong to the realm of the stigmatizer. They are situated on the input side of the model and are 'projected' onto the stigmatized. The green elements in the model all refer to the stigmatized, in our case the product user or wearer.

Note that a similar model could be drawn depicting the identity threats of the bystanders that are present in the interaction. We will return to this insight when we characterize the various types of appraisal. In the next paragraphs we glance over the model from the perspective of the product user, the stigmatized. We will expand on certain elements in the model and include aspects that relate to the product.

Figure 2.4. Schematic representation of the unprepared encounter that we target in our research. The elements on the right depict the contextual elements present in the immediate situation. The situation comprises four contextual elements: the user, the product, bystanders, and culture.



Input variables

Major (2005) defines three context specific input factors that potentially lead to an identity threatening or stigmatizing situation (boxes A, B and C in figure 2.3). These input variables will determine whether a person will judge a situation to be socially threatening.

- **Collective representations** (box A) are shared cultural understandings and beliefs. They include how people of a specific social group think about themselves in their society. Collective representations can also apply to symbols or products that have a commonly shared meaning for members of a social group or culture. Because they are widely known and shared in the culture, and among the stigmatized, collective representations may create what Claude Steele (1997) calls “a threat in the air”. They can affect the behavior of the stigmatized in the absence of obvious forms of discriminatory behavior on the part of others, and even when no other person is present in the immediate situation (see Crocker, 1998, for a similar line of reasoning).
- **Immediate situational cues** (box B) are structured situations that signal that one is at risk of being devalued, negatively stereotyped or discriminated against because of one’s social identity. These cues are often provided by people who are present in the immediate social interaction, such as groups, bystanders and passers-by. They can range from blatant remarks or deviant behavior to subtle behavioral or attitudinal responses.
- **Personal characteristics** (box C). Personal characteristics strongly influence how situations are perceived and appraised by the individual. These personal characteristics are shaped by the individual’s past experience, through exposure and understanding. They include aspects such as personality, background, individual norms and values, skills, etc. Influencing factors include:
 - what individuals think most bystanders think about them and their product;
 - how individuals believe society views them personally or because they use or possess a product;
 - the stereotype awareness: how individuals recognize the general public’s negative view on them and their product;
 - the stereotype agreement: how individuals endorse the same stereotypes perceived to be common in the general public.

Assessment / Appraisal

Identity threat (box D) results when individuals appraise the demands from the input variables as potentially harmful to their social identity, and as exceeding their resources to cope with those demands. The appraisal results from an interaction between the input variables mentioned in the previous paragraph:

- The perceived cues in the immediate situation. These cues can be affective (human related) or semantic (product related).
- The collective representations that the individual brings to that situation.
- The individual's personal characteristics.

The stigmatized is not always consciously aware of this phase, i.e. the appraisal process can be automatic, nonverbal, instantaneous, and occur outside of consciousness (Smith 1991).

Responses

When a situation is appraised as harmful, the stigmatized can respond in two ways. Involuntary responses (box E) are stress, anxiety, increased vigilance, and working memory load. The stigmatized can also react with voluntary responses (box F), such as coping efforts. With these coping efforts the stigmatized actively responds to the stigma and attempts to overcome it.

Outcomes

Both responses are followed by the long-term outcomes (box G) of those responses. Important outcomes of a product-related stigmatization process can be lowered self-esteem, loss of status and reduced social interaction. These could in return be reflected in physiological outcomes such as stress and increased blood pressure.

The model clearly demonstrates that stigma is a relational process involving at least two actors: one who inflicts the stigma (the stigmatizer) and one who receives the stigma (the stigmatized). The primary focus of Major's model is on the experience of the stigmatized: how they understand and interpret their stigmatization, how they cope with it, and how it affects their psychological well being, cognitive functioning, and interactions with non-stigmatized individuals. Our research does address the experiences of the stigmatized, but focuses primarily on the discrediting perceptions, attitudes and behaviors of 'the stigmatizers'. As such we focus on the input variables at the start of the stigmatization process and the appraisal or assessment of the human-product interaction.

We focus our efforts on this part of the process in an attempt to solve the product-related stigma at the (semantic) source and to make symptomatic curing or coping with stigma at the target side obsolete. By approaching the threatening input variables with the appropriate design interventions, the designer can have an impact on the product-related stigma process and lower or terminate product stigma attribution before or during the appraisal phase.

A second focus is placed on the content side. From the different types of stigma we focus on product-related stigma and not existential, sociological or physical stigma (see Goffman 1963). It is not because we narrowed our scope towards one actor and product-related stigma that we brush aside the valuable insights brought by the overall process. In the next paragraphs we describe how the perceptions, attitudes and behaviors of both the stigmatizer and stigmatized are shaped.

2.3. Stigma and ‘the stigmatized’

2.3.1. Perceptual factors experienced by the stigmatized

Perceptual are those factors that the stigmatized takes in with one of the senses. Users of a stigma-sensitive product might observe or hear overt reactions of bystanders. A laugh or a frown, audible remarks and even the physical discomfort of their surroundings. Other obvious perceptual elements that the stigmatized could be confronted with are signals that urge for a specific dress code.

The discomfort experienced when a person enters our personal space is something most people can identify with. In a conversation with a stranger, it is immediately sensed when this person is standing too close. It makes us feel uncomfortable. The same holds for a bystander who consciously maintains a distance from us that we feel is too large.

People also have the tendency to adjust their behavior around users of assistive and medical products. As noted by Brookes (1998): “Assistive devices become a signal because the sight of a person using assistive technology sends a message that this is not an ordinary person and that one needs to behave differently around this person”.

2.3.2. Meaning factors experienced by the stigmatized

When users of stigma-eliciting products are faced with overt reactions from bystanders, it touches them emotionally, resulting in feelings of embarrassment or shame, making them socially insecure. A person’s self-esteem and self-image are developed across time and through interactions with others (Crocker & Quinn, 2002). The use of a stigma-eliciting product may impact those interactions and consequently contribute to a person’s self-image. This lowered self-image can be spotted by others, leading to exclusion by those others and even to self-exclusion.

How individuals feel about themselves when using a stigma-sensitive product is intimately tied to their self-image. In return, self-image also relates to the degree to which people will reach out to others, initiate relationships, and ultimately participate or withdraw socially. When people are not involved in social relationships, it is difficult to form a sense of acceptable social behavior, possibly leading to isolation (Scherer, 2003).

Self-stigma versus public stigma

Self-stigma often begins when a person becomes aware of other people's reactions.

When a person agrees with and internalizes these undesired social reactions and stereotypes, he or she is likely to feel the pain of self-stigma. As such, self-stigma is the private face of stigma and connects with the shame, anxiety and lowered self-esteem of the stigmatized himself. Once the public or social stereotypes are internalized, self-stigma tends to affect the stigmatized in three ways (Corrigan & Watson, 2002):

- they often think that their condition is a sign of weakness or incompetence,
- they develop feelings of low self-esteem,
- they anticipate discrimination, even in the absence of overt reactions, and in order to protect themselves they often limit social interactions.

In fighting self-stigma, the stigmatized can challenge his or her assumptions about his or her capabilities and not listen to internal stereotypes.

Stigma appraisal

When people use products, they experience complex social and emotional responses that are no different from the responses they experience when interacting with real people in the real world (Desmet, 2002). The central idea of stigma appraisal is that events are appraised for their significance for one's well-being. Subsequently, the outcome of this appraisal process directs affective, cognitive, behavioral, and physiological responses to that event (Smith 1991).

Literature in social psychology refers to two types of appraisal: primary and second appraisal. To avoid the discussion about the order or importance suggested by this separation, we would like to reformulate these appraisal judgments by relating to two aspects: value and arousal. The designer can address both.

Value appraisal focuses on whether a product, event, or experience helps to achieve an individual's goals. As such, it targets the value of an object or situation for the individual. A product or situation can be good or bad, or somewhere in between.

In the case of stigma, the value appraisal can assess the demands posed by a stigmatizer. The stigmatized evaluates the extent to which these demands are perceived as self-relevant, dangerous, or effortful, and if they create uncertainty. Unconsciously users of assistive devices can appraise pleasant products or reactions as good and unpleasant products or reactions as

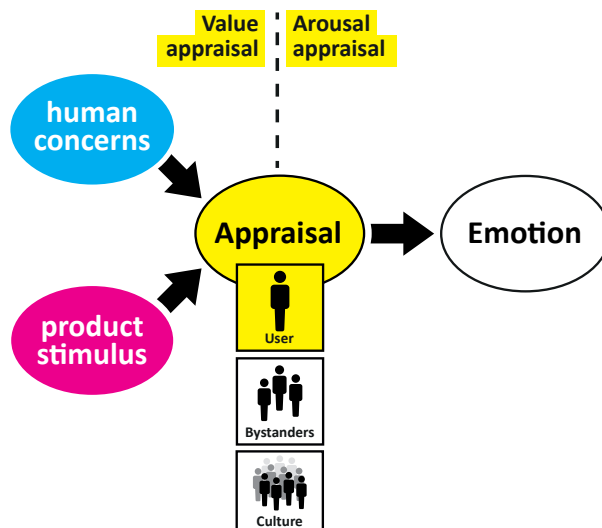
bad. Consciously however they may realize that a painful or uncomfortable assistive device, such as their prosthetic leg, is valuable and beneficial to them.

The arousal appraisal focuses on the level of ‘arousal’ that a product or situation might engender. In this process individuals assess whether they have the necessary internal and external resources to address a situation, object, or experience (Manstead & Fisher, 2001). Arousal can be described as a level of stimulation and is the physiological dimension of emotion. Our physical state (rest or relaxation versus stress or anxiety) largely determines how intensely we experience feelings of pleasure or pain (van Gorp, 2006). High levels of physical and mental stimulation amplify the value of an experience, whether it’s good or bad. Low levels of stimulation decrease the intensity. Later on in the human-product interaction, value will affect approach (i.e. pleasure) versus avoidance (i.e. pain), whereas arousal will affect how motivated we are to approach or avoid.

The appraisal theory (Desmet and Hekkert, 2007) suggests that we make appraisals when we evaluate a product against the concerns we have. The result is an emotional response (Desmet, 2002). On the negative side of the emotional spectrum, for example, threat or anxiety can be the result when the demands of a (self-relevant) situation are appraised as exceeding one’s perceived resources to meet those demands.

Additionally, appraisals of the same object or situation may elicit different emotional reactions at different times. Users of hearing aids might be disturbed and ashamed of their device during a private dinner, but appreciative of it during a rock concert, when the volume can be turned down.

Figure 2.5. The appraisal process and its focus on value and arousal.



The above-mentioned appraisals, followed by the appropriate emotions will affect how we plan to interact with products, and the perceptions and outcomes that surround those interactions (Forlizzi & Batterbee, 2004).

Our research has adopted the appraisal theory (Desmet and Hekkert, 2007) as one of its cornerstones. As suggested earlier, the appraisals of users of stigma-eliciting products can be strongly influenced by the appraisals of bystanders. Even a society or culture can have its appraisals, where collective concerns are balanced with product stimuli. In our attempt to influence the appraisal processes of all stakeholders involved, we focus our efforts on the left part of the appraisal theory, depicted in figure 2.5. By avoiding appraisals leading to negative value and enforcing positive value attribution, stigma-free product design should strive to decrease product-related stigma in the value appraisal phase.

2.3.3. Behavioral reactions of the stigmatized

As a result of a harmful product-related stigma situation, which exceeds the competence to deal with the situation, the stigmatized can exhibit voluntary or involuntary responses. Although the emotional and behavioral responses to stigma may be complex, a basic underlying dimension of both emotions and behaviors is one of approach and avoidance (Bargh, 1997; Cacioppo, Priester & Berntson, 1993; Neumann & Strack, 2000). An intimate psychological link exists between positive–negative feelings and approach–avoidance tendencies. These understandings suggest that positive emotions may stimulate users to approach a product, whereas negative emotion can be linked to the tendency to avoid a product. In paragraph 2.4.3, where the behavioral reactions of the stigmatizer are described, these reactions will be treated in more detail.

Involuntary responses to stigma

As stated earlier, important outcomes of a stigmatization process can be a distorted self-image and resulting poor self-esteem, loss of status, reduced or disrupted social interaction, person avoidance, anxiety, and depression (Crandall & Coleman, 1992). These could in return be reflected in involuntary physiological responses. Social psychologists describe these involuntary responses to the identity threat resulting from stigma as:

- Anxiety (Spencer et al. 1999) and Anxiety in the absence of self-reported anxiety (Blascovich et al. 2001, Bosson et al. 2004);
- Arousal (Ben-Zeev et al. 2004);
- Increased blood pressure (Blascovich et al. 2001);
- Identity threat consuming valuable cognitive resources (Klein & Boals 2001);
- Identity threat engendering automatic vigilance to threat-related stimuli.

The involuntary responses of the stigmatized, resulting from product-related stigma, are not explicitly addressed in our research. Many of the involuntary physical responses result from people feeling frightened, fearful, disgusted, frustrated, and nervous. As such, our stigma-free design approach does acknowledge the importance of avoiding involuntary responses such as anxiety.

Avoiding arousal however can be either beneficial or harmful. The term arousal is often used as a concept that closely relates to anxiety, attention, agitation and motivation. Products or situations that elicit high levels of arousal can be beneficial in that they increase motivation and make a user more focused. Too much arousal, however, can be overwhelming, causing a drop in performance and motivation. As such, situations or products that are valued as both unpleasant and eliciting high levels of arousal can lead to 'negative' stress, anxiety, increased blood pressure and so forth.

Voluntary responses to stigma (Coping strategies)

The stigmatized can also respond in a voluntary manner. In an active response to stigma, people can manage or cope with discreditable information about themselves. For example, a woman could perceive herself as a potential target of sexism, yet not appraise this as a threat if she feels she has more than sufficient coping resources to meet the demand (Kaiser et al. 2004a). There can be various reasons why she is able to cope with this situation: because she has the mental resources to do so, the ability to limit exposure to those who are prejudiced, a strong group identity, or she is endowed with a dispositional optimism.

As evidenced by this example, people can cope with stigma-induced identity threat in a variety of ways. Social psychology defines two categories of coping strategies:

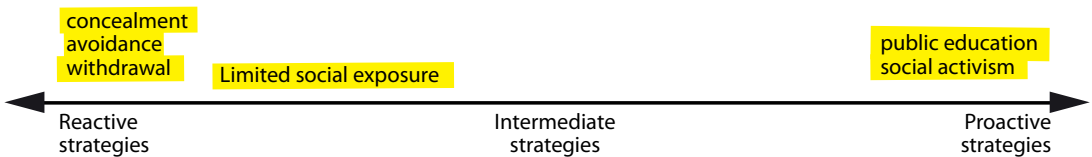
- **Primarily problem focused**, e.g. when an overweight person decides to go on a diet;
- **Primarily emotion focused**, e.g. restricting one's comparisons to others who are also overweight;
- **Some strategies may serve both goals**, e.g. to avoid wearing a bathing suit.

As voluntary responses to stigma, coping strategies are a fundamental part of our stigma-free design approach. Coping strategies can be qualified as engagement strategies and are characterized by an approach or fight motivation. They are the opposite of disengagement strategies, which reflect avoid or flight motivation (Miller 2004, Miller & Kaiser 2001). Coping strategies are initiated by the stigmatized and can help them to counter product-related stigma in ways that suit their personality. Some might choose for discretion whereas others might decide to actively and overtly challenge any negative attribution.

Concealment and avoidance versus social activism

Social psychologists (Siegel et al., 1998) have placed stigma coping strategies on a 'reactive–proactive continuum', ranging from concealment and avoidance to social activism (figure 2.6).

Reactive strategies include: concealment, avoidance or withdrawal, and selective disclosure, i.e. informing only those people who the stigmatized believes will be supportive. There are several concealment strategies that have the potential to counter product-related stigma. Stigmatized product users have several options to conceal their human-product identity. By using skin-colored prosthetics, users choose to camouflage or conceal their device. Limited social participation or social exposure in the presence of the product



is another way to avoid the stress associated with the use of a stigma-eliciting product.

Figure 2.6. *The continuum of coping strategies.*

Intermediate strategies can consist of gradual disclosure, selective affiliation, discrediting stigmatizers, and challenging moral attributions. Intermediate strategies that can counter product-related stigma include interventions that empower the stigmatized to actively challenge the stigma. With products or interventions that boost social skills, for example, the stigmatized can become visually or verbally more assertive and compensate or anticipate negative remarks.

Proactive strategies include: precautionary disclosure (i.e. telling someone before they find out from someone else), public education, and social activism. As a response to product-related stigma, proactive strategies can aim to produce fundamental changes in cultural attitudes and beliefs towards certain products or user-groups. Social activism, for example, involves confronting the stigma by challenging its validity. All social activism strategies involve some form of 'coming out' of stigmatized individuals who wish to openly denounce the stigma in the hope of changing public perceptions of the group and how the group is treated in society (Darling 2003; Gill 1997; Sayce 2000; Siegel et al. 1998; White 2001). Likewise, even individual activism can be an option. By wearing a t-shirt with a bold print, users of assistive devices can transform their identity into a positive and viable self-image. A benefit of social activism over strategies such as concealment and withdrawal is that improvements in the interaction will spill over across a variety of situations and improve the lives of other similarly stigmatized people (Major et al. 2000).

The coping strategy that a stigmatized person uses has been linked to psychological and behavioral outcomes. Link et al. (1991, 2002) found that the use of reactive and defensive coping strategies were harmful in terms of psychological well-being. In contrast, Shih (2004: 175) argues that overcoming the hardship associated with stigma can be experienced as an empowering process. This insight supports growing evidence that proactive strategies are indeed related to more positive outcomes. Jones et al. (1984: 132), for example, argue that the self-esteem of the stigmatized will increase as they come to view themselves as other than helpless, dependent, and worthless.

Peer support

Through peer support, the stigmatized can 'reach back' and help other similarly stigmatized people. Initiatives of this kind are found in mutual aid organizations, self-help groups, and informal mentoring and they are often accomplished by sharing experiences, strength, and hope with others. In this role the stigmatized can become a role model and mentor. An 'experienced' prosthetics user, for example, can help others who are less far in the process of acceptance or mobility. As such, stigmatized individuals can become recognized as providers of help and support and not merely as receivers of help.

Various coping strategies that originate from research in social psychology have proven to be inspirational for the design interventions suggested in the PIMS (Product Intervention Model for Stigma), presented in Chapter 5. Even though our destigmatizing approach often strives for emotion-focused interventions, problem-focused interventions and mixed approaches might strengthen the overall impact.

The entire continuum of coping strategies, from reactive to proactive has proven its value. The specific situational context, along with the personal or group characteristics of the stigmatized, largely determines which strategies will be most advantageous. Social psychology literature indicates that stigmatized people can use reactive and proactive strategies in different parts of their social networks at the same point in time (e.g. Schneider and Conrad 1980; Siegel et al. 1998). In the same line of thought, reactive and proactive product-related coping strategies often collaborate to achieve the desired outcome in different situations or contexts.

Furthermore, over time, the stigmatized may progress from the use of one strategy to another. For example, the stigmatized may employ reactive strategies (e.g. concealment) early on in their 'stigma career' and then move toward the use of proactive strategies, e.g. social activism, over time (Darling 2003; Fine and Asch 1988; Herman 1993; Siegel et al. 1998).

In Chapter 5 we will elaborate on this topic and present a set of design interventions inspired by reactive and proactive coping strategies and geared towards the product, its user and collective cultural influencers.

Are the outcomes as radical for product-related stigma as they are for social stigma? (Self-esteem, stress, acceptance)

A law student with a prosthetic arm (Riam Dean, 22) was forced to work in the storeroom of the clothing retailer Abercrombie & Fitch because she did not comply with the company's strict "looks policy". Miss Dean told the central London tribunal that she felt "humiliated" and "questioned her worth as a human being" before quitting her job. She said that she "wasn't the same person," adding "I didn't want to socialize. If I did go outside the family home I felt so self-conscious I would cover up and wear long cardigans despite it being summer".



Figure 2.7. Riam Dean and her prosthetic arm.

2.4. Stigma and ‘the stigmatizer’

A stigmatizer can be anybody who witnesses a human interaction involving social stigma, or a human-product interaction involving product-related stigma. The most obvious stigmatizer is the bystander or passer-by who is in the visual (perceptive) range of the stigmatized. A less personifiable stigmatizer is molded in the cultural context. The norms and values that are active in a culture will influence bystanders. Referred to as ‘collective representations’ in the literature, these norms and values affect the stigmatized, even in the physical absence of bystanders. When individuals walk around with political symbols that are viewed as culturally inappropriate, they might feel nervous, vulnerable or threatened even when no other people are around. In the next paragraphs we will address the stigmatization process as experienced by the stigmatizers. Insights were gathered from literature in social psychology and design research and they address the perceptive, meaning, and behavioral factors of the stigmatizer.

2.4.1. Perceptual factors describing the stigmatizer

Perceiving stigma as visible versus concealable

As stated earlier, visibility is an important factor in stigma experience. The stigma has to be available for perception, draw attention, and subsequently break up the coherent image of the user (Goffman 1963:59 and 124). The ‘mark’ that triggers the stigma process can be visible or concealable, a distinction that is applicable to both social stigma and product-related stigma. Goffman (1963) asserts that having a highly visible stigma, such as a large birthmark or a perceptible stigma-sensitive product, can cause a person to be ‘discredited’. In situations in which the stigma can be concealed the person is merely viewed as ‘discreditable’. A ‘discredited’ person is someone who has unjustly been rejected and suffers loss of or damage to his or her reputation. ‘Discreditable’ merely expresses the tendency to bring discredit or harm to someone’s reputation. Examples of cases in which stigma can be concealed include mental illness, HIV/AIDS and a prosthesis that can be covered by clothing. Sensory perception goes beyond visual perception and can be extended to all physical senses: hearing, taste, smell, and touch. The unfavorable sensory aspects can be allocated to both stigmatized individuals and their products: the individual’s bad odor, sweat, or irritating voice, or a product’s uncomfortable feel, scent, taste or sound. Our research addresses cases of product-related stigma in which the product is visible and clearly linked to its user. Concealment of the product will be considered as a viable strategy to reduce the stigma-eliciting impact of a product.

Perceiving stigma as achieved versus existential

Next to being visible versus concealable, a stigma can be perceived as achieved or controllable versus existential or accidental. Based on their perception and appraisal, stigmatizers may display two types of emotions and reactions when confronted with a user of a stigma-eliciting product. Either users are viewed as responsible and blameworthy for their actions, or as irresponsible, accompanied by appropriate feelings of sympathy or compassion. Based on this 'cause' of stigma, Falk (2001) differentiated two types of stigmatizing conditions: 'existential stigma' (e.g. mental illness, race, etc.) where people did not cause or have little control over the stigma; and 'achieved stigma' (e.g. obesity, AIDS, etc.) where people have brought about a stigma because of their conduct and/or because they contributed to attaining it (e.g. prisoners).

Stigma-eliciting products that can be linked to an existential stigma condition include wheelchairs, crutches, or obliged protective devices. Many of these products are used involuntarily and are often indispensable to their users. Products such as piercings, extreme fashion and political symbols, can engender an achieved stigmatic condition. In some cases the users of such products conscientiously seek to be a part of a stereotype that is known to provoke or agitate cultural standards. From the perspective of these users, their stigma, and any reactions they cause others to have might actually be 'enjoyed'.

In general, individuals in the 'achieved stigmatic condition' are perceived as more responsible and blameworthy for their condition. Consequently, bystanders are more likely to respond to them, and the group more generally, with hostility and avoidance and are less likely to pity or help them (Corrigan, Markowitz et al. 2003; Weiner et al. 1988).

Perceiving multiple stigmas

Some people are members of several stigmatized groups simultaneously. For example, a formerly incarcerated person stated that "I am an outcast four times over: ex-convict, ex-junkie, black, and HIV-positive" (Wynn 2001, 17). Multiple stigmas are also relevant for product-related stigma. Additional their stigma-eliciting product, users can be faced with stigmas that may be more important, including economic circumstances (poverty), physical disability, race, and/or gender. Consequently, it is important for designers to check for multiple or simultaneous stigmas that users may have to live with. In addition, designers need to be aware that their solutions do not worsen the problems of users that already face multiple stigmas.

2.4.2. Meaning factors describing the stigmatizer

Once stigmatizers perceive the 'stigma mark' on the stigmatized, meaning will be attributed to what is perceived. Just like users assess the relevance of an object or situation for their well-being, so do bystanders. After the sensory perception, stigmatizers or bystanders initiate their specific appraisal of a situation. The appraisal process of stigmatizers is also guided by emotional affects. Negative affects will trigger higher levels of arousal, promoting focus of the mind and a body that is ready to take action (Norman, 2004).

An important factor in this 'meaning construction' is the presence of stereotyping content in the stigmatizer (Fiske 2002). People can hold both unflattering and flattering 'stereotypical images' of certain groups. Some stereotyped groups are disrespected as incapable and useless (e.g. elderly people), whereas others are respected for excessive, threatening competence (e.g. Asians). Some stereotyped groups are liked as sweet and harmless (e.g. housewives), whereas others are disliked as cold and inhuman (e.g. rich people). These differences can also matter to users and their stigma-eliciting products.

The social image of a person is closely related to his or her social status, or how a person is regarded by others. Others will view any product used by an individual as a symbol of status for that individual. Social status involves both material and cultural status (Jordan, 2000) and can be ascribed due to age, gender, race, state of health, and achieved through accomplishment. Material status is often linked to products that belong to expensive brands, radiating material wealth. Material status can also be achieved by using products that have become prestige items through comparison, like using the first smartphone in a world of flip phones. Having the appropriate taste or knowing which products are fitting or fashionable in a cultural group confers cultural status (Jordan, 2000). The maintenance of cultural status can also involve minimizing the stigma involved in dealing with a stigma-eliciting product or medical condition.

The emotions and responses of the stigmatizer are based on the social dimensions of warmth and competence

As stated earlier, the emotions and reactions of stigmatizers are often influenced by stereotypes. Stereotypes can be understood as thoughts or beliefs that stigmatizers adopt about specific types of individuals or groups. These stereotypes can refer to people and products and may or may not accurately reflect reality. The contents of stereotypes come and go with the winds of social pressures, but do correspond to certain principles.

Fiske (2002) argues that two dimensions, warmth and competence, can capture stereotypes. The warmth dimension reflects people's friendliness and the competence dimensions their ability. Fiske states that people who

are perceived as warm and competent elicit uniformly positive emotions and behavior. Different combinations of these dimensions will result in unique intergroup emotions and reactions (see figure 2.8). Older and disabled people combine the positive stereotype of warmth in one dimension with the negative stereotype of low competence in the other dimension. As such they are perceived by their surroundings as a dependent, non-competitive group. According to the model the resulting emotion in bystanders will be pity, accompanied by active helping and passive neglect. For example institutionalized older and disabled people in our society get support but are quite often socially isolated. The envied groups elicit passive association and active harm. For example neighbors might shop at stores of entrepreneurial foreigners (outsiders) but under societal breakdown these shops might be attacked and looted.

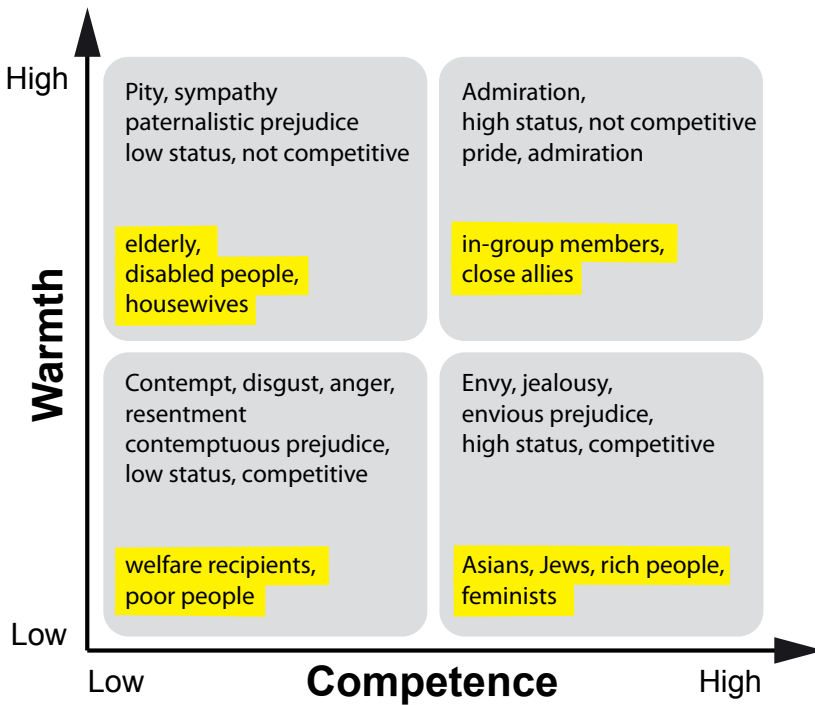


Figure 2.8. Four combinations of status and competence, and the corresponding forms of prejudice as a function of perceived warmth and competence.

Stereotyping people along these two dimensions may be functional; in order to survive, people need to know who is a friend or a foe (warmth) and who has higher status (competence). Both dimensions relate to two basic survival questions that we process prior to a human interaction. First and foremost, we try to evaluate whether the other intends harm or help (Warmth). Secondly, we assess if the other has the ability to enact those intentions (Competence). Eliciting warmth is vital in order to proceed to the dimension of competence. The warmth dimension captures personal traits that are related to perceived intent, including friendliness, helpfulness,

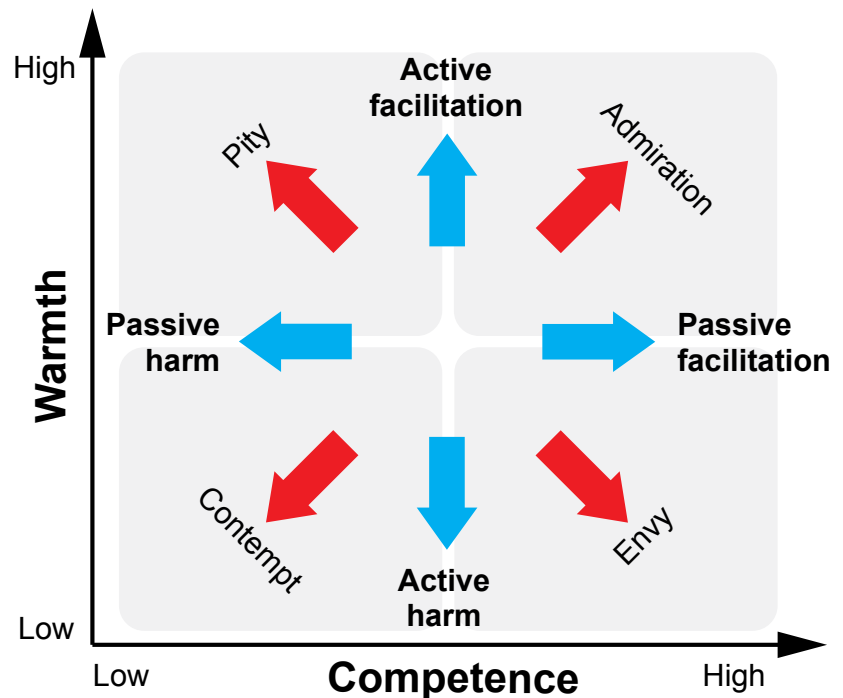
sincerity, trustworthiness and morality. Being primary, the warmth dimension predicts active behaviors: active facilitation (helping) versus active harming (attacking). The competence dimension reflects personal traits that are related to perceived ability, including intelligence, skill, creativity and efficacy. Being secondary, the competence dimension predicts passive behaviors: passive facilitation (association) and passive harm (neglect) (figure 2.9).

Stigma expressed in the dimensions of social cognition (warmth & competence)

Stigmatized groups tend to be negatively stereotyped in the dimensions of competence and/or warmth in most cultures (Fiske 1998). Social psychology researchers have demonstrated that the perception of disability, including the use of assistive technology, clearly elicits pity, compassion, and desires to be helpful, but that it also elicits distinctly negative and antisocial reactions as well. These negative reactions are evident in emotions such as disgust and anxiety, in attitudes and judgments such as the tendency to blame individuals for their disabling conditions (Ryan, 1971), and in a host of subtle and not-so-subtle nonverbal forms of behavior, such as the tendency to physically avoid contact with the disabled individual (Snyder et al., 1979).

An important factor in stigma experience is the power or dominance that is felt by the stigmatizer towards the stigmatized. Link and Phelan (2001) state that in these power situations elements of stereotyping, labeling, separation, status loss and discrimination more easily occur. Corrigan and Watson (2002),

Figure 2.9. BIAS map: schematic representation of behaviors from intergroup affect and stereotypes. The red arrows represent emotions and the blue arrows represent behaviors (Cuddy et al., 2007).



for example, describe attitudinal factors that stereotype people with mental illness as dangerous and unpredictable.

Attitudinal pressure from stigmatizers towards the stigmatized has also been signaled in relation to the use of assistive technology. The following example implies that the stigmatizer can even be a family member. A person with a disability may be excited about using assistive technology, but even then, it has been suggested, stigma associated with choices made by the families of school-age students with disabilities to not implement assistive devices due to perceived increased visibility or attention received if these children were to use these devices in public settings (Brooks, 1998; Smith-Lewis, 1992).

We advocate that the dimensions described in Fiske's model can be extended to describe the combined impact of users and their products. The dimensions could be used to assess whether product proposals are capable of semantically enhancing the stereotypes that shape the social image of users and their product.

In design research and practice the warmth dimension is often unintentionally used when designers create 'personas'. Personas are used to represent a specific user group. Personas are based on research and described in a visual narrative form or through empathic role-play. When personas are created, designers need to be aware that they need to send out enough 'warmth', so that people can relate and empathize with the depicted target group.

Personality traits versus product personality traits

Design research literature reveals valuable parallels with the dimensions of social cognition and its usefulness in assessing the combined influence of user and product on bystanders. Jordan (2000:7) describes products as "living objects with which people have relationships" rather than mere instruments. Stigmatizers can feel a wide range of emotions when they interact with product users. Additionally they will ascribe a wide variety of meanings to those emotions. A construction worker with a safety helmet might be associated with 'control' or 'confidence', whereas a white respiratory mask in a public setting might be associated with 'fear' or 'contamination'.

Just like we evaluate and stereotype people, we automatically and unconsciously perceive emotion in the form and content of things. Social psychologists refer to 'personality traits' in people, whereas product designers refer to 'product personality traits'. In relationships with other people, personality traits are an important part of attraction and conversation. They help us determine who we like and what we expect from those we encounter.

Users and bystanders will judge the personality of a product based on the same markers and criteria that they use to judge the personality of other people. In this respect, perceived personalities in products are no different (van Gorp, 2011).

When users or bystanders judge product personality traits, a semantic distinction can be made between traits that are dominant versus submissive and friendly versus unfriendly. As such, the friendly versus unfriendly traits can be used to communicate how friendly the product is. This continuum strongly correlates with the warmth dimension described by Fiske. Similarly, the dominant versus submissive product personality traits will convey the level of dominance, which strongly relates to Fiske's competence dimension. Dominant product personality traits will engender high arousal and can be achieved through visual elements such as angular and straight shapes, heavy and robust looks. Submissive product personality traits will engender low arousal and can be achieved through curved and round shapes, lightweight and delicate looks. Dominant tactile qualities include rough and hard surfaces, whereas submissive tactile qualities include smooth and soft surfaces. Auditory product personality traits for a dominant product are often louder with a deeper pitch, whereas submissive auditory product personality traits are quieter and higher in pitch. (van Gorp, 2011).



Figure 2.10. From left to right: a rugby wheelchair, a neutral wheelchair, and the wheelchair by Eva Dijkhuis.

Figure 2.10 shows three wheelchairs exhibiting distinct product personality traits. The chair on the left is used in wheelchair rugby and is designed to withstand heavy impacts. Aggressive bumpers and wheels help to strike and hold opponents, generating an overall 'unfriendly' image. The rugby wheelchair clearly radiates a dominant product personality. The green wheelchair in the middle is endowed with a submissive product personality. Its friendly visual features and colours give it a sociable and soft image. The third wheelchair is designed by IDE student Eva Dijkhuis (2006). Wheelchairs for children are often scaled down versions of adult wheelchairs, painted in a bright colour. With its central bumper, thick tires and energetic looks inspired by a mountainbike, Eva's wheelchair aims to facilitate and stimulate playful behavior. The chair manages to match product and user personality traits, supporting the child's aspirations towards being playful and independent.

Next to the visual aspects of a product, product intelligence (or competence) can also be expressed by how well something functions and how easy it is to communicate and interact with. Intelligence, resulting in competence, can also be communicated through the features or capabilities of a product.

To illustrate the impact of the social product appraisal of bystanders and their resulting behavior, we selected the example of the Tweenbot by Kacie Kinzer (2009) (figure 2.11). The Tweenbot is a small and friendly-looking robot that is equipped with a flag displaying its destination. Able to move only in a straight line at a constant speed, it bumps into all kinds of trouble. With its friendly looks the robot overcame challenges and obstacles, thanks to the pity, kindness and active facilitation of bystanders and passers-by.



Figure 2.11. Tweenbot by Kacie Kinzer (2009)

Collective meaning factors influencing the stigmatizer

The stigma stereotypes are conditioned by a broader and collectively shared regulator that influences the subjective perceptions and attributions of individual stigmatizers, bystanders or groups of bystanders. Major (2005) describes these as collective representations. In contrast to the stereotypes of individuals, these representations articulate and embody the collective beliefs, sentiments, and values of a social group or an entire society. If these broadly shared attitudes are negative, they appear to be deeply entrenched and resistant to change. Phelan et al. (2000) have found that negative attitudes toward persons with mental illness have not substantially declined between 1950 and 1996, and in some respects have increased.

Risk of contamination

A collective representation that is frequently linked to medical products is the risk of contamination. Social psychology has studied links between evolutionary mechanisms of disease avoidance and prejudices against individuals with physical disabilities. Because abnormal physical features are often accompanied by contagious diseases, humans plausibly developed

psychological mechanisms that respond to the perception of these features. This disease-avoidance system triggers specific emotions (disgust, anxiety), cognitions (negative attitudes), and behaviors (avoidance). Additionally, the system is over-inclusive: abnormal features that are not related to a disease, such as a limb amputation due to an accident, may also activate it. This disease-avoidance system partly clarifies prejudicial attitudes and behaviors directed toward people with disabilities (Park, Faulkner & Schaller, 2003).

2.4.3. Behavioral reactions of the stigmatizer

Once stigmatizers have perceived and appraised the user and his or her product, they have several ways in which they can respond and behave. As suggested earlier, stigmatizers often demonstrate mixed appraisals and responses towards the stigmatized. Although people may feel some revulsion to a user of a prosthetic arm, their actual behavior may reflect sympathy and kindness. In order to explain such findings, social psychologists have proposed a variety of dual process models (Gawronski and Bodenhausen, 2006; Pryor et al., 1999; Smith & De Coster, 2000; Strack & Deutsch, 2004). A common thread in these models is that both associative and rule-based processes are believed to shape people's reactions to a stigmatized person. People's immediate reactions to a stigmatized person are typically dominated by their associative thinking. Within a matter of seconds, however, more deliberative processing may come into play. Social psychology suggests that the dual process models can be useful in the study of reactions to a variety of social stimuli, such as reactions to consumer goods, political issues, art, humor, and various other stimuli of social relevance as well as other people (Pryor & Reeder, 2004).

As the basis for our experimental explorations we opted for the dual process model as proposed by Pryor et al. (2004). An assessment of the behavioral reactions of bystanders implies a study of the initial confrontation as well as the more deliberate and thoughtful responses that follow. Pryor indicated that there is an important reflex reaction within the first second, possibly followed by a more deliberate reaction that takes its time to build up.

Next to this distinction, Pryor's model also indicates that in reactions to perceived stigma, each of these processes has a time course (see figure 2.12). The two processes in figure 2.12 interact dynamically over time. A reflex reaction is not necessarily replaced by a later rule-based reaction. The reflexive processes may re-emerge if the stigmatizing attribute is re-experienced or if one is reminded of the stigma (Pryor and Reeder, 2004).

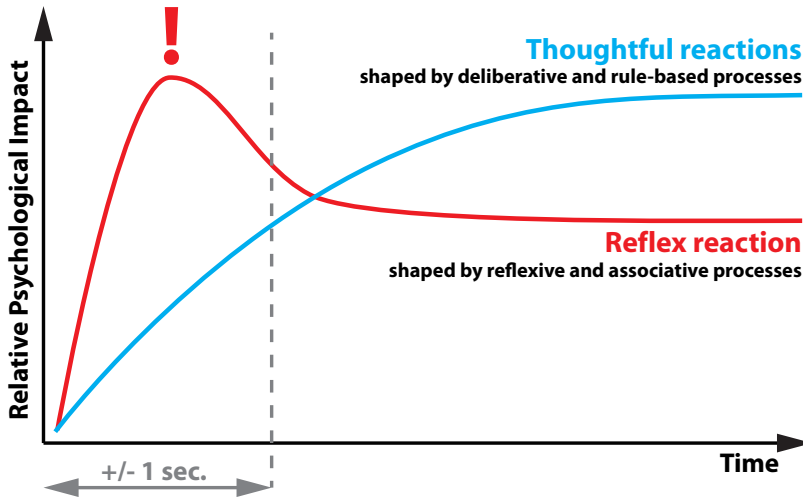


Figure 2.12. Dual Processes in psychological reactions to perceived stigma, as proposed by Pryor et al. (2004)

Reflex reactions: shaped by reflexive and associative processes

The reflexive process that is responsible for these reactions is immediate and, in the case of reactions to stigma, often instinctive, spontaneous and emotional. As represented by the red curve in figure 2.12, these spontaneous reactions to stigma are often powerful.

Social psychology evidenced that merely being exposed to a stigmatized individual immediately brings to mind negative evaluations (Fazio and Olson, 2003). These negative evaluations can be activated in a stigmatizer's mind even if he or she considers those reactions to be an inaccurate characterization of the stigmatized (Devine, 1989).

For example, upon exposure to an individual with a white respiratory mask, bystanders may initially react with fear even though they do not believe the individual is dangerous. An 'automatic' reaction of this sort may have been acquired from exposure to media or associations that link contagious diseases to white respiratory masks. Resulting reflex reactions could include a visual startling reaction or an involuntary frown.

The measurement of associative processing and reflex reactions often relies on implicit methods, such as response time measures (Greenwald et al. 1998). In the 'approach and avoidance experiment' (2010), presented in Chapter 3, attempts were made to assess these reflex reactions. The experiment measured the response times on approach and avoidance behavior towards pictures of people wearing different types of respiratory masks.

Thoughtful reactions: shaped by deliberative and rule-based processes

The reflex reactions do not necessarily prevail. Human beings are also capable of more thoughtful reactions to stigma. Rule-based processing involves conscious, deliberative or thoughtful reactions that rely more on 'facts'. During the rule-based process, the stigmatizer will actively consider the pros and cons of further interaction. Such deliberative processing may be triggered when stigmatizers reflect on the appropriateness of their initial associative reactions to the stigmatized (Pryor et al. 1999). Subsequently, thoughtful reactions may be a correction of earlier reflex reactions. Successive thoughtful reactions could be a smile, or masking behavior where bystanders pretend not to have noticed the unusual person and his or her product.

During the rule-based process, the stigmatizer may also consider whether the stigmatized is held responsible for his or her condition. As stated earlier, if the stigmatized is not considered to be responsible, stigmatizers typically react in a sympathetic way. In contrast, if the stigmatized is held responsible, stigmatizers are more likely to react with irritation and blame. This may help to explain why victims of lung cancer, which is typically viewed as a controllable outcome, experience greater social stigma than the victims of breast cancer, which is presumably less controllable (Reeder & Pryor, 2008).

Although the associative processes are continuously active during consciousness, rule-based processes may be turned on and off.

The conscious, rule-based processes are measured by explicit methods. These explicit measurements, which predict controlled behavior, often rely on standard self-report questionnaires or observational research. In Chapter 3 we present three experiments that assess these thoughtful reactions: the Spy Pack Experiment, the Dyadic Distance Experiment, and the Stain Dilemma Experiment.

Interpersonal dissociation (social distance) and avoidance

A defining and immediate reaction to stigma seems to be avoidance. People act as if physical contact or even proximity to the stigmatized can result in some form of contamination. The study of avoidant behavior has proven to be fundamental to our research. The reflexive component of avoidant behavior can be assessed by measuring approach and avoidance as tendencies that arise in the first milliseconds. Measuring the interpersonal or social distance exposes the thoughtful interpersonal dissociation of avoidant behavior.

Social psychology provides ample evidence of thoughtful avoidant behavior. For example, people choose to stand or sit at greater distances from the physically disabled, people with HIV and others, in comparison to the non-stigmatized (Kleck, 1969; Mooney et al. 1992; Snyder et al. 1979). Additionally people are more likely to cut short their interactions with the stigmatized (Kleck et al. 1966). People even react to objects somehow associated with stigmatized persons as if the objects have become contaminated, e.g. a sweater once owned but never worn by a person with HIV is devalued (Rozin et al. 1994; Rozin et al. 1992).

This process of avoidance or disassociation can be seen as the opposite of empathy. It is a state in which interactions are cut short, social distance is increased and mutual understanding is minimal.

2.5. Designer empathy towards stigma

In the previous paragraphs we described how products and their users are perceived and appraised in situational interactions. It is the task of the designer to optimize this interaction between products, users, bystanders and cultural influencers. This chapter briefly indicates ways to get designers in the right state of mind, a state that is needed to explore the various layers of meaning attribution that arise from human-product interactions.

Designing involves a creative and intuitive process, dealing with uncertainty, instability, uniqueness and conflicting situations (Cross, 2007). It is in the industrial designer's nature to be driven to solve problems. Time and financial pressure is often a first barrier that prevents designers to broaden their scope. In the subsequent pursuit, designers are often focused on the tangible solution that results from their intervention. In doing so, and unless specifically instructed to do otherwise, designers instinctively focus on providing the necessary utility for someone with physical and skill capabilities similar to their own (Cooper, 1999). Designers are either unaware of the needs of users with different capabilities, or do not know how to accommodate them into the design process. Subsequently, many products present unnecessary difficulties for users and are therefore 'disabled by design' (Coleman, 2001).

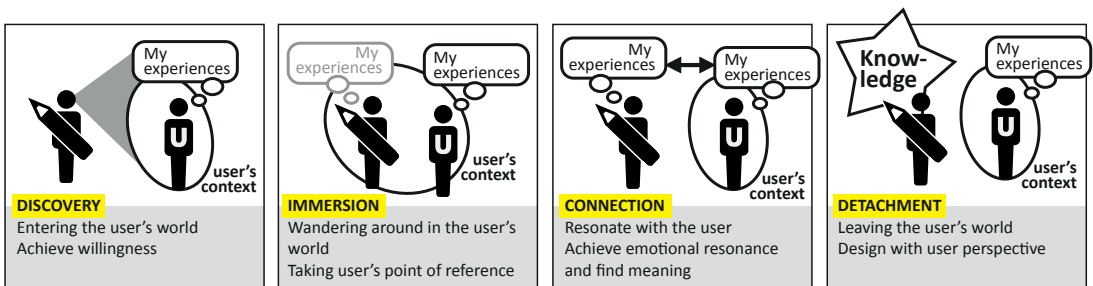
The elements mentioned in the previous paragraph often hinder the mental preparation that is needed to create a deeper understanding of users and their social surroundings. To connect with this deeper understanding, designers would benefit from a sensitivity that goes beyond 'tact' and embraces real user empathy. Proper user empathy can be critical when designers are faced with the design of products which they themselves have no user experience with. In such instances, direct contact with users and their social settings could provide insights that are necessary for the success of the design project. Furthermore, it can increase the amount of quality information and increase the designers feeling of 'being inspired' (Sleeswijk, 2009). The main advantage of this 'right state of mind' is that it will allow the designer to communicate and interact with all stakeholders on a higher than merely cognitive level of intelligence, i.e. the emotional intelligence level.

2.5.1. Empathy

In general, empathy involves understanding the emotional states of other people. It can encompass a broad range of emotional states, from caring for other people and having a desire to help them, to experiencing emotions that match another person's emotions, to knowing what the other person is thinking or feeling, to blurring the line between self and other (Hodges and Klein, 2001).

In handling social stigma, the benefits of increased personal contact or empathy are apparent. Social psychology research indicates that people who have personal contact (i.e. familiarity) with the stigmatized see them as less dangerous and do not shun or avoid them as much as people who have had little contact with them (Angermeyer et al. 2004; Corrigan et al. 2001). The same could be true for product-related stigma. People who have had previous encounters with a user and his stigma-eliciting product may develop a basic level of empathy with the user that facilitates subsequent interactions. Most encounters, however, are unprepared. Increased sensitivity and empathy is an essential designer ‘attitude’ that lies at the basis of any technique that assists designers to foresee the stigmatizing episodes in these unprepared encounters.

Cakmakli (2010) describes empathy in the context of design research and understanding user needs. For a designer, empathy is the capacity to imagine oneself as another person, usually the product user. It involves recognizing and representing the user’s personal characteristics, emotional states, and intentional actions in an accurate and tolerable way. In the process of product-related stigma the designer should recognize and represent the needs of the user as well as those around him. After applying an empathy enriched design process, designers could consider products that convey empathy by anticipating user needs or by offering help when the user needs it. In a stigma sensitive design process, user needs related to social well-being deserves special attention.



According to Kouprie and Sleeswijk (2009), the process of achieving empathy in design consists of four phases: discovery, immersion, connection and detachment (see figure 2.13). In the discovery phase the designer enters the user’s world and achieves willingness from the user. In this process, the designer should establish contact with all other stakeholders who interact with the user and her (future) product. In the immersion phase, the designer wanders around in the user’s world. For specific stigma-sensitive design projects, this immersion phase might imply the integration of a wide variety of stakeholders and social contexts. When faced with the conception of assistive technology, for example, empathy with both abled and disabled people is required. During the course of this immersion, the designer

Figure 2.13. The process of achieving empathy in design consists of four phases: discovery, immersion, connection and detachment. Adapted from Kouprie and Sleeswijk (2009).

potentially forsakes his own point of reference and changes his perspective to the user's point of reference. In the connection phase the designer resonates with the user and the other stakeholders in an attempt to achieve emotional resonance and meaning that can lead to valuable insights. In the final detachment phase, designers leave the user's world and take their insights back to the design team or the drawing board. Designing with user (and social) perspectives is now an option. The model above is of a prescriptive nature; all four phases are vital in achieving proper empathy in design. The first three phases are necessary to achieve a personal link with the user and the other stakeholders. After these phases, the designer detaches in order to design in a competent way, but with a deepened understanding of the user and those around him or her.

At this point it is valuable to note that this model can also clarify why random bystanders often react conspicuously towards users of protective, assistive or medical devices. During these often unprepared encounters, there was no discovery or immersion phase prior to the perception or connection and therefore bystanders are more likely to react with rejection and avoidance.

2.5.2. Meta-position

Before designers can successfully enter this process of empathy and 'heightened' sensitivity, specific competences are needed. Human-product interactions need to be looked at from a meta-position, as described by Krippendorf (2006). He refers to this position as 'second order understanding' or understanding of the user's understanding of products. In disciplines such as Conceptual Interaction Therapy and Leadership and Organization Development this approach is referred to as 'empathic resonance' (Vleugels 2008) and 'appreciative inquiry/understanding' (Schon, 1983). The main purpose of a heightened perspective is to go beyond pre-conditioned mind-sets and attitudes from the past. In creative dialogues the designer allows stakeholders to express their perceptions, thoughts and intentions (the three basic behavioral components) in meta-position terms of 'here and now'. By taking this perspective the designer will collect conflicting and struggling concerns from stakeholders in their context. The meta-position will help designers to balance and integrate expressed physical, cognitive, emotional and even existential concerns or needs.

To fully witness and process the full range of stakeholder-product interactions, the designer has to possess additional levels of mental capacities above practical wisdom and cognitive intelligence. According to Goleman (1996) meta-position calls on emotional intelligence (EQ). Zohar (2000) extended the human intellectual capacities (IQ) to an even higher level and introduced the notion of spiritual (existential) intelligence (SQ). It seems that every human being is born with these intelligences and has the ability to evolve in them.

The four intelligence levels converge with four hierarchical levels in human needs; physical, cognitive, emotional (relational) and existential (Nuttin 1965; Maslow 1970; Zohar 1997; Barrett 2006) . All too often, the fulfilment of higher emotional and existential needs is searched for using only cognitive approaches, which is inadequate for this purpose. Understanding the true experiences and aspirations of users and stakeholders requires 'reflective' and 'generative' competences of these higher than cognitive intelligences (Schon 1983, Isaacs 1999). It will endow the designer with sensitivity for emotional and even existential concerns of stakeholders and the accompanying way of speaking (sensing), thinking (meaning) and behaving (acting).

At the beginning of Chapter 3 we report on the process and results of a user-experience design project called the 'Pleasurable Mask Experience'. The assignment used the design process of diverging and converging of ideas in empathy enhanced settings. This method of diverging and converging of ideas is the basis of knowledge development in a designerly way (Stappers, 2007).

2.5.3. Experience prototyping

Designers cannot wholly control or define the users' experiences and their social interaction patterns. When stigma-sensitive products are visibly worn and taken out in public, interactions with other people and additional contextual elements will influence the overall experience.

Hence, an investigation of product-related stigma by an outsider is often not powerful enough. It has to be experienced from within. There is a long research tradition on developing empathy through direct experience of other people's lives. Some of it has been aimed at understanding the lives of those living in poverty. In the late 1920s George Orwell dressed up as a tramp and wandered the streets of East London with vagabonds and beggars, a period of his life described in his book *Down and Out in Paris and London*.

As stated earlier in this chapter, Patricia Moore carried out an important experiment in experiential empathetic adventuring in the late 1970s. With her research journey she created empathy in herself with the struggle which is life for an aged person. But at the same time she also caused empathy or experienced a lack of due empathy in others. By putting Vaseline across her glasses to simulate glaucoma, by binding up her joints to simulate arthritis, she basically invented the concept of empathy tools for designers. Her approach has inspired designer and researchers to invent tools for simulating the effects of aging, vision impairment, arthritis and much more.

Figure 2.14. the famous OXO good grips potato peeler, an iconic product in the world of inclusive design.



Empathy tools allow designers to 'immerse' themselves in the user experience in order to gain deeper insights. It is also known as "empathic research" or "role-playing" – it allows the designer to understand not just the physical use of products and spaces, but how the individual experiences situations and tasks emotionally and socially. Moore created tools which other designers have used to create empathy, much in the same way in which we made our students wear dust masks in order for them to feel what it is like to be stigmatized.

Based on the insights she gained, she was able to inspire the design of a series of products that were suitable for use by elderly people. The OXO-grip potato peeler, designed by Smart Design, was one of these inventions (figure 2.14). Although the product was aimed at people with arthritic hands, it proved to be a product with a much broader appeal. In an interview by the California College of the Arts on the power of design, Patricia Moore quoted:

"Design has morphed into the cornerstone of equity, culture, and socialization. It's about bringing resources to people who do not have them... The power of design is to look at each individual, their home, their community, and the infinite small things that make for success or failure of interaction in those realms...."

In order for a designer to become aware of these ‘infinite small things’ during a social human-product interaction, it has to be experienced from within. Situations and human-product interactions need to be experienced as realistically as possible. Experience prototypes may be used to explore these interactions. Pastalan (1982) referred to this technique as “Empathic Modeling”. Through the use of special spectacles, he simulated age related visual changes to allow designers to participate in a variety of everyday environmental tasks as if these normal physiological aging processes affected them.

Prototypes are no longer being built to merely establish technical feasibility or usability issues. Surely, design researchers still gather people into a usability-testing laboratory and ask them to use a product under consideration. These tests will provide valuable information about the ‘understandability’ and effectiveness of the basic design. Although essential to the design process, the information gathered from these tests rarely says anything about the sociability of the design. Therefore, user-experience design advocates the use of prototypes that are able to assess the overall experience that a product can deliver to the user and its surroundings.

Marion Buchenau and Jane Fulton-Suri (2000) described experience prototyping to encompass all activities that prioritize the engagement of people with an experience, even at the expense of fidelity to the design. For them, experience prototyping is aimed at allowing designers, users and clients to “experience it themselves”, rather than to rely on demonstrations or proof of someone else’s experience. Experience prototyping can also be used on kids, educating them on stigma sensitive topics when they are young and still shaping their social identity.

Experience prototyping can be accomplished through interaction with existing stigma-eliciting products or specially designed prototypes that address specific issues of the social interaction. To increase designer awareness



Figure 2.15. The age simulation suit GERT

about the obstacles encountered by users of assistive technology, it could suffice to have them use wheelchairs, walkers, etc. A number of disability awareness groups actually advocate the use of existing assistive technologies such as wheelchairs, white canes, etc., that allow able-bodied individuals to be placed in the position of the stigmatized. Other examples of experience prototypes include 'fat suits' (i.e. weighted jackets to simulate heart conditions), special glasses that simulate vision disorders, arthritis simulation gloves, and headsets and earpieces that form a schizophrenia simulator. Figure 2.15 shows the GERontologic Test suit GERT. This age simulation suit offers the opportunity to experience the impairments of older persons even for younger people. The age-related impairments that can be simulated are:

- opacity of the eye lens
- narrowing of the visual field
- high-frequency hearing loss
- head mobility restrictions
- joint stiffness
- loss of strength
- reduced grip ability
- reduced coordination skills

The mask prototypes, used in the Immersive Experiment in Chapter 3, are 'lookalike' models used to assess the 'experience' factor of users and their situational surroundings. Where most experience prototypes focus on factors like user engagement and subjective well-being, the scope of our interest extends to the subjective emotions and reactions engendered in bystanders. Wearing a respiratory mask in public will generate functional and comfort issues, generally tolerated due to temporary or obligatory use. Design practice has several ways to retrieve and process these functional product improvements. The social inconveniences experienced while wearing a respiratory mask in public, however, cannot be simulated without actually wearing a mask in public. It is only there, in its context of use and surrounded by others, that the designer can experience the real social impact of the product. For the purpose of our research we framed these as 'social experience prototypes', geared at discovering the social impact of the product on its surroundings.

2.6. Conclusions

Our literature review in both design research and social psychology has proven to be inspirational for our theory building. Both fields provided stigma-influencing insights that shaped both our theory building, and experimental research.

We initiated our review in design literature and positioned our research in the contributing fields of Inclusive Design, Product Semantics and Human-Centered Design.

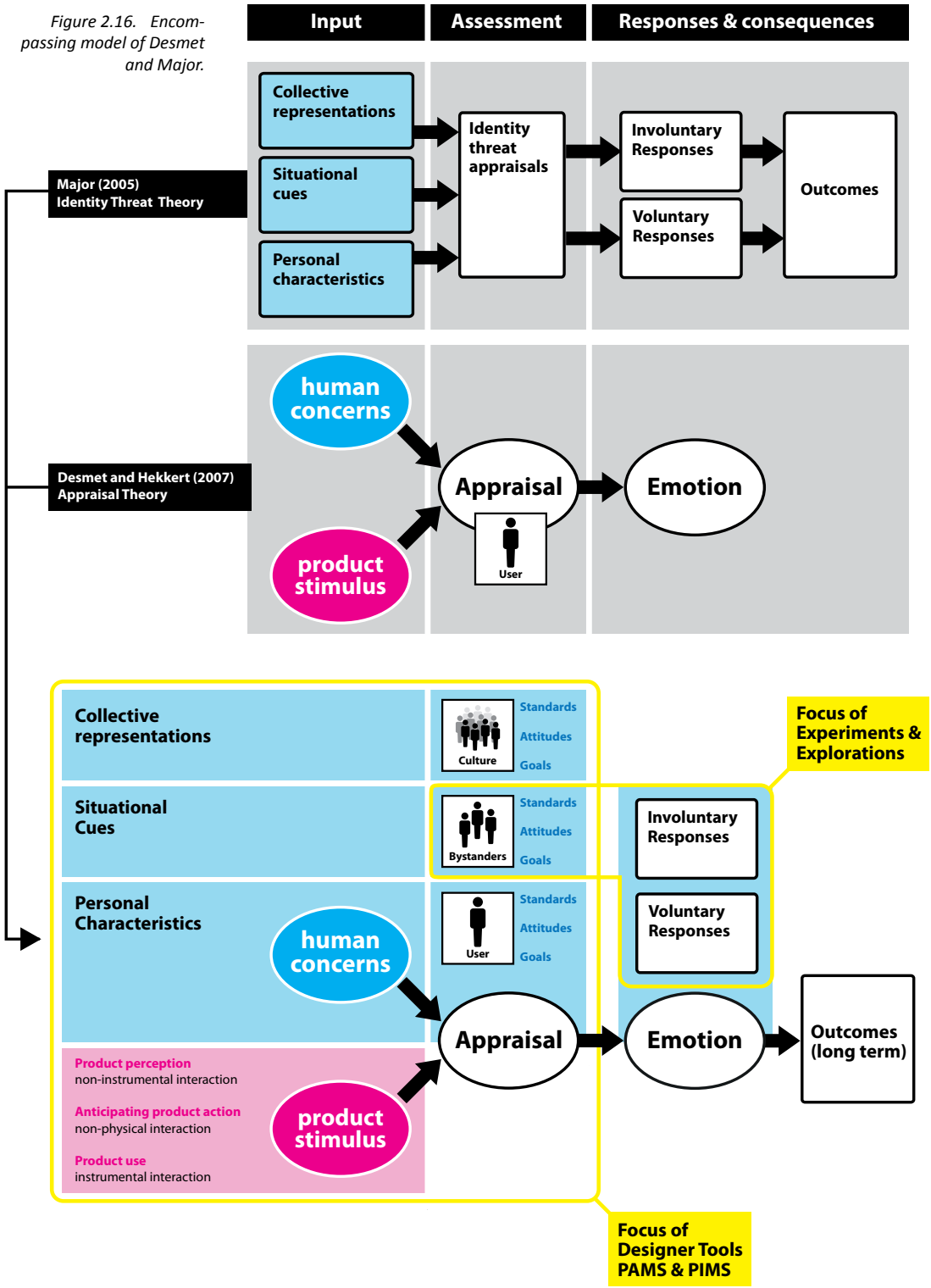
Despite their specific focus on universally usable products, the field of Inclusive Design did connect with our subject and provided us with valuable product cases and design research. Product Semantics provided us with the necessary concepts to think and write about product meaning. In the field of Human-Centered Design we pursued models that were able to structure our stigma specific human-product relations. Most models in this area deal with the emotional impact of products on the positive side of the acceptance spectrum. The term 'pleasurable design' inspired us to put forward our research as its counterpart, 'product stigmaticity'. We selected the Appraisal theory of Desmet and Hekkert (2007) as the first basis for building our theory. The model connects the levels on which the product can impact the human-product interaction with the human goals that have to be met by the product.

In the second part of our literature review we explained our motivation for choosing the term 'stigma' and how we delimited the term in our research. As a first deliverable, this review brought forth our working definition of the term 'stigma'. Within our research we frame 'stigma' as a perceivable 'mark' (often visible), belonging to an individual or group of people, situated in a particular social context that violates standards, and/or induces aversive emotions in other people and leads to interpersonal disassociation (rejection, avoidance, etc.).

We selected Major's identity threat theory (2005) to provide the second basis for building our theory. The model takes a top-down perspective of social stigma, from the stigmatizing bystanders and their cultural influences, towards the stigmatized user. A central aspect in this model is the appraisal phase, where the individuals appraise whether the stigma-specific demands are potentially harmful to their social identity. As such the identity threat theory of Major (2005) reveals parallel approaches that complement our previously selected appraisal theory by Desmet and Hekkert (2007). In figure 2.16 we present how both models merged into an encompassing model that helps to explain our focus and subsequent advancements.

On the input side of the encompassing model we situate the three input variables suggested by Major. These variables arise from the stakeholders and their concerns: the personal characteristics and concerns of the stigmatized,

Figure 2.16. Encompassing model of Desmet and Major.



situational cues provided by the context and its bystanders, and the collective representations shaped by cultural values and standards. By extending these input variables with the product stimulus levels suggested by Desmet & Hekkert (2007), we address the full product-related stigma process and link human experiences to objects and contexts.

The encompassing model extends the appraisal phase to include the appraisals of users, bystanders and cultures. Each of these three stakeholders has its standards, goals and attitudes. If the demands from the input variables exceed the resources of any of the stakeholders to cope with those demands, the product-related stigma process will continue towards emotions, and responses and outcomes of these emotions.

In our stigma-free design approach we focus on the left part of the encompassing model and strive to counter product-related stigma in the value appraisal phase. As such, our stigma-free design approach aims to avoid appraisals leading to negative value and enforces positive value attribution.

The yellow outlines in figure 2.16, indicate the areas in which our research progressed. In answer to our first research question (understanding product-related stigma), we focused on the input variables, context and appraisals associated with product-related stigma. The resulting 'Product Appraisal Model for Stigma' (PAMS) is presented in Chapter 4 and operationalizes how the product-related stigma process unfolds and how the various stakeholders contribute. Our five experimental techniques, aimed at quantifying product-related stigma and presented in Chapter 3, focus on the behavioral reactions from bystanders.

In answer to our final research challenge, managing product-related stigma, Chapter 5 suggests 17 stigma-reducing design interventions (PIMS – Product Intervention Model for Stigma) that target the product and stakeholders that are addressed on the input side of the encompassing model.

In paragraphs 2.3 and 2.4 we structured the literature according to the two main actors who shape the process of product-related stigma: the stigmatized and the stigmatizer. We zoomed in on the perceptive, attitudinal and behavioral elements that impact these two actors. From the perspective of the stigmatized, we warned for the danger of self-stigma. To address self-stigma, designers can incorporate product features that empower the stigmatized, allowing them to rise above negative assumptions and internalized stereotypes.

Next to involuntary responses to product-related stigma, such as anxiety, increased blood pressure and stress, we were inspired by the voluntary responses or coping strategies that the stigmatized employ in response to social stigma. Various coping strategies have proven to be inspirational for the design interventions suggested in Chapter 5. Coping strategies ranged from reactive (concealment, avoidance or withdrawal) to proactive strategies (social activism, empowerment).

From the perspective of the stigmatizer, our research addresses those instances where the product-related stigma is perceived as achieved and/or controllable versus existential or accidental. Stigma-eliciting products that can be linked to an existential stigma condition include wheelchairs, crutches, or obliged protective devices. Many of these products are used involuntarily and are often indispensable to their users. Products such as piercings, extreme fashion, and political symbols, can engender an achieved stigmatic condition. When stigmatizers are confronted with a stigmatized in the 'achieved stigmatic condition', they are perceived as more responsible and blameworthy for their condition, often resulting in social exclusion and avoidance.

We selected the model of Fiske (2002) to explain the stereotypes that influence the emotions and responses of stigmatizers. Fiske (2002) argues that two dimensions, warmth and competence, can capture these stereotypes. People who are perceived as warm and competent elicit uniformly positive emotions and behavior, whereas stigmatized groups tend to be negatively stereotyped in both dimensions in most cultures (Fiske 1998). We advocate that Fiske's dimensions of social cognition can be extended to describe the impact of product-related stigma, delivering insights that should enable the designer to semantically enhance the stereotypes that shape the social image of users and their product. Design research literature showed valuable similarities to these two dimensions. When users or bystanders judge product personality traits, a semantic distinction can be made between traits that are dominant versus submissive and friendly versus unfriendly. The friendly versus unfriendly continuum strongly correlates with the warmth dimension. Similarly, the dominant versus submissive strongly correlates with the competence dimension.

The dual process model as proposed by Pryor et al. (2004) served as the basis for our experimental endeavors. The assessment of behavioral reactions from bystanders implies a study of the initial confrontation as well as the more deliberate and thoughtful responses that follow. Pryor indicated that there is an important reflex reaction within the first second of the interaction, possibly followed by a more deliberate reaction that takes its time to build up. The experiments and explorations presented in Chapter 3 attempt to assess both reflex and conscious reactions.

In paragraph 2.5 we switched our focus from the interaction between the stigmatized and the stigmatizer towards the designer. Because it is the task of the designer to optimize the interaction between products, users, bystanders and cultural influencers, we briefly indicated ways to get designers in the right state of mind. An empathic understanding and the right mindset can endow designers with a sensitivity that goes beyond ‘tact’ and embraces real user empathy. The complementing meta-position can endow the designer with sensitivity for the relational and even existential concerns of the stakeholders and the accompanying way of speaking, thinking and behaving.

Finally we asserted that it is recommendable for a designer to experience product-related stigma from within. Experience prototypes may be used to experience situations and human-product interactions as realistically as possible. In the Immersive Experiment, presented in Chapter 3, we use mask prototypes that we labeled as ‘social experience prototypes’ geared at discovering the social impact of the product on its surroundings.

CHAPTER 3 EXPERIMENTAL STUDIES

Can designers determine whether their design concepts are ‘burdened’ with product-related stigma, and if so, can it be quantified? Designers would not only value this insight during their creative process, it could also help them to support design decisions with quantitative data. Additionally, a quantitative measure could help to assess which product properties have influenced the human-product interaction and to what extent subsequent improvements were successful.

This chapter reports on our pursuit for techniques that objectively assess the ‘degree’ of product-related stigma that is ‘attached’ to existing products as well as new concepts. In our explorations we aimed to find techniques that deliver a quantitative measure and could plausibly result in an affordable and straightforward tool for designers.

All experiments and explorations were executed with dust masks as stimuli. Although the results of the experiments do not apply to other products, the setups and techniques can be generalized towards other assistive, protective and medical devices.

Measuring product-related stigma

From our own experiences, anecdotal information and initial explorations, we became aware that a public and unprepared encounter with a user of a dust mask causes many practical and emotional complications. The subjective appraisals of both users and bystanders are responsible for the wide variety of emotional and behavioral responses which result from this unprepared encounter. In our study of this encounter, it was our aim to rule out the subjectivity and introduce a technique that would enable designers to objectively evaluate their design interventions.

As stated earlier, the impact of these encounters on the well-being of the mask users or bystanders is strongly influenced by personal characteristics, such as character, previous experiences and self-image. A product that is appraised as stigma-free by one user can be stigma-sensitive for someone else. It is valuable to focus on the thoughts, feelings and reactions of the individual user, but they are hard to measure objectively. Our experimental techniques therefore target the many and diverse passers-by and bystanders who witness the user and his or her product. By averaging the behavioral reactions of a large sample of random passers-by, we obtained a more objective measure to quantify product-related stigma. Prior to our exploration in behavioral research, we considered the use of questionnaires, self-report and physiological measurement techniques.

Questionnaires and self-report

Although an inquiry among individual users or bystanders is valuable, it introduces subjective interpretation. During our explorations we worked with questionnaires on two occasions. To select the appropriate stimuli for the Approach and Avoidance Experiment, we used a Likert scale questionnaire to rate several mask designs in the social dimensions of warmth and competence. During the Spy Pack Exploration, we questioned participants after their encounter with our mask wearer. We discovered that both masks users and bystanders found it difficult to express and verbalize their experiences. For example, startling reactions in response to product-related stigma often occur unconsciously and are difficult to recount and report after they have occurred. Although the insights derived from questionnaires and interviews are valuable, we specified our search towards measures and techniques that are robust, easy to operate and as objective as possible.

Psycho-physiological measurements

An assessment of affective experiences can also be achieved by recording psycho-physiological data. Several research institutions endeavour this type of research. This non-exhaustive list identifies physiological parameters that could serve as measures for arousal, anxiety or stress that is accompanies the use (user) or perception (bystander) of a stigma-related product:

- Cardiovascular responses (heart rate)
- Galvanic skin response
- Blood pressure
- Visual attention and facial expression

Recording these parameters presents many challenges. In lab settings it is often difficult to generate authentic emotional responses that match those which are experienced in actual interactions. In field experiments it is difficult to differentiate the affective physiological responses from other physiological responses.

In our search for an affordable and straightforward tool that can be used by design teams, we eliminated the setups that involved substantial medical know-how (cardiovascular responses, galvanic skin response, and blood pressure). These would also require the attachment of measuring devices on the participating bystanders. The use of these measuring devices would not allow for unintentional cooperation and would spoil the authenticity of the unprepared encounter. In order to grasp the intensity of the unprepared encounter, we tried to take our research as close to the actual encounter as possible, while remaining inconspicuous. In design research there is a tendency to move research out of the lab and as close to the actual interaction as possible.

Behavioral experiments and explorations

Behavioral research permits us to come closer to and observe the actual unprepared encounter. By observing the behavioral reactions of a large number of random bystanders and passers-by, we obtained a level of objectivity in our explorations. As we progressed in our explorations, we switched from experiments set up in lab conditions to controlled indoor environments and finally real life outdoor encounters.

As suggested earlier, an assessment of the behavioral reactions of bystanders implies a study of the initial confrontation as well as the more deliberate and thoughtful responses that follow. Social psychology evidences that there is an important reflex reaction within the first second, possibly followed by a more thoughtful reaction that takes more time to build up. The initial reflex reactions can be very powerful, but they do not necessarily prevail. Human beings are also capable of more thoughtful reactions to stigma.

To put it simply, we separate the behavioral reactions in the first second from those that occur in the following time sequence and take them into account.

Both types of reactions can interact dynamically over time. A reflex reaction is not necessarily replaced by a later thoughtful reaction and a reflex reaction may re-emerge if the stigmatizing attribute is re-experienced (Pryor and Reeder, 2004). It is also important to note that results obtained from measuring both types of reactions are sometimes dissociated (Gawronski & Bodenhausen, 2006). Products that elicit strong reflex reactions in the initial second may engender little conscious behavior afterwards, and vice versa.

Reflex reactions

Reflex reactions occur within the first second and are triggered by reflexive and associative processing. When a user with a dust mask is perceived an often unconscious association with contagiousness may arise. This association may have been acquired through exposure to media or associations that link contagious diseases to white dust masks.

In response to this perception, reflex reactions can include startling reactions or an involuntary frown. Most of these reflex reactions are immediate, instinctive, spontaneous and emotional. In our first experimental exploration we attempted to assess these reflex reactions in a lab setting. The parameter used to quantify the reflex reactions was the reaction time in approach and avoidance behavior. Later on we attempted to detect these reflex reactions in observational setups.

Thoughtful reactions

Reflex reactions were separated from the more thoughtful reactions that occur over a certain period of time. In this time frame bystanders use thoughtful processes to decide on their actions or correct previous actions. We attempted to assess the more thoughtful reactions in real-life conditions. The experiments were initiated in a controlled indoor environment, but soon moved to crowded public areas. An important and defining conscious reaction to stigma seems to be avoidance. As such we tried to quantify how people approach and pass a user and his stigma-eliciting product. We quantified the interpersonal distance that was maintained at the moment of passing by and we observed when passers-by made visual contact with our mask wearer, whether they had startling reactions or looked back. Detecting the moment of visual perception and possible startling responses proved to be very challenging. Subsequently, our understanding of these reactions remains premature. Instead we focused most of our explorations on the interpersonal distance, or the distance that passers-by maintain as they pass the user and his or her product.

Explorations and experiments on product-related stigma	What was measured	Parameters
1. Approach & Avoidance experiment (Padua, Italy – 2009) - Lab environment		
<p>Our first exploration was executed at the social psychology department of the University of Padua, Italy. The 'Approach and Avoidance Experiment' explores the initial reflex reactions that occur within the first second. The experiment was set in a lab environment and captures reflex reactions towards pictures of people with or without dust masks, presented on a screen.</p>	<p>Reflex reactions of bystanders</p>	<p>Reaction times on approach and avoidance behavior towards visual stimuli</p>
2. Immersive Mask Experience (Antwerp - 2010) - Uncontrolled outdoor environment		
<p>This exploration was aimed at investigating the actual unprepared encounter between mask users and bystanders in a real-life setting. During the 'Immersive Mask Experience' 60 design students were sent out into the city to walk around wearing white dust masks. Their experiences and reports on the behavioral reactions of bystanders delivered important initial insights and clearly demonstrated that dust masks are easily perceived and do engender reactions in bystanders.</p>	<p>Empirical research exploration</p>	<p>None – aimed at empirical insights</p>
3. Spy Pack Exploration (Antwerp - 2011) - Controlled indoor environment		
<p>The previous exploration evidenced that the reactions of bystanders were observed and 'felt' by all participants and that they distressed them. The biggest contribution of the 'Spy Pack Exploration' is that it allowed us to observe and study the real-life and unprepared encounter in a controlled indoor environment. By analyzing the images of seven cameras we investigated the staring and walking behavior of passers-by and evaluated parameters such as moment of visual perception, interpersonal distance and 'looking back' for their relevance.</p>	<p>Thoughtful reactions of bystanders</p>	<p>Visual attention / Interpersonal distance</p>
4. Dyadic Distance Experiment (Antwerp – 2012) - Field experiment / outdoor		
<p>A relevant contribution of the Spy pack Exploration was the confirmation that at least two parameters proved to be comprehensive, measurable and valuable for further exploration: the moment of visual perception and the interpersonal distance. The 'Dyadic Distance Experiment' focused on deviations in the walking path of passers-by, quantified by the parameter of interpersonal distance. The experiment was set in real-life outdoor situations, and accurately measured the shortest interpersonal distance between a passer-by and a mask wearer, by means of an ultrasonic sensor.</p>	<p>Thoughtful reactions of bystanders</p>	<p>Interpersonal distance</p>
5. Stain Dilemma Experiment (Antwerp – 2012) - Field experiment / outdoor		
<p>The 'Stain Dilemma Experiment' was a simplified variation of the 'Dyadic Distance Experiment'. The experiment required a minimal setup and focused on the walking path of the bystanders as they pass the mask wearer. By placing a physical obstruction in their walking path, passers-by are forced to walk around the obstruction or in between the obstruction and the mask wearer. The researcher only had to count the instances in which these reactions occur.</p>	<p>Conscious reactions and explicit behavior of bystanders.</p>	<p>Interpersonal distance</p>

None of the parameters that we used in the experiments have the intention to be 'the' measure of product-related stigma. There is no single and most significant measure to express product-related stigma yet and we wonder whether it would be valuable to direct our efforts towards this goal. Certain products elicit more stigma than others and a specific stigma-eliciting product will not necessarily score high on all the parameters. The experimental techniques are mainly suited to compare product proposals and existing products and to rank them based on the 'degree' of product-related stigma that is attached to them. Designers can use these techniques to compare product proposals, without making statements on the exact attributes that caused or influenced their performance.

The results of the experiments as such do not present a direct contribution for designers. The techniques and guidelines that are used in the experiments and explorations are more relevant and should enable designers to set up comparable research activities. The final two experiments embody our most comprehensive experimental insight and can be the basis for additional research on behavioral deviations in the walking path of passers-by in the vicinity of users of stigma-eliciting products.

3.1. The Approach & Avoidance Experiment

The Approach and Avoidance Experiment was set up in a lab environment and aimed to explore the reflex reactions of bystanders towards users of stigma-eliciting products. Because these reactions precede the thoughtful reactions, we explored them first. By measuring reaction times on a selection task, this experiment assesses the approach and avoidance-like tendencies of participants that are confronted with pictures of people who wear dust masks. The dependent variable or parameter was reaction time and this was easy to quantify with appropriate software. Although this experiment primarily focused on reflex reactions, a complementing questionnaire was added to the procedure. By comparing the results on both tasks we verified whether the reflex reactions and questionnaire responses were consistent and/or whether they diverged on this socially sensitive issue. The experiments were executed in October 2009, in cooperation with the department of social psychology of the University of Padua, Italy.

3.1.1. Method

In essence, human behavior is driven by two fundamental action tendencies: approach and avoidance (e.g., Carver, 2001; Higgins, 1997; Miller, 1944). The approach system generally responds to rewards and opportunities, and the avoidance system responds to threats and punishments. These two systems exert unique influences on action, motivation, and emotion.

Approach and avoidance-like experiments have been widely used and validated in socio-psychological research. In 1996, Bargh et al. asked participants to evaluate words presented on a computer screen as either “good” or “bad” by pushing or pulling a lever. Their results illustrated that the perception of a stimulus as positive or negative primes or facilitates approach or avoidance motor behavior, respectively (Bargh et al., 1996).

We selected the Approach and Avoidance Motor Behavior Experiment as described by Paladino (2008) and Castelli (2004). Their work relies strongly on previous studies but is different in several respects. Whereas previous studies had used (out)groups that were characterized by highly stigmatizing features, such as child molesters or HIV-infected individuals, their research included a wide range of groups that do not involve a personal threat (e.g., age and political groups). Likewise, the procedure of our study also considers responses to in-group members, i.e. people without masks.

The dependent variable in this experiment is the reaction time. The independent variables are the types of movement (approach versus avoidance movement) towards pictures of people with vs. without masks and the variation in the type of masks (competent, warm or neutral). All these variables were manipulated within participants. Only the order in

which participants had to respond to the different mask types and the first response they had to give to classify masks was counterbalanced between participants.

Tested hypotheses

Selection task	Pictures of people with masks	Pictures of people without masks
APPROACH Press 'forward' positioned button for mask or no mask	Forward movements towards people with masks should be slower compared to people without masks	Forward movements towards people with no masks should be faster compared to people with masks
AVOIDANCE Press 'backward' positioned button for mask or no mask	Backward movements away from people with masks should be faster compared to people without masks	Backward movements away from people with no masks should be slower compared to people with masks

3.1.2. Experiment

Pre-test to select evocative stimuli (pictures of dust masks)

The dust masks for this experiment were selected on the basis of a pre-test. We initially searched for dimensions that could be useful in classifying the existing dust masks that are on the market. In our pre-test we used the universal dimensions of social cognition, as described by Fiske and colleagues (2007); i.e. Warmth and Competence. As stated earlier, Fiske found that people who are perceived as warm and competent elicit uniformly positive emotions and behavior. Conversely, stigmatized groups tend to be negatively stereotyped in the dimensions of competence and/or warmth in most cultures. Stereotyping people along these two dimensions may be functional; in order to survive, people need to know who is a friend or a foe (warmth) and who will act on these basic benevolent or hostile intentions (competence).

If both these qualities were represented by a selection of masks, it would be interesting to investigate if these masks change the perception of the person that is wearing them in terms of 'competence' or 'warmth' in comparison to a selection of 'neutral' masks.

In the pre-test we tried to select those masks that were thought to represent each of these dimensions (neutral, competence and warmth). The neutral masks were all white dust masks, which are the most commonly used on the market. The so-called competence masks were dust masks used in different professions and in sports. The warmth masks were personalized and colorful, and were conceived specifically for this experiment. In order to select the masks that best represented their category, a pre-test was conducted with

16 participants, of which 9 were male and 7 were female. Participants' age ranged from 20 to 35 years old ($M = 23$, $SD = 2.76$). All participants had the Italian nationality and were Italian native speakers. In the pre-test they were asked to rate 44 pictures of people with dust masks on 7 dimensions, each on a 7-point scale. Three dimensions were related to warmth (friendly, well-intending, sociable), three to competence (capable, competent, efficient), and one to beauty (attractive). On the basis of these judgments, we selected the three masks that best represented their category and conducted separate one-way ANOVA's on competence, warmth, and attractiveness judgments comparing these judgments for the different types of masks.

Testing for differences on the competence dimension between mask type, results showed a significant main effect $F(2, 30) = 4.49$, $p < .05$. In contrast with our expectations, the images we labeled as competence masks scored low on competence traits, i.e. participants classified people who were wearing reference (neutral) and warmth masks, respectively, as more competent and efficient than the actual competence masks (comparing means: REFmasks $M = 4.33$, $SD = 1.39$; Wmasks $M = 4.12$, $SD = 1.34$; C masks $M = 3.61$ $SD = 1.21$). The judgments on the warmth dimension also showed a significant main effect, $F(2, 30) = 33.93$, $p < .001$, revealing that perceived warmth was indeed higher for people who wore warmth masks. Mean comparison tells us that warmth masks were perceived as warmer and more friendly ($M = 4.81$, $SD = 1.30$) compared to reference ($M = 3.79$, $SD = 1.14$) and competence masks ($M = 2.75$, $SD = 0.85$).

Finally, when testing for differences between the mask on attractiveness, a significant main effect emerged, $F(2, 30) = 8.54$, $p < .001$, showing that people who wore both warmth or reference masks were seen as more attractive ($M = 3.07$ $SD = 1.50$ and $M = 2.75$, $SD = 1.10$ for warmth and reference masks respectively) than the competence masks ($M = 1.92$ $SD = 0.67$).

Overall, pre-test data showed that masks that are mainly used in a professional environment do not convey competence on the persons who are wearing them, while personalizing a mask significantly increases the level of warmth the person wearing the mask is thought to have. These differences are important to bear in mind when interpreting the results of the main study.

Experimental setup

The selected stimuli were presented on a computer screen and the participants' speed and direction of approach-like and avoidance-like movements toward and away from models with no masks and models with masks were compared. At the end of the experiment, the same participants were asked to fill out a questionnaire with the intent to compare their spontaneous and implicit reflex reactions with their rational and explicit questionnaire answers. This study aims to test whether the generic distinction between models without

dust masks and models with dust masks is sufficient to trigger elementary motor tendencies associated with approach and avoidance.

Participants

This research was conducted on a sample of 48 students and former students at the University of Padua, of which 20 were male and 28 were female. Participants' age ranged from 19 to 32 years old ($M = 21, SD = 2.81$). All participants had the Italian nationality and all but one were native-speaking Italians. Data from this last participant were excluded from the analysis due to the high number of mistakes that were made (i.e., the participant's responses did not match the instructions). All students participated voluntarily.

Materials

Three images of models wearing a mask were selected in each category that was created (warmth, competence, reference). In addition, a single image of a model without a mask was selected as well. Each of the 4 models (2 females and 2 males) was seen wearing all of the masks. Thus, participants saw 10 different images of each of the 4 models, creating a total of 40 stimuli (see figure 3.1).

Figure 3.1. Overview of all 40 stimuli: Four models, three mask conditions and the no-mask reference condition

Images were presented on a computer screen, which was situated at a distance of approximately 50 centimeters from the participant. We provided a modified keyboard, which was used in previous approach-avoidance tasks (Paladino, 2008). This is a standard computer keyboard from which all the



buttons have been removed. Three bigger wooden buttons were added: an upper (approach), a central and a lower one (avoidance). The upper one was colored in red and the lower one in green, while the central one had no color. The keyboard was displayed in a vertical position and adjusted to the right or to the left according to the participant's dominant hand (see figure 3.2). Given the position of the keyboard, each participant had to respond by moving their arm toward (approach-like movement) or away from (avoidance-like movement) the stimulus that was presented on the computer screen when pressing the forward and backward keys, respectively.



Figure 3.2. Experimental setup

Procedure

Implicit judgments – reflex reactions

Participants were divided into two conditions: 24 followed the instructions of the mask approach condition while the remaining 24 conducted the experiment in the no-mask approach condition. This way, the participants' first response instructions were counterbalanced.

- In the **no-mask approach condition**, the participants' first task consisted in pressing the approach button for images of models without a mask.
- In the **mask approach condition**, their first task was to press the approach button for images of models wearing a mask.

Every response trial was structured as follows: participants were requested to press the red (approach) or green (avoidance) button for mask or no-mask images, depending on the condition. Immediately after giving their response, they had to press the central button. When they did this correctly, they heard a beep that signaled that the next image was about to appear. Participants were asked to wait for the new image holding their hand above the central button. Participants were told to be as quick as possible in giving responses

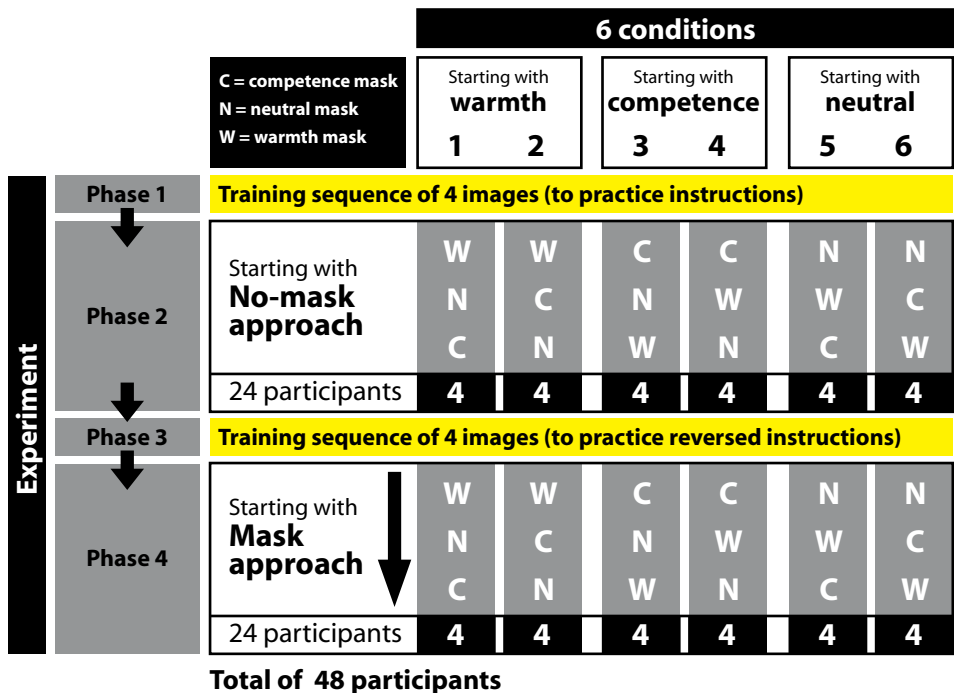
and to make as little mistakes as possible. The complete task consisted of three blocks. In each block, participants were confronted with one of the three mask types: warmth masks, competence masks, and reference/neutral masks. Even though every participant responded to each mask type in different blocks, the order in which the various categories of masks appeared was counterbalanced between participants. See figure 3.3 for an overview of the experimental setup.

Each block was structured in four phases that were presented as follows:

- **Phase 1:** First, the computer program displayed a training sequence of four images, in order to verify whether the person understood the specific task instructions correctly.
- **Phase 2:** Immediately following this training phase, participants saw all the stimuli responding to the specific instructions for no-mask approach or mask approach.
- **Phase 3:** The third phase was again a training sequence of four images in which the response instructions were reversed.
- **Phase 4:** In the fourth phase participants responded to all the stimuli with the new instructions.

Figure 3.3. Overview of the distribution of participants and experimental conditions.

In each block, 24 stimuli were presented twice in a random order, once with the first instructions and once with reversed instructions. Hence, the complete task, made up of three blocks, comprised 144 trials (see figure 3.3).



Explicit judgments – responses to the questionnaire

At the end of the computer task, participants were invited to fill out a questionnaire, while they were shown four images, one after the other. These images showed all four models: three of them were wearing masks and one barefaced. All models wearing masks wore the same mask type as before and their masks also corresponded to the masks that participants saw in the first block of the computer task. The implicit judgments from the first block are more genuine because no comparison is possible, guarding the responses from any habituation to the task or influence of seeing other types of masks in previous blocks. Therefore, we only compared the implicit judgments of the first task with the explicit judgments at the end of the questionnaire. The masks were presented in a fixed order but the model who was wearing them was randomized. The fourth target was always the one wearing no mask. As such, each participant judged each model once and all three masks of each category (i.e., warmth or competence or reference).

In the first question of the questionnaire, we asked participants to pretend they were actually meeting the person pictured for the first time, exactly in the way he/she appeared. They had to imagine this for each target and answer four questions about general liking (e.g., How much do you like this person? How much would you like to meet this person?). All ratings were made on 7-point Likert-type scales ranging from 1 (not at all) to 7 (very much).

3.1.3. Results

Implicit judgments (data processing of reaction times)

In our results, we focus on the analysis of the reaction times that were recorded during the first experimental condition (phase 2 in figure 3.3). We focused on these measurements to avoid any influences of order effects, despite all of our counterbalancing efforts. Additionally, we wanted to exclude all effects due to the inevitable comparative nature of the implicit judgments that were recorded after the first phase.

Response latencies of 47 participants were taken into consideration, excluding very slow (slower than or exceeding three seconds) and very fast reaction times (faster than or below 300 ms). Very slow reaction times may indicate that the participant did not perceive the stimulus or lacked concentration. Very fast reaction times may indicate that the participant reacted prior to the perception of the stimulus. These outliers were processed as errors together with the incorrect responses and made up 2.6% of the total amount of responses. This exclusion rate of 2,6% indicates that the participants acted with a good level of arousal and concentration.

The remaining responses were log-transformed and analyzed in a 2 (Target: mask vs. no-mask images) x 2 (Reaction: approach vs. avoidance) x 2 (Experimental condition: no-mask approach vs. mask approach) x 3 (Mask type: warmth vs. competence vs. neutral) mixed ANOVA of which the first two factors were measured within participants and the latter two between participants. All means were transformed back to reaction times in the following sections for ease of interpretation.

General results – mask/no mask

From this analysis a main effect of reaction emerged, showing that participants were generally faster at approaching rather than avoiding the different targets ($F(1, 41) = 9.86, p < .05$). In addition, the two-way interaction between participants' Reactions and Target turned out to be significant ($F(1, 41) = 8.84, p < .05$). Mean comparisons showed that approach movements were performed faster towards mask images ($M = 757.48$) compared to avoidance movements ($M = 780.55$), while the reverse was true for the no-mask images ($M = 820.57$ and $M = 749.95$ for approach and avoidance reactions respectively). Importantly, these effects were qualified by the three-way interaction between Target, Reaction and Mask type that showed to be marginally significant, $F(2, 41) = 2.53, p = .092$.

The results for different mask types:

In order to get a better understanding of the interaction between mask types separate 2 (Target: mask vs. no-mask images) x 2 (Reaction: approach vs. avoidance) within-subjects ANOVA's were calculated for each mask type (warmth, competence and neutral).

For the **'warmth' masks**, apart from a significant main effect of participants' reactions, no other significant effects emerged ($F < 1$). For these masks there was no statistically relevant difference in how fast masks and bare faces were approached or avoided.

The **'competence' masks** were approached faster ($M = 735.94$ ms) than they were avoided ($M = 789.81$ ms) and this effect was statistically significant ($F(1, 14) = 10.18, p < .05$). The reverse happened for the no-mask images, which were avoided faster than they were approached ($M = 753.49$ ms and $M = 822.9$ ms, for avoidance and approach reactions respectively).

The reactions to the **'neutral' masks** showed a significant interaction effect: $F(1, 13) = 7.99, p < .05$, between target and behavioral responses. Participants responded faster when approaching ($M = 764.63$ ms) than they did when avoiding ($M = 873.68$ ms) reference masks, while the reverse happened for the correspondent bare faces ($M = 882.18$ and $M = 759.92$ for approach and avoidance movements respectively).

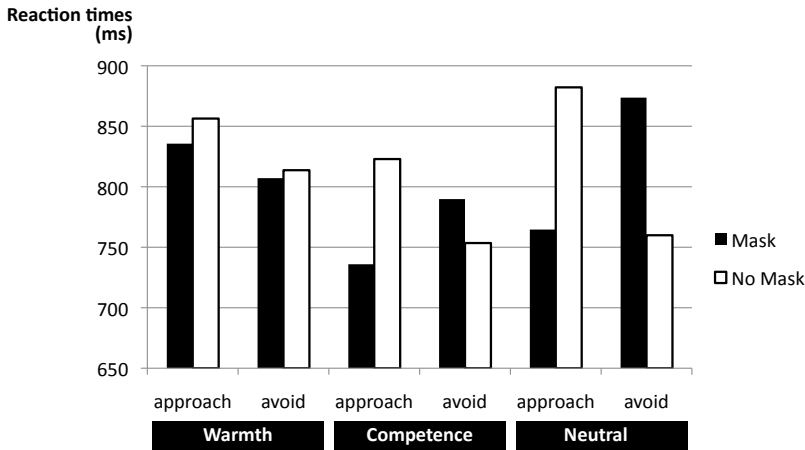


Figure 3.4. Between-participant comparisons by mask type (only first block). Three factors interact: approach/avoid, mask/no mask and mask type (from left to right: warmth, competence, reference).

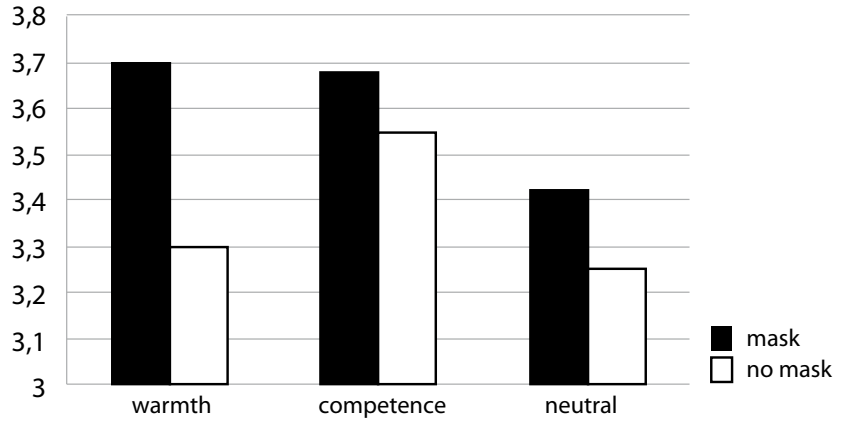
Explicit judgments (analysis of questionnaires)

As stated earlier, participants were also invited to fill out a questionnaire, while they were shown four images. Participants had to pretend they were actually meeting the person in the picture for the first time and they had to answer four questions about general liking (e.g., How much do you like this person? How much would you like to meet this person?). All ratings were made on 7-point Likert-type scales ranging from 1 (not at all) to 7 (very much).

Results for Liking (warmth)

The first four questions of the questionnaire all reflected general liking and were aggregated in a single index ($\alpha = .72$), which was calculated separately for the models with mask and compared with the barefaced model. These means were analysed in a 2 (Target: mask vs. no-mask) x 3 (Mask type: warmth vs. competence vs. neutral) mixed ANOVA of which the first factor was calculated within participants and the second between participants. Results showed that the mask types did not influence the 'liking' judgements (non-significant - $F < 1$). Still, the depicted means in figure 3.5 show that participants tended to like the warm masks slightly more compared to the bare faces. This difference, however, was only marginally significant ($p = .11$). Moreover, the mean judgment on liking was the highest ($M = 3.7$) for warmth masks. Clearly no differences emerged for competence and neutral masks.

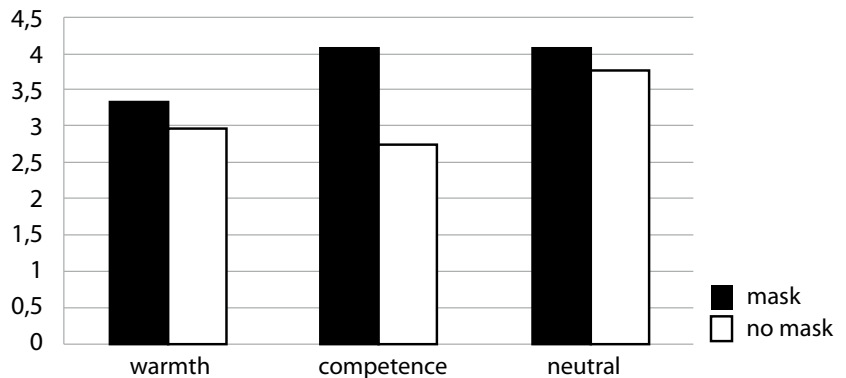
Figure 3.5. Explicit liking judgments in function of the target and the type of mask (Non-significant interaction).



Results for Professionalism (Competence)

Looking at the ANOVA calculated on the means of judgments on professionalism (specialist, professional, scientist, $\alpha = .62$), we found that overall masked persons were judged as more professional ($M = 3.82$) than the bare faces ($M = 3.16$) (significant main effect of target, $F(1, 44) = 12.11$, $p < .01$). Moreover, a significant interaction effect emerged between target and mask type, $F(2, 44) = 3.29$, $p < .05$, indicating that competence masks were seen as the most professional among the mask types ($M = 4.07$), and in comparison to the corresponding no-mask images ($M = 2.73$) (figure 3.6).

Figure 3.6. Professionalism means of interaction between type of mask and mask/ no mask (Significant $p < .05$).



3.1.4. Discussion

The reaction time measurements do not agree with our hypotheses. Reaction times were faster when participants had to approach the mask stimuli. This result not only contrasts with our expectations, but also to a certain extent with the explicit judgments given by the participants. Indeed, the masks that were least liked in the reaction time experiment proved to be the most liked ones in the questionnaire.

An alternative explanation could be linked to the way in which the experiment was set up. People had to decide whether something was present (mask) or not. Formulating the task in these terms, people may have been faster at approaching masks because it is easier to point at something (making a forward movement) that is present than to point at something that is absent. Following this explanation, it is plausible that the reaction time measures reflect the fact that people liked the warmth masks better, because this facilitation effect was absent for the warmth masks. Interpreting the data from this perspective, we suggest that the warmth masks are most likely to be ignored on the face of a person. However, more research is needed to support this alternative explanation. In an iteration of the experiment, we suggest researchers alter the original setup, asking participants for example to categorize people with glasses and people with masks.

3.1.5. Conclusions

This experiment bears witness that experimental techniques from social psychology can be inspirational for the field of design research. Understanding and interpreting behavioral tendencies towards stigma-eliciting products by measuring implicit reflex reactions as well as analyzing questionnaires, which reflect more thoughtful responses, can be a basis for a quantification of the product-related stigma potential.

The technique that was used to record the reaction times is relatively straightforward to execute, but does require a tight control over the experimental script and its parameters. Analyzing the results is time-consuming and requires a solid comprehension of statistic analysis.

At the end, the experiment revealed little effect. The experiment was intended as a comparison task, but turned out to be a detection task due to the visual contrast between the mask and no-mask conditions. It is advised to replicate this study with stimuli that have a product in or around the face in both conditions (e.g. glasses, hat, scarf). By doing so, the experiment returns to its original purpose and allows researchers to compare two human-product conditions. At the same time, a reduction of the esthetical variability between the mask types may allow for a better evaluation of the implications of design interventions or product variances.

To improve our understanding of the unprepared encounter, we will direct our experimental efforts towards setups that approach real-life conditions and encounters. The following experiments will explore the observable behavior of bystanders, whether intentional or not.

3.2. The Immersive Mask Experience

The immersive mask experience was a pivot point in our research and motivates a shift from the lab towards a real-life situation. We moved our attention away from the reactions and experiences of the bystanders towards a personal experience in which we could observe the bystander and experience the intensity of their reactions. The immersive mask experience allows the designer to get as close as possible to a real-life situation and experience 'in the flesh' what it is like to wear a dust mask in public. As such, we orchestrated this exploration as a straightforward and manageable learning method for designers, aimed at first person experiences instead of quantifiable data.

Additionally, the immersive mask experience was organized to explore the qualities which the 'experience prototyping approach' has for our research. We wanted to find out whether an immersive experience with a social experience prototype could have a positive effect on the designer's sensibility and empathy. In contrast with most functional experience prototypes the use of our social experience prototype (a plain white dust mask) was not considered an enjoyable activity. By placing our students and ourselves in this situation, we underwent a powerful confrontation with the phenomenon of product-related stigma.

3.2.1. Concept and procedures

The immersive experience exploration was part of a design assignment called 'The Pleasurable Mask Experience', in which students had to design a mask that was unconstrained by negative connotations projected both by users and bystanders. The project represented a workload of 4 ECTS (European credits) and 60 third grade bachelor students in Product Development at the Artesis University College of Antwerp participated. The assignment challenged students to conceive a pleasurable dust mask experience for four specific target groups: the active elderly (yourself in 40 years), children aged 3 to 7, children aged 8 to 12 and bike couriers. For each of these target groups, the students had to develop a mouth and nose covering dust mask that was fitted with existing filtering technology. To ensure the integration of emotional awareness and empathy, a three-step framework was used. Each step of this three-step framework consisted of a divergent and convergent phase. The various empathy-enhancing activities are marked in yellow (figure 3.7).

The immersive mask experience was organized a few weeks before the actual start of the design project and presented a vital first step in our empathy-enhancing process. On the day they received their white dust mask, students were instructed to wear their mask in public settings for at least two hours a day. In the design assignment, we initially intended this exploration to

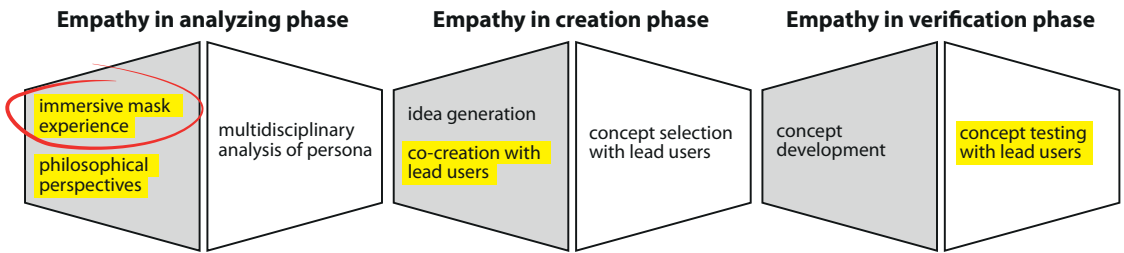


Figure 3.7. The three-step framework followed in the 'Pleasurable Mask Experience' assignment.

divert students away from themselves as a point of reference to an empathic understanding of their future user. Additionally, we wanted to make sure that students would not underestimate the physical and psychological discomfort associated with wearing a dust mask.

As they set out wearing their masks in public, students personally experienced the reactions of bystanders, which they observed and documented. Students often made their walks in small groups of two or three. One of them wore the mask, while the others observed from a 'safe' distance to avoid spoiling the authenticity of the reactions. At the end of the exercise, students were requested to present an A3-poster with quotes and pictures that portrayed their feelings and experiences.



3.2.2. Results

We purposely did not inform or prepare our students for this assignment. After distributing the masks, we noticed a lot of opposition and frustration. Most students 'hated' the assignment and only a very small number of students stated that they had no objections to wearing their dust masks in public. During the immersive experience, we discovered that the perceptions and attitudes of students differed dramatically. Their personalities strongly influenced the way in which they coped with the assignment. Some students reluctantly did what they had to do while others took immediate action to improve their masked appearance. In figure 3.8 we see how two students, Chloë and Robrecht, immediately tried to alter their masks to look less conspicuous.

Next to their frustrations about various usability and comfort issues, most students also illustrated the emotional consequences of wearing a dust mask on their posters. Several students even managed to capture the expressions of bystanders with hidden cameras or pictures taken by their spy colleagues.

Figure 3.8. Chloë (top) and Robrecht (bottom) try to adjust their masks and the accompanying 'social image' through some quick alterations.

These were the most common reactions and associations reported by our students:

- **Social distance:** The participants observed or 'felt' that bystanders maintained a greater (safer) distance. Several students reported that this turned out to be an advantage while using public transport; they always had a seat or enough room to move around.
- **Awkwardness and embarrassment:** Friends or family were often ashamed when a masked student accompanied them.
- **Contagiousness:** With the bird- and Mexican flu in the back of their minds, some people made a connection with infectious diseases and contagiousness.
- **Mysophobia (fear of germs):** Wearing a mask can also be associated with a pathological fear of contamination or germs.
- **Staring:** Students described and visually documented that people often stared in many different ways. Students literally quoted that virtually 'everybody stared' at them. However, when students stared back or tried to overtly photograph these reactions, most bystanders turned their heads, suggesting that they did not want to be linked to their own judgmental behavior. These are our interpretations of the most commonly reported staring reactions:
 - *The 'ignoring' stare:* The passer-by did notice the student but pretended as if he or she didn't.
 - *The 'sympathetic' stare:* The passer-by noticed the student and gave a look of recognition or sympathy. This sympathy was often linked to the absurdity of certain situations.
 - *The 'maintained' stare:* Reports were made of elderly people who explicitly stared for longer periods of time and with expressions ranging from non-existing over disapproval to fearful.
 - *The 'laughing' stare:* Fused by curiosity, children and youngsters displayed little reservation and often combined their staring with laughter, remarks or questions.
- **Tourist:** Because most students walked along the street of Antwerp, bystanders also made associations with foreign tourists visiting the city with respiratory protection. Students also reported that they gave bystanders and friends the most bizarre explanations about why they were wearing the masks.

An experience that was shared by many was the social unease that they themselves experienced. Even in the absence of others, most students felt uncomfortable and a target of attention.



*Observatie /transport

Opbergen: Het mondmasker kan opgeborgen worden tot de 10e secondaire versie. Deze vorm is compact maar ontvuld automatisch zichzelf. Ook kan deze manier van vervoer voor kinderen zorgen. Anders: beter voorbaar materiaal en een bescherm-eld-studie voor ontvankelijk zorgen.



*De 5 meest storende ongemakken

*Observatie /product

- 1 Slechte aansluiting:** Het mondmasker sluit niet aan met de zijken van de neus & de rechte onder de oorschelp. Daardoor valt het vaak verschillende ongemakken zoals een **aangepaste fit** & een **bemoeien van het zicht**.
- 2 Slechte aansluiting 2:** Het masker onderzakt dat beweegt & op het gemakker helpt droog bij het aansluiten maar & **ver van afstand**, het kan ook knellen en na meerdere malen te gebruiken versrekt dit ongemak maskeraad & vraag het meer op en het weer goed te plaatsen.
- 3 Rekkers:** De rekken kunnen **pijn** zijn wanneer ze aan het haar trekken bij het gebruik, het aanbrengen en het uittrekken van het mondmasker. Door hun kleur zijn de **Lubrip-zichtbaar** & sommige kapsels worden snel wondbaar.
- 4 Huidirritatie:** Na lang gebruik wordt ervaren dat de huid **rood** veront en de vorm van rode plekken & jeuk. Dit wordt veroorzaakt door de wrijving van de stof met de huid & de hoge luchtvochtigheid binnen het masker. In de zomer kan het ook zijn dat het mondmasker een **strik** maakt doordat de huidvloeit die niet bedekt zijn gebouwd worden.
- 5 Luchtvochtigheid:** Bij het geleide gemakker wordt ervaren dat de uitgedroogde lucht niet vast naar buiten gaat. Hierdoor wordt het binnen snel **vochtig** & kan dit na meerdere malen gebruik voor onaangename geuren & onhygiënisch bestanden zorgen.



*Observatie /omgeving

Tijdens de observatie werd vastgesteld dat de **samband** van de mensen veel meer op & gericht is dan wanneer er niet met een mondmasker **verkeert**. Dit kan met **contacterend** werken. Door de mensen te meer **vertrouwen** met & zich het **verkeert** een **meer** & "binnen" personen die **verkeert** de **de** de **massa** **toest**. Tijdens de **observatie** werden & **meer** **omgevingen** ("Wat is er aan de hand?"), **wie** **wat** is er **niet** **verkeert** van **personen** die er **niet** **veel**. **Achter** **me** **op** **toesla** & **houden** als "binnen" en "binnen". **Kinden** **konden** **het** **niet** **lezen** **in** **te** **lezen**. **Tijdens** **wanneer** **je** **dat** **buiten** **loopt** **wordt** **je** **met** **de** **massa** **op** **de** **lezen** **gevoelt** **je** **draagt** **een** **mondmasker**.

Conclusie: Sociaal onaanvaard

*Jens Baert - 3 BA PO - Usability - Individuele opdracht mondmaskers



3.2.3. Conclusion

The general conclusion of this experience was remarkable; students did not like the fact that they were stared at, 'like they were bearers of an infectious disease'. The exploration clearly emphasized that dust masks have a strong stigmatizing effect, and are not perceived as a 'normal' feature in our streets and public places. Their personal experience also made students aware of the challenge ahead and the importance of an encompassing user experience approach.

Many of the assumptions that they had incorporated in their first design concepts, proved not to coincide with the expectations of the target group. The immersive experience gave our students something that went beyond the notion that empathy with the user is important; it created an empathic awareness that stretched out towards the larger social environment.

Figure 3.9. on the left, examples of student posters visually representing their experiences (Jens Baert & Jonathan Cools).

Below, some concept sketches of dust masks that were conceived during the 'Pleasurable Mask Experience'.



3.3. The Spy Pack Exploration

The immersive mask experience evidenced that a lot can be learned from the real-life interaction between users of stigma-eliciting products and those who surround them. As stated earlier, an important and defining thoughtful reaction to product-related stigma seems to be avoidance. The Spy Pack exploration is the first in a series of three explorations that aims to quantify how people approach and pass a user and his stigma-eliciting product.

Following the measuring of reaction times in a lab environment, this exploration represents our first attempt to approach and observe the actual unprepared encounter. The Spy Pack exploration focuses on the bystander's perceptual and behavioral responses that result from a product-related stigma encounter and is set in a controlled indoor environment. Perceptual responses were explored by observing the staring behavior of passers-by as they approached and passed a dust mask user. The behavioral responses were investigated by analyzing deviations in the walking paths of passers-by as they approached and passed a dust mask user.

By analyzing the images of seven cameras, we investigated the relevance of three parameters:

Perceptual parameters related to staring behavior

- **Moment of perception:** the distance between a passer-by and the mask wearer at the moment of visual perception.
- **Looking over the shoulder:** the registration of the number of passers-by that looked over their shoulder after passing the mask wearer.

Behavioral parameters related to walking behavior

- **Interpersonal distance:** the registration of the closest interpersonal distance between the passer-by and the mask wearer as they pass each other.

The main goal of this exploration was to determine which of these parameters are most relevant for further exploration. The setup of this exploration was inspired by observational research methods. By simulating real-life conditions in an indoor environment, we managed to reconstruct the valuable 'first time encounter' in a controlled environment. The research was conducted on a sample of 87 male and 82 female participants, who were randomly assigned to three conditions, a no-mask reference condition and two distinct mask conditions.

3.3.1. Method

In this experiment, the independent variables were the gender of the confederate (mask wearer) and the three mask conditions (no mask – standard white mask – blue Respro mask). All variables were counterbalanced.

The dependent variables that were measured:

Variable 1 – Staring behavior / Moment of perception: This measure provides an indication of the moment or sector in which our confederate was noticed, as the passer-by approached him or her. A sector scale (figure 3.13) reflected whether the perception occurred without delay, with short delay or with long delay. Early detection could be an indication of increased interest, vigilance or alertness, which could in turn signal to the mask wearer that the passer-by does not feel at ease in his or her presence.

Variable 2 - Staring behavior / Looking over the shoulder: An overt type of staring behavior occurs when people turn their heads after passing a mask wearer. We inserted this variable for exploratory reasons, mainly because numerous reports of this reaction were made during the ‘Immersive Mask Experience’. The overt nature of this behavior, combined with the distinguishable rotation of the head made it relatively easy to assess when the reaction occurred. This overt reaction has an undeniable impact on the mask wearer who notices it.

Variable 3 – Interpersonal distance: This is the closest distance between the passer-by and our research confederate during the interaction. Interpersonal distance reflects people’s willingness to avoid an individual.

The experiment was set up in a controlled indoor environment and registered the behavior of people passing by a confederate, wearing a dust mask in a discrete setup. During the course of the experiment the confederate was discretely occupied with his mobile phone and did not make visual eye contact with any passers-by. The walking and staring behavior of the passers-by was registered by five overhead HD-camera’s, supplemented with two HD pen camera’s that were attached to a backpack in an unnoticeable way.

3.3.2. Experiment

Stimuli

The experiment focused on those parameters that could serve as indicators or predictors of stigmatizing behavior around stigma-eliciting products. We repeated our experiment for two mask types and a no-mask reference situation (See figure 3.10). The first mask was a white disposable dust mask with a double headband and no breathing valve (NORTH 810-FFP1). These masks protect against non-volatile solid and liquid particles and are commonly used for light construction work.



Figure 3.10. A male and female confederate in the three conditions.

The second mask is the Respro City mask, a mask that is often used by bike couriers in busy city traffic. The blue Respro mask has breathing valves on both sides and was chosen because of its high visibility. It would be interesting to detect whether there are differences between these two mask conditions on any of our three parameters.

Experimental setup

The experiment was set up in a spacious hall with no visual or physical obstructions. The hall had a length of 20 m and a width of 2,7 m. The confederate was placed, leaning against the wall, at a distance of 12 m from the entrance. Five overhead cameras were positioned in a lighting rail, 4 m above the confederate. To avoid distortion, we made sure that there was enough overlap between the video images of the overhead cameras. The combination of the five images enabled us to monitor the passers-by over a distance of 15 m, 10 m before and 5 m after passing the research confederate. Prior to the actual experiment we interrogated 35 passers-by and asked them

whether they had noticed anything unusual in the empty hallway; none of them reported noticing the overhead cameras.

Figure 3.11. The hall in which the experiment was set up.



Participants

The research was conducted on a total sample of 169 students and employees of the Artesis University College of Antwerp, of which 87 males and 82 females. Participants' age ranged from 18 to 50 years old. All participants had the Belgian nationality and participated unknowingly. Participants were intercepted at the end of the hallway, where the intentions of our research were clarified and permission was asked to process the images. All participants agreed to cooperate. Male and female participants and confederates were counterbalanced within each condition (no mask, white mask and blue mask). We explored six conditions:

Condition	Mask type	Gender of research confederate
1	Neutral – no mask	Female
2		Male
3	White mask	Female
4		Male
5	Blue mask	Female
6		Male

Equipment

All six conditions were filmed in full sequence. To allow synchronization of the seven video-images, an audio signal was incorporated at the start of the recordings. Above the research confederate, five Sanyo X-acti HD cameras were installed and in the backpack two VIO POV wide-angle HD cameras were built in. We will refer to this backpack with spy-like qualities as the ‘spy pack’. Figure 3.12 shows how both cameras were integrated in the spy pack. The five images from the overhead cameras were ‘stitched’ and carefully aligned in Adobe Premiere.



Figure 3.12. Build-up of the spy pack backpack / A male research confederate wearing the spy pack.

Procedure

In order to qualify as a valid participant, a passer-by had to singly approach our test person, without being obstructed by others during the full length of the interaction process. Passers-by who encountered a distracting event during the interaction were excluded from the sample. The subjective data that were included in the observations offered valuable information on the ‘rich’ reactions (smile, frown, looking away, etc.) that passers-by displayed.

All video images were processed in Adobe Premiere and compiled into one overall image that comprised the images of all seven cameras used in this experiment. The images were assessed on a 32” High Definition LCD screen that provided the necessary resolution and contrast for an accurate observation.

Variable 1 – Staring behavior / Moment of perception (MP)

To efficiently determine the moment of visual perception, we specified three sectors in the 10 m range that was registered when someone approached the mask wearer. We labeled this a sector scale (figure 3.13) and it indicates

whether the perception happened without delay, with short delay or with long delay. If the passer-by did not visibly look at our confederate, in any of these three areas, we encoded this participant's perception as 0. The moment of visual perception was determined by analyzing the frontal video image of the spy pack on a large screen, combined with the composed image of the overhead cameras. Passers-by who clearly turned their head towards our confederate or stared into the camera mounted on the confederates' shoulder, were considered as valid participants. When a clear visual detection of the passer-by was observed on the frontal camera, the image was paused and the correspondent sector was indicated with the appropriate statistical value: 0 (no visual perception), 1 (sector 1/long delayed perception), 2 (sector 2 /shortly delayed perception), 3 (sector 3/no delay or immediate perception). In figure 3.13 a passer-by noticed our confederate in sector 2, with a short delay.

Figure 3.13. Variable 1
Staring behavior: no delay,
short delay or long delay.



Variable 2 – Staring behavior / Looking back

This variable is an indication of enhanced staring behavior and was derived from the images of the rear camera in our spy pack. Displayed on a large screen, these images enabled us to detect whether people looked over their shoulder or stared into the rear camera. This parameter was transformed into a 0 (no looking back) or a 1 (looking back behavior). No attention was given to the relative position of the passer-by towards our confederate at the moment of looking back.

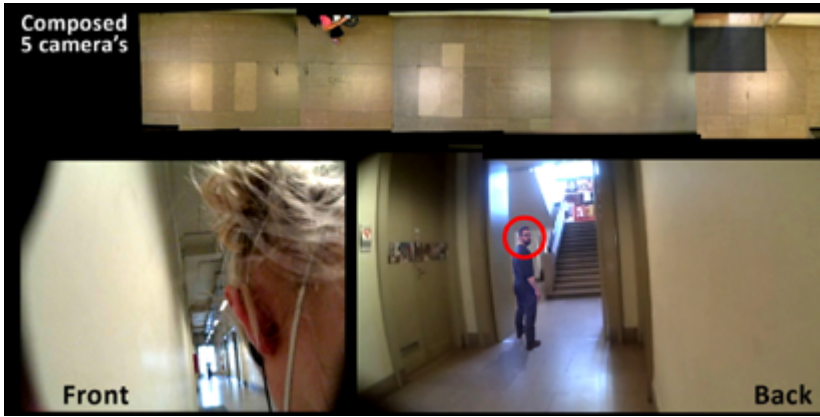


Figure 3.14. Variable 2 Staring behavior: a passer-by looking over his shoulder.

Variable 3 – Interpersonal distance

This variable was conscientiously derived from the combined overhead camera images. The wall against which our confederate leaned served as the zero mark for our distance measures. As portrayed in figure 3.15, we intended to measure the distances between the zero mark and the passer-by at three points in the walking trajectory. Differences between the distances at WD1 (Walking Distance 1) and WD3 would provide us with an indication of the explicitness of the avoidant walking behavior. However, in this exploration we only address the interpersonal distance at WD3, which is the shortest distance between the confederate (zero mark) and the passer-by. When a passer-by was aligned with this mark, the video image was paused and the distance between the center of the head and the zero mark was assessed with the help of a grid-overlay. This grid, with an accuracy of 25mm, was positioned over the composed and aligned images of three overhead cameras, one exactly above the confederate and two consecutive ones in the direction of the entrance. To increase the accuracy, measurements were taken from this ‘zoomed-in’ image.

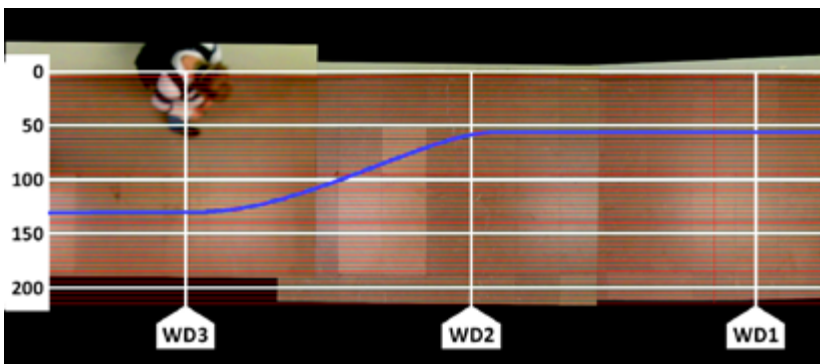


Figure 3.15. Variable 3 Deriving the walking distance between the zero mark and the passer-by.

3.3.3. Results

Two hypotheses were examined after the data were gathered. The hypotheses are linked to the detection and measurement of explicit behavioral responses, namely staring behavior (moment of perception and looking back) and avoidant walking behavior vis-à-vis a wearer of a stigma-eliciting dust mask.

Hypothesis 1 – Moment of Perception (MP)	MP mask < MP no mask
Hypothesis 2 – Interpersonal distance on WP3 (ID)	ID mask > ID no mask
Explorations	Differences between mask types, gender of research confederates, and gender of participants for MP and ID

Our first hypothesis predicts that a person who wears a dust mask is perceived significantly faster, which could in turn be an indication of heightened alertness or self-protection of the passer-by. Our second hypothesis forecasts that a passer-by will maintain a greater (safer) walking distance when our confederate is wearing a dust mask. In addition, it would be interesting to discover significant behavioral differences in any of the three parameters, related to the two mask conditions and related to the gender of the participants or confederates.

Prior to the validation of our hypotheses, we examined whether the gender of the confederate or passer-by had the potential of influencing any of our three parameters. For each of the three conditions (no-mask / blue mask / white mask) the experiment was executed with both a male and a female confederate.

After analyzing the results of 87 male and 82 female passers-by, we noted a similar distribution of the results among male and female passers-by and confederates when it came to the two staring variables (moment of perception and looking back). A chi-square with continuity correction showed no significant difference for looking back (passers-by: $\chi^2(1, \text{correction}) = 0.022$; $p = .881$ / confederates: $\chi^2(1, \text{correction}) = 0.146$; $p = .702$). A Mann-Whitney U test showed no significant difference between the medians for the sector in which the confederate was perceived (passers-by: $z = -0.007$; $p = .995$ / confederates: $z = -1.347$; $p = .178$).

An analysis of the valid results of 44 male and 47 female passers-by assessed gender influences on the walking behavior. The Mann-Whitney U test did not show a significant difference between medians of both confederates (median male: 177,5 / median female: 167,5, $z = -1.483$, $p = .138$) and passers-by (median male: 172,5 / median female: 170, $z = 0.810$, $p = .418$). Performed on the four gender combinations of passers-by and confederates, a median test showed no significant differences in walking distances ($\chi^2(3) = 1.338$; $p = .720$).

These results enabled us to add the male and female samples for the three experimental conditions. Collapsing these variables generated a bigger sample for each condition and increased the accuracy of further statistical analysis.

Variable 1 – Staring behavior / Moment of perception

The data stored in this variable were linked to a score of 0 (no visual perception), 1 (delayed perception), 2 (shortly delayed perception), or 3 (no delay or immediate perception), according to the sector in which the passer-by made visual contact with our confederate. A confederate in the neutral no-mask condition was not perceived by 39% of the passers-by. This percentage drops to respectively 9% (white mask) and 5% (blue mask) for the mask conditions.

The white mask is detected faster with a total of 84% in sectors 2 (shortly delayed) and 3 (immediate detection), whereas the blue mask is detected slower with a total of 82% in sectors 1 (delayed) and 2 (shortly delayed).

	No-perception (0)	Delayed (1)	Short-delayed (2)	Immediate (3)
Neutral	39%	20%	35%	6%
White mask	9%	7%	54%	30%
Blue mask	5%	37%	45%	13%

Figure 3.16. Percentage indicating the moment (sector) of perception

After performing a test for equality of medians (Kruskal Wallis), we did notice a significant difference between the three medians ($\chi^2(2) = 29,886$; $p < .002$). Comparing the equality of medians two by two with the Mann-Whitney U test each time delivered a significant difference (neutral - white mask: $z = -5.117$; $p < .001$ / neutral - blue mask: $z = -3.031$; $p < .003$ / white mask – blue mask: $z = -3.175$; $p < .003$).

Variable 2 – Staring behavior / Looking back

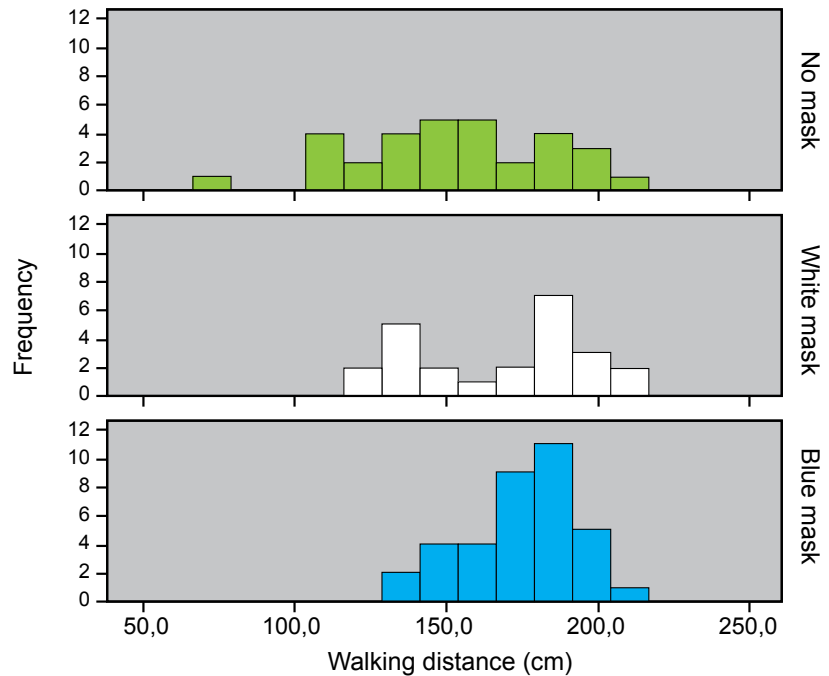
This variable was introduced to serve as an indicator for increased visual interest from the part of the passer-by. Our results show that none of the participants looked over their shoulder after passing a confederate without a dust mask. For the blue mask 7 out of 56 participants (12%) looked back and for the white mask 11 out of 59 participants (18%) did. The chi-square with continuity correction did not indicate a significant difference for the two mask conditions ($\chi^2(1, \text{correction}) = 0.422$; $p = .516$).

Variable 3 – Interpersonal distance

The interpersonal distance on which we report is measured at point WD3 (closest distance between confederate and passer-by), as indicated in figure 3.15. A test for equality of medians (Kruskal Wallis) displays a significant difference between the medians of the walking distance for the three mask conditions ($\chi^2(2) = 8.606; p < .015$). The median of the walking distance for the blue mask condition is significantly higher than for the no-mask condition (Mann-Whitney U: $z = -2.996; p < .004$). With 10 percent significance, there is a significant difference between the medians of the walking distance of the neutral and the white mask condition (Mann-Whitney U: $z = -1.682; p < .094$). A Post Hoc Tukey HSD used on a one way ANOVA shows a .068 significance between the neutral and white mask conditions.

Figure 3.17 better represents the spread of the results. We can note an almost unvarying spread in the range between 110 and 200 cm for the no-mask condition. For the white mask we can see a shift of results towards the right, which clearly indicates that the passers-by did prefer to maintain a greater distance as they walked by our confederate. This shift is even more apparent for the blue-mask condition.

Figure 3.17. The relation between the walking distances, the three mask conditions and the frequency of occurrence.



3.3.4. Discussion

The results of this experiment led us to infer that passers-by do perceive a confederate with a dust mask noticeably faster and do exhibit behavioral changes, such as increased staring behavior and a greater interpersonal distance.

Both mask conditions were detected significantly faster than the no-mask condition, with the shortest delay for the white mask condition. A confederate without a mask was not noticed by 39% of the passers-by. This percentage dropped significantly to 9% for the white mask and only 5% for the blue mask. The white mask was detected faster than the blue mask, with an immediate detection rate of 30% (16% for the blue mask). Both masks did get high detection rates (54%-white / 45% blue) in sector 2 (short delay). Comparing the two mask conditions indicated a significantly faster perception for the white dust mask. This quick detection could be related to its contrasting color or the slightly larger size of the mask. Although visual detection is crucial, consequently determining the moment of detection proved to be a challenging task. We do realize that this parameter can be subjected to interpretation and that therefore it is problematic. This is why, in the following experiments, we focus on personal distance as the parameter that delivers an objective measure. By taking sufficient samples we can eliminate influences of variations at the moment of perception.

The increased visual interest for both mask conditions was also reflected in the number of passers-by that looked over their shoulder. None of the participants looked back after passing a confederate without a dust mask, whereas respectively 18% and 12% did do so in the blue and white mask conditions. Analyzing the images of the rear camera on a large screen allowed for an objective observation of this oftentimes overt reaction.

Apart from a heightened alertness, our results also showed a significantly greater interpersonal distance between a passer-by and a person with versus without a dust mask. Although the interpersonal distances did not vary significantly between the two mask conditions, we do note a more consistent and greater interpersonal distance (less variance) towards the blue mask.

The experimental setup in this specific hall taught us that it is advisable to use a wider passage area. With a width of 2,7m this hallway might have restricted the freedom of the passer-by. Moreover, the fact that subjects crossed the path of potential participants from the opposite side limited the number of valid participants and increased the duration of the experiment considerably. In a future setup we will transfer the experiment outdoors and allow for a passage of at least 4 m wide, with a more consistent flow of pedestrians. In addition, the exploration required a lot of hardware and preparation. In subsequent explorations we will aim to reduce the setup and evaluation time.

The use of video cameras directed towards the oncoming stream of passer-by as well as away from them did prove valuable for gathering 'rich' information and for reviewing the gathered data.

3.3.5. Conclusion

In our quest for a tool that can determine the 'degree' of product-related stigma attached to a product, the relevant contribution of this exploration was the confirmation that the three parameters of interest proved to be comprehensive, measurable and valuable for further exploration. Due to the exploratory nature of these findings and the basic stimuli, it was impossible to make any valid statements concerning the degree of acceptance of both mask conditions or the product attributes to which passers-by might have reacted.

The current setup had two flaws. The challenge of objectively determining the moment of perception, together with the multitude of images that had to be processed and evaluated, turned this exploration into a time-consuming undertaking.

It would be beneficial for further research to introduce improved experimental scenarios and a combination of camera's and sensors that allow for a quicker and more accurate data processing. The next two experiments focus on the objectively measurable parameter of interpersonal distance and attempt to improve its measurability.

3.4. The Dyadic Distance Experiment

The spy pack exploration was as a preliminary study leading to the next two explorations. The spy pack exploration confirmed that two parameters proved to be measurable and valuable in a quantification of the avoidant behavior of bystanders around users of stigma-eliciting products: the moment of visual perception and the interpersonal distance. The results of the spy pack exploration indicated that passers-by do perceive a confederate with a dust masks noticeably faster and do exhibit behavioral changes, such as increased staring behavior and a greater interpersonal distance. A faultless and unbiased detection of the moment of visual perception proved to be problematic, and as such we discarded this measure. Counting the number of people that looked over their shoulder after they passed the mask wearer assessed the increased staring behavior. Although this measure is straightforward and easy to detect it is difficult to determine what motivated this reaction. The response could be triggered by curiosity, positive affect or negative aversion. Consequently we shifted the focus of our explorations to the parameter of interpersonal distance as a valid and reliable measure to quantify the avoidant behavior of bystanders around users of stigma-eliciting products.

The two experimental techniques presented in this paragraph focus on the parameter of interpersonal distance. Both explorations are set in real-life outdoor situations and use the same five dust mask prototypes as stimuli. The first is called the 'Dyadic Distance experiment' and it focuses on an accurate measurement of the shortest interpersonal distance between the passer-by and a research confederate (mask wearer), by means of an ultrasonic sensor. The second experiment is called the 'Stain Dilemma' and is a simplified variation that introduces a physical obstruction in the walking path, forcing the passer-by to chose between two walking paths.

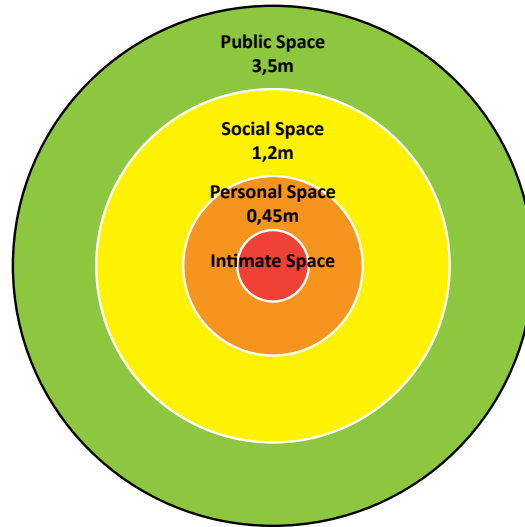
Interpersonal distance as a measure to quantify product-related stigma

Measuring interpersonal or social distance is a common method used to examine stigma and it refers to people's willingness to avoid versus interact with individuals. Previous explorations clearly indicated that the presence of a stigma-eliciting dust mask affects the interpersonal distance between the passer-by and the research confederate.

Hall (1966) states that the social distance between people is reliably correlated with physical distance, as are intimate and personal distance, according to the following delineations: intimate distance for embracing, touching or whispering (15 to 46 cm), personal distance for interactions among good friends or family members (46 to 120 cm), social distance for interactions among acquaintances (120cm to 370cm), and finally the public distance used for public speaking (370 cm or more) (figure 3.18).

Prior to the conceptualization of our explorations we reviewed the factors that have the potential to influence the interpersonal distance. The table below lists those factors that will influence the interpersonal distance between a mask wearer and a passer-by (next to the five mask stimuli that were used in the explorations).

Figure 3.18. Hall (1966).



Staring	Staring at an individual increases the chance of social interaction, and may result in a tendency or felt ‘obligation’ to interact. There is a correlation between the degree of eye contact and the resulting approach or avoidance reaction in bystanders. A smaller interpersonal distance results in less eye contact and vice versa, depending on the relationship of the individuals involved in the interaction. This effect is clearly observed in interactions between individuals of the opposite gender (Argyle, 1965). When designing an interpersonal distance experiment, the determination of the degree of eye contact needs to be specified accordingly. When wearing a dust mask, eye contact with the passer-by could increase the chance of visual perception. As such, during an encounter with a user of a stigma-eliciting product, exchanging visual contact may increase the interpersonal distance, expressing the unwanted character of the interaction.
Body orientation	When the mask wearer’s body orientation is diverted away from a passer-by, the chance of interaction with and visual perception of the stigma-eliciting product decrease, resulting in a smaller interpersonal distance. This behavior is related to social interaction patterns, which largely depend on cultural and societal factors. Our body language expresses a possible interest in the message that the other wants to convey. By orientating the body towards that person, we show that we are willing to receive this message (Martin, 1995). Directing the body orientation of the mask wearer towards the passer-by is therefore the most authentic and unsuspecting setup.

Culture	<p>The culture in which the interaction is set will subtly dictate a complex frame of reference for social interaction. Both social distance and body orientation are strongly influenced by these unwritten rules of social engagement (Martin, 1995).</p> <p>A distance that is sensed as comfortable in a contact-culture A might be sensed as 'invasive' in a non-contact culture B (Hall, 1966).</p>
Size and volume of the room	<p>Hall states that the social distances that are maintained and silently agreed upon in a particular culture influence the allocation and size of spaces. White (1975) states that the size of a room is negatively correlated to interpersonal distance. In a small room the interpersonal distance will be larger than compared to a bigger room.</p>
Social relationship	<p>Next to cultural influences, the social relationship between individuals will extensively influence their interpersonal distance. A person lets him or herself be approached more easily by some than others. A spouse, for example, is able to enter the intimate space without avoidance or flight reflexes from the other, a task that would be difficult for a stranger. As a result, interactions appear to be less intimate when they take place in the outer regions of the model (social or public space). When a person with a stigma-eliciting product enters a social zone that is undesired by the bystander, the latter will increase their interpersonal distance. This phenomenon is not easily explained and factors such as gender can have a significant effect (Wellens & Goldberg, 1978).</p>
Gender	<p>Gender influences interpersonal distance in certain situations. Studies have shown that, in comparison to women, men maintain a greater interpersonal distance when confronted with a stranger. Studies from the seventies (Adler et al. 1974; White, et al., 1975; Wellens & Goldberg, 1978) suggested that gender influences interpersonal distance in dyadic confrontations. Recent studies, however, point out that gender alone is not the determining factor. Differences in interpersonal distance are mainly influenced by the role, status, and social function that a person radiates in his gender-group. The 'degree' of masculinity or femininity has a greater impact on the interpersonal difference than the biological gender difference. Additionally, the attractiveness of a person can also influence interpersonal distance (Banziger et al. 1984).</p>
Status	<p>When differences in status are sensed, the interpersonal distance will be influenced. People with a comparable status will maintain a smaller interpersonal distance than people who differ strongly in status (Adler et al., 1974; White, 1975). These findings are not backed by other research. Mehrabian (1968), for example, discovered that during a social interaction there was little difference in interpersonal distance amongst people of various social statuses.</p>
Attributes / Accessories	<p>The presence of sensory input also impacts interpersonal distance. An unpleasant smell, the use of headphones or inappropriate clothing can result in a greater interpersonal distance (Workman, 1987; Oaten, 2009; Tajadura-Jimenéz, 2011). There are indications that other attributes, such as mobile phones, music players, and smartphones might influence social interaction. To maintain a focus on the product of interest, it is therefore important that the research confederate is inconspicuous and uncompromised by unwanted attributes.</p>

3.4.1. Experimental stimuli, setup and participants







The location and stimuli are kept identical for both experiments. By simulating real-life conditions, both experiments measure the valuable ‘first encounter’ of a large group of passers-by, in a natural setting, with a research confederate that wears one of five distinct mask typologies.

In both experiments the independent variables are the gender of the confederate (mask wearer) and the mask/no-mask conditions. All variables are manipulated between participants. We now discuss the stimuli, experimental setup and participants, which are the same for both experiments. After this overview we present each experimental technique separately.

Stimuli

Both experiments are repeated for five distinct mask types and a no-mask reference situation, as presented in figure 3.19. During the course of the experiments, we briefly also incorporated a green respiratory mask (not depicted). This mask proved to be out of context for this experiment. Because the mask conditions did not interfere with each other during the actual experiments, we chose to exclude this condition from the experimental sample.

Figure 3.19. The mask stimuli: five mask types and a no-mask reference situation

		
<p>No-mask: reference condition (Referred to as ‘No-mask’)</p>	<p>White disposable dust mask: Headband behind the ears, no breathing valves. (Referred to as ‘White mask’)</p>	<p>Red Respro City mask: Neoprene cycling mask with breathing valves on both sides. (Referred to as ‘Respro mask’)</p>
		
<p>Respro Bandit Scarf: Filter laminated between cotton materials of scarf. Printed pattern in dark grey and black. (Referred to as ‘Scarf mask’)</p>	<p>Mask prototype 1: Transparent mask, mouth and nose are visible. Fine orange edge. (Referred to as ‘prototype transparent’)</p>	<p>Mask prototype 2: Transparent front with sporty looks and details. (Referred to as ‘prototype sport’)</p>

Experimental setup

In our attempt to simulate a real-life encounter, we took both experiments outdoors and selected a suitable city location. The location was selected in such a way that passers-by would experience as little visual and physical distraction as possible, i.e. physical obstructions, visually competing signals, or competing pedestrian circulation. Both experiments were set on a wide sidewalk close to the central railway station of Antwerp, Belgium. Pedestrian traffic on this 320 cm wide sidewalk is mostly one-directional and unhindered over a length of at least 10 m. The street had limited car traffic and potential effects of social insecurity were not present. Our research confederate took a position next to the staircase of a metro exit. The 120 cm high wall of the metro exit provided a suitable surface for positioning the measuring device of the Dyadic Distance experiment. Measurements were done in one direction only.

These are the requirements that were observed while selecting the proper location:

- No object within a range of 500 cm of the research confederate.
- No bad or extreme weather conditions while performing the experiments. Weather conditions were equal in both experiments and for the various mask conditions.
- We performed the experiments between 3 p.m. and 6 p.m. in the afternoon. At that time, pedestrian traffic proved to be constant on that specific sidewalk, resulting in a flow of approximately three passers-by per minute.

The research confederate was dressed discretely and acted unsuspecting. These are the requirements that were accounted for in the selection and preparation of the research confederate:

- No eye-catching or too colorful clothing
- No visual referral to subcultures or social groups
- Normal build: average in size, weight and attractiveness
- No extra accessories or visual attributes such as headphones, hats, bags, rucksacks, jewelry, piercings, tattoos, etc.
- No potentially stigmatizing physical conditions: physical abnormalities, smell, noises, etc.

In both experiments, the research confederate oriented him or herself towards the approaching passer-by.

Participants

Due to the vicinity of the central railway station, this location presented us with a broad spectrum of participants, ranging in age, gender, and nationality. The research was conducted on a sample of 392 passers-by for the Dyadic distance experiment and a sample of 480 passers-by for the Stain Dilemma experiment. All participants participated unknowingly and were unaware of the experimental setup or its intentions. Because the video images were used only as a visual backup, participants were not informed about the intentions of our research, nor did we ask permission to process the images. Male and female participants and confederates were counterbalanced within each condition (no-mask, and the five mask conditions).

To qualify as a valid participant, passers-by had to conform to these specifications:

- People behave different if they are in a group. Due to these behavioral differences, only singular passers-by were included in the sample. Passers-by had to maintain an interpersonal distance greater than 150 cm in order to qualify as a singular individual.
- Passers-by walking in the reverse direction were excluded from the sample.
- Passers-by accompanied by an animal were excluded from the sample.
- Passers-by who were obstructed during the interaction were excluded from the sample
- Passers-by who encountered or were engaged in distracting activities such as listening to sirens, phone conversation, listening to music, or lighting a cigarette, were excluded from the sample.

3.4.2. Method

The dependent variable that was measured in this experiment is called the dyadic distance. By definition, a “dyad” is a collection of two people, the smallest possible social unit. As an adjective, “dyadic” describes their interaction. In this study we use the term “Dyadic Distance” to describe the shortest interpersonal distance between the two people of interest, the passer-by and our research confederate (labeled as DD in figure 3.20).

The experiment registered the behavior of people passing by a confederate wearing a dust mask in a discrete setup. During the course of the experiment the confederate was discretely occupied and did not make visual eye contact with any passers-by. The walking and staring behavior of the passers-by was registered by 2 HD cameras and provided us with rich user insights on the interaction. No further analysis was performed on these data. The dyadic distance was measured with a narrow beam ultrasonic sensor, wirelessly linked to a laptop. The output of this experiment consisted of the ratio-scaled data of 392 participants, equally distributed over the various mask and gender conditions. Depending on pedestrian traffic, the registration of 60 participants for one condition took about 20 minutes.

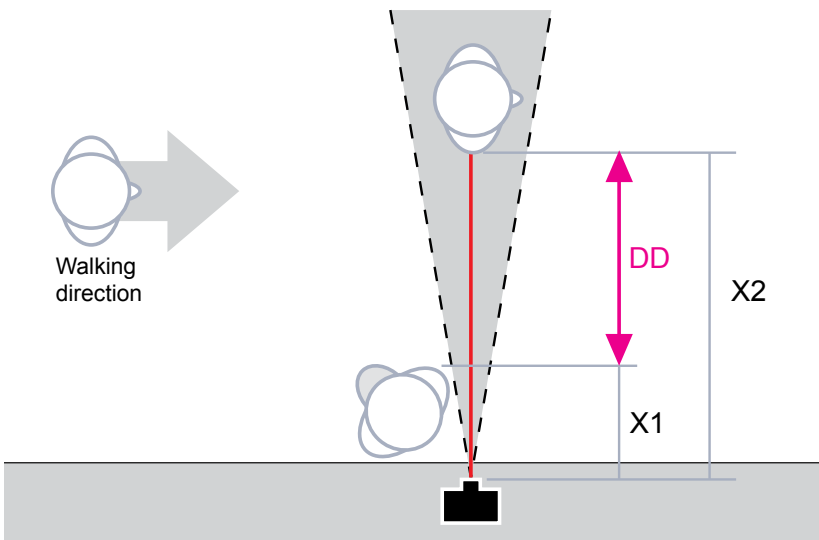


Figure 3.20. The experimental setup and the position of the ultrasonic sensor.

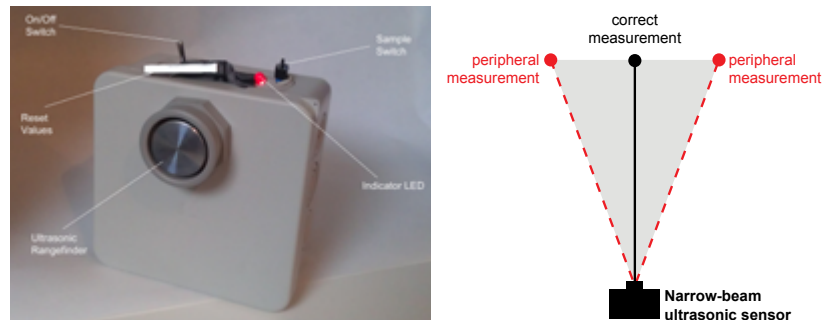
Equipment

Next to the stimuli, two research confederates (one male, one female) and an independent researcher, the DD experiment required the previously mentioned DD-measuring tool and a laptop with DD-software and a Bluetooth connection. The DD-measuring tool was built on an Arduino platform and

used a narrow-beam ultrasonic sensor suitable for in- and outdoor use (Maxbotic XL-Maxsonar WRC MB7081). A 9 Volt battery fed the system and to achieve a wireless connection, a Bluetooth module (BlueSmirf Gold) was added to the Arduino board. A switch on top of the housing allowed us to send two different data sets, allowing for a quick changeover between the various conditions. The Arduino board was programmed with PLX-DAQ software and fed its data to MS Excel. The DD-tool is straightforward to build with limited knowledge of electronics and it should not exceed a total cost of \$300.

To avoid the deformation of the measurements, the presence of parking sensors, or other ultrasonic sources needed to be avoided. The DD measuring tool was placed at a distance of about 15 cm in front or next to the research confederate (see figure 3.21).

Figure 3.21. The DD measuring tool



Procedure

Once the DD-tool was positioned, it followed a specifically programmed calibration sequence to determine the initial distance towards the opposing wall or object. After the calibration session, the sensor takes two measurements per second. It takes about a second for a passer-by to pass through the field of the sensor, resulting in one to three measurements per participant. During the experiment the independent researcher was responsible for the elimination of false or peripheral measurements. This real-time assignment was subtly executed from a distance of at least 5 m from the interaction. This evaluation can also be done by analyzing camera images.. Both methods are suitable as long as they do not influence the experiments.

During the experiment the researcher assigns a gender code to each valid passer-by and selects the correct DD measurement from the set of maximum three measurements (the lowest value), thus eliminating the peripheral measurements of the sensor (see figure 3.21).

Gender research confederate / mask-condition / gender passer-by									
Gender Research confederate			Mask condition					Total	
			No-mask	White mask	Respro mask	Scarf mask	Proto Transp.		Proto Sport
Male research confederate	Gender of Passer-by	Male	30	21	23	17	17	15	123
		Female	11	12	10	13	13	15	74
	Total		41	33	33	30	30	30	197
Female research confederate	Gender of Passer-by	Male	20	20	19	15	20	24	118
		Female	10	12	19	14	13	9	77
	Total		30	32	38	29	33	33	195
Total observed participants								392	

For each of the six conditions, at least 30 samples were registered with both a male and a female research confederate. In each mask condition/ research confederate gender combination, male and female passers-by were separately counted and registered (see table above).

3.4.3. Results

Our hypothesis predicts that in an experimental setup, cleared of external influencers, a passer-by will maintain a greater (safer) walking distance from a research confederate who wears a dust mask. In addition, it would be interesting to discover significant differences in interpersonal distance between the mask conditions and variances related to the gender of the participants or confederates.

Prior to the validation of our hypotheses, we determined whether the gender of the confederate or passer-by significantly interacted with the parameter of interpersonal distance.

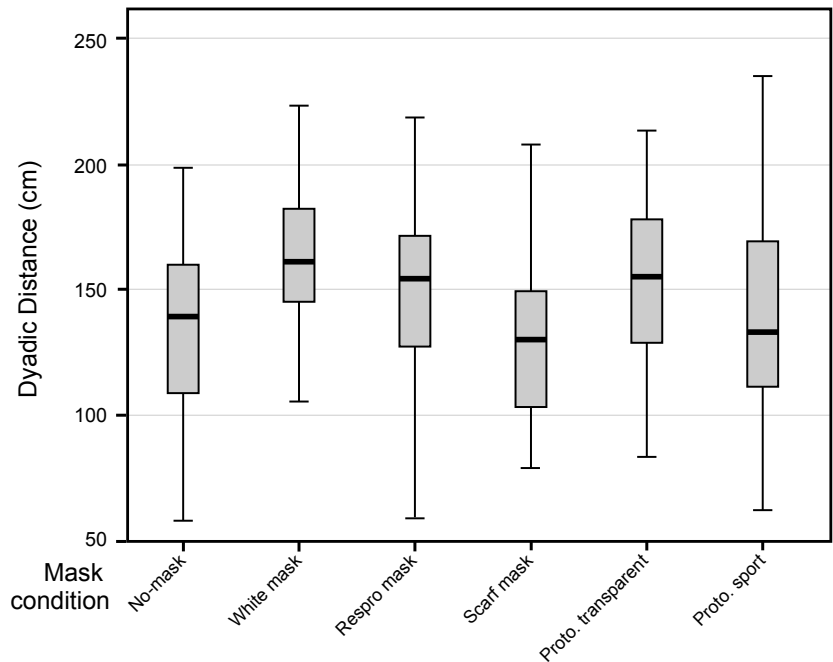
After analyzing the results of 241 male and 151 female passers-by, a two-way ANOVA, with dyadic distance as the dependent variable, showed no interference between the gender of the passer-by and the mask condition ($F(5) = 1.794, p = .113$).

These results enabled us to derive conclusions related to the different mask conditions that mutually apply to both male and female participants. Adding the male and female samples generated a bigger sample for each condition and increased the accuracy of further statistical analysis. However, for the post-hoc analysis of the variance in dyadic distance among the various mask conditions, it can be interesting to separately evaluate male and female participants.

The DD was measured as portrayed in figure 3.20 and represented the closest distance between a research confederate with mask and a passer-by. The box plot in figure 3.22 depicts variances in dyadic distance for each mask condition (male and female participants are merged).

Using Fisher's Least Significant Distance (LSD), a post-hoc analysis compared the mask conditions in pairs and exposed significant interactions between mask pairs. After each LSD analysis, we integrated a visual interpretation of the findings. The figure below each LSD-table visually groups the mask conditions by their average mean dyadic distance. Each group clusters mask conditions for which the mean dyadic distance does not differ significantly.

Figure 3.22. Box plot – Dyadic distance / Mask conditions.

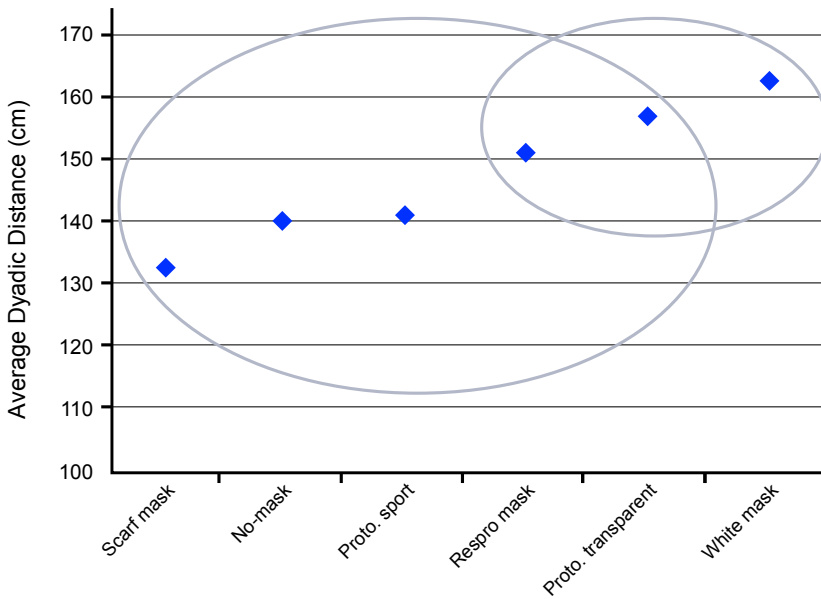


Result DD-experiment – Male participants

Analyzing male only participants, ANOVA indicated significance ($F(5)=3.301$, $p=0.007$) between mask conditions. Post-hoc analysis with LSD rendered the table below, displaying the significant relationships in green. From the 15 possible combinations, five combinations had dyadic distance measures that differed significantly ($p<0.05$) (figure 3.23).

Significance between mask conditions – only male participants (passers-by)						
	No-mask	White mask	Respro mask	Scarf mask	Proto trans.	Proto sport
No-mask						
White mask	0,008					
Respro mask	0,065	0,431				
Scarf mask	0,952	0,012	0,078			
Trans. proto	0,219	0,191	0,588	0,230		
Sport proto	0,350	0,001	0,010	0,416	0,045	

Figure 3.23. Table and graph with the result of the DD-experiment – Male participants.

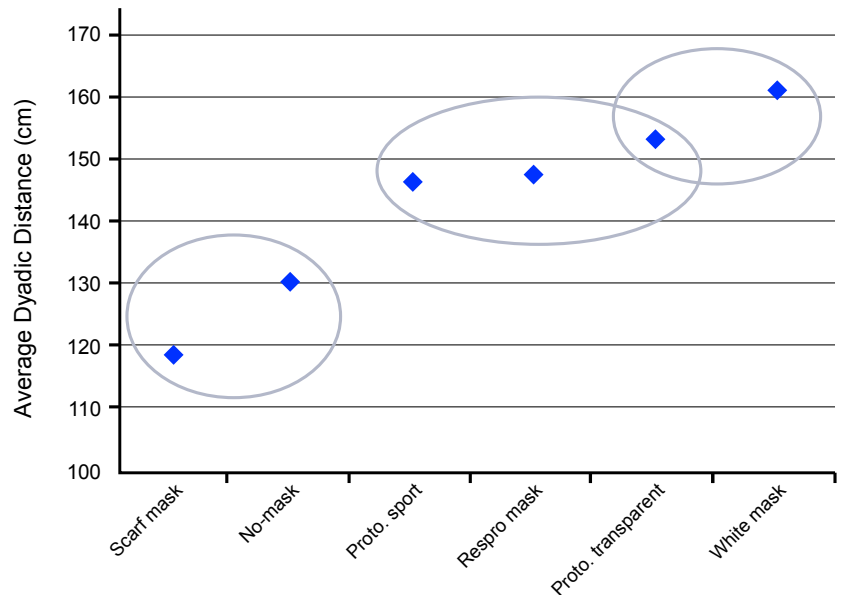


Result DD-experiment – Female participants

Analyzing female only participants, ANOVA indicated significance ($F(5)=8.916$, $p<0.001$) between mask conditions. Post-hoc analysis with LSD rendered the table below, displaying the significant relationships in green. From the 15 possible combinations, 10 combinations had dyadic distance measures that differed significantly ($p<0.05$) (figure 3.24).

Figure 3.24. Table and graph with the result of the DD-experiment – Female participants.

Significance between mask conditions – only female participants (passers-by)						
	No-mask	White mask	Respro mask	Scarf mask	Proto trans.	Proto sport
No-mask						
White mask	0,000					
Respro mask	0,020	0,036				
Scarf mask	0,129	0,000	0,000			
Trans. proto	0,002	0,260	0,343	0,000		
Sport proto	0,030	0,035	0,928	0,088	0,316	

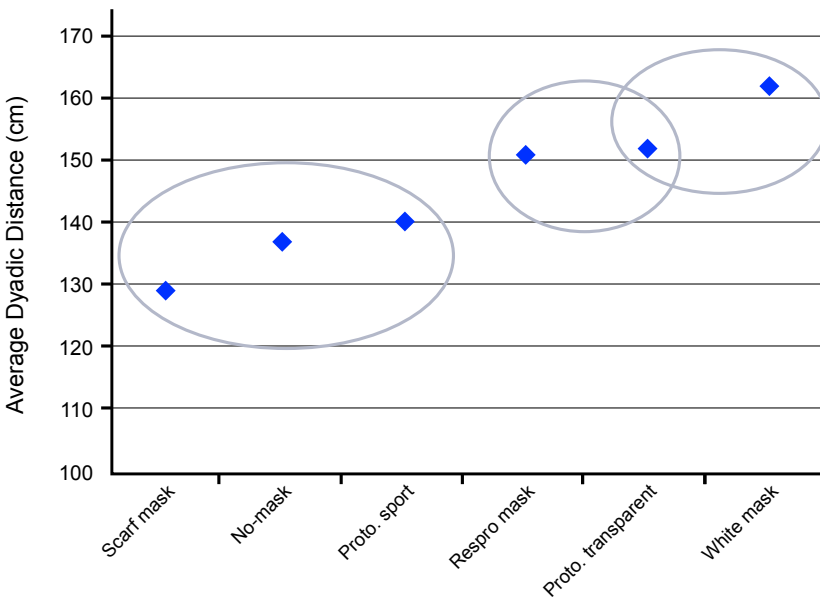


Result DD-experiment – Male and female participants

Analyzing both male and female participants, ANOVA indicated significance ($F(5)=8.677, p<0.001$) between mask conditions. Post-hoc analysis with LSD rendered the table below, displaying the significant relationships in green. From the 15 possible combinations, ten combinations had dyadic distance measures that differed significantly ($p<0.05$) (figure 3.25).

Significance between mask conditions – male and female participants (passers-by)						
	No-mask	White mask	Respro mask	Scarf mask	Proto trans.	Proto sport
No-mask						
White mask	0,000					
Respro mask	0,007	0,048				
Scarf mask	0,249	0,000	0,000			
Trans. proto	0,005	0,088	0,829	0,000		
Sport proto	0,538	0,000	0,045	0,088	0,031	

Figure 3.25. Table and graph with the result of the DD-experiment – Male and female participants.



Analyzing the three clustering figures we observed that the following masks conditions appeared in the same group for nearly each situation:

- No-mask / Scarf mask / Sport prototype mask: these three mask conditions engendered the lowest dyadic distance-values in bystanders for each situation (male participant / female participant / male + female participant). The scarf mask had the lowest dyadic distance value, followed by the no-mask condition.

- Respro mask / transparent prototype: both these mask conditions scored mid-range values.
- White mask: the white mask scored the highest average dyadic distance in each situation and was clustered with the transparent prototype.

3.4.4. Discussion

The result of the DD-experiment led us to infer that avoidant behavior of passers-by towards users of dust masks, expressed by the dyadic distance parameter, can be measured. The average dyadic distance between the white mask and the no-mask reference condition differed about 30 cm. In contrast with our expectations, the no-mask condition did not engender the smallest dyadic distance. The scarf mask generated the smallest dyadic distance in each condition. The other mask conditions all differ about 15 cm from the no-mask reference condition.

The most general and valuable conclusion from the DD-experiment was the detection of three groups of masks that revealed no reciprocal significance. The results of our subsequent exploration, the Stain Dilemma experiment, will either confirm or disconfirm these initial findings. Because both experiments were set up to be comparative, we will elaborate on the final results of both experiments in a joint discussion and conclusion paragraph at the end of this chapter.

3.5. The Stain Dilemma Experiment

The experimental setup, location, stimuli and participants are identical to the DD-experiment (See paragraph 3.4.1.).

Method

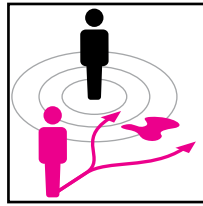
The measurement of interpersonal distance with the dyadic distance technique delivered an accurate dataset for each mask condition. The next experiment focuses on the thoughtful and unconscious decisions that are made during a social interaction. When we walk around, our brain is constantly scanning and analyzing our visual surroundings. In 1971, Goffman already pointed out that the study of walking behavior might deliver interesting insights in the study of social stigma.

The 'Stain Dilemma' experiment reduces the input variables to a minimum and focuses on the walking path of the bystander as he passes a person who uses or wears a stigma-eliciting product. By placing a physical obstruction in the walking path, the passer-by is forced to walk around the obstruction or in between the obstruction and our confederate.

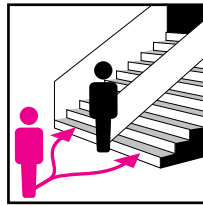
Prior to the experiment, we tried several obstructive setups. During these explorations, the unsuspecting passers-by had to walk towards and pass a research confederate while presented with two options in their walking path. However trivial these dilemmas might appear, they are all possible influences on the choices and behavior of the passer-by. We briefly discuss the setups that were evaluated during the preliminary explorations. These are the steps that were followed in analyzing the setup explorations:

- Selection of valid participants: only those passers-by who enter the social space of the research confederate in an angle of 60° will be considered. Passers-by entering from peripheral regions are less likely to notice the confederate. In setups 1 and 2 passers-by approach two doors or staircases allowing the passer-by to avoid the interaction and pass the confederate behind his or her back. Both these setups were therefore excluded.
- Reducing the maximal interpersonal distance to 3 m. People will rarely walk with their shoulders touching a wall, therefore a passage of 4 m between the research confederate and the nearest wall is advisable. This distance presents the passer-by with three possible trajectories, i.e. passing the confederate either in his intimate, personal or social space (ranked from near to further). Because the intimate space is rarely or only accidentally entered, we chose for a setup that focuses on the personal or social space.
- Controlling the variables: Public setups that forced pedestrians off the sidewalk were not successful. Setups 1 to 4 introduced too many uncontrollable variables.

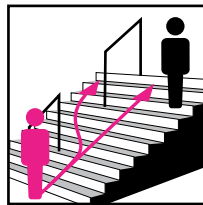
- Setup 5, the stain dilemma, proved to be promising. When positioned in the right context, a stain from spilled food or drinks can be a quite common obstacle.



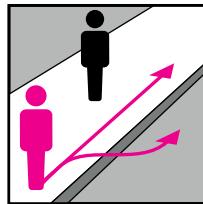
Setup 1- Selection of doors: The research confederate was placed between two doors which lead to the same destination. During the interaction, subtle obstacles direct the passer-by in a linear path towards our confederate. The focal attention of the confederate is clearly directed towards the right door. Will the passer-by take the right door, which involves a delicate interaction with the confederate, or will he or she take the left door and pass the confederate behind the back, thus avoiding any interaction?



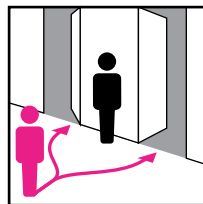
Setup 2 – At the start of a dual staircase: As the passer-by approaches the staircase, he has the option to pass our confederate on the left or on the right. As the focal attention of the confederate is directed to one side, will this affect the decision of the passer-by? A similar experiment can be conceived when a passer-by has to make a selection between an electric staircase and a regular staircase that are positioned next to each other. Will the passer-by sacrifice the luxury of the electric staircase and take the regular one, when the focal attention of the passer-by is directed towards the electric staircase?



Setup 3 – Wide staircase: In this experiment the research confederate takes a position on one side of a wide staircase with a central rail in the middle. Will a passer-by continue his route on the same side of the staircase or will he or she make a detour and switch towards the other side of the staircase?



Setup 4 – Sidewalk: This experiment uses a sidewalk that allows for at least two pedestrians, walking side by side. The edge of the sidewalk is higher than the adjacent road and presents an obstacle in the walking path. The confederate is positioned at about 100 cm of the edge of the sidewalk, a distance that should leave a comfortable passageway between the confederate and the edge of the sidewalk. Will the passer-by stay on the sidewalk or will he or she opt for a larger detour and leave the sidewalk as he or she passes?



Setup 5 – Stain dilemma: This experiment was conceived as a 'safer' and subtler interpretation of setup 4. The boundary of the sidewalk is replaced with a visual stain that presents a passer-by with two options. The stain is positioned at the edge of the social circle, between the personal and social space, at about 120 cm from the research confederate. By making the stain highly visible and large enough so that people are not tempted to walk over it, the stain forces passers-by to make a deliberate choice between two walking paths. Walking between the confederate and the stain increases the chance of an interaction, whereas the path around the stain presents a 'safer' option and decreases the chance of social interaction.

Equipment

The 'Stain dilemma experiment' requires little equipment and setup. The most crucial object is the physical obstacle that is introduced in the walking path. The obstacle was to be easily detectable, without being suspicious or alarming. In city life, pedestrians are often confronted with unpleasant spills and obstacles on the sidewalk. The experiment relies on the pedestrians' subtle awareness of these familiar obstacles, and their intent to avoid them in an almost routinely way. Because our experiment was setup close to the railway station, in the presence of many food and beverage stalls, we chose to imitate a spilled milk shake. We avoided the use of unpleasant animal or human droppings to avoid any negative connotations with our research confederate. This connection could activate unwanted disease avoidant behavior in the passer-by. A spilled milk shake is no anomaly on a city sidewalk and does not allocate many cognitive resources as the passer-by approaches and avoids it. We labeled our obstacle the 'fake shake' and positioned it on the border between the personal and social space (Hall, 1996) surrounding the research confederate.

The 'fake shake'

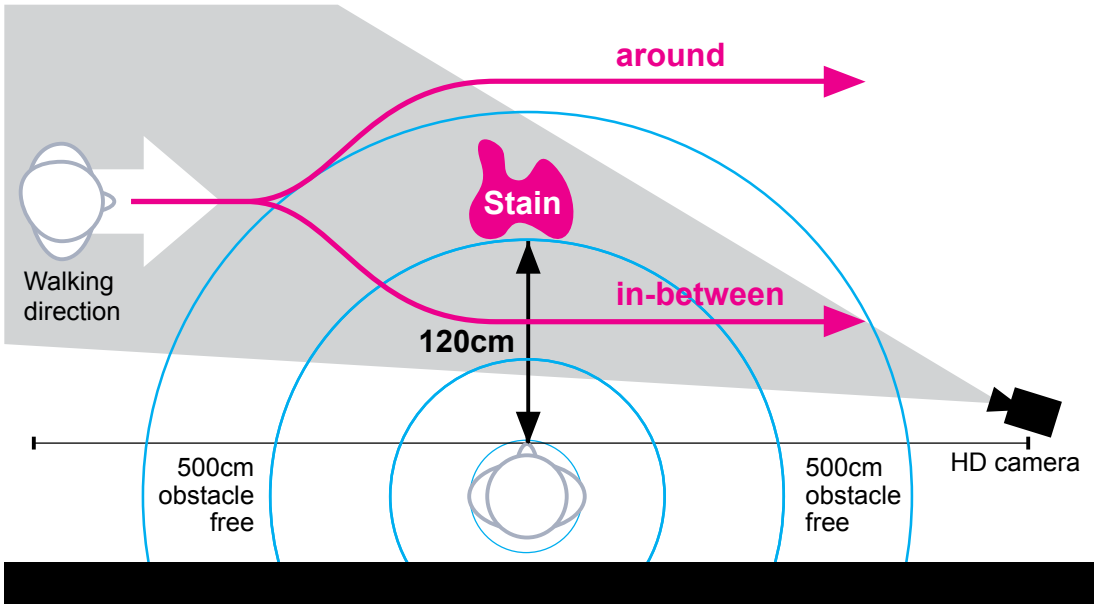
The 'fake shake' is a realistic imitation of a strawberry milkshake, including cup and straw (see figure 3.26). We chose a bright and contrasting color to increase the chances of visual perception. The shake is made from a mixture of acrylic paint and other additives to give it the right texture, solidity and shine. A plastic cup and straw were added to increase the reality of the object. For visual reference and in order to collect 'rich'-data, the experiment was

Figure 3.26. The 'fake shake'.



Figure 3.27. Experimental setup of the Stain Dilemma experiment.

registered with an invisible HD camera. The camera registered the passers-by as they approached our research confederate (see figure 3.27). In its most elementary version, data collection requires no more than a pencil and a piece of paper. Additionally it is possible to develop a smart phone application for easy mobile data registration and analysis.



Procedure

To qualify as a valid participant, a passer-by had to singly approach our research confederate, without being obstructed during the full length of the interaction process.

As with the DD-experiment, both male and female participants were recorded. The amount of participants averaged about 40 for each mask and gender condition, bringing the total amount to 480 participants (see table below).

Data registration was limited to two variables, each with two possible values.

- The gender of the passer-by: male or female
- The path: around the stain or in between stain and confederate

Gender research confederate / mask-condition / gender passer-by									
Gender confederate	Gender passer-by	Reaction passer-by	Mask-condition						Total
			No-mask	White mask	Respro mask	Scarf mask	Proto transp.	Proto Sport	
Male research confederate	Male	Around	13	20	11	19	15	17	95
		In-between	11	3	10	9	7	7	47
		Total	24	23	21	28	22	24	142
	Female	Around	11	11	14	9	9	13	67
		In-between	5	6	5	3	9	3	31
		Total	16	17	19	12	18	16	98
Female research confederate	Male	Around	6	20	17	16	12	13	84
		In-between	13	1	9	12	12	11	58
		Total	19	21	26	28	24	24	142
	Female	Around	8	18	10	9	9	11	65
		In-between	13	1	4	3	7	5	33
		Total	21	19	14	12	16	16	98
Total observed participants								480	

3.5.1. Results

The hypothesis of the stain dilemma experiment predicted that when a mask is appraised as stigma-sensitive, a passer-by will actively avoid entering the personal space of the research confederate. By walking around the stain, through the social space, a passer-by demonstrates that he prefers to avoid the user of the dust mask.

As was the case with the DD-experiment, we analyzed additional differences between the mask conditions and variances related to the participants or research confederates' gender.

The influence of the confederate's gender on the participant's reaction (around / in-between) were analyzed with a chi-square test with continuity correction. Only the no-mask condition displayed significant interaction between gender and reaction.

Mask condition	Significance	Chi-square with continuity correction
All mask together	No significance	chi ² (1) = 1.315 p = .251
No-mask	Significance	chi ² (1) = 4.060 p = .044 of < 0.05
White mask	No significance	chi ² (1) = 3.794 p = .051
Respro mask	No significance	chi ² (1) = 0.055 p = .815
Scarf mask	No significance	chi ² (1) = 0.224 p = .636
Prototype transparent	No significance	chi ² (1) = 0.203 p = .651
Prototype sport	No significance	chi ² (1) = 1.425 p = .233

Further analysis was performed on the combined samples of male and female confederates.

Result stain dilemma experiment – Male and female participants separately

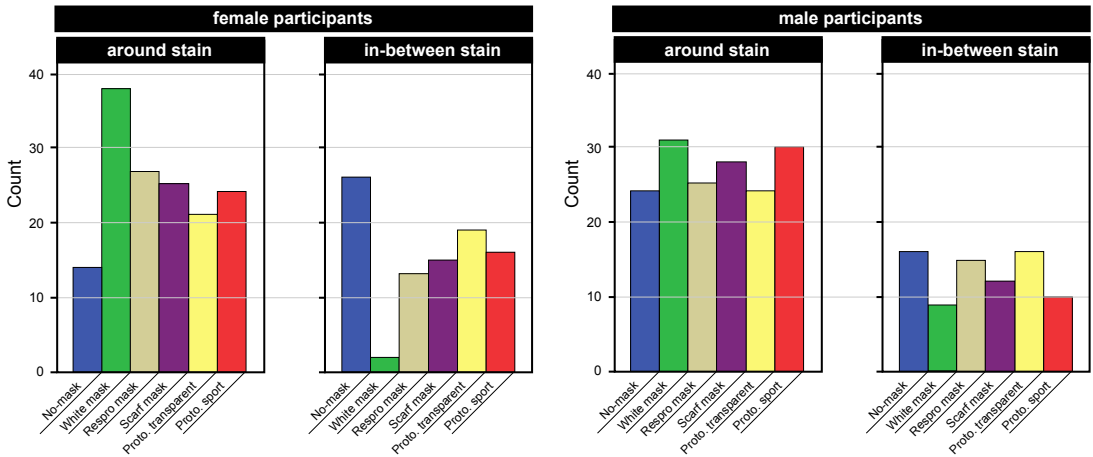


Figure 3.28. Count around and inbetween stain for female and male participants separately

After analyzing the result of 284 male participants, a chi-square test with continuity correction revealed no significant differences in the reactions to the different mask conditions ($\chi^2(5)=5.470$, $p=0.361$). The results of the female participants (196 samples) did reveal significant differences in reaction ($\chi^2(5)=33.011$, $p<0.01$). We especially noticed the apparent result for the white mask condition. Only 2 out of 40 female participants felt comfortable to enter the personal space of the wearer of the white dust mask.

Result stain dilemma experiment – Male and female participants combined

The results of the combined analysis of male and female participants (480 samples) are visualized in the bar-diagrams of figure 3.30. A chi-square test with continuity correction for the entire sample (male + female participants) indicated that the participant reactions differed significantly for certain mask combinations ($\chi^2(5)=29.526$, $p<0.01$). A two-sample proportion test was used to disclose the proportional differences in reactions towards the different mask conditions. To reduce type 1 errors, the alpha value was lowered to account for the cumulative effect of the different mask combinations ($\alpha = 0.05/(5+4+3+2+1) = 0,0034$). The table below displays the significant differences in proportion between the mask combinations ($< 0,0034$).

Similar to the analysis of the DD-experiment, the results of the analysis allowed for a clustering of mask conditions that did not reveal significant interaction among each other. The clustering revealed three groups. In a first group we situate the no-mask and transparent mask conditions. For both these masks participants felt most comfortable to enter the personal space of the mask wearer, i.e. between stain and mask wearer. A second group bundles the scarf mask, sport prototype, and Respro mask. The white mask condition is isolated from the other conditions, with 69 out of 80 passers-by walking around the stain.

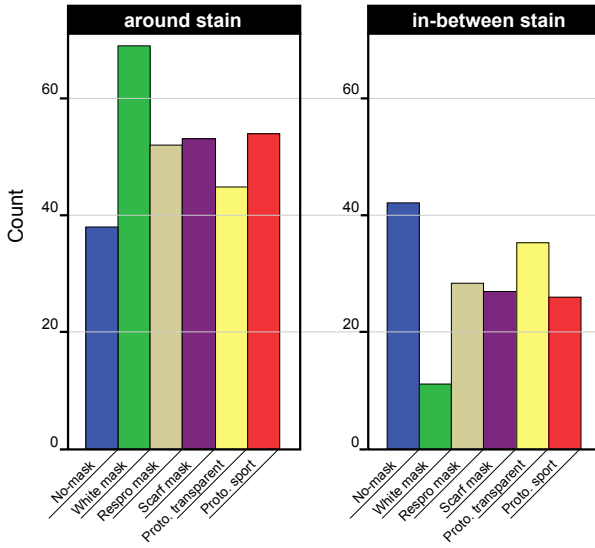


Figure 3.29. Count around and inbetween stain for female and male

Significance between mask conditions – male and female participants						
	No-mask	White mask	Respro mask	Scarf mask	Trans. proto	Sport proto
No-mask						
White mask	0,000					
Respro mask	0,000152	6,25E-09				
Scarf mask	0,000045	3,20E-08	0,7669			
Trans. proto	0,067121	2,03E-14	0,0490	0,0236		
Sport proto	0,000012	1,57E-07	0,5504	0,7636	0,1546	

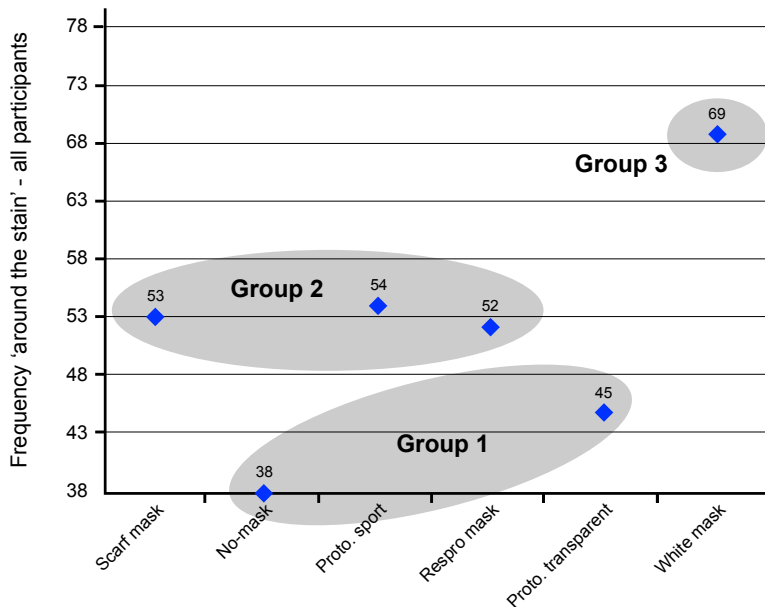


Figure 3.30. visual grouping of the count 'around the stain' for all participants and mask conditions

3.5.2. Discussion

The results of the stain dilemma experiment revealed significant proportional differences in the reactions to the no-mask and white mask conditions. The other mask conditions positioned themselves in between these extremes.

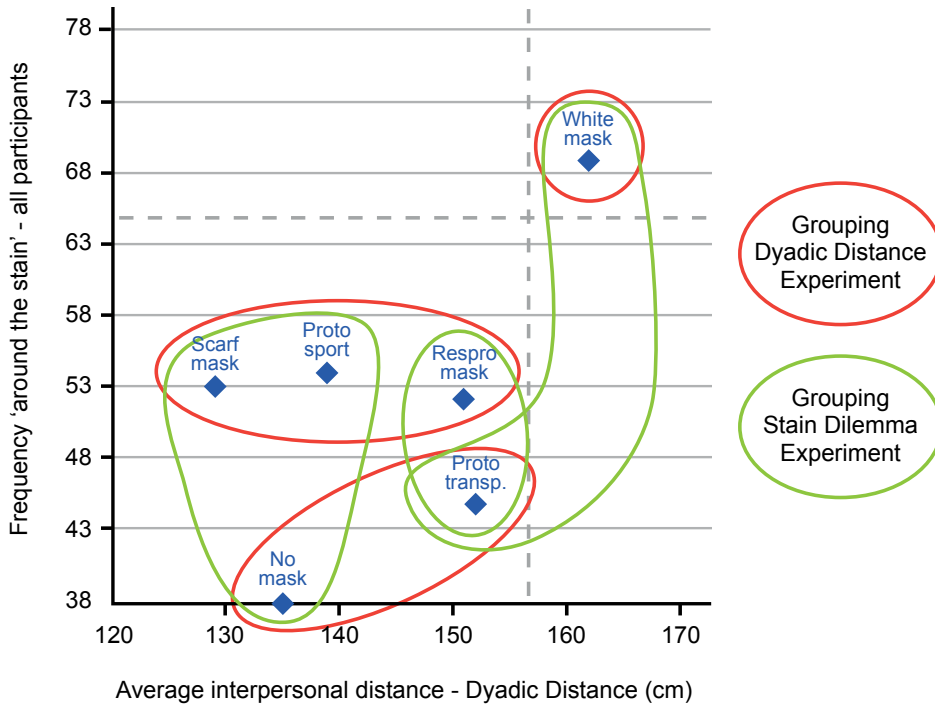
Although the analysis of the reactions of the male population did not reveal significant differences, we mention that in four out of six conditions their reactions scored proportionally higher in comparison to the female participants. This could indicate that in general passers-by are less inclined to enter the personal space of male individuals.

3.5.3. Discussion of Dyadic Distance and Stain Dilemma Experiment

Both experiments illustrated that they can be effective in assessing and measuring avoidant behavior of bystanders towards dust masks. A remarkable observation was that the average interpersonal distance as well as the proportion of people walking around the stain was always greater in a setup with a male research confederate. Male research confederates, independently of the mask they wore, always seemed to increase avoidant behavior in bystanders. Literature in social psychology confirms such behavior around men and suggests that it is linked to the social power or menace engendered by the male species (Dabbs & Stokes, 1975). This passive 'force' endues men with a greater social space and could clarify why passers-by will maintain a greater distance from them. Because our experiments only allowed for an avoidance area of no more than 320 cm, this effect compressed the 'comfort zone' around our male research confederates. This effect has to be taken into account in future explorations.

In an analysis of the mask groupings that were made for both experiments, it is possible to determine areas of convergence between the different mask conditions.

Figure 3.31 shows a graphical representation that represents the results from both male and female participants in both experiments. The horizontal axis represents the DD-experiment and indicates the average dyadic distance for each mask condition. The scale starts at 120 cm, which is the border between the personal and social space (Hall, 1966), and runs up to 170 cm. The vertical axis represents the Stain Dilemma experiment and indicates the relative count of passers-by walking around the stain. The scale starts at 38, which is the amount of passers-by who walked around the stain in the neutral condition. Because the samples for each mask condition were identical in the stain dilemma experiment, the count can be interpreted as proportionate. In figure 3.31 we depict the mask groupings for each experiment.



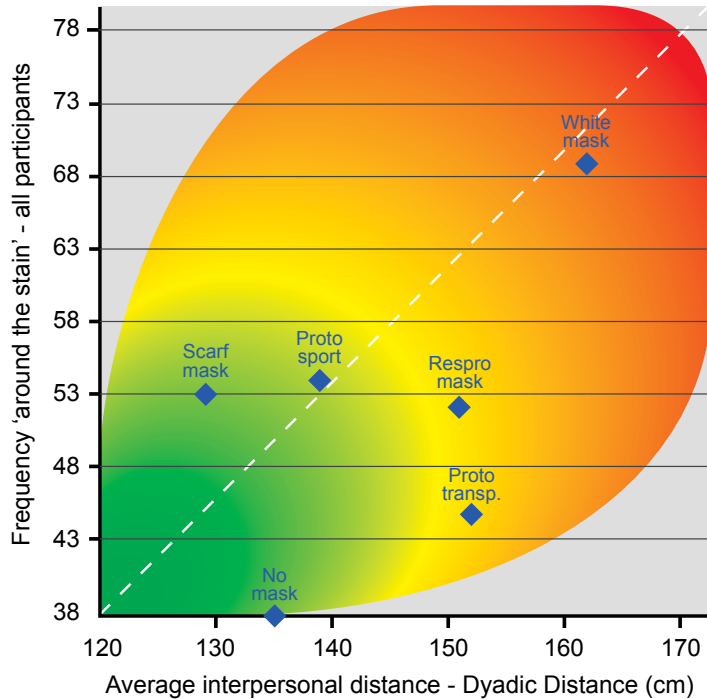
The representation in figure 3.32 aims at visualizing the ‘degree of acceptance’ or the ‘degree’ of product-related stigma of a mask type with the aid of a gradient scale. Products that reside in the green part of figure 3.32 are considered to be acceptable, resulting in a regular interpersonal distance. As a product migrates to the red area, it becomes less accepted, accompanied by a greater dyadic distance and a large number of people walking around the stain. If a product ends up in the grey zone, close to the axes, the validity of the results should be questioned, because this would mean that the results of the two experiments are opposed, which is unlikely. The gradient representation in figure 3.32 allows for a straightforward interpretation and communication of the experimental findings, ideal for meetings with stakeholders.

Figure 3.31. Combined experimental results / groupings of the different mask types.

The combined visualization in figure 3.32 also aids in exposing inconsistent results for certain mask types. The further a product moves away from the centerline, the less consistent its experimental results are. A mask can score a low average dyadic distance, together with a high number of passers-by walking around the stain, and vice versa. A closer look at the instances prior to visual contact could clarify these findings.

If there are no striking features that visually alert a passer-by, he or she will approach the mask wearer as a ‘normal’ person. In this situation it is plausible that the decision to divert from the walking path will be made at the last moment. This could explain why the scarf mask, which nicely blends

Figure 3.32. Combined experimental results: proportion around the stain x average interpersonal distance.



with its surroundings, engenders a low dyadic distance measure, combined with a high count of people walking around the stain. The scarf is only noted as unnatural or awkward when the passer-by is relatively close, promoting his 'last-minute' decision to walk around the stain. An opposite scenario can be observed for the transparent prototype that combines a substantial dyadic distance with a low count of people walking around the stain. Due to its brightly colored edge and its medical-like transparency, this mask has the potential to attract attention from a greater distance, a possible explanation for the greater dyadic distance. However, the soft looks and the visibility of facial features might comfort the passer-by as he or she approaches. These traits will increase the 'warmth' dimension of the wearer, encouraging the passer-by to pass between the stain and the mask wearer when forced to make a 'last-minute' decision.

3.5.4. Conclusion of Dyadic Distance and Stain Dilemma Experiment

Both experiments prove that it is possible to measure significant differences in the behavioral reactions of bystanders towards users of stigma-sensitive products. The results suggest that the interpersonal distance between the product user and those who pass them is a valuable measure to quantify the 'degree' of product-related stigma. We suggested that an accurate detection of the interpersonal distance could be obtained with a perpendicular measurement received from an ultrasonic sensor. We labeled this parameter the 'Dyadic Distance' and our experimental findings suggested that registering 30 participants for each human-product condition should suffice.

The stain dilemma experiment can be interpreted as a simplified as well as a complementing experiment. An eye-catching stain positioned on the border between the user's personal and social space, forces passers-by to choose a path. The path around the stain presents the 'safe' option, indicating the desire to avoid the user and his product. The path through the user's personal space will be chosen when passers-by feel comfortable around the user-product combination. Because the stain dilemma experiment only renders binary results, it requires a larger sample for each condition. We advise to sample at least 40 participants for each human-product condition.

The experiments are conceptualized for efficiency (in time and resources) and allow for testing in a public setting that approaches real-life conditions. The cost of the experimental hardware ranges from €300 for the dyadic distance experiment (software and PC excluded) to as little as €50 for the stain dilemma.

Both experiments do not aim to deliver meticulous data by which stigma-sensitive products can be accepted or rejected. Nor do they provide the designer with exact information on which design features engendered the recorded reactions in bystanders. Nevertheless, these experiments have proven to be valuable in ranking a set of design proposals or products. By exposing products on a user, in realistic settings, and subjected to a large number of passers-by, the experiments can provide quick and valuable insight for designers.

3.6. Conclusion of the experimental chapter

The experimental techniques presented in this chapter represent our creative and exploratory way of wrestling with the phenomenon of product-related stigma. All explorations and experiments attempted to measure and visualize the behavioral responses of bystanders towards users of dust masks.

Experiments and explorations

After exploring the reflex reactions in a lab environment, our experimental focus shifted towards the thoughtful reactions of bystanders. In support of this decision, we argue that the laboratory setup was too detached from real-life conditions. The reflex measurements that have to be taken in the approach and avoidance experiment require an interference free experimental setup that can only be achieved in a lab environment. Moreover, the experimental stimuli, i.e. pictures of the mask wearers displayed on a computer screen, are far removed from the real-life encounters that we replicate in the other experiments. Apart from the experimental setup and stimuli, the experiment also requires extensive preparation and analysis.

The spy pack exploration allowed us to test various behavioral parameters and ways in which these could be registered and analyzed. As such this exploratory approach was of a tentative nature and too complex to be easily reproduced. All experimental efforts and insights are therefore crystalized in the final two experiments.

What have we learned about the mask types and the bystander's appreciation of them?

In all experiments the white medical mask stood out as the most conspicuous mask, generating clearly observable and measurable avoidant behavior in bystanders. From all of the mask types we examined, the white mask was the most common and recognizable one. When confronted with a wearer of a white medical mask, a 50-year-old man literally commented that "something is in the air". Other people had the politeness to walk up to our research confederate asking why they were wearing the mask and informing whether everything was all right.

In most experiments, the red Respro mask could also count on an unconcealed and early detection. Due to its contrasting color and unconventional looks, it got a lot of people questioning its true purpose.

Overall, the Respro scarf or bandit mask engendered the least reactions in bystanders. In both color and shape this mask blended well with the situational setting, making it less eye-catching than many of the other masks. With experimental conditions set in chilly early spring, the mask was tolerated as a being worn by people that are sensible to cold temperature.

A passer-by even approached our scarf mask wearer and sarcastically asked him, "Are you that cold, Sir?".

For the most part, the transparent mask prototype generated curiosity. Our research confederates indicated that they were often approached while wearing the transparent mask. Reactions of passers-by towards the transparent sport prototype are comparable to the reactions engendered by the transparent prototype mask.

During our experiments we hoped to generate a lot of rich information from our camera images. After analyzing the many hours of recordings, we could not extract much additional information. The main reason is that overt and verbal reactions to all mask types were similar. Most mask generated looks and verbal comments. Based on the video images alone, it would be impossible to determine criteria for an objective ranking of the mask stimuli. Occasionally people manifested their verbal or overt behavioral reactions outside of the visual range of our cameras, long after passing the mask wearer.

Alternative applications of the experimental approaches

Both experiments can be applied to other stigma-sensitive products, given that they have a substantial visual and contextual link with their user.

Next to protective, assistive or medical devices, the range of applications can be extended with more popular products that are approaching our bodies. If adopted by the public, the Google glasses predicts a whole range of exciting technological products that are intrinsically linked to our body. A prediction of the acceptability of these products which are 'new to the world' is conceivable with the aid of these experimental techniques.

We can imagine that these techniques can also be employed for products that serve a public function related to safety or attention. The general public better avoids products like noisy compressors or roadside works, whereas certain safety zones have to be easily approachable.

The experiments may also be promising for the fashion industry. By measuring the avoidant behavior around their creations, fashion stylist can be informed about aversive effects of certain design decisions. In some cases avoidant behavior around products might be desired, e.g. in law enforcement situations. This aversive or 'shock' effect could be desired or undesired, depending on the context. In the context of law enforcement a greater interpersonal distance between the law enforcer and its opponents may even be sought after.

**CHAPTER 4 PAMS
THE PRODUCT APPRAISAL
MODEL FOR STIGMA**

4.1. Introduction

Following the literature review (Chapter 2) and the experimental explorations (Chapter 3), this chapter aims to explain and operationalize how the product-related stigma (PRS) process unfolds, and how the various stakeholders contribute. The experimental explorations clearly evidence that instances of product-related stigma occur in real-life encounters. These encounters engender both positive and negative emotions and reactions in users, bystanders and the broader cultural context. We are about to explore the factors responsible for eliciting these positive and negative experiences in people's encounters with products. As such this chapter contributes to two of our research goals. It deepens our understanding of PRS and prepares designers with the information needed to manage the PRS process.

A first synthesis in our research leads to a designer tool called the 'Product Appraisal Model for Stigma' (PAMS). The PAMS reveals and explains the context and appraisal factors that influence the product-related stigma process. Ultimately, the PAMS tries to alleviate the complexity of surrounding products, people and cultures.

The model consists of two formats: a coherent graphic representation of relevant factors and a tangible designer tool that integrates three matrix checklists. By providing such tool, we hope to improve its designer appeal and facilitate group discussion. The designer tool is constituted by two printed cardboard sheets that require basic assembly. The output of the PAMS is a list of stigma-specific design challenges in need of vital attention at the start of a stigma-specific design challenge. Chapter 5, concerning the 'Product Intervention Model for Stigma' (PIMS), will document 17 design interventions that can be applied to the stigma-specific challenges, as revealed by the PAMS. These interventions serve as a support to designers who are managing stigma-sensitive design challenges, and they aim at reducing the product-related stigma content of new design proposals.

The PAMS was conceptualized and refined during two designer workshops. Both workshops were aimed at exploring the contextual and appraisal issues that surround the use of assistive, protective and medical devices. A first exploratory workshop was organized in December 2012 at the University of Antwerp. About two months later we organized a second workshop at the TU Delft. In this final workshop we assessed the appropriateness and effectiveness of our first conceptual PAMS model. At the end of this chapter, we will summarize the results of this workshop.

Workshop 1: Exploratory Workshop on context and appraisal, prior to the conception of PAMS

In December 2012 we organized a workshop with nine colleagues from the faculty of Design Sciences. All participants were design professionals and were affiliated to this institute as assistant teachers, professors or PhD researchers. The workshop consisted of two exercises. An introductory exercise was organized prior to the actual workshop. This exercise challenged the participants to experience the practical and social discomfort of wearing a dust mask. In this workshop we evaluated their findings. During the actual workshop, the participants had to assess and evaluate the reactions and experiences of three imaginary users of stigma-sensitive products.

Task 1 - Introductory exercise: Immersive Mask experience

Two weeks prior to the workshop, all participants received an envelope with instructions and material for an immersive exercise. The exercise was similar to the second exploration discussed in Chapter 2 (Immersive Mask Experience).

The envelope contained the detailed instructions for the exercise, a white medical dust mask and a set of 25 'experience cards' (Figure 4.1). To mentally prepare our participants for the workshop, we instructed them to wear the dust mask each time they went outside and to report their findings on the experience cards. Each participant received a specifically colored set of experience cards and had to use a new card for each experience he or she encountered. The participants were instructed to briefly describe the stigma-specific incident and its location. Additionally they had to indicate the context or stakeholder which had caused the stigma-relevant experience.

- Stigma-relevant experiences linked to the product
- Stigma-relevant experiences linked to the user (him or herself)
- Stigma-relevant experiences linked to one or more bystanders
- Stigma-relevant experiences linked to the cultural context

The main goal of this exercise was to increase the participants' connection with the topic in preparation for the workshop exercises.

Figure 4.1. The materials that were sent to the participants for the introductory immersive exercise.



The experience cards were gathered at the beginning of the workshop. They were allocated to the appropriate context or stakeholder that was accountable for the stigma-relevant experience. We received a total of 70 experience cards from our nine participants and they were distributed as follows (Figure 4.2):

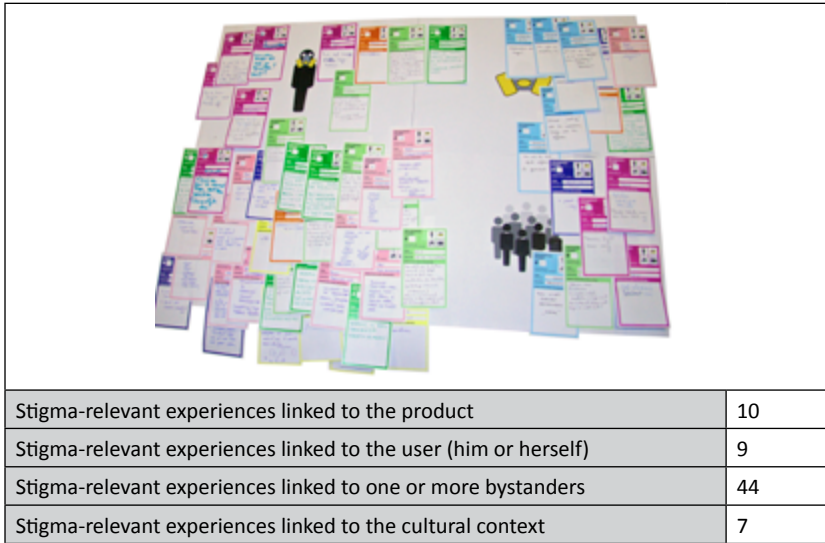


Figure 4.2. The experience cards were allocated to the appropriate context or stakeholder which had caused the stigma-relevant experience.

Main insights:




- All participants abundantly reported on stigma-relevant reactions from bystanders. Over half of the experience cards reported on product-related stigma aspects that were experienced during encounters with bystanders.
- The participants also reported that it was difficult to decide exactly when a specific incident started belonging to the realm of the social or cultural context.
- Most product-related experiences addressed usability and comfort-related issues.

Task 2 – Envisioning the stigma relevant experiences of imaginary users.

In groups of three, our participants were instructed to fill out a new series of experience cards for three imaginary users of stigma-sensitive products. We presented each product user on an A3 poster containing two pictures and a brief description (Figure 4.3). They were asked to relate to this user and to imagine the stigma-relevant experiences that he or she would encounter. To assist and structure the participants’ analyses, they were given a checklist of questions relating to the four context levels that we wanted them to explore. This initial set of questions was made up of stigma-relevant issues that had arisen during the literature review and from the insights that were gathered from the immersive mask experience (Chapter 2). This initial set of questions would later be transformed into the PAMS.

We gave our groups 45 minutes to fill out as many experience cards as possible. Figure 4.2 renders the amount of stigma-relevant experience cards which the participants filled out for each context category and each product user.

Figure 4.3. The three imaginary product users and the amount of stigma-relevant experience cards that our participants filled out for each user and context level.

		Product	User	Bystander	Cultural
Marc is 38 and he exercises daily with his prosthetic leg.		15	8	11	7
Lisa is 74 and uses a walking aid (rollator) to get around town. She also uses it to do her shopping.		13	10	7	3
Simon is 32 and needs oxygen therapy.		10	10	10	7
Total		28	38	28	17

During the group discussion that followed the exercises, the participants reported that the conceptual checklist was helpful to guide them through the various layers of stigma and meaning attribution within each context. Participants also reported that the checklist helped them to explore the social contexts and stakeholders in a more structured way. As is rendered by the table above, there was more of a connection with culturally relevant stigma issues.

During the workshop we noticed that the way we presented the four checklists was not efficient. All of the questions were visible at once and the structure underlying them was perhaps not clear from our presentation. Additionally, by presenting all questions at once, the checklist did not receive enough focus during the group discussions. For the further development of a successful product-related stigma appraisal tool, we had to focus on presenting a thorough and structured introduction to the topic and its stakeholders, followed by a checklist that would present the stigma-relevant issues and questions with more focus.

4.2. Context & stakeholders

Some protective, assistive and medical products carry with them a long history of 'rejection', while others become unacceptable or stigma-sensitive when they are used outside of their intended context. Products designed for use in hospitals or care facilities, for example, can be affiliated with undesirable meanings when employed in public.

As a protective device, the dust mask illustrates the often-conflicting sensitivities and layers of meaning attribution that will be dealt with in this chapter. In Western culture, dust masks are associated with protective usage in certain well-recognized areas. In the proper professional context, respiratory masks protect construction workers or medical staff. Within that context, the product is accepted, respected and understood. Once the mask is taken out of this professional context, it can send out both positive and negative signals. From the viewpoint of the user, the mask is not only uncomfortable to wear, but also sends out signals of contamination and disease. This visual connotation can generate unfavorable reactions from bystanders. Adding to this, the use of dust masks is often obliged for health reasons, which pressures the user into an unwanted or forced use situation.

On a deeper level, the dust mask also challenges cultural standards in both a positive and negative manner. The significance of the dust mask in Western culture sharply contrasts with its presence and connotation in Asian culture, where dust masks are common and worn as a sign of respect towards others, by protecting them from contamination. A culture-transcending fact about dust masks is that they cover the wearer's nose and mouth, thus hiding facial features that are vital for human interaction. This 'covered' face may trigger caution in observers and obstruct social interaction. These examples illustrate that encounters with users and their stigma-eliciting products are often distressing experiences that are the result of the aesthetic and functional aspects of the product itself, the individual experiencing the stigma, the observing bystanders and the cultural context in which the situation is set.

Literature in social psychology also confirms that "stigma is a mark that is attributed to a person while in interaction with a specific social context" (Major 2005). Products as such do not have a meaning without a context and more importantly, the meaning of the product can change in each context (Krippendorff, 2006). People can attribute a multitude of meanings to a product. Mapping out the appropriate context will limit that number of 'meanings' and will allow us to focus on the relevant content. The product 'meaning' will thus be limited to what the context allows it to be. The consequences of a product-related stigma encounter are therefore always dependent on the immediate situational and cultural context, and the 'meanings' those contexts hold for the stigmatized user and the surrounding stakeholders.

An understanding of the social and cultural context, often overseen in existing design methodology, is crucial for gaining insight into the factors that may have an influence on the acceptance and emotional appreciation of a new product.

We argue for the existence of four distinct context levels in which products are appraised and receive their 'meaning':

- The context of the product (and its interaction components, physical properties);
- The context of the stigmatized or the stigma-experiencing individual (user or wearer);
- The context of the observing bystanders and passers-by (individuals or groups in the immediate surroundings);
- The context of the evaluating culture/society in which the product is launched and used.

Four context levels of meaning attribution

Major's model refers to three context levels in social stigma, labeled as the three stakeholders in figure 4.4: the individual user (Personal characteristics), the immediate social surroundings (Situational cues), and culture (Collective representations). Because a product-related stigma appraisal will always balance the human concerns of the stakeholders with the interaction components of the product, the 'Product' is our fourth fundamental context level.

In 'A theory of everything', Wilber (2000) also discerns these four context levels and places them along two continuums (Figure 4.5). The vertical axis discerns the individual (product & user) from the collective (groups & culture) and the horizontal axis discerns subjective (user & groups) from objective (product & culture) elements.

The product users, together with the individuals that perceive and evaluate them, can be interpreted as subjective influencers and correspond with the personal characteristics and the immediate situational cues in Major's model (see figure 4.4). Users and groups might in turn be influenced by a broader systemic-objective source of social and product stereotypes, which is shaped by cultural structures and values. In Major's model this context is described as collective representations (see figure 4.4).

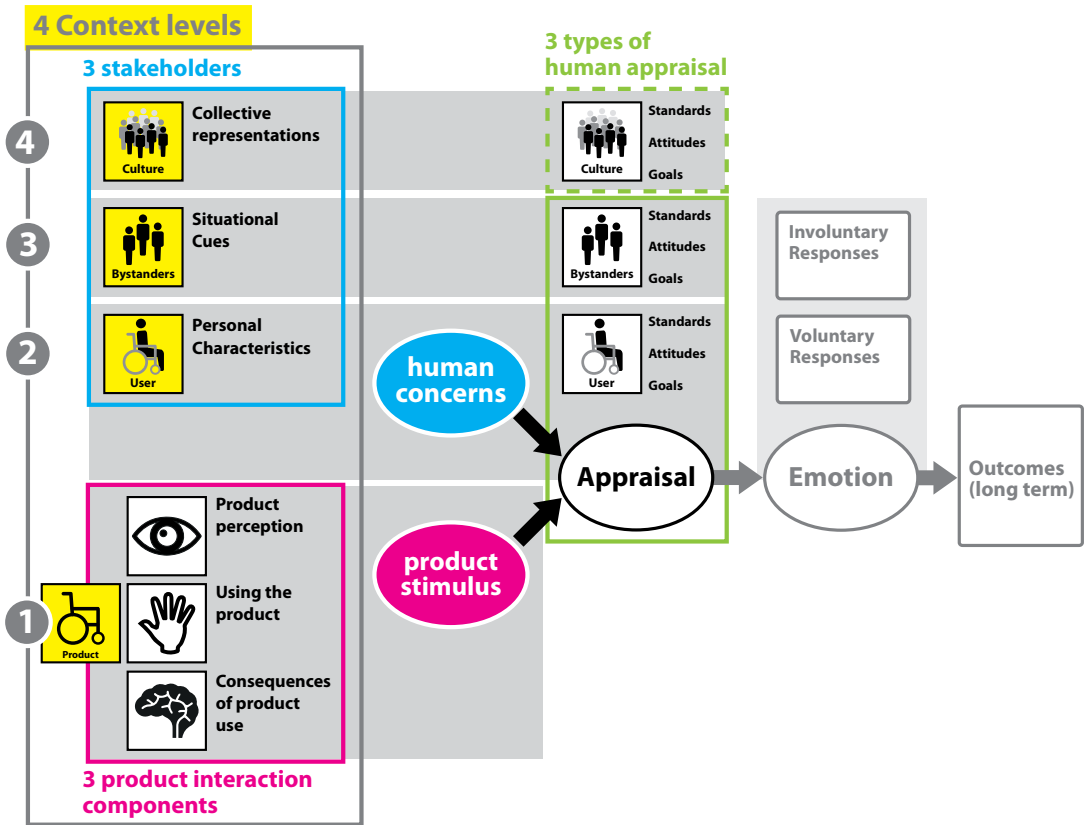


Figure 4.4. Our model, encompassing the Appraisal Theory of Desmet and Hekkert (2007) and the Identity Threat Model of Major (2005).

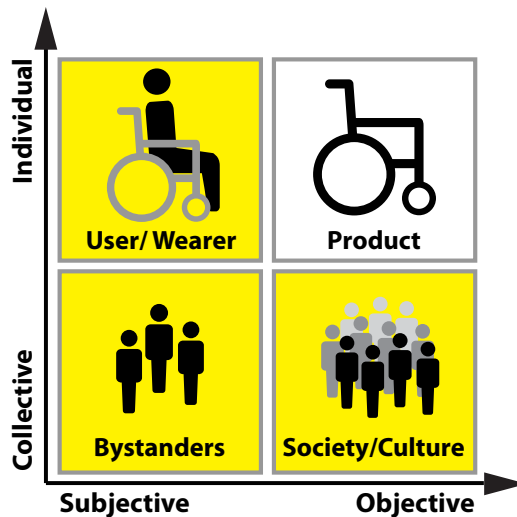


Figure 4.5. Four context levels: the product as conceived by the designer and three other 'stakeholders' who appraise and influence the human-product interaction. This is our reformulation of K. Wilbers' 'All Quadrants All Levels' model featuring an integrally conceived reality.

Context level 1: The product and its material properties

The context that is best understood by designers is the context of the product and its physical properties. Aspects such as shape, material qualities and other sensory aspects all belong to the context of the product. Through its appearance and other sensory aspects, a product has the potential of imposing an identity threat on its user, both physically and psychologically.

The opening quote in our introduction chapter neatly summarizes the importance of this context: “Many well-meaning inventions fail – not because they aren’t helpful, but because they aren’t appealing”. Indeed, many assistive, protective and medical devices that function well on a technical and functional level fail because of sensory and emotional rejection. An important reason could be that aesthetic and sensory qualities are often not prioritized in the design of these products. Even when considered, they are often added as a last-minute cosmetic treatment to a conceptually conceived product proposal. Sensory qualities that can benefit the overall product experience and support both personal and social well-being, need to be considered much earlier in the process. Sensory product qualities are not limited to the product’s visual appearance but encompass tactile, olfactory and audible qualities too. As the basis of our model we will use the product context, which is the aspect on which the designer has the most impact. In the Product intervention model for Stigma (PIMS) that follows the PAMS, 13 of the 17 stigma-free design interventions are aimed at the context of the product. Within the product context we distinguish three product stimulus components (Desmet and Hekkert, 2007) expressing and influencing the behavioral experiences and intentions of our three stakeholders:

- the non-instrumental interaction component (perceptions),
- the non-physical interaction component (consequences of use),
- the instrumental interaction component (use).

Context level 2: The context of the product wearer or user

This is the context of the individual and subjective evaluations of product users. Focus is given to the experiences of the stigmatized product user: how they understand and interpret their stigmatization, how they cope with it, and how it affects their psychological and physiological well-being, cognitive functioning, and interactions with other individuals. All of these experiences are shaped by the individual’s personal characteristics discussed earlier, such as personality, background, past experiences, norms, values and skills.

In this context we situate examples of product-related stigma conditioned by the user’s sensitivity to stigma and the degree to which the user identifies with his in-group or ‘domain’ of stigmatization.

Next to products in relation to their users, this context also concerns the aspect of human differences among users. Aspects such as skin color, gender, and ability are 'labels' of a social selection process. These aspects are identifying differences that will matter socially.

Differences between users are often apparent when designers are faced with the conception of assistive, protective or medical devices. When designers consider the needs of differently abled people, their emotional desires deserve equal attention. On a physical or medical level their goals, standards, and attitudes will be influenced by their respective 'abilities' or limitations. On a personal level, however, their desires vary just like any other population. In other words, different people have different abilities, but different people will also have different needs and desires irrespective of their abilities (Pullin 2009).

Context level 3: The context of the bystander(s)

This context corresponds to the immediate situational cues in Major's model (Figure 4.4). Product meaning not only engenders appraisals in users, but it also has a substantial impact on the immediate social setting, which it resides in. This is the context in which users are perceived and evaluated by surrounding others. Negative reactions of bystanders, passers-by or people in the social interaction range of the product user are an example of negative social appreciation. As stated earlier, during the human-product interaction with a stigma-eliciting product, user well-being is strongly influenced by the reactions in the immediate social surrounding. A strong or visible reaction from bystanders can be viewed as an identity threat and it has the potential of damaging the user's self-esteem.

In this context 'stigma' can be connected to the concept of 'discrimination'. In contrast to stigma, discrimination focuses the attention on the stigmatizers, i.e. those who discriminate, rather than on the people who are the recipients of these behaviors (Sayce, 1998).

The attribution of unfavorable associations by bystanders and social groups is one of the focal points in our research. In the product-related stigma process these unfavorable associations often arise from product stereotypes. Stereotypical aspects that can be assigned by bystanders or social groups to users of stigma-eliciting products are:

- Products can pose a threat to others: e.g. a dust mask can pose the threat of contamination.
- Products can induce aversive emotions: e.g. extreme piercings.
- Products can display a social identity that is under-appreciated in a certain context: e.g. inappropriate clothing for a specific social gathering.
- The possession of a product may lead to rejection: e.g. political symbols.
- Products can arouse feelings of compassion, e.g. a blind cane.

Context level 4: The context of society/culture

Users, bystanders, and passers-by might in turn be influenced by a broader systemic-objective source of product stereotypes that is shaped by cultural structures and values. When envisioned as a collective of bystanders and users, a society or culture can have an appraisal. A culture's or society's concerns are embedded in the rules, laws, practices, systems and structures, of states, political parties, businesses, public institutions and other levels of organization. All societal entities are lead and managed by people who have either direct decision (appraisal) power or who are entitled with representative authority. As such a culture or society is an important actor, because its leaders and their governance establish behavioral principles that people have to endorse. This might include the (appropriate) use of specific products.

In Major's model, this context is described as collective representations (box A in figure 4.4). Collective representations are shared cultural understandings and beliefs. They include how people of a specific social group think about themselves in their society. Collective representations can also apply to symbols or products that have a commonly shared meaning for members of a social group or culture, and even ideologies. Virtually all members of a culture, including members of stigmatized groups, are aware of cultural stereotypes, even if they do not personally endorse them (Steele, 1997).

Because they are widely known and shared in a culture, or among the stigmatized, collective representations may create what Claude Steele (1997) calls "a threat in the air". An important difference with the previous context is that these collective representations can affect the behavior of the stigmatized in the absence of obvious forms of discriminatory behavior on the part of others, and even when no other person is present in the immediate situation (see Crocker, 1998, for a similar reasoning).

Although often intriguing to the Western eye, protecting the face from polluted air, cold weather, sun or viruses is common behavior in China and other Asian countries. Facemasks are an everyday product in China and serve a broad range of needs ranging from self-protection to health etiquette. This example illustrates that culture influences the appreciation and social visibility of a product. Cultures differ in climate, vegetation, food and social habits. Moreover, each culture has its values, tastes and morals. These differences will impact the design or use of artifacts in that specific culture.

Some examples of how products can violate collective (cultural) representations:

- Products can surpass social and cultural boundaries: e.g. the tolerated length of a mini-skirt varies culturally.
- Products can be rejected based on evolutionary origins that are often deeply entrenched and resistant to change: e.g. in the case of a dust mask, covering the face is viewed as a threat. A passer-by cannot detect the visual expression of the mask wearer is evolutionary programmed to be cautious.
- Societal respect: e.g. wearing a dust mask at work in Japan is seen as an act of respect. Wearers signal that they are contagious and do not want to infect their colleagues.
- Legal restrictions: e.g. explicitly wearing religious symbols is forbidden in some public offices.

4.3. Appraisal

After having placed the stigma-eliciting product and its users in their contexts of use, surrounded by the social entities that witness and influence the human-product interaction, we now focus on types and layers of appraisal. The topic studied by appraisal theories is the reason why people react to things differently. Even when presented with the same or a similar situation, all people react in slightly different ways based on their appraisal of the situation. These appraisals elicit various emotions that are specific to each person.

Product appraisal is a dynamic process involving various stakeholders and types of meaning attribution, resulting in either product acceptance or rejection. In the case of protective, assistive and medical devices, avoidance of negative emotions and reactions may be more critical than the eliciting of positive emotions and reactions.

According to appraisal researchers, all emotions are preceded and elicited by an appraisal (Roseman, 2001). An appraisal may start off as a quasi non-cognitive, automatic evaluation of a stimulus for one's personal well-being. This immediate personal significance of a product, rather than the product itself, already causes an emotion. Because appraisals mediate between products and emotions, different individuals who appraise the same product in different ways will feel different emotions. The appraisal of protective, assistive and medical devices can engender both positive and negative emotions and reactions in stakeholders.

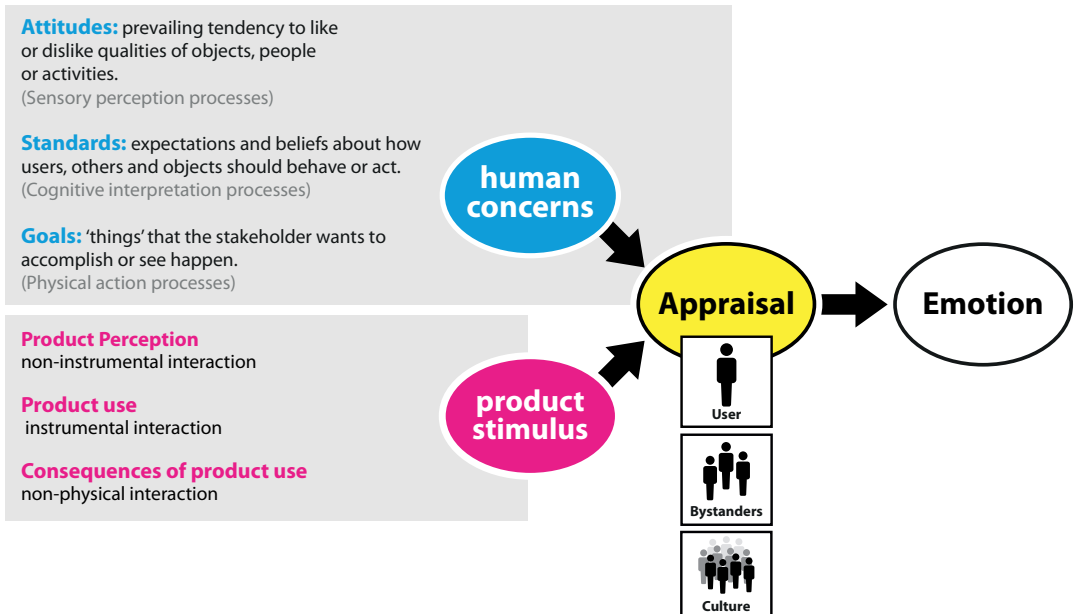
A child who receives a new brightly colored wheelchair may appraise this as a positive event, accompanied by feelings of happiness, joy, excitement, and/or anticipation. The child may feel empowered by the new wheelchair, increasing his or her physical freedom and independence. Conversely, if the

child’s social surrounding perceives the wheelchair negatively, the child’s emotions, as a result, may include sadness, or disappointment. A similar emotional pattern may appear when bystanders react with exaggerated sympathy or compassion, eliciting emotions of sadness or pity. As a result, bystanders may respond with facilitating reactions that the child did not ask for. This example illustrates that products do not only elicit mere intra- and interpersonal, like (attraction or pleasure) and dislike (aversion or pain) reactions. Moreover, we often do not feel a particular single emotion towards a product but a combination of ‘mixed’ and sometimes paradoxical emotions (Desmet, 2002). Furthermore, a person can also appraise a given product in different ways simultaneously, and thus experience ‘mixed emotions.’

Appraisal Theory of Desmet and Hekkert

The emotional variability that can be observed in human-product interactions with stigma-eliciting products demands a model that accommodates the variability illustrated in the previous paragraph. Several authors have mentioned useful perspectives and differentiations in their models. All models presented in Chapter 2 (Figure 2.2), illuminate certain aspects of the complex human-product interaction process. After analyzing the various models, we selected the model of Desmet and Hekkert (2007) to provide the cornerstone of our model (Figure 4.6). Their Appraisal Theory distinguishes three types of appraisal references that seamlessly connect with the three product stimulus components. As such it links human experiences to objects and contexts in a systematic approach, assisting designers to design with predefined emotional intentions. The key variables in the model are human concerns and product stimuli.

Figure 4.6. An adaptation of the Product Appraisal Theory by Desmet and Hekkert (2007).



Human concerns

In the Appraisal Theory, the cognitive components, attention, evaluation, and intention correlate with 'human concerns'. Every emotion hides a concern, that is, a more or less stable preference for certain states of the world (Frijda, 1986). According to Frijda, concerns can be regarded as points of reference in the appraisal process. Stimuli that match our concerns are appraised as beneficial, and those that mismatch our concerns as harmful. This principle also applies to products: a product elicits an emotion only if it is appraised as relevant for a person's concerns. Some concerns are universal, for example the concern for safety, for love and for self-esteem. Others are more personal and can vary strongly between and in individuals. A well-designed assistive device can make its user proud, because it matches his or her concern for social acceptance, for example. Concerns refer to human needs: attitudes, standards, and goals respectively. In the next paragraph we will elaborate on these aspects in more detail.

Stimulus (Product Stimulus)

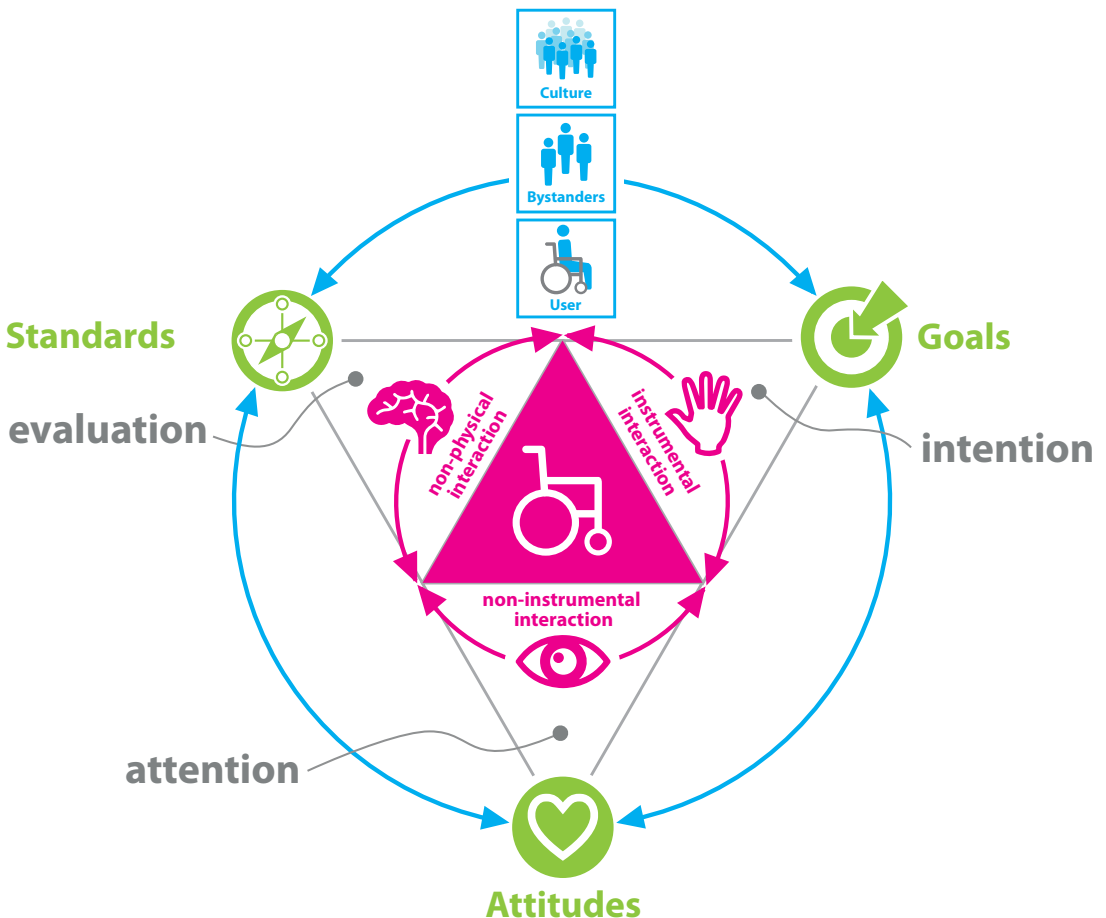
According to Frijda (1986), any perceived change has the potential to elicit an emotion. This can be some event, e.g. a bystander that makes a remark at a woman who self-administers an insulin injection in a public setting. The bystander's aversion could be evoked by the event of seeing the needle and the exposed body part. It is not only the actual event but also remembered or imagined events related to needles that could have triggered the emotion. Products can act as emotional stimuli in three different ways: as object (product perception), in activity (product in use), and as identity (thinking about the product or consequences of product use). We all know from experience that thinking about products can elicit strong emotions. Fantasizing about a motorcycle trip can fill us with excitement. A toy can remind us of our own childhood and elicit feelings of happiness. One and the same product can please us in perception, but frustrate us in use, for example.

Two variables, product stimulus and human concerns, in their variety of occurrence combine to a 3x3 matrix of nine sources of product emotion. Emotional reactions can vary over time as described by the dual process model of Pryor et al. (2004), mentioned in Chapter 2. In the next paragraph we connect and relate all these aspects to the 'Product Appraisal Model for Stigma' and add which conflicts in emotions can occur between the various stakeholders that we defined earlier.

4.4. PAMS: The 'Product Appraisal Model for Stigma'

Similar to the Appraisal Theory of Desmet & Hekkert (2007), our model makes a comprehensive and visual connection between the product stimulus components, related to products, and human concerns, related to stakeholders. In its two-dimensional representation (Figure 4.7) PAMS links three types of human appraisal with respect to the human concerns (green), which are active in three stakeholders (blue), to three sequences observable in intentional behavior towards products (magenta). Although all the elements constituting the model have a dedicated position, they cannot be isolated as such.

Figure 4.7. The PAMS-model. The PAMS builds on the existing design models of Desmet and Hekkert (2007), Major (2005), and Vleugels & Van Den Bosch (2008).



Three product stimulus components

In the center we find the product and its three product stimulus components (Figure 4.7). These components are similar to the Appraisal Theory of Desmet and Hekkert (2007) and describe how people interact with products. In essence, a human-product interaction is made up of three components:

product perceptions (sensing - how the product looks and feels), product use (acting - what the product is capable of doing, technically and functionally), and the consequences of product use (meaning - what are the stakeholders' experiences as a consequence of product use).

The arrows around the inner triangle describe the sequence of the experience or interaction: from sensing, through acting, to meaning. Although this is a comprehensive sequence, interactions can also start with the meaning or acting sequence.



Product perception (Sensing): This is labeled the 'non-instrumental interaction component' in the appraisal theory (Desmet and Hekkert, 2007). Non-instrumental interaction refers to interactions that do not directly serve a function in operating a product, such as perceiving, playing with or caressing the product. This component is related to human attention and sensory perception. It is the sensory component that contains the product's look, feel, taste and sound.



Product use (Acting): This is labeled the 'instrumental interaction component' in the appraisal theory (Desmet and Hekkert, 2007). This area is event focused and expresses human intentions with products. Examples of instrumental interaction are using, operating, and managing products. This area contains the product's functional component: what the product is capable of doing, technically and functionally.



Consequences of product use (Meaning): This is labeled the 'non-physical interaction component' in the appraisal theory (Desmet and Hekkert, 2007). Non-physical interaction refers to fantasizing about, remembering, or anticipating usage. One can also imagine, anticipate, or fantasize about possible consequences of interaction. In a stigma-sensitive design challenge these consequences of a human-product interaction are important to consider. The consequences of using a wheelchair may be that passers-by make verbal remarks, generating negative affective reactions. This component expresses human evaluation.

Three stakeholders

Often not only the interaction between users and their products causes unhappiness or social deprivation as such. In our experimental explorations we discovered that user well-being and product 'acceptance' are fundamentally influenced by the reactions of people in the immediate

situation, complemented with the ‘invisible’ pressure of cultural norms and values. As such, our model does not focus exclusively on the behavior and experiences of product users, but also on a culturally bound network of stakeholders.

The PAMS adds two important context levels to the Appraisal Theory, being the appraisals of bystanders and those of the cultural context. As such, the model assists designers by navigating them through the types of product-meaning attribution, as appraised by the stakeholders that are involved in the interaction.



User: The product user or wearer has a personality, background, past experiences, norms, values and skills. All of these aspects will influence the user’s sensitivity to product-related stigma.



Bystander(s): The surrounding others who perceive and evaluate the product user. During the human-product interaction with a stigma-eliciting product, user well-being is strongly influenced by the reactions of bystanders, passers-by or the people present in the social interaction range of the product user.



Culture: We do not consider a culture to be a person, but as a ‘construct’ of commonly shared values and norms held by people who belong to a specific cultural entity. A culture can have an appraisal as a collective of bystanders and users. The concerns of users and bystanders are always and to a large extent conditioned by nurturing and learning in cultural contexts. Although certain cultural norms and values may be addressed as a part of the appraisal of the user or bystander, we do conceive of this level as a separate and important stakeholder in the stigma appraisal of human-product interactions.

Three human appraisal types

Surrounding the central triangle we have positioned three other triangles, which represent the three types of human appraisal. They refer to the human concerns in the human-product interaction. These types of appraisal make the connection between the product stimulus components and the way they are appraised by the stakeholders in view of their concerns, namely as goals, standards or attitudes. We positioned these appraisals on a circle with bi-directional arrows to make a visual reference to the stakeholders who can ‘circle around’ a product and appraise it as such. On the tips of the resulting large triangle we positioned the concerns that humans try to balance in their everyday experiences with products. People constantly try to satisfy the numerous concerns that they associate with their everyday activities.

Some concerns strive for an immediate satisfaction, whereas others aim for long-term gratification. These concerns are essential for solving any stigma-specific design challenge, but they often remain abstract terms in the mouths of designers. Concerns function like attractants, energizing human behavior. As in the Appraisal Theory of Desmet and Hekkert (2007), the PAMS defines three human concerns leading to three types of appraisal:



Attitudes appraisal (attention): Attitudes can be understood as the conditioned and life-historical content, belonging to the individual's previous sensing, meaning, and acting. What the individual perceives in the present passes through these 'attitude-filters' and explains the selective nature of human perception. Attitudes can be viewed as the stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.



Standards appraisal (evaluation): Standards refer to value, or the human evaluations of what is perceived. They encompass the stakeholder's expectations and beliefs about how users, others and objects should behave or act. We used the visual metaphor of the compass, referring to the mental compass that humans use to evaluate situations.



Goals appraisal (intention): Goals provide orientation and purpose in human behavior, as conscious behavior is always goal-oriented. Goals can be interpreted as 'things' that the stakeholder wants to accomplish or see happen.

Designers should not only address concerns in relation to the object that has to be designed, but also in relation to the activity that is enabled or supported by using the product and in relation to the stakeholders involved in the interaction.

Attitudes, standards, and goals vary with each stakeholder and with each situation. They explain the tremendous diversity in human emotion and behavior. The PAMS evaluates and compares the content of each of these appraisal types, as the three stakeholders who appraise in each sequence of a human-product interaction give them content.

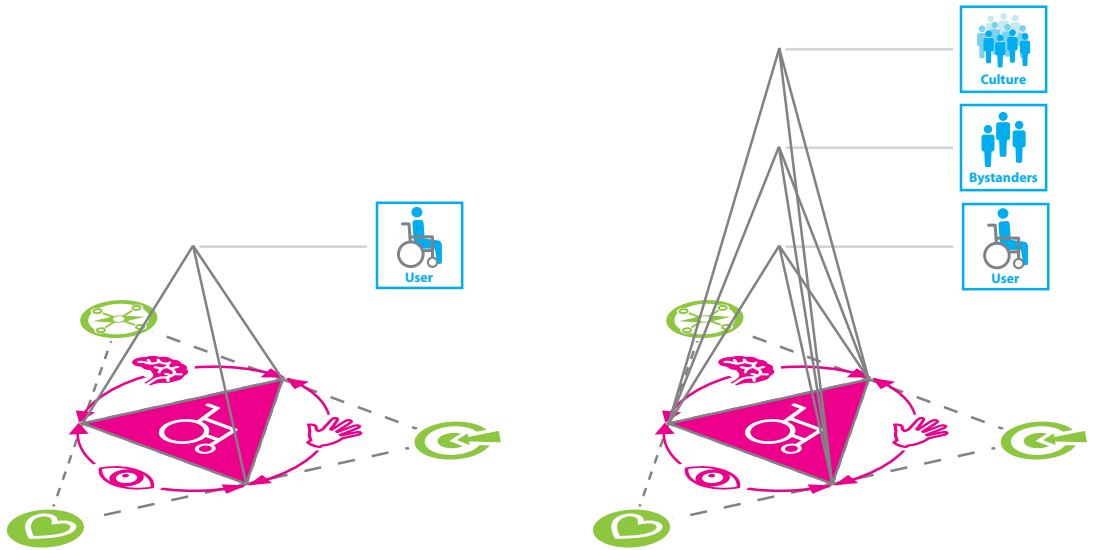
While evaluating these aspects, our interest is focused on the conflicting concerns often evidenced by these stakeholders: intra- and inter-users, bystanders and culture. To manage the product-related stigma process and to improve the overall acceptance of products, designers should balance the needs of the different stakeholders. The PAMS is aimed at balancing these needs and supports designers in exploring and connecting the various forms of meaning attribution or appraisal by stakeholders in the product-related stigma process.

Here are just some of the design challenges that PAMS helps designers manage:

- Conflicts between product perception and use or consequences of use by users, bystanders or culture, e.g. having a preference for high heels (perception of user), despite the fact that they are uncomfortable to wear (consequence of product use).
- Conflicts in inter-stakeholders appraisal, e.g. having fun on a motorcycle (positive for user) that produces 110 dB (negative for bystanders).
- Conflicts between types of appraisal intra- and inter-stakeholders, e.g. being obliged to wear a dust mask (appraisal of user) that engenders avoidant behavior in bystanders (appraisal of bystander).
- Conflicts between types of appraisal within a specific context or stakeholder, e.g. using a sexually discomfoting contraceptive (positive towards goal of protection – user appraisal of goals) during sexual intercourse (negative towards goal of pleasure – user appraisal of attitudes).
- Conflicts between stakeholders for a specific type of appraisal, e.g. wearing a ‘hijab’ or ‘burqa’ while serving a public function. This situation recently led to tension between Muslim users and non-Muslim bystanders (in Belgian law and custom, religious symbols cannot be visually displayed while performing a public function). In this example the norms and values of the user (user appraisal of standards) conflict with those of the cultural context (cultural appraisal of standards).
- Conflicts between product and stakeholders and between types of appraisal, e.g. building a family car that can reach 320 km/h. This achievement is appraised as a satisfier for the car constructor who is proud of the technical excellence built into the vehicle. In the eyes of society (culture), however, this car can be viewed as a lethal weapon in the hands of its user. The functional specifications of the car (product context level – product in use) are in conflict with the norms and values of the culture and the consequences for that society (cultural context level - consequences of product use). Often products qualify on a technical and systemic level, but at some point they can procure psychological or moral damage to their user.

4.4.1. The PAMS as a tangible designer tool

Figure 4.8 depicts the 3D-conversion of the PAMS. The tetrahedron, representing the transition from a surface (Figure 4.7) to a volume, intends to visualize both scope (towards attitudes, standards, and goals) and stakeholder-content, converging into one attraction point. Each tetrahedron has the product as its basis and three appraisal areas as sides.



The three appraisal areas move around the product basis, as depicted in figure 4.8. As such, all stakeholders project their attitudes, standards and goals on every product interaction sequence, i.e. product perception, product use and the consequences of product use.

Figure 4.8. The 3D-conversion of the PAMS-model, exposing the appraisal tetrahedron of each stakeholder.

In figure 4.8 the surface representing the ‘appraisal in view of attitudes’ rotates around the product base with its product stimulus components. To make the differentiation between the three appraisal types more manageable, we introduce a matrix for each type of appraisal. All three stakeholders perform ‘appraisal in view of attitudes’, resulting in a 3x3 matrix. The other 3x3 matrices are built in a similar way, addressing the two other types of appraisal. As such three 3x3 matrices can be traced back from the model, mapping the three product stimulus components onto the three stakeholders for the three types of appraisal (Figure 4.9).

The social processes experienced by the stakeholders and intermediated by the product are made visible by simultaneously looking at each area of appraisal for all three stakeholders. This perspective allows a designer to see reactions that occur as a result of the actions of other stakeholders and their alternative relationship to the product.

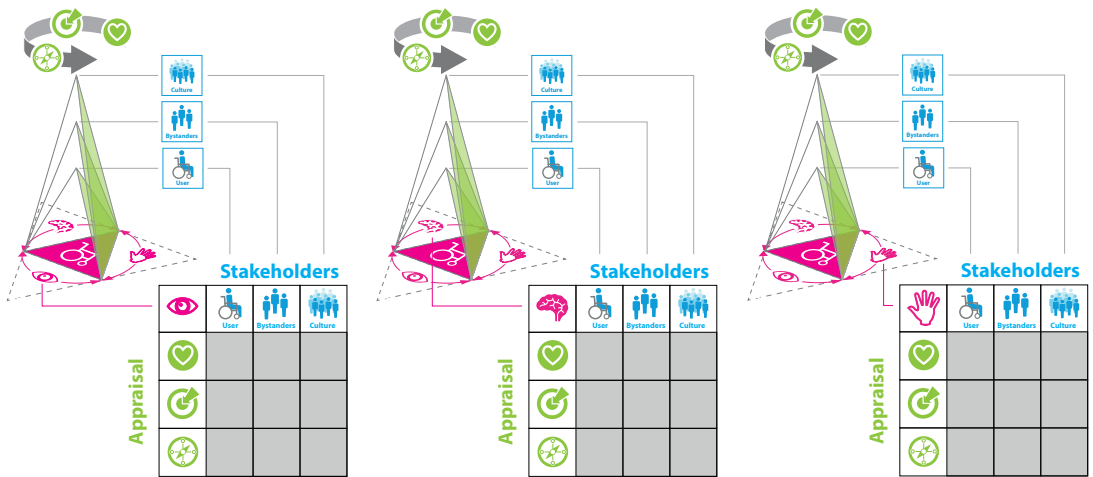


Figure 4.9. The structure of a PAMS-matrix – Stakeholders appraisal related to product perception.

In these matrices we inserted questions that address sensitivities related to product-related stigma. The 27 questions that arose from the three matrices were extracted from the literature as well as our empirical and experimental findings. Further selection and refinement was accomplished in two designer workshops, one organized at the University of Antwerp and the other at the Technical University of Delft.

Attempts were made to standardize the way in which the 27 questions are formulated. Each cell of each matrix contains a question that can be linked to a specific part of the 3D model and its subsequent content. In certain cells we added complementary questions that extend the scope or trigger specific sensitivities related to the main question. As designers complete the matrices it is possible that certain cells remain empty. Additionally, the questions do overlap and a specific answer may be suited for several cells. It is not the position of the answer in the matrix that matters, the fact that a specific sensitivity did arise is more important.

PAMS Matrix configurations

There are several ways to construct the 3x3 matrices. Each of the layouts represents a specific grouping of answers that has the potential to reveal specific conflicts:

- The PAMS tool comprises of
- One tetrahedron containing the 27 questions. Each side-surface of the tetrahedron holds 9 questions related to one of the 3 product stimulus components.
- Two 'jackets' that reveal only 3 out of 9 questions on each side surface, allowing for a focus of the attention towards appraisal assessment or stakeholder assessment.
- 3 possible configurations of the PAMS matrices

Configuration 1: Matrix topics = Product stimulus components: perception, use, and consequences of use

- X-axis = Stakeholders: user, groups, culture
- Y-axis = Appraisal types: standards, goals, and attitudes

These matrices group all questions for each product stimulus component. It is our default configuration. The topics of the matrices switch from product perception, over product use, to the consequences of product use. For each product stimulus component, the appraisal types in relation to the different stakeholders are assessed. These matrices will reveal conflicts or tensions between the various stakeholders and their appraisals of a given human product interaction.

Configuration 2: Matrix topics = Appraisal types: standards, goals, and attitudes

- X-axis = Stakeholders: user, groups, culture
- Y-axis= Product stimulus components: product perception, use, and consequences of use

These matrices group all questions for each type of appraisal. The topics of the matrices switch from appraisal of standards, over appraisal of goals, to the appraisal of attitudes. For each appraisal type, the product stimulus components in relation to the different stakeholders are assessed. These matrices will reveal conflicts or tensions between the various stakeholders during the three stages of product interaction.

Configuration 3: Matrix topics = Stakeholders: user, groups, culture

- X-axis= Product stimulus components: product perception, use, and consequences of use
- Y-axis = Appraisal types: standards, goals, and attitudes

These matrices group all questions for each stakeholder. The topics of the matrices switch from product user, over groups, to culture. For each stakeholder, the product stimulus components in relation to their appraisals are assessed. These matrices will reveal conflicts or tensions between the appraisal types during the three stages of product interaction, for each specific stakeholder.

4.4.2. How can designers assess human appraisals related to product perception?

In this matrix we assess how the stakeholders perceive a product and how this matches or contrasts with their attitudes, goals and standards. Completing this matrix will reveal tensions between the sensory product appreciations and the concerns of the three stakeholders. The questions in the matrix address experiences related to the senses. These experiences happen fast and instinctively and demand little or no cognitive effort. When addressing product perception, designers are typically focused on visual appearance. To fully grasp the perceptual impact of a product on its stakeholders, the focus needs to be extended to all of the human senses. Aspects such as tactility, scent, and sound can play an important role in the appraisal of products: e.g. the tactile sensations when shaking hands with a prosthetic hand, the olfactory sensations (smell) when wearing a dust mask, the disrupting sound of a medical device. Norman (2004) has termed these product aspects the 'visceral qualities' of a product. They entail the first instinctive reactions to a product stimulus, engendered by the sensory system. These visceral qualities of a product precede product use and have no (immediate) connection with possible reflections on the human-product interaction. In his pleasure theory, Jordan (2000) distinguishes four different 'pleasures' in the human-product interaction. The perception component matches with Jordan's 'physio-pleasure' and relates to the body and all the pleasures derived from the sensory organs. Applied to product-related stigma we suggest a shift to 'physio-displeasure', or all the bodily displeasures derived from the sensory organs.

Attitudes appraisal related to product perception:








When assessing the attitude appraisal, the 'looks' of a product can please or displease our visual attitudes. When stakeholders assess the sensory qualities of a product and its user, it passes through sensory 'attitude filters' that will direct them towards liking or disliking. Additionally, they help the stakeholder to make rapid judgments (good/bad, safe/dangerous). Products can be more than sensory-repellant to their users; they can represent sensory discomfort to their surroundings and can even go against cultural taste.

Goals appraisal related to product perception:

A question that deserves consideration when assessing the goal appraisal, is how the sensory aspects of a product can motivate its user in wearing or using the product. Obligated product use, or the dependence on a product has never been a rewarding motivation for product use. Additionally, the perception of a product and its user might conflict with the goals of bystanders, possibly distracting or influencing their behavior.

Standards appraisal related to product perception:

The sensory qualities of products may conflict with the stakeholders' values and standards, as they evaluate what is perceived or sensed. These standards can express personal or cultural value or significance and are variable in time and place. On a basic level, product perception can turn off a user because he evaluates certain materials, technological features, brands or institutional references as unfavorable. When the other stakeholders perceive a product and its user, this can elicit feelings of compassion, admiration, aversion, or jealousy in bystanders. It is up to the designer to decide which of these is a desired interpretation.

Product Perception (Sensing)			
 <p>Perceiving, playing with or caressing the product. Human attention</p>	 <p>User</p>	 <p>Bystander</p>	 <p>Culture</p>
 <p>Attitudes Appraisal The stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.</p>	<p>Does the product exhibit sensory discomforting or repelling features for its user? (Visual, noise, smell, tactile, taste) <i>A user experiences a claustrophobic feel when wearing a dust mask.</i></p>	<p>Does the product exhibit a sensory discomforting or repelling impact on bystanders? <i>The unsuspected tactile impact when an unsuspected bystander shakes hands with a user of an artificial hand.</i></p>	<p>Does product perception violate social or cultural taste? <i>Cultural attitudes regarding mini-skirts or piercings can be in conflict with or violate cultural taste.</i></p>
 <p>Goals Appraisal 'Things' that the stakeholder wants to accomplish or see happen. Goals provide orientation and purpose in human-product interaction.</p>	<p>Does product perception obstruct the user in obtaining his or her goals? <i>When a user perceives a pair of crutches for the first time, does the product 'look' reveal to its user how to achieve the goal of walking with crutches?</i></p>	<p>Does product perception obstruct others in obtaining their goals? <i>Perceiving a user-product combination can induce avoidance/greater social distance in bystanders, conflicting with their goal of passing the user in a conventional way.</i></p>	<p>Does product perception obstruct a culture in obtaining its goals? <i>Certain political symbols/signs can obstruct or undermine cultural and societal goals.</i></p>
 <p>Standards Appraisal The stakeholder's expectations and beliefs about how users, others and objects should behave or act. Standards refer to value.</p>	<p>Does the user perceive unacceptable products or product aspects according to his quality standards (physical, ergonomical, psychological, moral)? <i>A product can be devalued through negative brand associations or a negative institutional identity.</i></p>	<p>Do bystanders perceive products or product aspects of users that fail according to their quality standards: physically, ergonomically, psychologically, morally? <i>When bystanders perceive a wheelchair user, the encounter could elicit feelings of aversion, compassion, or admiration in the bystander.</i></p>	<p>Does the perceived cultural significance and value of the product or product aspects indicate change over time or in durability? <i>Public views have changed on the way people with braces are perceived.</i></p>

4.4.3. How can designers assess human appraisals related to product use?

This matrix assesses the stakeholders' intentions towards a physical interaction with the product, and the question how that interaction may correspond or conflict with their standards, goals and attitudes. It addresses usability aspects and their impacts on the stakeholders. This area corresponds with Normans' (2004) behavioral level and is all about getting products to function well. Additionally, it is about making that functionality easily accessible and user-inclusive.

Users of assistive, protective or medical devices often depend on their devices and are therefore confronted with a situation of obliged use. As designers, should we challenge this and question technically sophisticated assistive, protective or medical devices that lack the impact or intent to stimulate the user into operating it? From the perspective of the bystanders this matrix exposes whether the 'product in use' is likely to negatively stereotype its user or obstruct the bystanders from attaining their goals. The intention to interact with a product is also influenced by how the stakeholders evaluate the product's intended use. In order to achieve certain goals, the product might need additional functionalities like being waterproof, dustproof, or adjustable. A typical conflict arises from this matrix when the perceived intentional use of the product, the product use, or the consequences of product use do not stroke with social values or obstruct other stakeholders from attaining their goals and intentions.

Attitudes appraisal related to product use:








Products can be awkward or repellent to use. When observed by others, this discomforting interaction can engender feelings of uneasiness or even pose a threat to them. On a cultural scale product use can be disfavored by cultural values or standards or even forbidden.

Goals appraisal related to product use:

In this area we assess whether the product has all the functionalities and characteristics to accomplish the user's goals. Furthermore, that what is comfortable and efficient in achieving the goals of the product user might be obstructing the goals or freedom of the bystanders or culture. A wheelchair, for example, may increase the physical freedom of its user, while restricting the physical freedom of bystanders in crowded public places. On a cultural scale, product use can indicate undesirable social behavior and come into conflict with the societal orientation towards decent behavior.

Standards appraisal related to product use:

When users appraise whether a product in use meets their standards, they assess whether there are uncomfortable moments while using the product and how using the product makes them feel. Certain episodes in product use can make the user feel silly, uncertain or less capable. Additionally, while in use a product can come into conflict with the expectations and beliefs of other stakeholders. In the cell connecting 'product in use' to societal standards, we assess the cultural value of a product changing over time or its familiarity of use. Is there cultural preference in product use and could a more widespread use influence product acceptability?

Product in Use (Acting)			
 Human intentions with products: using, operating or managing products.	 User	 Bystander	 Culture
 Attitudes Appraisal The stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.	Is the product discomforting or repelling during its use (in general or in specific situations)? <i>Applying and removing an adhesive eye patch may be uncomfortable and painful.</i>	Does using the product cause unease or a threat to others? <i>Fitting an artificial limb in public may cause unease in bystanders. When a user administers an insulin injection in public, the needle might alarm bystanders.</i>	Does using the product conflict with cultural habits, rules or laws? <i>A tourist meets an old man in India who takes off his prosthetic leg. Although this feels perfectly natural to the old man, this action may offend the tourist, who wonders whether it is appropriate to do this in the Indian culture.</i>
 Goals Appraisal 'Things' that the stakeholder wants to accomplish or see happen. Goals provide orientation and purpose in human-product interaction.	Does the product fit its purpose of use, physically, functionally, ergonomically, and morally? <i>Are there functional inconveniences or ways in which the product obstructs the physical freedom of its user (not waterproof, dustproof, adjustable, too heavy, ...)? Is the product difficult to use in combination with other products?</i>	Does using the product interfere negatively with the behavior of others; does it prevent others from attaining their goals? <i>A wheelchair may increase the physical freedom of its user, while restricting the physical freedom of bystanders in crowded public places.</i>	Does using the product indicate inappropriate cultural or societal behavior? <i>Using alcohol in public can be considered as inappropriate in a particular culture, thus conflicting with the goal of proper social behavior.</i>
 Standards Appraisal The stakeholder's expectations and beliefs about how users, others and objects should behave or act. Standards refer to value.	Are there any dissonant experiences (unbalances between thinking/feeling and acting) when using the product? <i>The use of a product can feel dissonant with somebody's feelings/ thoughts and behavior.</i>	Does using the product challenge the tolerance of bystanders? <i>E.g. parents of a child in a wheelchair value big handles when giving assistance to their child. This conflicts with the child's values and aspirations to be 'seen as independent'.</i>	Does the introduction of the product still need to overcome thresholds in view of cultural or social acceptability? <i>When more people use an asthma inhaler in public, this ritual becomes widespread, plausibly influencing its cultural acceptance.</i>

4.4.4. How can designers assess human appraisals related to the consequences of product use?

This matrix represents the cognitive interpretation area in which the stakeholders evaluate how they expect products and people to behave, and assess whether this meets their standards, goals and attitudes. The questions address reasoning about the human-product interaction. To put it simply, it is what the stakeholders ‘think’ of the product, the ‘meaning’ of things.

Krippendorff (2006) states that people do not see and act on the physical qualities of things, but on what they mean to them. It’s the interpretation component that succeeds the physical interaction. This area can be linked to what Norman (2004) calls the affective level of reflective design. Although the product affects this level, it is strongly linked to the stakeholder’s past experiences, previous knowledge and personal characteristics. On the collective side of the matrix we check whether the product conflicts with societal and cultural norms and beliefs and how this harmony or tension has evolved over time.

Attitudes appraisal related to the consequences of product use:

Products can match or mismatch with the personality and lifestyle of its user. Others may like or dislike the user’s personal taste. A person with extreme piercings, expressing his true identity, can be disapproved of or rejected by others or by a culture as a whole. To avoid this pitfall, it is important for designers to evaluate the stereotypical cultural aspects that are revealed when people are asked to think about and give their opinion about a certain product.

Goals appraisal related to product use:

Looking back on the interaction, users can reflect whether the product met their goals and whether they tolerated the interaction out of necessity or because they actually enjoyed certain aspects. As a consequence of product use, users can be stereotyped by cultural values, even when they are no longer engaged with the product.

Standards appraisal related to product use:





Looking back on the interaction, a product can conflict with the user’s expectations and beliefs. How do bystanders value our user after the interaction and does this affect them mentally? These values can migrate to the cultural level and affect cultural beliefs, which may or may not be damaged as a consequence of product use.

Consequences of Product Use (evaluation and meaning)			
 <p>Fantasizing about, remembering, or anticipating usage or consequences of usage</p>	 <p>User</p>	 <p>Bystander</p>	 <p>Culture</p>
 <p>Attitudes Appraisal The stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.</p>	<p>Does the look and feel of the product match with the personality and lifestyle of its user?</p> <p><i>Product semantics and product meaning need to complement the attitudes of the product user.</i></p>	<p>Does the look and feel of the product and its user match with the attitudes of the bystander?</p> <p><i>A product that matches its user's personality can refer to a subculture or group that is disapproved of or rejected, e.g. extreme piercings.</i></p>	<p>Does the look and feel of the product and its user match with cultural preferences?</p> <p><i>What are the stereotypical cultural habits associated with the product that shape this cultural evaluation?</i></p>
 <p>Goals Appraisal 'Things' that the stakeholder wants to accomplish or see happen. Goals provide orientation and purpose in human-product interaction.</p>	<p>Is the product tolerated purely out of necessity or physical dependency?</p> <p><i>Product tolerance is the minimal acceptance level when no higher level can be reached.</i></p>	<p>Do the consequences of product use harm the physical or psychological integrity of others?</p> <p><i>Products in use can harm peoples' integrity. Physically: noise, smoke; Psychologically: personal space, freedom ...</i></p>	<p>Cultural and societal goals should be met. Are the product and its features in compliance with these goals and the supporting regulations?</p> <p><i>Individual aspirations are secondary to societal goals. Fake products are 'outlaws'. A fake Rolex watch can be linked to a lower social class, thus conflicting with the goal of its user to elicit status.</i></p>
 <p>Standards Appraisal The stakeholder's expectations and beliefs about how users, others and objects should behave or act. Standards refer to value.</p>	<p>Does the product conflict with the user's expectations and beliefs following product use?</p> <p><i>People often carry out 'after sales checks' of their recently bought products. E.g. a new car.</i></p>	<p>Does the product conflict with the bystander's expectations and beliefs following product use?</p> <p><i>During or after their encounter with a product user, bystanders can be confronted with their own vulnerability.</i></p>	<p>Does the product conflict with the cultural values, expectations and beliefs following product use?</p> <p><i>How can the avoidance of conflict be turned into the opposite - a hype? How can it be turned into a product that is the result of a high generative level of creation and supported by the full blessing of culture and society?</i></p>

Workshop 2: PAMS challenges revealed during the TU Delft workshops

Two months after the introductory workshop in Antwerp, we organized a second designer workshop at the TU Delft. We introduced and tested a set of stigma-relevant questions aimed at exploring the context and appraisal issues that surround the use of assistive, protective and medical devices. The participants were divided into four groups. Each group explored one of four imaginary product users (Figure 4.10).

Figure 4.10. The four imaginary product users of our second workshop.

			
<p>Marc is 38 and he exercises daily with his prosthetic leg.</p>	<p>Simon is 32 and needs oxygen therapy.</p>	<p>Lisa is 74 and uses a walking aid (rollator) to get around town.</p>	<p>Lee is 34 and steers his wheelchair with a Tongue Drive System.</p>

This workshop consisted of two main exercises. For the first exercise, participants were asked to assess the stigma-relevant issues for each product user with the aid of improved checklists. The main goal of this exercise was to explore and refine the questions that make up the PAMS. During the second exercise, we explored the applicability and comprehensibility of our future stigma-alleviating design interventions. The results of this second exercise are presented at the end of Chapter 5.

In the matrices below we present some of the answers given in the stigma-specific questionnaires that each group was asked to complete for their specific user and his or her product. We did not test the tangible cardboard model during the workshop.

We selected one specific product user to highlight the answers that came out of the checklists.

Figure 4.11. Product user Simon and his oxygen therapy equipment.

















Simon is a 32-year-old graphic designer who has a respiratory condition that requires him to have oxygen therapy (Figure 4.11). Due to his condition, Simon needs supplemental oxygen, for which he depends on an oxygen dispenser. He uses a stand-alone unit during the night and the depicted mobile dispenser during the day. The mobile oxygen dispenser is integrated in a modern shoulder bag that contains the oxygen bottle and pump. The oxygen flow is controlled with subtle buttons in the shoulder strap. The oxygen travels through a nasal cannula, a lightweight translucent tube that is placed underneath the nostrils.








After completing the checklists, participants were instructed to detect the most relevant stigma-specific challenges. These were the five challenges that were filtered for product user Simon:

- Make the tubes of the nasal cannula less repellent for bystanders.
- Reduce the medical look of the tubing.
- Make the product less inconvenient for Simon by addressing the practical issues, especially those related to socially uncomfortable episodes in product use.
- Avoid the effect that Simon feels 'looked at' because he is sitting in a chair with a shoulder bag.

On the next 3 pages we positioned the various insights and answers for this specific user in the appropriate matrices.

Product Perception (Sensing)			
	 User	 Bystander	 Culture
 Attitudes Appraisal The stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.	Does the product exhibit sensory discomforting or repelling features for its user? <i>The feel of the tubes behind the ear and the irritating tubes in the nostrils bother Simon. A shoulder bag does feel warm in summertime.</i>	Does the product exhibit a sensory discomforting or repelling impact on bystanders? <i>In a crowded train, bystanders could be annoyed by the noise of the oxygen flow.</i>	Does product perception violate social or cultural taste? <i>Having an object in the nostrils is not regarded as an expression of beauty or style in most cultures. In contrast, members of a remote tribe might perceive the nasal cannula as an object of beauty.</i>
 Goals Appraisal 'Things' that the stakeholder wants to accomplish or see happen. Goals provide orientation and purpose.	Does product perception obstruct the user in obtaining his or her goals? <i>The buttons in the shoulder strap have clear pictograms and their functions are instantly recognizable for Simon.</i>	Does product perception obstruct others in obtaining their goals? <i>Simon's looks do attract attention and bystanders often interrupt their conversation to stare at him.</i> <i>Bystanders often avoid sitting next to Simon on the bus.</i>	Does product perception obstruct a culture in obtaining its goals? <i>From a distance, Simon looks like someone who escaped from the hospital. In certain cultures people might be tempted to approach Simon and ask if he needs help.</i>
 Standards Appraisal The stakeholder's expectations and beliefs about how users, others and objects should behave or act. Standards refer to value.	Does the user perceive unacceptable products or product aspects according to his quality standards? <i>Simon does like the looks of his shoulder bag; they definitely give him a dynamic look. By adding a trendy brand name or Nike-logo, the perceived value might increase for Simon.</i>	Do bystanders perceive products or product aspects of users that fail according to their quality standards? <i>Simon sometimes has the impression that his 'shoulder bag look' does not stroke with the standards of certain business clients that he meets in his job.</i> <i>When bystanders perceive Simon, some might feel compassion. In contrast, a lot of people reported that he elicits feelings of admiration for being so open and positive, regardless of his condition.</i>	Does the perceived cultural significance and value of the product or product aspects indicate change over time or in durability? <i>The nasal cannula has been invented in 1949 (by Wilfred Jones). Since that time the product has always been linked to medical use.</i> <i>When the shoulder bag was launched, it was associated with a female user group.</i>

Product in Use (Acting)			
	 User	 Bystander	 Culture
 <p>Attitudes Appraisal The stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.</p>	<p>Is the product discomforting or repelling during its use (in general or in specific situations)? <i>Fitting the nasal cannula can be uncomfortable.</i></p> <p><i>The straps behind the ears are annoying.</i></p> <p><i>The shoulder bag can become heavy after a while.</i></p>	<p>Does using the product cause unease or a threat to others? <i>Fitting the nasal cannula may cause unease in bystanders.</i> <i>Simon often senses that bystanders maintain a greater distance. The tubes tend to make him look like a sick person, resulting in people maintaining a safe distance.</i></p>	<p>Does using the product conflict with cultural habits, rules or laws? <i>Simon could be invited to remove his nasal cannula when he interacts with children, because most cultures tend to keep their children away from uncomfortable confrontations.</i></p>
 <p>Goals Appraisal 'Things' that the stakeholder wants to accomplish or see happen. Goals provide orientation and purpose in human-product interaction.</p>	<p>Does the product fit its purpose of use, physically, functionally, ergonomically, and morally? <i>The adjustability of the strap can be cumbersome.</i> <i>The nasal cannula obstructs head movements.</i> <i>The tubes can get tangled up in clothing or a scarf.</i> <i>Tubes are difficult to use in combination with glasses.</i> <i>Sitting on a chair with the shoulder bag is a problem.</i> <i>Not enough room left in the shoulder bag</i> <i>The shoulder bag is not waterproof.</i></p>	<p>Does using the product interfere negatively with the behavior of others; does it prevent others from attaining their goals? <i>Bystanders could be physically hindered by the shoulder bag in crowded spaces.</i> <i>After Simon touched his nasal cannula, bystanders did not want to shake hands with him.</i> <i>Intended as a joke, a child pressed the buttons on the shoulder strap. The child thought they were linked to a music player.</i></p>	<p>Does using the product indicate inappropriate cultural/societal behavior? <i>Simon could be prompted to remove his shoulder bag in shops were bags are not allowed as a theft control measure. Although permission will be granted in his case, the societal safety goal conflicted with Simon's goal of a smooth entrance.</i> The same will be true when he passes through airport safety control. In this instance safety goals conflict with his goal of a discrete passage.</p>
 <p>Standards Appraisal The stakeholder's expectations and beliefs about how users, others and objects should behave or act. Standards refer to value.</p>	<p>Are there any dissonant experiences (unbalances between thinking/feeling and acting) when using the product? <i>Simon feels uncertain and 'looked at' while engaged with his nasal cannula.</i></p>	<p>Does using the product challenge the tolerance of bystanders? <i>Others see Simon as a sick person. By altering the tubing, bystanders would perhaps suspect that Simon is an athlete on a temporary oxygen cure.</i></p>	<p>Does the introduction of the product still need to overcome thresholds in view of cultural or social acceptability? <i>When the nasal cannula would find a widespread application in oxygen bars, its cultural value might alter. The public might believe that the tubes are associated with a person that enjoys a healthy oxygen cure while walking.</i></p>

Consequences of Product Use (evaluation and meaning)			
	 User	 Bystander	 Culture
 <p>Attitudes Appraisal The stakeholder's prevailing tendency to like or dislike qualities of objects, people or activities.</p>	<p>Does the look and feel of the product match with the personality and lifestyle of its user?</p> <p><i>The backpack is neatly styled compared to other oxygen dispenser units. Simon would like to add a personal touch by adding some patches. The tubes leave a mark on his cheeks as soon as he removes them.</i></p>	<p>Does the look and feel of the product and its user match with the attitudes of the bystander?</p> <p><i>Although the backpack does fit Simon's personality, it sends out a 'young' image. Certain business clients might appreciate a more 'classy' look.</i></p>	<p>Does the look and feel of the product and its user match with cultural preferences?</p> <p><i>When prompted to 'make himself comfortable', Simon will need to keep his backpack on. In certain cultures this could be considered as disrespectful.</i></p>
 <p>Goals Appraisal 'Things' that the stakeholder wants to accomplish or see happen. Goals provide orientation and purpose in human-product interaction.</p>	<p>Is the product tolerated purely out of necessity or physical dependency?</p> <p><i>Simon tolerates the product out of physical dependency. He does appreciate the freedom he gained as a consequence of his usage. Simon really likes the sober and subtle control buttons in the shoulder strap.</i></p>	<p>Do the consequences of product use harm the physical or psychological integrity of others?</p> <p><i>Some bystanders reported that they felt anxious after they met Simon. They felt slightly uncomfortable because they were afraid to hurt him.</i></p>	<p>Cultural and societal goals should be met. Are the product and its features in compliance with these goals and the supporting regulations?</p> <p><i>The product signals societal integration capacity. Although Simon looks 'different' he is self-reliant.</i></p>
 <p>Standards Appraisal The stakeholder's expectations and beliefs about how users, others and objects should behave or act. Standards refer to value.</p>	<p>Does the product conflict with the user's expectations and beliefs following product use?</p> <p><i>The product continuously supports Simon in a vital physical function, while being totally independent from others.</i></p>	<p>Does the product conflict with the bystander's expectations and beliefs following product use?</p> <p><i>After their encounter with Simon, bystanders reported that they were confronted with their own vulnerability.</i></p>	<p>Does the product conflict with the cultural values, expectations and beliefs following product use?</p> <p><i>The nasal cannula is often associated with the elderly and a hospital environment. These associations are shared by many and could be tough to alter.</i></p>

4.5. Conclusions

This chapter outlined how the product-related stigma process unfolds, how the various stakeholders contribute and the resulting challenges that arise. Two models supply the foundations for our designer tool called the 'Product appraisal model for Stigma' (PAMS). Major's 'Identity Threat Model' (2005) was complemented with the Appraisal Theory of Desmet and Hekkert (2007). The encompassing model depicts the complex interactions between three 'dimensions' that will impact a product during its entire life cycle: three product stimulus components, three stakeholders, and three types of appraisals aimed at human concerns. As such, the PAMS explains and reveals the context and appraisal factors that influence the product-related stigma process. By alleviating the complexity of surrounding products, people and cultures, the PAMS should manifest the stigma specific sensitivities, conflicts, and challenges that designers need to take into account prior to their design effort. Failure in addressing any of the issues brought up by the PAMS, could lead to product rejection by the stakeholders. The PAMS can be interpreted as the 'unveiler' of product-related stigma, preparing the designer for the next step where stigma-reducing design interventions seek to 'heal' the product of its stigma content.

The PAMS is presented as a tangible designer tool that integrates three matrix checklists. A tangible tool should appeal to designers and has the potential to facilitate group discussion.

This designer tool would benefit from additional testing with designers and design teams. Research efforts can be directed towards an improved comprehensibility, assessing the effect of the tangible aspects of the tool and the group dynamics during the completion of the tool. Ultimately it is our goal to extend this model to other semantic challenges.

As a supplement to this thesis we provide a poster containing the PAMS and visual instructions on how to build and use the model. Additional models can be requested by contacting the author.



SPIM - The Stigma in Product Appraisal Model

Each side **tetrahedron A** provides the designer with a set of nine specific questions that are linked to product perception, products in use and reflecting on product use.

Tetrahedron B, the appraisal jacket, can be placed and turned around tetrahedron A. As such, each side of the model will challenge the designer with a set of questions that may reveal conflicts or tensions between the various stakeholders and their appraisals of a given human-product interaction in view of their standards, goals and attitudes.

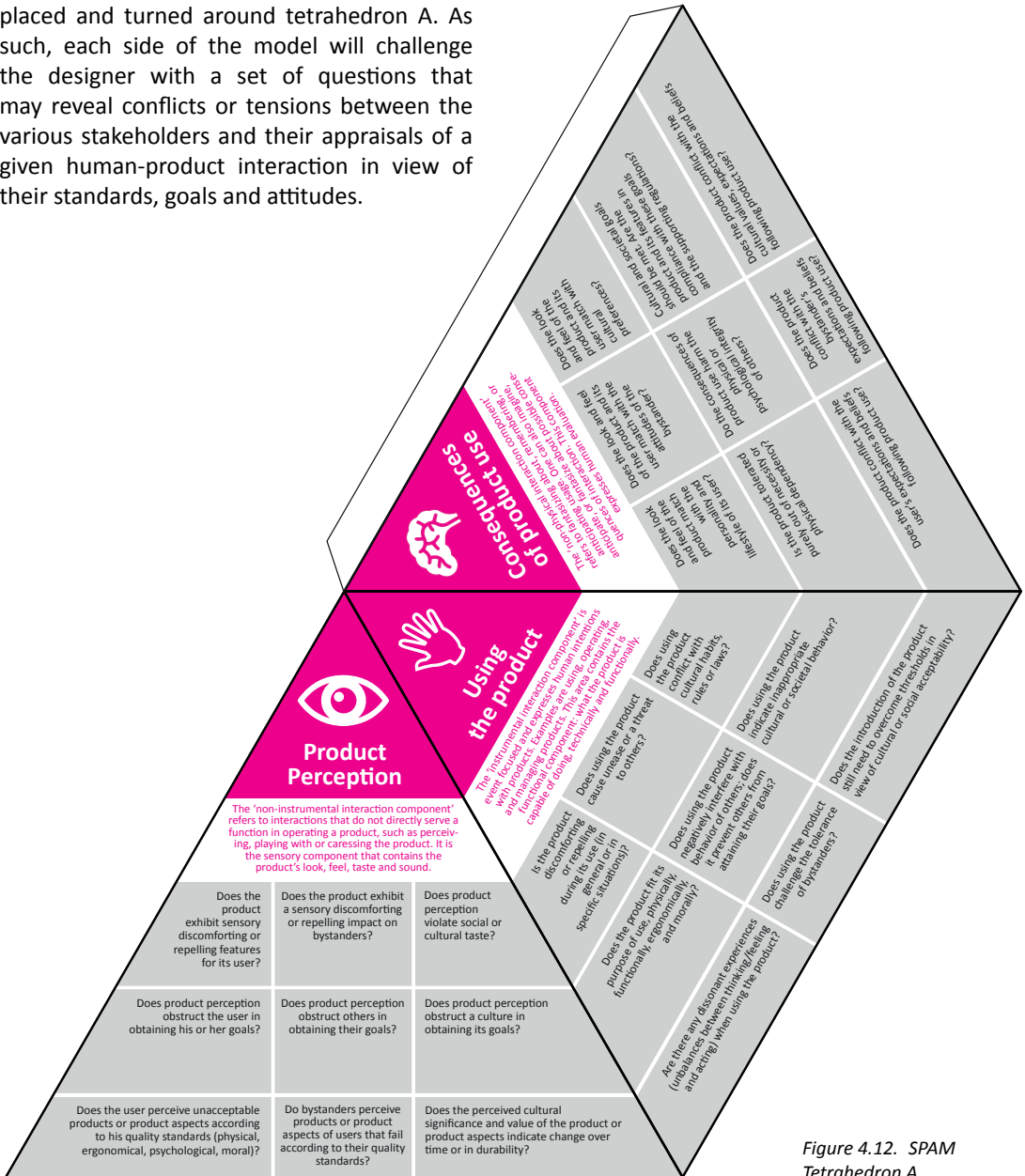


Figure 4.12. SPAM Tetrahedron A

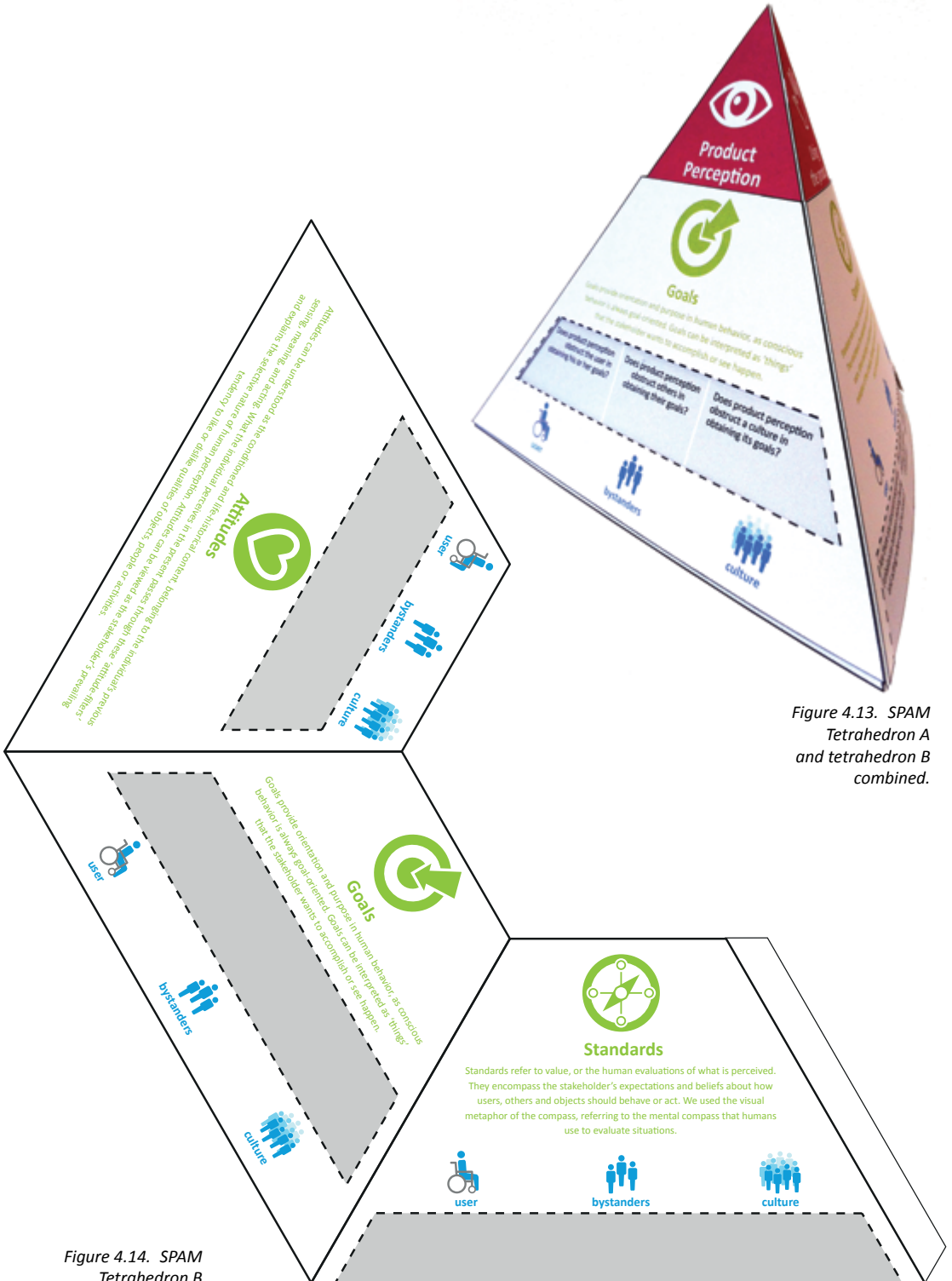


Figure 4.13. SPAM Tetrahedron A and tetrahedron B combined.

Figure 4.14. SPAM Tetrahedron B

CHAPTER 5 PIMS
THE PRODUCT INTERVENTION
MODEL FOR STIGMA

This chapter presents the ‘Product Intervention Model for Stigma’ (PIMS). After the ‘Product Appraisal Model for Stigma’ (PAMS) that exposes vital sensitivities and pitfalls, the PIMS is our second deliverable for designers. The model comprises a set of 17 design interventions that enable designers to take on their semantic responsibility and alleviate products of their stigma-eliciting properties. By incorporating these interventions, designers can aim for solutions that relieve product-users from the social stress related to owning or using a protective, assistive or medical device in unwelcoming contexts. Apart from the benefits for the individual user, additional benefits can include increased user-product attachment and collective well-being.

The PIMS-interventions are specifically intended to meet the stigma-relevant design requirements that arose during the application of the PAMS. These requirements are only part of the total design brief and need to be complemented by and balanced with vital design requirements that address the functional (accessibility and inclusiveness), technical and economical requirements of the future product. The PIMS is claimed to be an operational and valid framework of design interventions. It complements existing design-ideation tools and can be applied to a broad range of stigma-sensitive products. The various interventions will be presented in a compact and consistent style, facilitating overview and comparison. To address the requirements of the creative process, the PIMS-interventions are also presented as a card set, specifically aimed at designers.

Why 17 design interventions?

We limited our tool to 17 interventions after collecting and analyzing a database of over 200 stigma-eliciting products and concepts. The database comprises existing products, conceptual product proposals, as well as concepts conceived during experimental and educational workshops. We initiated our database analysis by grouping the design solutions in product categories. Based on our own insights we separated the effective from the less effective for each category. The stigma-alleviating aspects that arose in the good examples were translated into an initial set of promising design interventions. During the course of our research this set expanded until the moment where all new stigma-alleviating product cases could be classified in a specific strategy. The resulting set was compacted into 17 manageable and promising interventions that we selected as relevant for our stigma-free design approach. The comprehensibility and manageability of the interventions was refined in two designer workshops at the University of Antwerp and the Technical University of Delft.

All interventions are meant to suggest a general design direction and will be exemplified with products from our database that will stick to the visual mind of designers. The examples not only illustrate that a specific intervention is viable, but they also provide instructional guidance for designers.

The examples portraying existing products were not conceived through application of the described PIMS-interventions.

What is the impact of the interventions and how are they grouped?

The PIMS-interventions intend to have an impact on the context levels and stakeholders that we distinguished earlier: products, users, bystanders (groups) and culture. We grouped the two collective contexts (groups and culture) into one strategic intervention domain, which influences cultural factors. As such, The PIMS-interventions address three intervention domains, and are grouped accordingly. In figure 5.1 we classify the interventions according to their appropriate intervention domain and crystallize their content into one visual and a header.

- **Product:** A first set of 13 interventions addresses the efforts that the designer can direct towards reshaping the meaning of the product. The product category is partitioned into 5 categories, with interventions focusing on:
 - User-product de-identification
 - User-product identification
 - Product use
 - Product materialization & technology
 - Product interaction
- **User:** A second set of 2 interventions groups all efforts towards empowering product-users, enabling them to cope with the effects of product-related stigma.
- **Culture:** In a final set of 2 interventions, we situate efforts towards reshaping the cultural or societal context in which products are launched and perceived.

By addressing the collective context levels, the interventions suggested by the PIMS strive beyond short-term relief and aim for design solutions that deliver personal as well as social relevance. By involving stakeholders such as policy makers, governmental agencies or companies, designers can initiate or support social and cultural initiatives. Although these cultural interventions will be dealt with, we primarily concentrate on the actions that can be taken by designers. Their design interventions, and how they reduce a product's stigma-eliciting properties, remain our focus.

How can the designer apply the interventions?

The interventions are presented in a compact and consistent way, allowing designers to compare, evaluate and combine them accordingly. The interventions intend to be inspirational and instructional and are mainly communicated through examples.














A successful stigma-free product is often the result of several complementing design interventions. Because the three intervention domains intertwine, a successful set of interventions will often traverse more than one intervention domain. We recommend designers to focus on each intervention domain. Neglecting any of them will reduce the overall effect or lead to product rejection. Conversely, a multiple focus will multiply the effect.

Certain combinations of interventions will produce strong outcomes, whereas other combinations are impossible because they strive for opposite effects. For example, concealing stigma-eliciting product features is opposed to the strategy that endows products with a vibrant and individual look that matches the user's lifestyle. Matching the appropriate design interventions to a specific stigma-relevant design challenge is a creative and generative effort.

By integrating and combining interventions from these three domains, the designers will be able to physically assign new meaning to and reshape the individual and collective image of a product.

Figure 5.1. Three intervention domains and 17 design interventions countering product-related stigma.

13 product interventions

De-identify				
	Camouflage or disguise stigma-sensitive product features	Diversion of attention divert the bystander's attention away from stigma-sensitive product features	1	2
Identify				
	Strengthen the product's individual identity in such a way that users wish to associate themselves with that product, and value it as an extension of or addition to their personality.	Strengthen the product's institutional identity reinforce the link between products, their institutional context and roles people play in those institutions.	Strengthen the product's group identity in such a way that it enforces feelings of belonging to a social group or subculture.	Strengthen the product's brand identity Avoid negative brand associations and reinforce positive brand associations.
	3	4	5	6
				
Eliminate physically or mentally confronting moments in product use Adapt the product's functionality or its usage rituals accordingly.	Integrate additional benefits and experiences Incorporate experiential benefits that pleasantly surprise the user beyond the strictly practical and functional product aspects.	Manage the frequency and intensity of product use Adapt the product so users can limit the frequency or intensity of product use and reduce social tension and exposure.	Focus on the ultimate product goal By exclusively addressing this ultimate goal, the product could become obsolete in all other situations.	
7	8	9	10	
Material & technology				
	Reshape product meaning through advances in technology Applying new technology can make a product smaller, more performing, cheaper to buy and own, etc.	Reshape product meaning through advances in material technology Applying new technology can make a product lighter, more ecological, etc.		
	11	12		Reflects on meaningful interaction with other products Strive for a semantic cooperation between complementary products / mimic the typology of a product that is accepted.
				Interaction

2 user interventions

2 culture interventions

			
Endow the product user with extra abilities Instead of adding disabilities, try to increase the user's abilities above those of 'abled' users. Extra ability can also be suggested.	Boost the user's social skills Make the user rise above the reactions of others by making him or her visually or verbally more assertive.	Campaigns or interventions that educate or change public views Also consider interventions in public space to promote interaction or appropriate behavior	Increase positive social visibility / product endorsement Increase the social 'visibility' of a product / product endorsement by influential political, sports or media figures
14	15	16	17

5.1. Can the designer reshape the meaning of the product?

The designer is responsible for the semantic and user-experience qualities of a product. To reduce the unfavorable effects of product-related stigma, the PIMS suggests 13 design interventions aimed at reshaping the meaning of the product. The interventions are assigned to 5 categories (figure 5.1).

Figure 5.2 provides a quick and visual introduction to some of the interventions, and how they can complement each other. This table presents a selection of 7 concept illustrations that were conceived by students Lola Bladt and Jonathan De Clerq. All stigma-alleviating concepts are based on a persona that wears an eye patch. We briefly describe each concept and link it to the PIMS-interventions that were used and the PAMS challenges that were addressed.

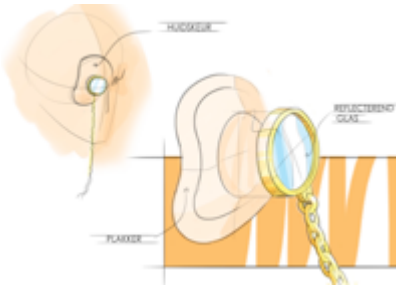
Figure 5.2. Introduction to the design interventions.



Eye patches are used to cover a lost or injured eye. The most stereotypical eye patches are skin-colored with adhesive bandages.

PAMS challenges related to the eye patch:
Whatever its shape or color, the eye patch is a visually prominent feature that will attract the attention of bystanders.

Product Concept	Concept Description	PIMS interventions/PAMS challenges
	<p>Concept A: The eye patch is integrated into a fake reality-augmenting headpiece. A firm fit is achieved by integrating a headphone. The social image of the wearer has moved from a one-eyed “disabled” to a high-tech early adopter.</p>	<ol style="list-style-type: none"> 1. Technological product enhancements 2. User empowerment: the new look suggests a user with extra abilities. 3. Eliminating discomforting moments in product use: fitting the eye patch is like putting on a headphone. 4. Meaningful interaction with another product: the headphone. Reference to the original product is gone.
	<p>Concept B: This concept attempts to restore facial symmetry with a molded patch, based on a digital scan of the wearer’s face. From a distance, bystanders can distinguish the product as an eye patch, up close the patch will engender a more harmonious facial look.</p>	<ol style="list-style-type: none"> 1. Camouflaging stigmatizing product features: the 3D-shaped patch restores the facial looks. 2. Increased user-product identification by adding a custom fit and color. 3. Boosting the user’s social-skills: this patch makes the user stand out, wearing it gives evidence of strong self-esteem.



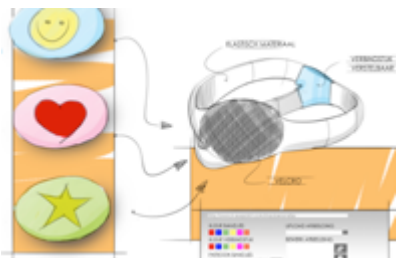
Concept C: This skin-colored patch is complemented with a fake monocle with a reflective lens. The monocle was an article of gentlemen's apparel until the nineteenth century and was used to correct or enhance the vision in only one eye.

1. User-product de-identification / camouflage: skin-colored patch.
2. User-product identification: the monocle delivers a dandy-like identity for those that have the guts to wear it. By using camouflage and identification, two seemingly opposite strategies are integrated into one concept.
3. Meaningful interaction with another product: a monocle.



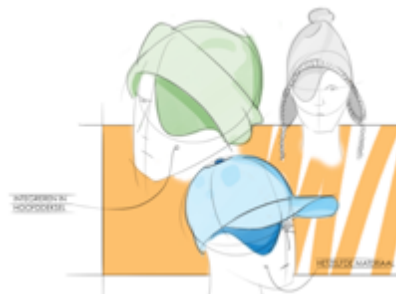
Concept D: In this concept, the eye patch is integrated in a sporty sweatband with a visible brand association.

1. Meaningful interaction with another product: the functional and semantic qualities of a sweatband.
2. Increasing user-product identification by applying a respected and favored brand identity.
3. Product use: social exposure with the patch can be limited by turning the wider part of the headband to the back of the head.



Concept E: The child can configure his personalized eye patch: images can be uploaded and printed on the eye patch; colors can be combined as pleased.

1. User-product identification: the eye patches can be personalized to match the wearer's identity on the Patch-ID website.



Concept F: The patch is integrated in a fashionable headpiece. Sewn on the inside of a personalized hat, the patch can be employed when needed.

1. Meaningful interaction with other product: functional and semantic qualities of the particular headpiece.
2. User-product identification: through looks that reflects the user's identity or through brand identity.
3. User-product de-identification: the bystander's attention is diverted towards more appealing features.
4. Product use: social exposure is limited. The patch can flip away.



Concept G: The patch is presented as an add-on for glasses. Glasses have cast off their stigma-eliciting image and are now called eyewear. As such the eye patch can become part of a persons' fashion statement.

1. Meaningful interaction with other product: integration of the functional and semantic qualities of glasses.
2. Product identification: through looks that reflects the user's identity or through brand identity.
3. Eliminating discomforting moments in product use: putting on glasses is a fast and unsuspecting routine.

5.1.1. Can the designer make the user not identify with the product?

Users can identify with products. Product identification can be viewed as the psychological orientation towards an object, with a resulting feeling of close emotional association. When users de-identify with a product, they do not wish to be identified with that particular product. There is an emotional de-association between the user and the product.

We suggest two de-identification interventions that relate to ‘concealment of’ or ‘turning attention away from’ stigmatizing features. These interventions can be seen as reactive or flight interventions and involve defensive attempts to artfully dodge, avoid or reduce the impact of product-related stigma, without actively challenging it. By promoting a user escape, the design solutions that result from these interventions often send out the signal that impairment is something to hide (Pullin, 2009).

As suggested earlier, assistive devices are often rejected by their users for other reasons than their technical function or a lack of skill or confidence in using the product. Occupational therapist Clare Hocking (1999) argues that abandonment also “relates to people’s perception of themselves as disabled, and to broader issues of identity.” Product users often choose to de-identify themselves with their assistive or medical device, specifically because they are perceived as being sick or disabled.

Pullin (2009) also asserts that for the design of assistive or protective devices, by tradition, priority is given to enablement (or protection), while attracting as little attention as possible. Despite the apparent advantages of covering or hiding stigma-sensitive product features, it can also promote social unease, putting the user under the enduring stress of being ‘revealed’. De-identification interventions are the counterpart of the user-empowerment interventions that are treated later in this chapter.

Intervention 1: Can the designer camouflage or disguise stigma-sensitive product features?

Short description: *The aim of this intervention is to camouflage or disguise the entire product or its most prominent stigma-sensitive features. It challenges designers to conceive products that make the user happy without feelings of emotional attachment. The use of translucent or skin-colored materials to hide the obtrusiveness of certain design features is exemplary of this intervention. Taken to its extreme, this intervention should render a product invisible.*

The camouflage intervention applies to all sensory levels. Discomforting product odours, noises or tactile features are all elements that may require camouflage. Therefore, prior to applying this intervention, the designer needs to consider all sensory incongruities that might upset others or cultural norms or values. A product can be camouflaged or disguised at all times or at specific moments when the disguise is considered necessary.

Prostheses are often made from flesh colored material in an attempt to camouflage them against the skin. Matching a product to a specific skin tone is to be handled with great precision. When tones do not correspond, bystanders might be confronted with a visual incongruence between what they see and the mental and visual image they hold of a certain body part.

Apart from translucent or skin-colored solutions, other objects or accessories can also hide stigmatizing features. One option is to fully cover the stigma-eliciting product itself, the other option is to partly cover it and hide the most prominent stigma-eliciting features. In figure 5.6 Ruben Hekkens attempts to cover a bike helmet with different types of fashionable headwear.

Disguising or camouflaging interventions are not an option when:

- The user's disability and/or the stigma-sensitive product cannot be concealed adequately.
- The stigma-sensitive product has a signal function that safeguards the user, e.g. a blind cane.
- The user feels confident and self-assured and does not want to hide his or her stigma-eliciting product.

Overall, as designers, we do not endorse this intervention. Camouflaging or hiding a product sends out signals of product-undesirability. By going great lengths to hide an assistive, protective or medical device, a user increases his vulnerability and reduces his assertiveness in social life. And, projecting this strategy onto the dimensions of social identity, it possibly reduces the user's competence.

Examples of camouflage and disguise:

The evolution of the hearing aid illustrates the transition from visible, over camouflaged (translucent and skin-coloured) to invisible (figure 5.3). This evolution has been made possible through significant advances in technology that we will treat later in this chapter.

A prosthetic hand that strongly resembles a real hand, can introduce additional sensory incongruities (figure 5.4). When shaking hands, a bystander can become confused and shocked by the ‘frigid’ sensation of a plastic prosthetic hand. When applying the camouflage technique, it is important to consider that the unconscious and unprepared bystanders expect a complete ‘human image’ that lives up to their expectations, on all sensory levels. Product camouflage is often applied in a static manner that does not stroke with a dynamic ‘human image’. When bystanders perceive a realistic ‘fake’ limb, they also expect it to behave as a natural limb, with all the accompanying nuances. As such, slightly unnatural movements or the sustained immobility of an artificial limb will not stroke with the bystander’s expectations and could elicit discomfort. To avoid this emotional unease, users of prosthetic limbs often avoid the use of their prosthetics or choose a device that clearly contrasts with their body. Materials such as wood, metal, and features eliciting a technical, athletic or functional look are often preferred over the ‘fake skin’ options.

The same can be said for translucent solutions. A facial mask that is completely translucent can be visually awkward. From a distance, bystanders can possibly interpret the ‘translucent blur’ or invisible object as an awkward facial feature. As observed in our mask explorations it is often wiser to retain the stereotypical semantic characteristics of a product. If, for example, a transparent facemask is visually recognizable by solidly coloured edges, it will be recognized as a facemask. Conversely, the translucent front of the mask can become a social asset. As bystanders approach, they can detect the mask wearer’s mouth and facial expression, elements that can vitalize human communication (see figure 5.5).

Figure 5.3. (Left) The Zon-hearing aid invisibly hides behind the ear and uses a translucent miniature headphone.



Figure 5.4. (Right) Skin-coloured products.



Figure 5.5. An early prototype of our fine dust mask. A good example of the use of translucency.



Figure 5.6. Rubens Hekkens - camouflaging bike helmets with headwear.

Intervention 2: Can the designer divert the bystander's attention away from stigma-sensitive product features?

Short description: *This intervention suggests that the designer should aim for a diversion of the bystander's attention, away from the stigma-sensitive features, towards more appealing or eye-catching features. The bystander's attention can also be lured away from the stigma-sensitive product as a whole, towards a more accepted product within the visual scope of the bystander.*

The diversion of attention can be realized in the product itself, by diverting attention away from the awkward features towards its more appealing features, or by diverting attention away from the stigma-sensitive product as a whole, towards a more accepted product within the visual scope of the bystander. For example, instead of focusing on the dust mask, a designer can concentrate his efforts on the conception of a conspicuous scarf or hat which accompanies it. The bystander's attention can also be lured away by integrating brightly colored features or accessories.

In a consideration of this intervention, it is vital to evaluate how the product of interest relates to other objects on the body: clothing, accessories, etc. A white dust mask attracts a lot of attention because it is placed outside of its medical context, but also because its color contrasts with the user's clothing.

When are de-identification interventions appropriate?

The previous two design interventions relate to user-product de-identification. From the perspective of the product user, these interventions are especially important on the levels of product perception and product value. The value of a product may be low if a user does not wish to identify himself with a product and opts for discretion, diversion or concealment.

The de-identification interventions are mainly useful to reduce the impact of the initial product perception by others, on all sensory levels. By hiding or drawing attention away from stigmatizing product features, product users attempt to reduce social tension. Their ultimate goal is to sustain the spontaneity of the social interaction, even while wearing an assistive, protective or medical device. Without ignoring the importance of these interventions, we would like to invite designers to challenge the more traditional option of de-identification and explore ways for users to feel good while interacting and exposing themselves with their product.

Figure 5.7. The
'Hearing Aid
Charms' designed by
Hayleigh Scott



Example of diversion of attention

American teenager Hayleigh Scott came up with the idea of the 'Hearing Aid Charms'. When she was little she attended a school for hearing impaired children, where she noticed that a lot of her classmates tried to hide their hearing aids behind their hair. Hayleigh however wanted to make her hearing aids shine, be fancy and be proud of them. She turned her designs into charms that she hung from her over-the-ear hearing aids and wore them to school. Soon her classmates and their parents were begging her to design hearing aid charms for them. Hayleigh patented the idea and now runs her own little business with her family. What is especially brave and striking about Hayleigh's designs is that she dared to decorate them with large and conspicuous jewelry. Although she diverts the attention away from the hearing aids, the overall design radiates pride and teenage fanciness.

5.1.2. Can the designer make the user identify with the product?

‘Identifying with a product’ entails that users wish to associate themselves with a product, and possibly value it as an extension of or addition to their personality. Certain human-product combinations are difficult to conceal, due to the product’s visual impact or the users physical or medical condition. Instead of opting for the previous de-identification interventions, where the aim is to attract as little attention as possible, designers can also opt for interventions that attract attention to the user and his product in a more positive way.

Users of assistive devices are often expected to use a specific device, selected by a medical team, and to be grateful for the improved function or support they receive despite any stigma, embarrassment, or negative image generated by the device. Because the product user does not always select the product, competitive marketing is rarely an issue. Consequently, little or no attention is paid to the aesthetics of most assistive or medical devices. Product adaptation is primarily geared at the ergonomic and functional needs of users and seldomly addresses their personal preferences. By neglecting these preferences, users are often forced to use products that emphasize their fragility or disability. This is a situation which has negative consequences for their emotional well-being and social integration. By conceiving products that complement the user’s preferences and lifestyle, the user may feel inclined to identify with the product.

Product identification can be achieved through product personalization, a technique commonly used in many areas of product design. Product personalization has been defined as “a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual” (Blom, 2000). Product personalization can enable users to obtain products that are unique and match or express their identity. If properly integrated, these interventions may provide extrinsic value or meaning and can imply feelings of pride, joy, status and a sense of belonging, instead of shame and stigma. Products can also express and enforce feelings of belonging to a social group, culture, gender, profession, race or nationality.

Design interventions can therefore be directed towards redefining or strengthening the identity of the product in one or more of these domains.

- Designers can strengthen the product’s **individual identity**.
- Designers can strengthen the product’s **institutional identity**.
- Designers can strengthen the product’s **group identity**.
- Designers can strengthen the product’s **brand identity**.

A general example to illustrate the strategy

The polycarbonate pressure masks in figure 5.8 are used for the treatment of hypertrophic facial scars which can be the result of a burn tragedy. Although the pressure method for treating hypertrophic scars has been demonstrated to be effective, the pressure must be applied constantly for as long as six to 12 months. During that period, the wearer is not only confronted with elastic fabric pressure garments that are uncomfortable, he also faces psychological challenges related to the extreme visual and social impact of the mask. Master student Gert van Laer (2012) suggested interventions to reduce the social impact of these masks. Although the original mask is made translucent, this does not suffice to reduce its visual impact and presence. Instead, Gert explored solutions to personalize the mask and make the visual experience less impacting for its surroundings. The upsetting latches and straps are replaced with more subtle and friendly looking ones. As the custom mask was produced each user had the option to choose his personal print.

Figure 5.8. Pressure mask concepts: on the left we find the original masks, on the right the design improvements suggested by Gert van Laer.



Intervention 3: Can the designer strengthen the product's individual identity?

Short description: *In this intervention the designer aims to reshape the product in such a way that users wish to associate themselves with that product, and possibly value it as an extension of or addition to their personality.*

Most people are attracted to products that are somehow related to them or how they envision themselves. In addition to the self-awareness and individuality of a person, all objects that are semantically linked to that individual become significant and have the potential to intertwine with the personality or self. Communicating individuality or personality through design involves the use of aesthetics to communicate both an emotion and personality that the user finds attractive. By incorporating aesthetic individuality through mass customization or personalization, users are enabled to incorporate their own 'creative mark'. This 'creative mark' can be achieved in many ways. (see figures 5.10, 5.11, 5.12 and 5.13).

Creating or selecting a product that matches the user's identity is primarily beneficial for the user. An observing bystander might not notice or is not necessarily pleased with another person's individual choices. What does touch and possibly influence bystanders is the perception of a pleased and confident user. By personalizing a product's appearance or by selecting the matching product, the user puts time, effort into the product. In other words, the user invests energy in a product. Scholars have argued that product attachment is related to the effort invested in a product (Belk 1988, Csikszentmihalyi et. al, 1981).

In her thesis project 'Proaesthetics', designer Francesca Lanzavecchia shows concepts that neatly illustrate the levels on which a product may address and appeal to the personal or situation-dependent identity of its user. Walking canes are very common assistive devices and are used by many people. Regardless of ability or injury we will all use them at a certain point in our lives. Figure 5.9 shows three walking cane concepts by Lanzavecchia:

- **Brittle:** This aid manifests the symptoms that afflict sufferers of brittle bone. A delicate-looking cane but at the same time strong enough to support body weight.
- **Exo-Hip:** The beauty of a replacement hip joint is repurposed as a walking aid. An iconic symbol of a man-made cure becomes a portrayal of the body condition.
- **Bone:** A bone-shaped cane to make up for the one not functioning properly. A symbolic expression in form, for its user to come to terms with, and for the public-at-large to recognize the fortitude of human frailty.

Figure 5.9. Pro-aesthetics canes & crutches, Francesca Lanzavecchia 2008



Examples on how to strengthen the product’s personal identity:

- **By selecting a matching product from a wide array of product options** (figure 5.10).
- **By means of a configurator**, generating a product that is presumably unique, although it is the result of a finite selection process (figure 5.11)
- **By adding a personal touch in a DIY (do it yourself) way**
 - Example 1. A child with a classic white brace can express his or her individual and social identity through personal messages (figure 5.12)
 - Example 2. For the people at the Burning Man Festival in the desert of Arizona, respiratory protection is a common necessity, turning the dust mask into an extra accessory used to express one’s identity (figure 5.12)
- **Through individual product customization.**

Example: Bespoke (3D-Systems) - custom-made prosthetics resulting from a detailed and individual briefing with clients.(figure 5.13 - images courtesy 3D systems)



Figure 5.10. Nutcase helmets.

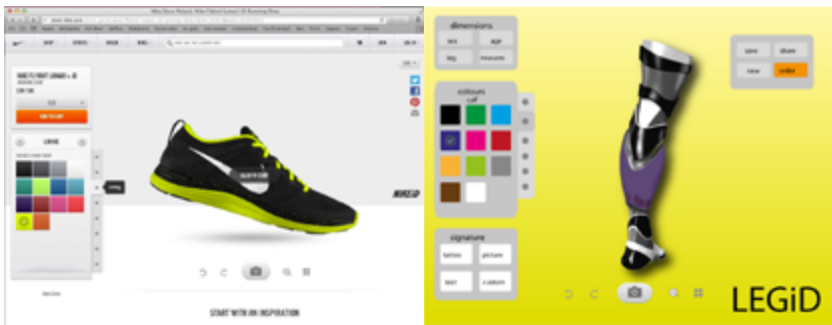


Figure 5.11. Left: Nike ID – Right: Student concept: prosthetics configurator



Figure 5.12. Left: White cast brace – Right: Mask at Burning Man, Arizona



*Figure 5.13. Bespoke:
custom-made
prosthetics*

Intervention 4: Can the designer strengthen the product’s institutional identity?

Short description: *In this intervention the link between products, their institutional context and the roles people play in that institution is reinforced. The designer should attempt to incorporate and emphasize positive institutional traits into the product.*

By incorporating and emphasizing positive institutional traits into a product, an individual will identify more strongly with that product and the institute or organization that uses it. This link can offer the product user social and emotional support.

Hygienic masks in a hospital environment are part of the obliged uniform when entering a patients’ room. They have a strong institutional identity and connect the user with the appropriate status that is linked to this identity. The facial masks, worn by nurses, doctors, and medical staff, are deliberately associated with hygiene and serenity. Because of this institutional identity, many medical products are colored in shades of white, grey, and light brown. It links them to the sterile context of the institution.

In an army context, protective masks intentionally radiate aggressiveness, imposing an image of dominance and threat on its surroundings (figure 5.14). By integrating dark colors and visual elements derived from power tools, masks of fire fighters or construction workers often radiate competence, sending out the message of being equipped and qualified.



Figure 5.14. Military masks.

Intervention 5: Can the designer strengthen the product's group identity?

Short description: *In this intervention the designer aims to reshape the product in such a way that it enforces feelings of belonging to a social group or subculture. Groups can provide the user with emotional support, social validation for their perceptions, and a sense of belonging*

A product user's individual identity can be or become part of a group identity, and enable a closer identification with that group (Allport, 1954). Products can strengthen this sense of belonging to and identification with a group. This process can be valuable for product users and their attempts to cope with the social stress of product-related stigma. Groups can provide them with emotional support, social validation for their perceptions, and a sense of belonging. For example, customers in a piercing salon who read that prejudice existed against body piercings, subsequently identified more strongly with that group than did customers who read that prejudice against body piercings had decreased (Jetten et al. 2001).

Exemplifying this intervention, we propose two examples. Figure 5.15 depicts a student concept in which the undesirable wrist protection is visually transformed into a 'tattoo wrist protector', matching the desired look and attitude of the skater population.

The D.O.C. reversible safety vest for bikers, a group often characterized by their strong communal ties and rules. The vest in figure 5.16 relieves bikers from some of the image-damaging issues related to wearing an obliged fluorescent safety vest. The product neatly integrates two seemingly opposed goals, visibility in traffic and credibility in the bar. Once the biker takes off his fluorescent vest, it can be turned inside out, transforming it into a leather vest. Both sides of the vest can be personalized with the necessary patches and group-identifying elements.

Figure 5.15. Student concept: Wrist protection for skaters that mimics the look of a tattoo.





Figure 5.16. The D.O.C. reversible safety vest, designed to make the 'toughest' riders more visible.

Intervention 6: Can the designer strengthen the product's brand identity?

Short description: *This design intervention focuses on the alleviation of negative brand associations and the reinforcement of positive brand associations. The designer should attempt to reinforce the positive emotions and experiences that this brand evokes in the user.*

Brands deliver their products and services in a consistent way, according to set standards. Products reflect the identity of a company or brand and the emotions and experiences that this brand evokes in the user. Regardless of their stigma-eliciting properties, certain products are burdened with negative associations due to their brand identity. Certain stigma-eliciting products carry brands that strongly link them to medical or assistive products. Although most of these products have a reputation for being well-engineered, their style is often conservative and they elicit associations with physical vulnerability. Other brands produce low-priced products that potentially link their users to the image of a financially poor lifestyle. In both cases the designer is left with three options. First, the designer can disconnect the product from any negative brand affiliation. Second, public perception of the brand can be altered, increasing its social or cultural status and/or value. And third, the status of a product or brand can be enhanced by integrating positively perceived brand values or features. By reinforcing the positive brand traits that radiate onto its customers and by addressing the loyalty of these customers, designers may reinforce user-product identity through brands. An active introduction of or emphasis on positively perceived brand values can be an efficient intervention, given that the brand in question knows and understands its newly targeted user group, and that brand characteristics are successfully transferred onto the product.

Figure 5.17. Masks designed by Studio Diddo: Gucci, Channel, and Versace.

The full-faced dust masks by Studio Diddo are attractively designed artist statements (figure 5.17). The concepts share many qualities with other products that are developed in conjunction with high fashion brands such as Gucci, Channel or Versace. The affiliation with such major brands can send out positive signals related to product quality, and self-image.





Figure 5.18. A series of gas masks by Freehand Profit, a Los Angeles based artist. All masks are re-imagined and transformed from a pair of Nike shoes.

When are identification interventions appropriate?

The previous four interventions are all connected to the product's identity and strongly relate to the value aspects that are addressed in the PAMS model. If a designer manages to alter the product's meaning in such a way that it expresses and possibly strengthens the user's identity, their concepts can engender:

- **Pride** – linked to the user's individual identity
- **Joy** – linked to the user's individual identity
- **Status** – linked to the user's institutional identity
- **A sense of belonging** – linked to the user's group or cultural identity

Adapting a product to match the user's identity is a rewarding intervention, but designers should be careful that their interventions do not engender sensory discomfort on other levels. An aspect that is highly personal and rewarding for its user may be disapproved by surrounding people. Personal taste often conflicts with cultural taste or beauty ideals.

5.1.3. Can the designer reshape the meaning of products in use?

Owning or using a product is a dynamic process with sequences of both pleasant and unpleasant experiences. Next to being 'unwanted', products can also be irritating, cumbersome or impractical. And, when developing assistive or medical devices, designers have to address certain special needs that the target group might share, due to impairment or limited abilities.

Ability versus disability in assistive products and technology

In design there is a tendency to make a positive-negative distinction between ability and disability. Pullin (2009) asserts that it is important to note that contextual factors are important in this debate. Defining somebody as disabled or able-bodied somehow implies that this is a constant: we are all either always disabled or always able-bodied. Pullin rightfully states that abilities change depending on the context. Environments themselves may render us more or less capable, and the same holds for activities or states of mind. In this view we can accept the idea that disabled and nondisabled people may nonetheless have shared needs in particular circumstances, despite their differing abilities. In our future argumentation and in order to avoid stereotyping a population, we will not look at our product users as a group that shares a particular disability. We will look at our users as a population that is as diverse as the population of a particular culture as a whole. Aspects related to adjustability and modularity will not be addressed in great detail. However, the following interventions will invite the designer to attend to functional challenges and balance them into a concept that is not overburdened with features or visual complexity. A product that suits everyone everywhere might sound tempting, but often results in solutions that are intimidating and confusing for the user. In our research, we do not wish to elaborate on specific clinical challenges related to product use, but rather focus on the semantic and social aspects of product use.

Product use is dynamic and the relationship to the product changes over time

Products are in constant 'motion' and their meanings not only change over time, but also in their modalities of use. By interacting with them, users gradually learn more about their products. They may for example progressively understand and appreciate them better. In the literature this is described as the systematic change of experience or use over time.

As individuals use a product, their perception of the qualities of the product will change. Over time people get used to a product, which eventually changes their perception of its usability. At the same time this process may result in users that are less excited about their product than they initially were. Even more interestingly, in different phases of use they will evidently attach different appreciations to different qualities. In their first interactions with a product they may focus on its usability and stimulation.

After they have used it for some time, they might become less concerned about its usability, and other aspects of the product such as novel functionality or communication of a desired identity towards others become more important (Karapanos, 2010).

In addition, as people age, they have a clear preference for products that require little thought, are easy to maintain, and which accommodate to them, not vice versa.

Let's exemplify this with the case of a dust mask that needs to be worn in public as a protection against pollution. Initially the dust masks are 'hated', they are unwanted and users often find them uncomfortable. After some time they become more tolerated, because users can experience the positive effects on their health. Ultimately the dust mask may become a part of everyday life, wearing it can become a routine and the user's sensitivity for remarks and discriminating behavior of bystanders diminishes or disappears.

In the next paragraphs we list four ways in which designers can enhance product acceptance through altering product use.

Intervention 7: Can the designer eliminate physically or mentally confronting moments in product use?

Short description: *In this intervention the designer adapts the product’s functionality or its usage rituals in such a way that physically or mentally confronting moments in product use can be avoided.*

The acceptability of an assistive, protective or medical device depends not just on its functionality or usability but also on how using it makes an individual feel. On a sensory level, the product may be discomforting or even repellant to operate. These discomforting moments can be linked to certain phases in use or specific locations where the sensory discomfort is more present. As designers address these instances they should consider the effects of their interventions on others. Bystanders may be offended or threatened when a user performs certain use-rituals. Additionally those rituals may conflict with cultural values or standards. By reshaping usage rituals or by copying usage rituals from other more tolerated products, designers can generate a big impact on the social wellbeing of the product user.

Certain stigma-eliciting products, such as protective or medical devices, will also be used in stressful or dangerous situations. It is important to realize that these instances command more cognitive, emotional and physical resources. Because the user’s capacity to process information will be reduced, stressful circumstances require more usable products (Norman, 2004). An added benefit of a product that is easy to use may be that it results in a product that is made suitable for a larger audience. Simple products are often the most cognitively and culturally inclusive. Sometimes it is better to deny the user a feature that could have been useful, in favor of a better overall experience (Pullin, 2009).

Figure 5.19. The Echo Novo pen is used to administer insulin in a discrete manner. By integrating the mainstream characteristics of a pen this product takes a great leap from the traditional insulin needle.

The example of the insulin pen is suitable to explain the impact of certain usage-rituals (figure 5.19). Injecting insulin with a medical needle used to be an impacting experience for the user and the observing bystanders. The exposed flesh and the threatening look of the needle can be avoided by using insulin pens. Styled like colorful pens, their appearance is nowhere near as threatening as that of a medical needle. By allowing injections into most body parts and if necessary through clothes they eliminate nearly all the physically and mentally confronting moments in product use.



Intervention 8: Can the designer integrate additional benefits and experiences in product use?

Short description: *In this intervention the designer aims to integrate additional functional benefits into the product concept. Apart from strictly practical or functional aspects designers could also incorporate experiential benefits that pleasantly surprise the user as he operates the product.*

Considering weight, compactness and adjustability are all aspects that will benefit the product user. Additionally these aspects could also benefit others. A compact wheelchair will be valued in a crowded area and a light prosthetic leg will enable its user to walk for longer periods of time.

When the practical issues of a product concept are addressed, designers should strive beyond the fulfillment of these basic needs and goals. Designers may consider the following additional benefits:

- Product handling could be difficult in certain unusual situation, were additional specifications such as being water or dust-proof are vital.
- Products may be extremely cumbersome when they are not in use, using too much of our precious storage space for example.
- Products could serve different functions at different times, or several functions at the same time. Integrated lighting will endow a bike helmet with an extra and useful function.
- Plain and boring product manipulations can be replaced with challenging and experiential sequences that delight the user and those around him.

By endowing products with additional benefits that extend beyond their functional scope, designers can 'create' product experiences that take the user away from its physical dependency of the product.

In figure 5.20 designers have presented three ways to solve the cumbersome usability aspect of a bike helmet that is not in use: use it as a lock, as a shopping bag, or just fold it in half and put it in your bag. The folding solution manages to reduce the helmet's volume, making it more practical to store away. The two first concepts however managed to transform the function of the helmet, adding unexpected and rewarding benefits for its users.



Figure 5.20. From left to right: , The Head-lock designed by Lim Seokjoong, Kim Younghye, Kwon Zion, and Na Hyesook / Bohème bike helmet from the Helmet Design Competition from Intramuros magazine (France) / The Overade foldable helmet by Philippe Arrouart and Patrick Jouffret, of agency 360.

In figure 5.21 designers Lanzavecchia and Wai present their interpretation of an indoor walking cane. The ‘Tea-Time Cane’ can be perceived as a cane with furniture properties or furniture with body-supporting capabilities. The boundaries are blurred in this tripod cane that supports the little daily break in life, returning independence and the pleasure of small rituals to its user.



Figure 5.21. Tea Time by Lanzavecchia and Wai.

Intervention 9: Can the designer manage the frequency and intensity of product use?

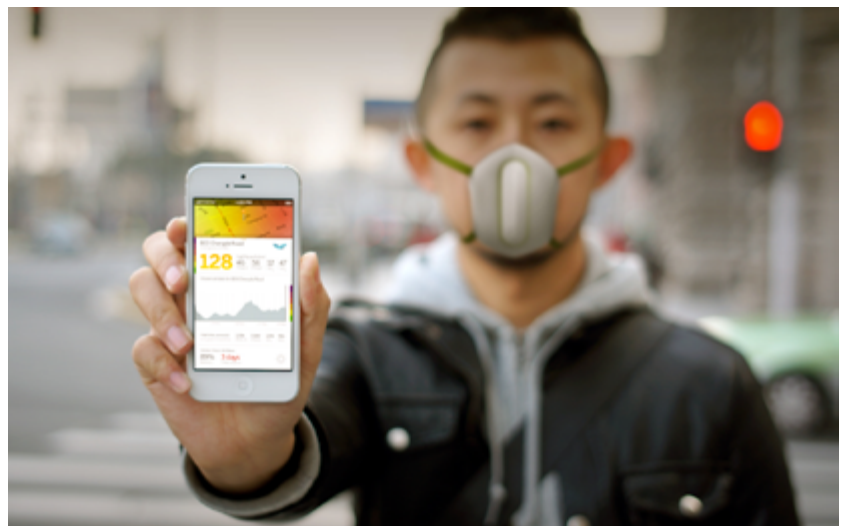
Short description: *In this intervention the designer aims to adapt the product in such a way that users can limit the frequency or intensity of product use in order to reduce social tension and exposure.*

Another important aspect connected to product use is the frequency or intensity of use. By limiting the frequency or intensity of use, social exposure with the product may be reduced. This reduced social exposure could provide temporary mental alleviation or physical freedom. Certain products do not require a continuous use. A bike courier will only use a dust mask when the air is polluted, thus avoiding reactions in periods when the mask is not required. Optimizing the frequency or intensity of use may be a matter of providing the proper instructions or information to users. In a more technical solution, the product itself may be capable to process and analyze information and reduce its visibility.

The Airwaves Connected mask (figure 5.22) is a design concept developed by Mingmin Wang and Azure Yang (Frog Design). The mask uses a particle sensor to measure air quality and shares the data via Bluetooth. A smartphone app collects, visualizes and shares the data with the community. Users can benefit from this publicly shared pollution data and adjust their product use accordingly.

Apart from its impact on the frequency of use, this product solution has the potential to introduce a powerful 'competence' aspect. If extra warning lights were added to alert for pollution, users would be able to visually share their pollution data with others.

Figure 5.22. The Airwaves Connected mask (Frog Design) uses a particle sensor to measure air quality and share the data via Bluetooth, allowing the user to wear the mask only when necessary.



Intervention 10: Can the designer limit PRS by focusing on the ultimate product goals?

Short description: *In this intervention the designer places an extreme focus on the actual or ultimate product goal. By exclusively addressing this ultimate goal, the product could become obsolete in all other situations.*

This intervention can be interpreted as an extreme variation on the intervention that addresses the frequency or intensity of product use. We do mention it as a separate strategy because we believe that it can result in strong design outcomes. Many protective or assistive devices serve one specific goal at one specific moment. Protective devices such as helmets will only serve their ultimate goal on impact and can only serve their use once. The airbag in a car is another example of a product that cleverly mixes its invisible looks with a great efficiency upon impact.

In an extreme scenario a designer could envision that dust masks are only required when polluted air is inhaled. As such the design concept should primarily solve this challenge, thus eliminating all other functional or social consequences. The main quest of this intervention is simple: do not make the product larger or more functional than is really necessary. The dust mask should only be visible when air is inhaled, the helmet only upon impact. This extreme focus on the product's ultimate goal can reduce expenses and social tension at the same time.

Every cyclist recognizes wisdom in wearing a helmet to prevent severe head injuries. In an attempt to provide protection while avoiding the self-esteem issues connected to wearing a helmet, two Swedish scientists (Haupt & Alstin) came up with the 'Hövding' helmet (Figure 5.23). This airbag collar, aimed at cyclists, is worn around the neck as a scarf and inflates to enclose the rider's head in the event of an accident. It is only then, upon impact, that the true motive or goal for wearing a bike helmet is revealed.

Figure 5.23. The 'Hövding' Helmet.



5.1.4. Can the designer reshape product meaning through advances in material and technology?

Design is a continuous circular process of further developing products. New technologies or advances in material technology strongly influence this progression and offer many opportunities to designers. Applying new technology and materials can send a product through an important transformation and positively or negatively influence its acceptance in many ways. From one life cycle to the next, evolutions in technology and materials can make a product substantially smaller and/or lighter, more performing, more ecological, cheaper to buy and own, etc.

Figure 5.24. Top:
The \$25 Prosthetic
by Dana Badeen
Bottom: The C-leg
by Otto Bock



An example of a product that virtually disappeared due to technological advances is the hearing aid. It evolved from being a visible, often skin colored, product into a discrete and nearly invisible in-ear device. The same holds for the invention of eye lenses and laser eye surgery, which allowed many people to give up their glasses.

In the field of prosthetics we see a lot of experimenting with the relationship between technology, material and body. Materials such as carbon fiber have allowed artificial limbs to be stronger and lighter, limiting the energy needed to operate them. Material technology cannot only make prosthetics lighter and stronger; it can also make them cheaper and more widely accessible to users. Dana Badeen came up with a \$25 prosthetic arm (figure 5.24), making prosthetics affordable. Cut from of a sheet of high impact resistant polycarbonate and flat packed, it can be efficiently shipped to the location where it is needed.

On a technological level, prosthetics has seen the evolution from basic primeval devices into technology-laden products. The integration of electronics has become common practice in the production of artificial limbs. In 1964, we saw the development of the first myoelectric prosthesis. This prosthesis uses the potentials from voluntarily contracted muscles in a person's residual limb, which are detected on the surface of the skin, to control the movements of the prosthesis. Robotic prostheses even go further and integrate biosensors, which detect signals from the user's nervous or muscular systems. The most recent evolutions capture signals from the brain and translate these into motion in the artificial limb.

A more radical direction in this field explores the possibilities of providing 'extra ability', i.e. augmenting the body's abilities through technology. Special limbs are developed to aid in the participation of sports and recreational activities, for example. Currently, there is much debate within the scientific community about using advanced prostheses to replace healthy body parts with artificial devices and systems to improve function. Later on in this chapter we will discuss this 'extra ability' as an intervention to increase user empowerment, by endowing the user with abilities that exceed those of the average human being.

Intervention 11: Can the designer reshape product meaning through advances in technology?

Short description: In this intervention the designer aims to reshape the meaning of the product by applying new technology. Applying new technology can make a product smaller, more performing, cheaper to buy and own, etc.

Figure 5.25. Top: 'Supersonic Stick' (by Minhye Kim) / Bottom: the 'Eye Stick' (by Wonjune Song)



The 'Supersonic Stick' (figure 5.25 – top), is a wrist-worn accessory that proclaims to escort the blind, while eliminating the blind cane and its social stigma. The 'Supersonic Stick' sends out ultrasonic pulses, and with the spatial information it receives in return, it communicates oncoming obstacles to the wearer in the form of resonant or vibrating messages. Although the use of ultrasonic technology may seem to be a promising design direction in this respect, this particular concept introduces some important flaws. With regard to its appearance, the almost invisible 'Supersonic Stick' differs drastically from the highly contrasting and uniformly recognized white cane. The white cane has important semantic qualities, sending out vital information about the vulnerability of its user. Passers-by and other traffic users will assist or adjust their behaviour in the presence of a blind person and his cane, which they will not do in the presence of someone using the 'Supersonic Stick'. The 'Eye Stick' (figure 5.2. – bottom) integrates technology in a better and more subtle way. Situational information is captured with a lens at the end of the 'Eye Stick' and sent to its user through haptic feedback. Although both products aim for the same goal, the 'Eye Stick' still embodies the semantic qualities of a classic white cane.

Figure 5.26. PURE-breathe breathing filter. (Available at: www.purebreathe.com - Accessed on august 13, 2013)



An example of a recent evolution in mask design that marks a transition through changes in technology is the PUREBreathe mask (figure 5.26). This mask is often used by athletes and is designed specifically keeping exercise in mind. When exercising heavily, most breathing is done through the mouth (nose clip provided with the mask). As such, this personal air-filter can be held in the mouth like a snorkel, eliminating the hot and sweaty feel of a classic facemask. Additionally, by using electrostatic filtering material that provides low resistance to the airflow, breathing comfort is greatly improved.

Intervention 12: Can the designer reshape product meaning through advances in material technology?

Short description: *In this intervention the designer aims to reshape the meaning of the product by applying new materials or material technology. Implementing new materials can make a product lighter, stronger, more ecological, cheaper and more widely accessible to users.*

The two concepts below illustrate that cardboard can be a surprisingly versatile manufacturing material in the hands of designers. Although most cyclists may not feel protected by something as fragile as cardboard, both of these helmets prove to be efficient in absorbing impact during a collision. The paper pulp helmet (figure 5.27) sets a beautiful example of recyclability and the Kranium helmet (figure 5.28) proves that cardboard can be lighter but at the same time also stronger than the standard materials that are now used for bike helmets.

The paper pulp helmet is a low cost, recyclable bicycle helmet for use in conjunction with the London Bicycle Hire Scheme. The helmet is manufactured from waste newspapers that circulate the London transport network. They are intended for short periods of use and are water-resistant for up to 6 hours. The helmet and strap are fully recyclable and can be re-pulped into a new helmet without any degradation of the material.



Figure 5.27. The 'paper pulp helmet' by T. Gottelier, B. Petersen, and E. Thomas.

Kranium is a bicycle helmet constructed from cardboard and designed by Anirudha Surabhi. The helmet is made from a honeycomb cardboard structure. Instead of remaining rigid, the helmet is designed to allow a degree of flexing in order to absorb the impact. As such, and while remaining 15% lighter, the helmet can withstand a force up to three times higher than the force which a typical bicycle helmet made from expanded polystyrene (EPS) is designed to withstand.



Figure 5.28. Bike helmet Kranium by Anirudha Surabhi

Intervention 13: Can the designer reshape product meaning through the product's meaningful interaction with other products?

Short description: *In this intervention the designer aims to reshape the meaning of the product by reflecting on its possible interaction with other products. The designers can generate a product that mimics the typology of a product that is accepted or even celebrated.*

The interventions we discussed so far are all connected through meaning and human involvement. This intervention addresses how products relate to each other in a meaningful way. There are several ways to look at how products interact.

A first aspect is product quantity, or the number of products in relation to the number of existing reference products. Large numbers of a particular product circulating in public can have a positive influence on the product's acceptance. By introducing an improved dust mask that is accepted and worn by a large section of the population, it becomes more 'visible' and will slowly find its accepted position among the collective representations of a culture. The term 'mainstream product' is often used for products that have found their way to the masses. Their adoption by the public can be related to quality, popularity or because they possess mainstream looks or characteristics. The application of such characteristics can be achieved on both a functional and semantic level.

A second way to achieve a meaningful interaction between products is to promote a semantic cooperation. Krippendorff (2006:193) states that interactions between products can be cooperative, competitive or independent. When two or more products interact in a cooperative manner, positive traits from both can be united to improve the acceptance of a new concept. Products can also mimic the archetypal shape of an object that is accepted or even celebrated. Products that copy or complement each other's typology can produce strong design outcomes.

Products that copy each other’s typology can exemplify parallels between products. Several years ago, when Bluetooth headsets were hyped, we noticed that hearing aids (B in figure 5.31) imitated the look and feel of these headsets (A in figure 5.31). A more recent evolution involves the integration of the hearing aid into eyeglasses (C in figure 5.31). This transition was enabled by miniaturized technology and reinforced by its cooperation with accepted and fashionable eyewear. The meaningful interactions with complementary products that are used often or worn at all times are not our only inspiration. Also products with occasional use can be inspirational and can provide the basis for a meaningful interaction with a stigma-eliciting product. Although the depicted hearing aid crayon is only an artist’s impression, it could be inspirational as a concept direction (D in figure 5.31).

A dust mask that is integrated in a scarf or sweater is yet another example of how products can complement each other (figure 5.29).

The concepts in figure 5.32 illustrate three cases in which a stigma-eliciting product is coupled with the typology of another product that is either present in the usage situation or might be complementary to the product in the actual interaction.

Figure 5.29. Student concept: a dust mask integrated in a sweater.



*Figure 5.30.
Hearing aids and
their parallels –
Hearing aid coupled
with glasses /
Bluetooth headset /
crayon hearing aid*



*Figure 5.31. ski
helmets that refer
to existing and
more fashionable
headpieces (Ribcap).*









Present situation	Improved design concepts	Description
		<p>The integration of a dust mask in a 'bike helmet mask'. The helmet on the right contains an air filter. Student concepts by O. Thysbaert (left) and K. Soete (right).</p>
		<p>Student concept (T. Janssens - J. Van Hulle): A combination of nose protection and glasses.</p>
		<p>Student concept (M. Sayevitch M. - S. Van Brusselen): Mobile oxygen dispenser – through tubes in glasses.</p>

Figure 5.32. Student concepts that apply the intervention of reshaped product meaning through meaningful interaction with other products.

5.2. Can the designer empower the user against stigma?

A second option for a designer to cope with product-related stigma is by empowering the user. In this intervention, which refers back to the personal characteristics in Major's model, the designer can develop ammunition for users to cope with stigma. 'Empowering products' should deliver intrinsic value and meaning and make a product user feel stronger or more capable. Empowerment has to boost the user's self-esteem and general feelings of self-worth, self-regard, or self-acceptance, which are the aspects Rosenfield (1997) mentions as being central to our psychological well-being, as they color the affective tone of our daily experience.

When properly integrated, the outcomes of the empowerment intervention can actively involve the user in the anti-stigma intervention and can convert him or her from a passive victim into an active challenger of stigma. Empowerment has the potential of boosting user involvement and increasing user abilities to exceed the abilities of those who do not own or use the product. Whereas the intervention that aims to integrate user-product identification in the final product not necessarily enhances empowerment, empowerment will always strengthen user-product identification.

A strong focus on the user and his desires remains key in incorporating these ingredients into a specific product proposal. In addition to the user-experience ingredients, this intervention should inspire the user to exceed his 'limitations' and engage in meaningful and stigma-challenging activities. Next to being an integral part of a product, extra ability can also be suggested. Suggestion is often powerful enough to elevate the expectations of the user and the bystanders. Features that deliver or express physical performance, speed, assertiveness, and sexiness suggest the opposite of vulnerability and stigma.

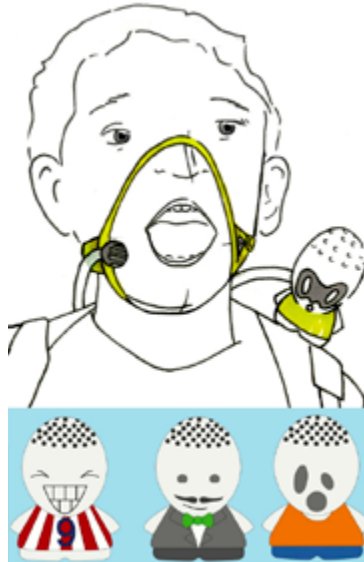
Curious about the potential of this intervention, we organized a one-week workshop (February 2012) in which we challenged students to design a dust mask for kids that realized some degree of empowerment for them. Figure 5.33 shows three results in reaction to which children openly expressed their acceptance and joyfulness.

Concept 1 is a Spy Mask that is aimed at adventurous boys and empowers them with spy qualities such as a digital spy camera with visor. The batteries and electrostatic air filter are incorporated in a rugged backpack that leaves plenty of room for personal belongings.



Figure 5.33. Three student concepts that resulted from the empowerment workshop.

Concept 2: The electrostatic filter of concept 2 is situated in a 'cool' and customizable 'shoulder-friend' that accompanies the child wherever it goes.



Concept 3 has a pressure sensor that accompanies the dust mask. This sensor can be worn around the arms or legs and changes the mask's colour when it is touched. This simple device enables kids to play and develop a virtually endless number of games. As in the previous concept, concept 3 uses transparent material to make the dust mask more acceptable and friendly looking. By allowing the mouth to be visible, kids can detect their friends' facial expressions.



Intervention 14: Can the designer endow the product user with extra abilities?

Short description: *In this intervention the designer aims to develop a product that will endow the product user with extra abilities. Extra ability can also be suggested.*

Instead of adding disabilities, an assistive device or prostheses can also increase the user's abilities above those of 'abled' users. An example of this intervention can be found in the high-tech prostheses that turn disability into super-ability. By associating Olympic sport performances and model looks with a disabled person, some of the preconceived conceptions of disability are shattered. Images of fragility and dependence are replaced with speed and grace, generating an improved social image for this specific user and for people with disabilities in general.

The American award-winning athlete Aimee Mullins, who had both of her legs amputated below the knee as an infant, provides us with an inspirational example. To quote her own words: "A prosthetic limb does not represent the need to replace loss any more. It can stand as a symbol that the wearer has the power to create whatever it is that they want to create in that space. So people that society once considered to be disabled, can now become the architects of their own identities and indeed continue to change those identities by designing their bodies from a place of empowerment." As such Mullins has introduced interesting perspectives on how to conceive of prosthetic limbs and how to combine elements of function, sports, art, and fashion. Aimee has sixteen pairs of legs, some of which are functional, for sprinting, cycling, or swimming. Other legs are made in different lengths, to accommodate high heels. For special occasions she has the option to choose legs that are wearable sculptures, hand-carved out of wood, or made from porcelain or glass. The extra abilities are obvious: the Cheetah Flex legs will make her run faster than most abled athletes, a set of extra long legs will make her shine as a model, and her hand-carved wooden legs will make her the center of attention wherever she appears (see figure 5.34).

Figure 5.34. Aimee Mullins and a few of her remarkable prosthetic legs.





Another remarkable example of an extra ability is found in a common product for children (figure 5.35). Training wheels have been a necessary commodity for many children and their parents. The ‘Gyrowheel’ or ‘Gyroscopic Training Wheel’ replaces a bike’s standard front wheel and features a battery powered spinning disc inside that creates a “gyroscopic precession” force. This force stabilizes the bike and prevents it from wobbling or falling over. Not only does this product make the lives of parents easier, it provides a more rewarding training process for children and, according to the company, it empowers them with better riding techniques.

Figure 5.35. The ‘Gyrowheel’ or ‘Gyroscopic Training Wheel’.

A concept in which the extra ability is merely suggested is illustrated by the student concept in figure 5.36. The boy on the left depends on his crutches for most of his daily routine. The crutches from ‘Stark Industries’ (referring to the ‘Iron Man’ movies) endow him with virtual powers that will be recognized and valued by his friends.



Figure 5.36. Student Concept (Heesters - Sinnaeve): a boy with walking stick gets a stick from Stark Industries.

Intervention 15: Can the designer boost the user's social skills?

Short description: In this intervention the designer aims to reshape the meaning of the product so that it delivers a boost to the user's social skills. This intervention can make the user rise above the reactions of others by making him or her visually or verbally more assertive.

An alternative way of challenging stigma is to compensate, or strive even harder to overcome obstacles (Allport, 1954, Miller & Myers, 1998). If a user believes that a stigma may have a negative impact on an interaction, he can compensate by bolstering his social skills. By being visually or verbally more assertive, users can compensate and anticipate negative remarks. By rising above the reactions of others, the user not only protects, but also enhances his self-esteem.

Stigma-reduction interventions in this category often involve protest and advocacy. By using ambiguity, humor, or even irony, a user can undermine the reactions of others. A benefit of social activism over individualistic interventions such as concealment and avoidance/withdrawal is that any improved treatment by others will spill over across a variety of situations and improve the lives of other similarly stigmatized persons (Major et al. 2000). Proactive interventions such as social activism involve confronting the stigma by challenging its validity.

The braces in figure 5.37 depict the actual instances that caused the temporary condition. Instead of having to explain the story over and over, these amusing braces provide enough background information to amuse bystanders and avoid social discomfort.

Figure 5.37. By adding a print or slogan to a mask or brace these users may feel socially empowered and more capable of responding to reactions.



5.3. Can the designer reshape the social and cultural context?

This group of interventions is not primarily focused on a manipulation of the stigma-eliciting product. As a response to product-related stigma, these interventions aim to produce fundamental changes in cultural attitudes and beliefs or change the power relations that underlie the ability to act on them. These interventions will not engender change overnight, but they may be valuable in preceding or supporting the design effort. To change public views and to have a lasting impact, more coordinated and structural anti-stigma interventions, including legal and policy initiatives, are needed. In his attempts, the designer should try to achieve impact through the manipulation of collectively grouped stakeholders. By influencing collective stakeholders, such as government, political parties, consumer groups, trade unions, activist groups, and media groups, designers can activate the leverage necessary to change social and cultural attitudes and beliefs.

To change the public view on certain user-product combinations, the designer needs to focus on two types of discriminatory reactions. Reactions shaped by associative processes (instant and unconscious) typically develop over time as one is exposed to media and other culture-related forms of communication. For example, television and movies often portray people with dust masks in disaster situations which are linked to outbreaks of contagious diseases. This portrayal can condition the general public to be irrationally fearful of people who use dust masks to protect them from smog. To prevent the formation of these stigmatizing images and associations, design efforts can be geared at preventing the formation of the stigmatizing images in the first place or geared at overcoming the damage that is already done.

The anti-interventions should also address the rule-based processes that shape the conscious and overt behavior of the stigmatizing bystanders. Social psychology suggests three main stigma strategies (Corrigan and Penn, 1999) that can easily be assigned to their design counterparts:

- **Protest:** Protest can involve public rallies and campaigns that push the message that discrimination against a certain user-groups will not be tolerated. For example, by making issues visible and tangible, critical design can provoke public debate.
- **Education:** Education can dispel myths and replace them with facts. De-stigmatization through education can be powerful. If applied throughout childhood, as individuals develop, it can make lasting impressions.
- **Interpersonal contact:** Contact with members of a stigmatized group can help to overcome stigma. By exposing people to users of a stigma-eliciting product, feelings of empathy can produce positive changes in attitudes. Getting in contact with a stigmatized user will both increase knowledge (a rule-based process) about the user and create empathic or emotional bonds (an associative process).

This chapter will address the above-mentioned interventions from a designer's perspective.

Critical design

There is an increasing recognition that controversy can be employed to challenge and change attitudes. Just as art can challenge our preconceptions and open up our awareness towards broader social issues. In industry, design is increasingly valued not as much for solving problems, but also for making issues visible and tangible, thereby facilitating discussion and decision-making. Critical design is one of those emerging approaches which provoke public debate about the social and ethical implications of new products and technologies, rather than attempt to provide solutions (Pullin, 2009:115). 'Critical design' is all about using design to explore issues and ask questions, rather than to directly provide solutions to problems. In doing so it can promote new ways of thinking about the design of assistive, protective or medical devices that have come to provoke traditional responses. Critical design often relies on creating uncomfortableness or employing dark humor and might be viewed as wasteful in a world that still needs so many solutions. However, as a potential tool to influence societal and cultural values, critical design can supply a healthy challenge to current interests and tacit values in mainstream business. The combination of provocative and sensitive elements into campaigns or social design interventions can also exert a positive influence on social attitudes towards protective, assistive or medical products.

Anthony Dunne and Fiona Raby (2006) are pioneers in critical design, which they define as "design that asks carefully crafted questions and makes us think," as opposed to "design that solves problems or finds answers."

As with critical design, most of the design interventions suggested below have to be viewed as activities that are complementary to the reshaping of product meaning. They can increase public awareness and influence product stereotypes or acceptance by informing or challenging public views.

Intervention 16: Can the designer reshape the product's cultural meaning through campaigns or interventions that educate or change public views?

Short description: *By considering the public view or debate surrounding a product, this intervention challenges the designer to reshape the product's cultural meaning through campaigns or interventions that educate or change public views. Designers can also consider design interventions in public space to promote interaction or promote appropriate behaviour.*

One way to integrate 'undesirable' products in public life is by campaigns or interventions that educate or change public views. By considering the public view or debate surrounding a product, the designer can influence a valuable source of information. A common way of educating or changing public views is by campaigning. Campaigns can range from educational or promotional campaigns to organized efforts that intend to influence the decision making process in specific groups. Campaigns can be dispersed through flyers, posters, word of mouth, and mass media such as magazines, newspapers, TV, social media and the internet.

Educational campaigns

Educational campaigns can be effective because the impact can be realized as the individual develops. The values that are delivered through education can have a lasting impact on the individual's future beliefs and attitudes. Examples of educational campaigns have been known to address childhood obesity, exposure to the sun, appropriate traffic behavior and other topics. Obesity in children is a prominent and controversial topic that concerns many western countries. Obesity is viewed as a stigmatizing condition that is changeable and controllable and subconsciously interpreted as a person's choice. Even children fall prey to this negative way of thinking. In a study by DeJong (1980), children who are shown drawings of other children with different "handicaps", are reported to like the drawings of obese children a lot less than drawings of children with facial disfigurements, children in wheelchairs, or children with other types of handicaps. However, when subjects were told that the overweight kids suffered from weight issues because of a health problem, the photos of overweight kids were liked much more. Once children find out that many of the assumptions they have about obese children are not true, they display altered behavior. Educational campaigns, often accompanied by brochures, toys or games, can increase this awareness in a playful manner.

Guerrilla campaigns

Guerrilla marketing or campaigns, referring to the atypical tactics used in guerrilla warfare, can also be considered. By using low-cost and unconventional means (graffiti, stickering, flash mobs, through social media, etc.) these

Figure 5.38. Guerilla campaign: "Don't drink and drive this festive season", Paraquad SA 2008, Australia.



interventions can generate thought-provoking content at unforeseen moments and in unexpected places. They are typically aimed at specific and smaller groups. In some cases the risks have to be assessed and considered worthwhile as some of these campaigns may irritate local authorities. By generating a buzz or spreading like a virus, these campaigns can effectively promote products or ideas.

These campaigns are often on the borderline of public acceptance and are generally not tolerated if they serve commercial purposes. In figure 5.38 we see an interactive campaign against drunk driving which urges young people not to drink and drive by making their pub seats look like wheelchairs. The message is even repeated in the restrooms.

Interventions in public space to promote interaction or promote appropriate behavior

This intervention can involve the adaptation of existing products or the strategic integration of new products to promote social interaction or appropriate social behavior. The 'Vivanti senior bench' motivates seniors to discretely 'park' their walker in the middle of the bench, allowing them to participate in social life in an effortless and spontaneous way (figure 5.39)

Figure 5.39. The 'Vivanti senior bench' by Velopa.





Figure 5.40. Student Concept (L. Dewulf - J. Syen): One of the team.

Next to public furniture or other public facilities, design efforts can also be directed at clothing or other visible bodily accessories. In the student concept 'One of the team', the entire sports team expresses its solidarity with one player who has a prosthetic leg (figure 5.40).

Intervention 17: Can the designer change the product's cultural meaning by increasing its positive social visibility or through product endorsement?

Short description: *This intervention challenges the designer to reshape the product's cultural meaning by increasing its social visibility in a positive way or through product endorsement by influential political, sports or media figures.*

Increasing social visibility

A clear example of a product that gradually changed meaning because of increased social visibility and through word of mouth is the dental brace for children. The American Association of Orthodontists reported that seven out of ten mothers say that wearing braces actually made their children feel 'cool'. Braces today are considered 'cool' for a number of reasons. Since braces are more affordable, more kids have them. Contrary to becoming a member of a minority, most children nowadays expect to have to wear braces one day. Thus, even the 'cool' kids are going to have them at some point. Additionally, braces are seen as a sign of maturity. When influential figures started wearing them, the word spread and the product was talked about in a different way.

The walker or the walking frame is an assistive device for disabled or elderly people who need additional support to maintain balance or stability while walking. By organizing events such as 'Walker Races' or 'Walker Pimping Contests' the social stress surrounding the product is relieved, both for the user and the audience at the events (figure 5.41).

Figure 5.41. Positive social visibility for the walker through the German initiative called "Pimp My Rolli".



Endorsement by influential figures

Next to the sheer ‘visibility’ of a product in the streets or in the media, product use or endorsement by influential political, sports or media figures also has a great impact on its acceptance.

The German Worishofer sandals (figure 5.42) were primarily worn by European women as medical sandals and shunned by European trendsetters. Suddenly they hipped in the US among the under 40 and sartorially inclined. It all started with a mention in an influential shopping magazine that called them “chic” and “ridiculously comfortable”. After the mention, mainstream media outlets began covering the shoe. Soon they were spotted on the feet of celebrity icons.



Figure 5.42. The German Worishofer sandal worn by celebrity icons.

5.4. Conclusions

After the PAMS had revealed the most prominent stigma-sensitive design challenges, this chapter guided us to 17 interventions in three domains to alleviate the effects of product-related stigma. In applying these interventions, designers attempt to strive beyond short-term relief and aim for design solutions that deliver personal as well as social relevance.

The interventions were formed by the integration of findings from literature, experiments, and empirical findings. The 'what' and 'how' questions related to the usefulness of the interventions and their application were simultaneously answered through carefully selected examples. The comprehension and operationalization of the interventions were improved during designer workshops in Antwerp and Delft.

The de-stigmatizing design interventions address the three areas: the context of the product itself, the context of the individual user experiencing the stigma, and the context of the observing bystanders, together with the cultural context in which the product is launched. The primary objective of the interventions is to be inspirational. To reduce product-related stigma, designers can consider combinations of these interventions. A properly designed stigma-free product can be the result of several and often overlapping interventions. We conclude this chapter by analyzing the relevance and prospects of the suggested design interventions.

Reshaping the 'meaning' of the product

A first set of 13 interventions suggests that designer could reshape the meaning of the product and remove it from negative associations. Most of the existing design interventions can be classified in this domain. By considering physical interventions on the product, the designer may engender new product meaning through user-product de-identification or identification, in product use, through advances in material and technology and through meaningful interaction with other products.

Camouflaging or concealing stigmatizing product features is a first intervention, aimed at reshaping product meaning through user-product de-identification. Many stigma-eliciting products still feature elements that characterize this intervention. A light brown color, intended to mimic skin color, is still used for many of today's assistive and medical devices. Although often implemented, we do not endorse this intervention. The felt need to camouflage or hide a product can be interpreted as an escape from reality and will be associated with undesirability.

The diversion of attention towards more appealing products is a variation that may impose a similar moral dilemma. If a product is properly designed, it is unnecessary to divert attention away from it. The intervention could be more

useful to solve attention issues within the product itself. Due to technical or functional restrictions it is often impossible to make a product appealing from every angle. Designers should have the capability to divert the bystander's attention towards the positive product features and away from less appealing ones. Regardless of the appropriateness of the intervention it will be useful to evaluate which product features deserve more visual attention than others.

In conclusion, de-identification interventions may increase the user's mental vulnerability and oppose a forceful social presence. We believe that it is more appropriate to invest in interventions that promote social confidence and optimism and increase the user's competence in the presence of others.

A second set of interventions aims to reshape the meaning of the product in such a way that the user feels comfortable and even excited while interacting with the product. With the suggested identification interventions, the designer can match a product proposal with individual, group, institutional or brand identities, which can reinforce product attachment. Redefining or strengthening the appropriate product identity can replace social stigma with feelings of pride, joy, status and a sense of belonging.

To increase the personal relevance of a product for its user, designers can tailor stigma-eliciting products to the user's preferences and lifestyle. This process extends beyond 'cosmetic' or visual product mending and should integrate changes in functionality, interface, user-experience and distinctiveness that increase user attachment. Techniques that are commonly used include: product personalization, mass customization, and individual customization.

We found many product examples that reinforce individual, group and brand identities. Examples range from protective devices that are styled and branded to suit skaters and snowboarders to the embodiments of bicycle helmets by brands like Lacoste, Paul Smith, and Gucci. Individual, brand and group identities are often combined and reinforced within one and the same product.

An identity that was not often observed was the institutional identity. Although noticeably present in the design of protective devices for military and construction applications, we did not find strong institutional semantics in the field of medical design. Even if their discrete colors link many medical products, they often do not send out comforting or pleasurable signals. Masks and accessories of military staff and construction workers do display competence and authority.

However effective, caution is required. The previous four identification interventions may aim for 'extrinsic' identification by adding ego-enhancing features that do not necessarily make users stronger. If a user is dependent on these features for his well-being, he can become more vulnerable in their absence.

After the interventions related to user-product de-identification and identification, a third set of interventions suggests that the designer could reshape the meaning of products in use. Every product delivers both pleasant and unpleasant moments in its usage cycle. The resulting meaning and experience for its user will alter according to these dynamics. Protective, assistive or medical devices are often obligatory and many users depend on them for basic safety, health or well-being. The acceptability of these devices does not solely depend on their functionality, but strongly relies on how using them makes the user feel. To alleviate the stress related to obliged or undesired use, it is critical for designers to eliminate the physically and mentally confronting moments in product use.

To encourage product use and make it a more enjoyable experience, designers can choose to provide their concepts with additional benefits. Apart from being obliged and socially undesired, the bicycle helmet is often bulky and cumbersome when it is not in use. Designers came up with additional functions that transformed bicycle helmets into bicycle locks and shopping bags.

Another important aspect to consider when assessing product use is the frequency or intensity of use. It is often possible to reduce the social tension engendered by a stigma-eliciting product, by reducing the user's public exposure with the product. A dust mask only needs to be worn when necessary, while all other instances have the potential to create unnecessary tension. In its most extreme application, this strategy advocates that products are only needed in the instance that they need to provide protection or assistance.

By focusing on the ultimate goal of a bicycle helmet, scientists came up with a bicycle helmet that inflates milliseconds prior to impact. The other ninety-nine percent of its life the bicycle helmet is camouflaged in a scarf, creating little or no social impact. This strategy also captured a lot of interest during the designer workshops. Although the technical execution is sometimes challenging, many designers came up with rewarding ideas that eliminated cumbersome issues or even made the product obsolete for long stretches of time. Imagine dust masks that only appear when breathing in, or wrist protectors that pop out prior to impact.

A fourth set of interventions suggests that the designer could reshape the meaning of products by considering the application of new materials and/or technology. Evolutions in technology and material technology can send products through drastic progressions. Technology rendered hearing aids invisible and new materials can generate lighter, stronger, more ecological, and cheaper design solutions. This intervention may benefit from an analysis of existing as well as future technologies. Trends like miniaturization, nanotechnology, robotics, additive manufacturing, and memory and other implants are going to have a profound effect on the future of protective, assistive and medical devices. Technology and material evolution will facilitate

the exploration of design solutions that augment the body's abilities, allowing users to exchange disability with extra ability.

The final intervention in the product context relates to the positive design outcomes of product combinations that interact in a meaningful way. For example, the sheer number of products visible in public life will influence product acceptance. An increase in numbers can result in increased acceptance.

A more relevant interaction between products is found in the semantic merging between two or more product typologies. During the workshops, many students and designers embraced this intervention and felt inspired by it. Semantic features of products that are often used in parallel for longer or shorter periods of time can deliver complementing elements that substantially improve product acceptance. For example, the less accepted product can borrow elements from or mimic the entire typology of a more celebrated product. We presented a hearing aid incorporated in glasses, a snowboard helmet with the looks of a bonnet, and hearing aids that mimicked the looks of a Bluetooth headset. We emphasize that the meaningful interaction between products can extend beyond the product's appearance. Products can also mimic usage rituals or other functional traits.

Empowering the product user

In a second domain we proposed two interventions that may stretch the concept of acceptability towards user empowerment. The interventions propose that the designer could search for means to empower the user and emancipate him from a passive victim to an active challenger.

The extra ability intervention suggests that the designer could alter the product so it delivers an actual increase of ability over abled people. By integrating elements of speed, agility, sexiness and assertiveness, users will feel stronger and more capable. If not physically integrated in the product, the suggestion of extra ability may suffice to elevate the expectations of the user and his surroundings. Stigma-free design through the integration of extra ability can be an effective intervention, as it truly breaks down the negative associations between the stigmatized user and the assistive, protective or medical device they require.

A second empowerment intervention proposes that the designer could integrate elements that can boost the user's social skills. By being visually or verbally more assertive, the user can compensate, strive harder, and overcome his product-related stigma challenges. By applying an visible slogan on a dust mask, the user may protect and boost his self-esteem, rising above the negative reactions of others. Stigma-reduction interventions in this category often involve protest and advocacy, using ambiguity, humor or even irony to undermine the reactions of others.

A benefit of this strategy is that any improved treatment can spill over across a variety of situations and improve the lives of other similarly stigmatized people.

Striving for user-empowerment to contain the effects of product-related stigma gives evidence of higher product integrity and has the potential to intrinsically reinforce the user's capacities.

Reshaping the product's cultural meaning

In a final domain, we situate two interventions that may support the designer to reshape the cultural context in which products are launched and perceived. Both interventions are not primarily focused on the product, but group all efforts that produce fundamental changes in cultural attitudes and beliefs.

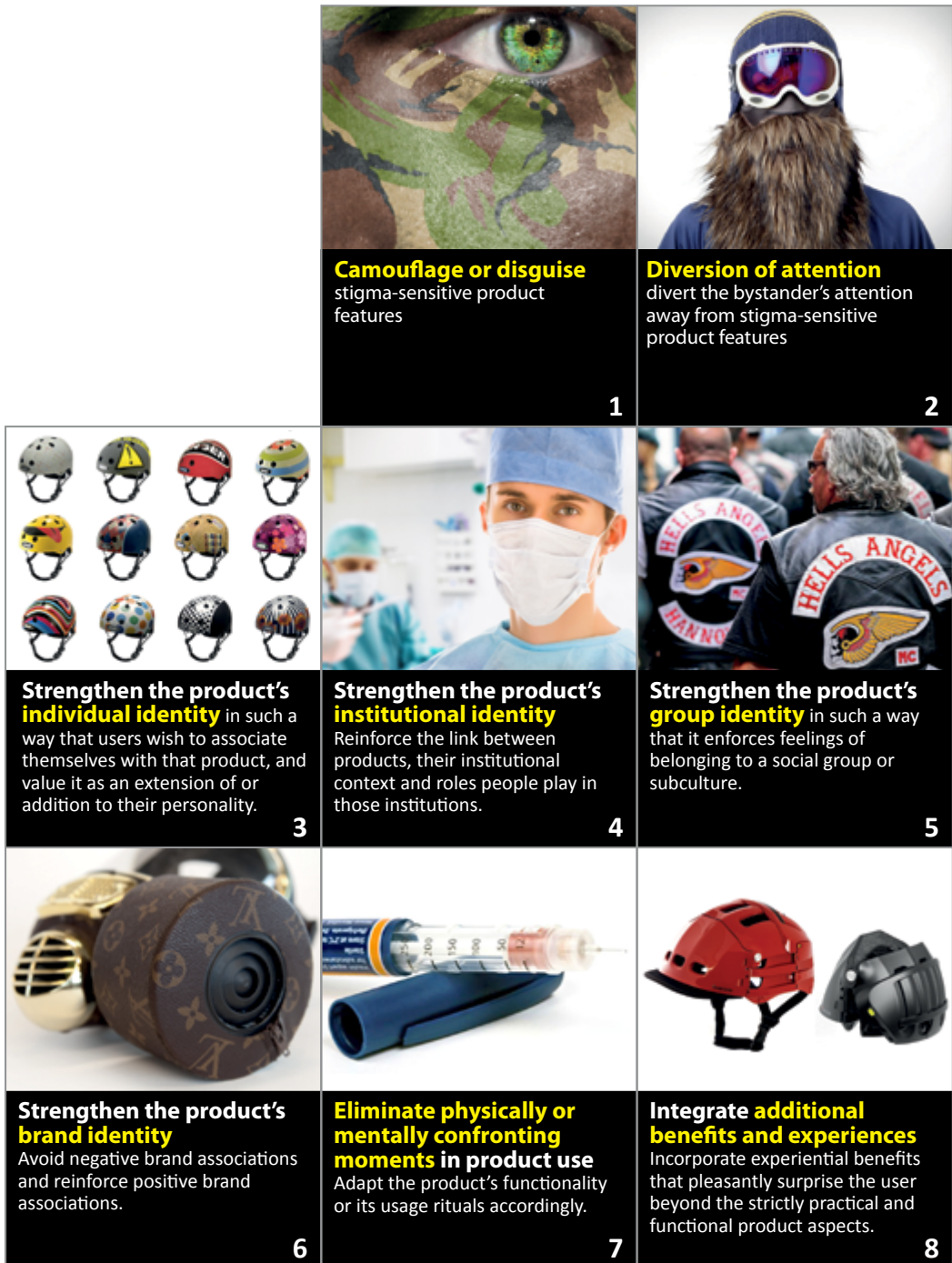
Campaigns, structural interventions in public space, and product endorsement can be valuable in preceding or supporting the design effort. In addition, by influencing collective stakeholders, such as the government, political parties, consumer groups, trade unions, activist groups, and media groups, designers can activate the leverage which is necessary in order to change social and cultural attitudes and beliefs towards product-related stigma issues.

The insights and strategies employed in critical design can prove to be valuable by provoking public debate. Combining provocative and sensitive design elements into campaigns or social design interventions can exert a positive influence on social attitudes towards protective assistive or medical products.

Educating and changing public views can also be accomplished through educational or promotional campaigns, dispersed by mass media such as magazines, newspapers, TV, social media and the internet. These interventions present a world on its own and we limited ourselves to some well-executed examples displaying guerrilla campaigns and structural interventions in public space. Humorous events such as 'walker races' or 'walker pimping' can be effective in releasing the social stress surrounding the use of assistive walking frames.

Next to the sheer 'visibility' of a product in the streets or in the media, we suggested that the endorsement of products by influential political, sports or media figures can enhance product acceptance.

Figure 5.43. The 17 PIMS interventions





Manage the frequency and intensity of product use

Adapt the product so users can limit the frequency or intensity of product use and reduce social tension and exposure.

9



Focus on the ultimate product goal

By exclusively addressing this ultimate goal, the product could become obsolete in all other situations.

10



Reshape product meaning through advances in technology

Applying new technology can make a product smaller, more performing, cheaper to buy and own, etc.

11



Reshape product meaning through advances in material technology

Applying new technology can make a product lighter, more ecological, etc.

12



Reflects on meaningful interaction with other products

Strive for a semantic cooperation between complementary products / mimic the typology of a product that is accepted.

13



Endow the product user with extra abilities

Instead of adding disabilities, try to increase the user's abilities above those of 'abled' users. Extra ability can also be suggested.

14



Boost the user's social skills

Make the user rise above the reactions of others by making him or her visually or verbally more assertive.

15



Campaigns or interventions that educate or change public views

Also consider interventions in public space to promote interaction or appropriate behavior

16



Increase positive social visibility / product endorsement

Increase the social 'visibility' of a product / product endorsement by influential political, sports or media figures

17

CHAPTER 6 **DISCUSSION &** **CONCLUSION**

Reflecting back on the research, we feel confident to state that we have explored the topic of product-related stigma from many angles. We have delineated its roots in social psychology and transferred and applied this knowledge on validated models from the field of human-centered design and design and emotion. Our theoretical insights were complemented with empirical research explorations and experiments, aimed at tools that can benefit designers in their quest to design products that are alleviated from stigma associations.

The methods that were used throughout the research strongly reflect my personal way of exploring. As a designer I enjoyed the constant mix of theory, explorations and the confrontation with design education and practice. In an area in which theory is vast and prevailing, a ‘classic’ research approach may be desirable. However, in our study of product-related stigma, an area which has few theoretical handles, it was up to us to find a way to deal with the phenomenon. In entering this new area, we have learned from our experiences and from the intense encounters and challenges that product-related stigma posed to designers, as well as from our observations and reflections on the process.

To alleviate the effects of the product-related stigma process, our research had three fundamental aspirations or goals: to understand, to measure, and to manage product-related stigma (PRS). To achieve these goals, our research was driven by three methods that continuously complemented and influenced each other: the literature review, experimental explorations and empirical research. In retrospect, this turned out to be one of the strengths of our research.

6.1. Understanding PRS

Literature review

The literature review provided a strong basis for our research. As in any other discipline, product design is embedded in theory and fueled by the expanding insights and knowledge of design practice. In my research I tried to combine both. The literature review became the red thread that ran through our experimental explorations and the various design workshops. The insights gathered from the literature continually influenced the conception of our experiments and provided the foundation for our designer tools.

Product Appraisal Model for Stigma (PAMS)

Instead of reinventing yet another framework, we decided to position our Product Appraisal Model for Stigma as a partner of complementing and validated models from social psychology and design research. Our stigma-related insights from social psychology were fitted into the identity threat

model of Major (2005) and applied to the appraisal model of Desmet and Hekkert (2007). The identity threat model inspired us to add two additional stakeholders. To extend beyond the sensitivities and pitfalls encountered by product users, the PAMS adds the concerns of bystanders and the culture in which the product is used. The Product Appraisal Model for Stigma (PAMS) is a tangible questionnaire in the shape of a tetrahedron that is related to three matrices and 27 questions. We believe that this set of questions addresses the most vital stigma-sensitive issues that designers should consider prior to their design effort. As such the PAMS is a counterpart of many models in the world of design and emotion that aim for 'pleasurable design'.

We positioned this first designer tool in two specific moments in the design process. The tool can support efforts in the fuzzy front end or analyzing phase, aimed at writing the project brief or receiving encompassing product specifications. The PAMS can also be used to validate the impact of de-stigmatizing design efforts after the product is launched. We trust that the PAMS will provide a solid basis for designers to explore the phenomena of PRS.

We do hope that the insights engendered by our model may in return inspire social psychologists. Many of the theories that apply to human relationships also apply to human-product relationships. The impact of products on human behavior is an area of common interest that is in full expansion. Insights in these processes will benefit the individual product user and broader cultural challenges.

The PAMS has already proven its relevance in my lectures on Product Semantics at the faculty of Design Sciences at the University of Antwerp. Students value the model and will continue to assist its further development. At first, it could prove difficult to apply the tool, but practice and experience will increase its speed of use and accuracy. We would like to monitor and evaluate this process to further improve the tool.

Reflections on the literature review

The literature review has been a continuous effort, but it was marked by two important moments. At the start of our research, we gathered our principal insights on the phenomenon of stigma from social psychology. After the first experimental explorations we increased the intensity of our literature review and explored design models that could reinforce our designer tools. As such our literature review resulted in a rewarding collaboration between both fields.

One of the contributions of this work is that it has brought the field of social psychology to the attention of designers. Although the topic of product-related stigma hasn't been addressed in-depth in design research, we found many parallels between the fields of design research and social psychology.

6.2. Measuring PRS

In our second research challenge we explored several techniques to measure and quantify how 'burdened' products and design concepts are with product-related stigma. Prior to our exploration in behavioral research we considered the use of questionnaires, self-report and physiological measurement techniques. We adapted behavioral research techniques because they permitted us to approach and observe the real phenomenon.

We focused our explorations on the public and unprepared encounter with users of stigma-eliciting products. We attempted to quantify the PRS-potential of these products by studying the behavioral reactions of bystanders. By averaging the behavioral reactions of a large sample of random bystanders or passers-by, we attempted to obtain an objective measure. While assessing the behavioral reactions of bystanders, we focused on two specific moments in the interaction: the initial confrontation with its reflex reactions and the more deliberate and thoughtful reactions that follow.

We initiated our explorations with a study of the avoidance-related reflex reactions to dust masks. The experiment was set in a lab environment and it captured our subjects' reflex reactions to pictures of people with and without dust masks, presented on a screen. Although the reflex reaction measure did present potential for future exploration, the experiment did not provide the necessary insightful results.

During the four experimental explorations that followed, we shifted our focus away from the lab and towards real-life encounters between mask users and bystanders. We gradually expanded our insights and systematically progressed towards a limited and relevant set of parameters. The parameter of interpersonal distance proved to be a promising measure to quantify the avoidant behavior of bystanders around users of stigma-eliciting products. We primarily focused on the walking paths of passers-by and observed and measured their behavioral deviations. This resulted in focusing on one specific moment in this unprepared encounter, the moment in which the passer-by passes our product user. By measuring this distance (the shortest distance between user and passer-by) for a large sample of passers-by varying in age, gender and ethnicity, we were able to introduce a degree of objectivity. The final two experiments represent the current state of the art. The 'Dyadic Distance Experiment' measures exact distances, whereas the 'Stain Dilemma Experiment' presents the passer-by with a choice in his walking path. Both experimental techniques are straightforward and have proven fruitful for assessing the reactions that are engendered by PRS processes.

We do not claim that our experiments are validated techniques. Further analysis is needed to improve their robustness and reliability. We consider our final two techniques to be predominantly suited as comparison tools, able to compare products or prototypes on their PRS-eliciting potential.

To designers who want to explore the stigma-eliciting potential of their concepts, we suggest they take the following steps:

- **Take a walk around and get public exposure with the product:** The second exploration in Chapter 3 (The Immersive Mask Experience) introduced the concept of the ‘social experience prototype’. By experiencing exposure in public with a visually resembling prototype, designers can experience a powerful confrontation with the phenomenon of product-related stigma. It can make them aware of the stigma-relevant challenges ahead and endow them with an empathic awareness of the future product users’ concerns.
- **Measure and rank the product proposals:** If required, the final two techniques in Chapter 3 will enable designers to rank their design proposals according to their PRS-eliciting potential.
 - **The Stain Dilemma:** This straightforward technique is time-efficient and requires a limited experimental setup. We would recommend this exploration to gather initial quantitative data that should suffice to enable designers to analyze initial design iterations.
 - **The Dyadic Distance experiment:** If the ranking turns out to be ambiguous, a more thorough exploration may be required. The Dyadic Distance experiment will deliver more rigorous data. The data resulting from this technique generally correspond with the data from the Stain Dilemma experiment, but it does deliver a more precise representation.
- **Adapt the product proposals and repeat steps 1 and/or 2.**

Reflections on the experimental techniques

The experimental track proved to be the area in which we could thoroughly investigate the phenomenon. In all of our explorations, we mainly focused on the relevance and appropriateness of the experimental techniques for designers. The actual results of the experiments are of less importance than are the techniques that will allow designers to observe and understand the phenomenon of PRS in a structured and objective way.

We also want to emphasize that our experimental explorations were focused on one specific product type (dust masks) and on one specific manifestation of product-related stigma, the behavioral reactions of bystanders. The dust mask was a valuable stimulus and we maintained this stimulus throughout the various explorations. A remarkable find that re-emerged in every experimental technique was the fact that white medical masks engendered the most attention and the most avoidant behavior in bystanders. This is an outcome which our designerly assumptions had not predicted.

6.3. Managing PRS

Our second designer tool, the Product Intervention Model (PIMS) for Stigma targets the conception phase of the design process. This tool comprises a set of 17 stigma-alleviating design interventions that have grown and matured as our research progressed. The de-stigmatizing design interventions address three areas: the context of the product itself, the context of the individual user experiencing the stigma, and the context of the observing bystanders, together with the cultural context in which the product is launched. It is likely that designers will value these interventions as the most hands-on aspect of the research. We believe that they will prove their effectiveness in design practice and more specifically in the fields of Inclusive (Universal) Design, Human-Centered Design, and Design and Emotion.

The various interventions are presented in a compact and consistent style, facilitating overview and comparison. Additionally, they intend to inspire designers and suggest a general design direction. In Chapter 5 we chose to exemplify the various interventions with product examples that will stick to the visual mind of designers. We opted for examples that appeal to a large audience and reveal the many angles from which the phenomenon of PRS can be addressed. Apart from illustrating that an intervention is viable, these examples may also provide instructional guidance for designers.

In reality, designers will often apply combinations of interventions to produce strong design outcomes. Applying the appropriate intervention is a creative and generative process that requires both expertise and practice. We trust that, in the hands of a trained designer, these interventions will alleviate the effects of PRS and increase both user-product attachment and collective well-being.

Reflections on the empirical research and designer workshops

During the course of my research I organized several design projects and designer workshops that subjected our insights, techniques and models to the designer viewpoint. The 'Pleasurable Mask Experience', a design exercise that ran in the first semester of 2009, proved to be a valuable confrontation with the phenomenon. The project resulted in 60 student concepts of dust masks that provided a wealth of information and insights. The integration of empathy enhancing activities and co-creation sessions proved that direct contact with the target group and their social surroundings is an essential part of the learning process.

During my theoretical lectures on product semantics (3rd Bachelor year Product design – Univ. of Antwerp – Design Sciences), I presented and challenged the preliminary designer frameworks that resulted in the PAMS and the PIMS. As a deliverable of this theoretical course, students were challenged to apply our conceptual PRS theories on a specific product group.

They had to detect PRS pitfalls and produce a series of stigma-free quick designs. Although these were rough ideas, they did give us the confidence that the tool was insightful for design students.

In January 2013 we organized two workshops on more refined versions of our tools, in which students and design professionals participated. These workshops taught us to change the way in which the tool was presented. In the development of the PAMS we shifted from plain questionnaires to a cardboard tetrahedron model that allows for a tangible and teamwork-oriented interaction. Each side of the tetrahedron model provides the designer with a set of nine specific questions that are linked to product perception, products in use and reflecting on product use. This results in 27 questions to which the answers are gathered in three matrices. These matrices allow for an overview that increases the likelihood of detecting stigma-relevant pitfalls or conflicts between the various stakeholders.

During the workshops, the PIMS interventions progressed into a set of intervention cards. We noticed how designers match these cards with the design challenges that arose through the application of the PAMS. They also browsed through them for inspiration or to challenge existing ideas. During all of these empirical research confrontations, we observed, analyzed and reflected on the behavior of students as well as designers. These insights provided challenges as well as possibilities and inspired our research

6.4. Recommendations for further research

Our research has explored, structured and demarcated the phenomenon of product-related stigma. By opting for this broad exploration, we allowed open endings and ample opportunity for further explorations. To indicate the broadness of the topic we introduced the term ‘product stigmaticity’ to encompass the investigation of stigma elicited by products. We see this dissertation as an introduction into an exciting area that merits further research.

Understanding product-related stigma attribution:

- **Product-related stigma attribution:** In this study I looked primarily at the visual impact of products in use. It may be worthwhile to explore whether other sensory modalities play a role in the PRS process.

Measuring product-related stigma:

- During our experimental explorations, we focused on the reactions engendered by existing dust masks as well as early prototypes. In future iterations, we would like to explore the relevance of our experimental techniques for other stigma-eliciting products. Apart from measuring the stigma related to protective, medical and assistive devices, the techniques probably have a wide range of additional applications, e.g. in fashion, for wearable technology, and for law enforcement products. Even the Google glasses can be considered to be assistive devices that will have a substantial impact on the social landscape. Although people do not depend on them and therefore are not forced or obliged to use them, they do deliver important assistive qualities. As such it is our aim to broaden the scope of our experimental techniques and adjust them appropriately.
- **Reactions to product-related stigma:** So far, we have concentrated our focus on the behavioral reactions of bystanders, specifically on the parameter of interpersonal distance. It may be valuable to consider studying other behavioral or emotional reactions.
- **Rich data:** Further research could focus on innovating ways to capture and analyze the rich information that is present in the human-product encounters that we investigated.
- **Empathy through social experience prototyping:** Our explorations in the immersive techniques that enable designers to feel the actual social consequences of their design iterations were real eye-openers. We consider this to be a promising technique that deserves further exploration.

- **Making the experimental techniques more intuitive and efficient for designers.** The techniques could be presented as do-it-yourself packages that allow for fast and easy exploration. The techniques may benefit from a simple software tool or app that performs the necessary analysis and statistical calculations in the background and presents the designer with visual indications on how well his or her prototypes scored.

Managing product-related stigma:

- Product-related stigma appraisal: We foresaw two useful applications for the PAMS in the design process, during the analysis phase and as a verification or validation tool at the end of the design process. We wonder whether the model needs adaptation towards these two distinct application purposes.
- Outcomes of product-related stigma: Our research focused on the PRS process from the stigma-relevant input variables up to the appraisal of users, bystanders and the cultural context. It was our attempt to halt the PRS process at the appraisal phase, to eliminate negative reactions and unfavorable long-term outcomes. It may be interesting to study the long-term outcomes of the PRS process. For which product groups do the outcomes justify additional research efforts?
- The evolution of product-related stigma over time: How does the PRS process for a specific product change over time? It would be interesting to study products that have gone through significant cultural appraisal phases during their evolution. The factors that influence these changes may prove to be inspirational for additional design interventions, or could reinforce existing interventions in the PIMS.

6.5. Personal reflections on the research

In January 2008, I started my PhD research as a product designer with little experience in design research. Naively unaware of the impact a PhD may have, I entered the research with a clear product-oriented goal. I eagerly accepted the challenge to develop a dust mask that would protect asthmatic children from the negative effects of smog and fine dust.

During the first four years of my research I attempted to address the technical challenges in a complementary research track that encompassed studies and projects in cooperation with both students and industry. Prior to the PhD research, I executed a preliminary and multidisciplinary analysis that inventoried the requirements of the future respiratory protection. In 2009 we found a suitable technological partner who had a mutual interest in the development of the filtering mask. Together with Genano Benelux, a specialist in domestic and industrial fine dust filtering techniques, we pursued an IWT (Flemish Agency for Innovation by Science and Technology) feasibility study. The technical and economical feasibility of the product proposal was assessed and two preliminary concepts were presented for further development. During the IWT feasibility study we briefly explored the technical miniaturization of the Genano filtering technique. At the end of the study we complemented the technical information with the semantic insights of our PhD research. Although the study revealed the appropriateness and feasibility of the project, the absence of further financial support has forced us to halt our quest, for now.

As the project progressed I felt how my own interest gradually shifted away from the product-oriented goal towards more generally applicable insights and methods. I increasingly became aware of the human and social pitfalls of the project. What would happen if children reject our skillfully engineered solution because it makes them feel silly? Together with the actual birth of my second son in 2010, I experienced the re-birth of my PhD topic. I was captivated by unraveling the dualities between social acceptance versus rejection and pleasure versus stigma. From then on, our project aimed to benefit designers who want to make 'unwanted' products more accepted and pleasurable.

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SUMMARY
SAMENVATTING

Summary

Imagine that you are walking through the local shopping mall wearing a dust mask. Apart from your own discomfort, you might also experience social unease in the people around you. As they approach, you might observe their anxiety, laughs, or frowns. As they pass, you might feel how they keep their distance from you.

Many of the products intended to relieve us from discomforting or unsafe conditions and many medical and assistive devices are experienced as unpleasant and uncomfortable. In addition, use of these products often results in negative, judgmental reactions from bystanders. This dissertation focuses on those instances in which a product is the causal factor of social rejection or stigma. We label this process “product-related stigma”. Product-related stigma has negative effects on the product user, ranging from stress to lowered self-esteem and social isolation. This is interesting for designers because they are in a position to shape the product appearance and experience in such a way that these reactions and effects may be reduced or avoided altogether.

In the project on which this thesis reports, we hoped to provide insight in and a better understanding of the factors that shape the experiences of users and those who surround them. Furthermore, we have developed a set of tools that support designers to relieve users of the social stress related to using these products. These tools strive to go beyond the physical adaptation between user and product to inspire products that support the user’s personal and social well-being.

To alleviate the effects of the product-related stigma process, our research has three fundamental aspirations or goals: to understand, to measure, and to manage product-related stigma (PRS).

Understanding product-related stigma

In order to come to understand PRS, we have explored its causes and the various stakeholders that are involved in the human-product interactions with stigma-eliciting products. During the literature review we collected theoretical insights regarding the factors that are responsible for eliciting positive and negative experiences in people's encounters with products.

Because product-related stigma occurs in social contexts involving a stigma-eliciting product, its user and those who surround him or her, we reviewed literature in design research as well as social psychology. Both fields have contributed vital insights into what influences stigma, as well as factors and models for our stigma-free design approach. As it is our aim to contribute to the design literature on products and stigma, we initiated our search in design literature, more specifically in Inclusive Design, Product Semantics and Human Centered Design. In the second part of the literature review we explained why we chose the term 'stigma' and how we have delineated it in our research. Everybody has experienced some degree of stigmatization at some point in their lives, be it a feeling of isolation, alienation, exclusion, or embarrassment resulting from being different in some way. Just like people may be rejected because of traits they may or may not have control over, a product can also be the causal factor of rejection or stigma.

We found that the effects and impact of product-related stigma experiences are the result of the aesthetic and functional aspects of the product itself, the individual experiencing the stigma, the observing bystanders and the cultural context in which the situation is set.



In answer to our first research question (understanding PRS), we introduce the Product Appraisal Model for Stigma (PAMS). Applied to a certain product, the PAMS will manifest the stigma-specific sensitivities, conflicts, and challenges that designers need to take into account during their design effort. Instead of reinventing yet another framework, we have decided to position our model as a partner of complementing and validated models from social psychology and design research. Our stigma-related insights from social psychology are fitted into the identity threat model of Major (2005) and applied to the appraisal model of Desmet and Hekkert (2007). The identity threat model inspired us to add two additional stakeholders. To extend beyond the sensitivities and pitfalls encountered by product users, the PAMS adds the concerns of bystanders and the culture in which the product is used.

As such, the PAMS can be interpreted as the 'unveiler' of product-related stigma, preparing the designer for the next step, in which PRS can be measured and stigma-reducing design interventions seek to 'heal' the product of its stigmatizing content.

The Product Appraisal Model for Stigma (PAMS) is presented as a tangible designer tool. The cardboard tetrahedron model allows for a focused and teamwork-oriented interaction. Each side of the tetrahedron model provides the designer with a set of nine specific questions that are linked to product perception, products in use and reflecting on product use. This results in 27 questions to which the answers are gathered in three matrices. These matrices allow for an overview that increases the likelihood of detecting stigma-relevant pitfalls or conflicts between the various stakeholders.

Measuring product-related stigma:

In our effort to measure PRS, we first had to establish that the use of protective, assistive, or medical devices in fact does engender unfavorable reactions in bystanders. Additionally, we tried to quantify the 'degree' of product-related stigma. We explored several techniques to measure and quantify how 'burdened' products and design concepts are with product-related stigma. Designers will not only value this insight during their creative process, it can also help them to justify design decisions with quantitative data. Quantitative measuring of PRS can assist in assessing which product properties have influenced certain reactions and to what extent subsequent improvements have been successful.

During our experimental explorations we focused on the reactions engendered by existing dust masks as well as early prototypes. In future iterations, we would like to explore the relevance of our experimental techniques for other stigma-eliciting products. Apart from measuring product-related stigma elicited by protective, medical and assistive devices, the techniques we have applied probably have a wider range of applications, e.g. in fashion, for wearable technology and law enforcement products.

We have adapted behavioral research techniques because they allowed us to approach and observe the real phenomenon. We have attempted to quantify the PRS-potential of products by studying the behavioral reactions of bystanders during a public and unprepared encounter with users of stigma-eliciting products. This unprepared encounter proved to be a good instance for measuring behavior, because passers-by are unable to 'mask' their reactions in these instances. By averaging the behavioral reactions of a large sample of random bystanders and passers-by, we were able to obtain a more objective measure. We focused on two specific moments in the interaction: the initial confrontation with its reflex reactions and the more deliberate and thoughtful reactions that follow.

We initiated our explorations in Italy with a study of the avoidance-related reflex reactions of bystanders to dust masks. The ‘Approach and Avoidance experiment’ was set in a lab environment and captured reflex reactions to pictures of people with and without dust masks, presented on a screen.

During the four experimental explorations that followed, we shifted our focus away from the lab and towards the real-life encounter between mask users and bystanders. We measured avoidance behavior of passers-by around users of stigma-eliciting products. We gradually progressed towards the parameter of interpersonal distance as a promising measure. Our explorations systematically progressed towards one specific moment in this unprepared encounter, the moment in which the passer-by passes our product user. By measuring the shortest distance between these two for a large sample of passers-by varying in age, gender and ethnicity, we were able to introduce a degree of objectivity.

To designers who want to explore the stigma-eliciting potential of their concepts, our thesis provides ample suggestions.

By experiencing public exposure with a visually resembling prototype of the stigma-eliciting product, designers can experience a powerful confrontation with the phenomenon of product-related stigma (The Immersive Mask Experience). It can make them aware of the stigma-relevant challenges ahead and endow them with an empathic awareness of the future product users’ concerns.

If required, the final two techniques in our experimental chapter will enable designers to rank their design proposals according to their PRS-eliciting potential.

The ‘Dyadic Distance Experiment’ measures exact interpersonal distances, whereas the ‘Stain Dilemma Experiment’ presents the passer-by with a choice in his walking path. Both experimental techniques are straightforward and can be insightful for assessing the reactions that are engendered by PRS processes. We do not claim that our experiments are validated techniques. Further analysis is needed to improve their robustness and reliability. We consider these techniques to be predominantly suited as comparison tools, able to compare products or prototypes on their PRS-eliciting potential.

Managing product-related stigma

Our final goal was to deliver tools for designers to manage the product-related stigma process. In our research the most essential emotional desire is the avoidance of negative emotions and reactions during a human-product interaction. However, we aimed for tools that strive to surpass this scope in favor of products that engender positive meanings for their users, elicit positive feedback from bystanders and complement and support cultural values.

After the PAMS or the experimental explorations have exposed the stigma-specific design challenges, designers can be inspired with design recommendations to alleviate the effects of product-related stigma. Our second designer tool, the Product Intervention Model for Stigma (PIMS), targets the conception phase of the design process. It complements existing design-ideation tools and can be applied to a broad range of stigma-sensitive products. The PIMS comprises a set of 17 stigma-alleviating design interventions that have grown and matured as our research progressed. The design interventions not only impact the product, but also empower the user or reshape societal and cultural factors.

It is very likely that designers will value these interventions as the most hands-on aspect of the research. The various interventions are presented in a compact and consistent style, facilitating overview and comparison. Additionally, they intend to inspire designers and suggest a general design direction. We chose to exemplify the various interventions with product examples that will stick to the visual mind of designers. Apart from illustrating that an intervention is viable, these examples may also provide instructional guidance for designers. In reality, designers will often apply combinations of interventions in order to produce strong design outcomes. Applying the appropriate intervention is a creative and generative process that requires both expertise and practice. To address the requirements of the creative process, the PIMS interventions are presented as a card set, specifically aimed at designers.

A first set of 13 interventions encourages the designer to reshape the meaning of a product away from negative associations. A second set of interventions stretches the solution space towards user empowerment. Two interventions inspire designers to emancipate users from their position of passive victims to active challengers. In a final area, we situate two interventions that enable the designer to reshape the social and cultural contexts in which products are launched and perceived. The two interventions are not primarily focused on the product, but they group all efforts that produce fundamental changes in cultural attitudes and beliefs.



We believe that these interventions will prove their effectiveness in design practice and more specifically in the fields of Inclusive (Universal) Design, Human-Centered Design, and Design and Emotion. We trust that, in the hands of a trained designer, these interventions will alleviate the effects of PRS and increase both user-product attachment and collective well-being.

Our research has explored, structured and demarcated the phenomenon of product-related stigma. To indicate the broadness of the topic we introduced the term 'product stigmaticity', in order to encompass the investigation of stigma elicited by products. We regard this dissertation to be an introduction into an exciting area that merits further research.

Samenvatting

Beeld u in: u wandelt door een plaatselijk winkelcentrum en u draagt een stofmasker. Naast de eigen hinder ervan zou u ook sociaal ongemak kunnen vaststellen bij de mensen rondom u. Terwijl ze u tegemoet wandelen, merkt u enige paniek, gelach of gefrons van de wenkbrauwen en wanneer ze u kruisen houden ze enige afstand.

Tal van producten die bedoeld zijn voor ons comfort of onze veiligheid (denk aan medische en fysische ondersteuningsmiddelen) kunnen we als onaangenaam en oncomfortabel ervaren. Bovendien gaat het gebruik van deze producten gepaard met beoordelingen van mensen rondom ons. De focus van onze thesis richt zich op die situaties waarin een product de oorzaak is van sociale afkeuring of stigma.

Wij noemen dit proces product-gerelateerd stigma (PRS). Het heeft negatieve effecten op de productgebruiker, variërend van ervaren stress tot een verminderd zelfvertrouwen en sociale isolatie. Dit wekt belangstelling bij ontwerpers, omdat zij producten en productervaringen zodanig kunnen vormgeven dat deze reacties en effecten gereduceerd blijven, zoniet zelfs geheel vermeden worden.

In het project waarover deze thesis rapporteert, willen wij inzichten in en een begrip van de factoren aanreiken die de ervaringen van gebruikers en omstanders kunnen modelleren. Daartoe ontwikkelden wij een aantal instrumenten die ontwerpers de mogelijkheid bieden om sociale stress bij gebruikers van de hierboven genoemde producten te milderen. De instrumenten beogen een stap verder te gaan dan de fysische aanpassing tussen gebruiker en product; zij inspireren tot productontwerpen die gericht zijn op persoonlijk en sociaal welbevinden.

Om de effecten van het product-gerelateerd stigmaproces te milderen richt ons onderzoek zich op drie fundamentele doelstellingen: product-gerelateerd stigma (PRS) begrijpen, meten en beheren.

Begrijpen van product-gerelateerd stigma (PRS)

Met het oog op het begrijpen van PRS, onderzochten wij de oorzaken ervan, alsook de diverse belanghebbenden bij de mens-product interactie van stigmaveroorzakende producten. Tijdens de literatuurstudie verzamelden wij theoretische inzichten aangaande factoren die verantwoordelijk zijn voor het uitlokken van positieve of negatieve belevingen bij het omgaan met producten.

Omdat PRS voorkomt in sociale contexten waarin stigmaveroorzakende producten aanwezig zijn, naast de gebruiker ervan en de omstaanders, onderzochten wij literatuur zowel uit de wereld van de design research als uit de sociale psychologie. Beide domeinen bieden belangrijke inzichten in de werking van stigma en tonen factoren en modellen voor een stigma-vrije ontwerpbenadering.

Vermits het onze bedoeling is om een bijdrage te leveren tot de ontwerpliteratuur aangaande producten en stigma, startte ons zoekwerk in de ontwerpliteratuur meer specifiek in de domeinen 'Inclusive Design', 'Product Semantics' en 'Human-Centered Design'. In het tweede deel van de literatuurstudie leggen wij uit waarom we de term 'stigma' kozen en welke definitie wij eraan geven.

Iedereen heeft wel eens een stigmatiserende ervaring gehad in zijn leven, zij het in de vorm van een gevoel van geïsoleerd zijn, vervreemding, uitsluiting of verlegenheid omwille van het enigszins anders zijn. Net zoals mensen afkeuring kennen wegens bepaalde eigenschappen die ze misschien zelf niet onder controle hebben, zo kan een product ook de oorzaak zijn van afkeuring of stigma.

Wij hebben gevonden dat de effecten en impact van PRS-ervaringen het gevolg zijn van meerdere factoren, namelijk de esthetische en functionele aspecten van het product zelf, het individu dat het stigma ervaart, de toekijkende omstaanders en tenslotte de culturele context waarin de situatie zich afspeelt.

Als antwoord op onze eerste onderzoeksdoelstelling (PRS begrijpen) introduceerden wij het '*Product Appraisal Model for Stigma*' (PAMS). Het model toont specifieke stigmagevoeligheden, conflicten en uitdagingen die ontwerpers in acht dienen te nemen bij hun ontwerpinspanningen. In plaats van nog een bijkomend schematisch kader te ontwikkelen, besloten we om ons model te positioneren als een 'partner' van reeds bestaande en gevalideerde modellen uit de sociale psychologie en de *design research*. Onze inzichten ten aanzien van stigma passen goed in het '*Identity Threat Model*' (ITM) van Major (2005) uit de sociale psychologie. Vervolgens hebben we deze inzichten toegepast in het waarderingsmodel van Desmet en Hekkert (2007). Het ITM inspireerde ons tot het toevoegen van twee

belanghebbenden ('stakeholders'). Naast de gevoeligheid en de obstakels die de productgebruiker kan tegenkomen, voegt PAMS hier ook nog de noden van de omstaanders en de cultuur toe waarin het product wordt aangewend.

PAMS kan beschouwd worden als een 'ontsluiering' van product-gerelateerd stigma; het geeft de ontwerper een handig instrument om PRS in te schatten en interventies te overwegen die het product ontdoen van zijn stigmatiserende inhoud.

Het 'Product Appraisal Model for Stigma' (PAMS) is een hanteerbaar ontwerpinstrument. Het kartonnen tetraëder model is specifiek ontwikkeld voor teamwerk. Iedere zijde van de tetraëder toont de ontwerper negen specifieke vragen die verband houden met productperceptie, productgebruik en de reflectie op productgebruik. Dit resulteert in 27 vragen waarvan de antwoorden weergegeven kunnen worden in drie matrices. Door te kijken naar deze matrices, verhoogt de kans dat stigmarelevante valkuilen of conflicten tussen diverse belanghebbenden tijdig worden opgemerkt.



Meten van product-gerelateerd stigma

In onze poging om PRS te meten hebben we eerst vastgesteld dat het gebruik van beschermings-, ondersteunings- en medische producten ongunstige reacties uitlokken bij omstaanders. Daarenboven probeerden we de 'graad' van dit product-gerelateerd stigma te kwantificeren.

Wij hebben meettechnieken uitgetoetst die kwantificeren in welke mate producten en ontwerpconcepten 'beladen' zijn met product-gerelateerd stigma. Ontwerpers zouden hiermee niet alleen hun voordeel kunnen doen tijdens het creatieproces, het zou hen ook kunnen helpen om ontwerpbeslissingen kwantitatief te beoordelen. Kwantitatieve metingen van PRS kunnen nuttig zijn om te onderzoeken welke producteigenschappen deze reacties beïnvloeden en in welke mate de daaruit voortvloeiende ontwerpverbeteringen succesvol blijken.

Tijdens onze experimentele onderzoeken hebben wij onze aandacht vooral gericht op de reacties die stofmaskers uitlokken, zowel de bestaande types als nieuwe prototypes. Bij toekomstig onderzoek zouden we het belang van onze experimentele technieken willen testen voor andere stigmaveroorzakende producten. Naast beschermings-, ondersteunings- en medische producten, mogen we aannemen dat deze technieken een brede waaier van toepassingen kunnen hebben, zoals in de modewereld, voor de draagbare technologie en bij wet opgelegde producten.

Wij hebben ook onderzoek op gedrag uitgevoerd omdat het ons toeliet het reële fenomeen te benaderen en te observeren. Wij probeerden het PRS-potentieel van producten te kwantificeren door de gedragsreacties te bestuderen van omstaanders tijdens een publieke en onverwachte ontmoeting met gebruikers van stigmaveroorzakende producten. Deze onverwachte ontmoetingen bleken geschikt te zijn om het gedrag van voorbijgangers te meten omdat deze hun reacties dan nauwelijks kunnen ‘maskeren’. Door het gemiddelde te berekenen van de gedragsreacties op een uitgebreide steekproef van toevallige voorbijgangers, probeerden we een objectieve meting te bekomen. We hebben ons gericht op twee specifieke momenten in deze onverwachte ontmoeting: de initiële confrontatie met de reflexreacties enerzijds, en de meer overwogen en bedachte reacties die daarop volgen anderzijds.

Wij begonnen onze experimenten in Italië met een studie over ‘reflexvermijdingsreacties’ ten aanzien van stofmaskers. Het ‘Toenadering- en Vermijdingsexperiment’ verliep in een labo en registreerde de reflexreacties ten aanzien van foto’s van gebruikers met en zonder stofmaskers op een beeldscherm.

In de vier daaropvolgende experimenten verlieten we de labo-omgeving en bestudeerden we ontmoetingen tussen maskerdragers en omstaanders in de werkelijkheid.

Wij maten het vermijdingsgedrag van voorbijgangers in de omgeving van gebruikers van stigmaveroorzakende producten. Geleidelijk kwamen we tot de parameter van interpersoonlijke afstand als een beloftevolle meetmaat. Uiteindelijk spitste onze aandacht zich toe op een specifiek moment in de onverwachte ontmoeting, namelijk het moment waarop de voorbijganger de productgebruiker passeert. Door de kortste afstand te meten tussen beiden bij een uitgebreide steekproef van voorbijgangers die variëren in leeftijd, geslacht en etniciteit, konden we een zekere objectiviteit bereiken.

Ons onderzoek biedt ontwerpers meerdere suggesties aan om het stigmaveroorzakend potentieel van hun concepten te meten.

Met een visueel gelijkend prototype van het stigmaveroorzakend product, kunnen ontwerpers een publieke blootstelling reël beleven en een sterke confrontatie aangaan met het fenomeen van product-gerelateerd stigma (The Immersive Mask Experience). Het kan hen bewust maken van belangrijke stigma-uitdagingen en hen empathie bijbrengen voor de bezorgdheden van de toekomstige gebruikers.

Met behulp van de twee laatste meettechnieken uit ons experimenteel hoofdstuk kunnen ontwerpers hun ontwerpen rangschikken volgens hun PRS-veroorzakend potentieel.

Het 'Dyadic Distance Experiment' meet de exacte interpersoonlijke afstanden tijdens het passeren, terwijl het 'Stain Dilemma Experiment' de voorbijganger de mogelijkheid biedt zijn wandelpad zelf te kiezen. Beide experimentele technieken zijn eenduidig en kunnen inzicht verschaffen in de reacties die uitgelokt worden tijdens het PRS-proces. Wij beschouwen deze technieken als zinvolle instrumenten om productconcepten te vergelijken; ze zijn in staat om producten of prototypes af te wegen op hun PRS-veroorzakend potentieel.

Wij stellen echter niet dat onze experimenten reeds gevalideerde technieken zijn. Er is zeker nog verdere analyse nodig om hun betrouwbaarheid en degelijkheid te verhogen.

Beheren van product-gerelateerd stigma

Ons uiteindelijk doel was om ontwerpers van instrumenten te voorzien waarmee zij het product-gerelateerd stigmaproces zouden kunnen beheren. In ons onderzoek is de overheersende gevoelsgeladen wens het vermijden van negatieve emoties en ervaringen tijdens de mens-productinteractie. Nochtans streefden we naar instrumenten die voorbij dit oogmerk konden reiken. Wij richtten ons op producten die positieve betekenissen uitlokken bij de gebruikers, positieve reacties krijgen van de omstaanders en die culturele waarden kunnen toevoegen en versterken.

Nadat PAMS of de experimentele exploraties de stigmaspecifieke ontwerpuitslagingen in beeld hebben gebracht, kunnen ontwerpers beginnen denken aan interventies om de effecten van product-gerelateerd stigma te milderen. Hiervoor is ons tweede instrument, het '*Product Intervention Model for Stigma*' (PIMS) nuttig in de conceptfase van het ontwerpproces. Het model kan een aanvulling betekenen van bestaande ideegenererende instrumenten en het is van toepassing op een breed gamma van stigmagevoelige producten. PIMS omschrijft een verzameling van 17 stigmamilderende ontwerpinterventies die ontwikkelden en tot rijping kwamen naarmate ons onderzoek vorderde. De ontwerpinterventies hebben niet alleen een impact op het product, maar ze ondersteunen ook de gebruiker en bovendien herkaderen ze maatschappelijke en culturele factoren.

Heel waarschijnlijk zullen ontwerpers deze interventies als het meest praktische aspect van ons onderzoek beschouwen. De verschillende interventies worden in een compacte en gelijkvormige stijl voorgesteld, waardoor ze overzichtelijk blijven en makkelijk te vergelijken zijn. Verder willen ze ontwerpers inspireren en een algemene ontwerprichting suggereren. Wij hebben ervoor gekozen om de verschillende interventies te illustreren met voorbeelden die de eerder visueel ingestelde ontwerper zullen bijblijven. Deze voorbeelden illustreren niet alleen de haalbaarheid van een interventie, ze bieden ook instruerende



begeleiding aan ontwerpers. Vaak zullen ontwerpers combinaties van interventies toepassen om tot sterke ontwerpresultaten te komen. Het toepassen van de gepaste interventie is een creatief en generatief proces dat zowel expertise als praktijkervaring vereist. Om de vereisten van het creatief proces te onderbouwen, worden de PIMS-interventies voorgesteld als een set kaarten.

Een eerste set van 13 interventies stimuleert de ontwerper om de betekenis van zijn product vrij van negatieve associaties te houden.

Een tweede set van interventies breidt de oplossingsruimte uit naar de emancipatie van de gebruiker. Beide interventies kunnen de gebruiker

inspireren om zich vanuit zijn of haar slachtofferpositie te emanciperen en zichzelf een actieve en zelfondersteunende rol aan te meten.

In het laatste deel situeren we twee interventies die de ontwerper toelaten de sociale en culturele context, waarin producten worden gebruikt en waargenomen, te stroomlijnen. Beide interventies zijn niet zozeer op het product gericht, dan wel op inspanningen die fundamentele veranderingen in de culturele attitudes en opvattingen kunnen teweegbrengen.

Wij geloven dat deze interventies hun nut zullen bewijzen in de ontwerppraktijk; voornamelijk in het domein van *'Inclusive(Universal) Design'*, *'Human Centered Design'*, en *'Design and Emotion'*. Wij zijn ervan overtuigd dat ze in de handen van een geoefende ontwerper de effecten van PRS kunnen milderen. Bovendien kunnen ze zowel de band tussen product en gebruiker, alsook het collectief welzijn bevorderen.

Ons onderzoek heeft het fenomeen van product-gerelateerd stigma uitgediept, gestructureerd en afgebakend. Om de breedte van het onderwerp aan te duiden hebben wij de term *'product stigmaticity'* geïntroduceerd om het volledige onderzoek rond stigma veroorzaakt door producten te kunnen omvatten.

Wij beschouwen deze thesis als een introductie in dit interessante domein dat zeker verdere exploratie verdient.

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ABOUT THE AUTHOR**

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Publications

Journal articles about the 'Product Appraisal Model for Stigma' (PAMS) and 'Product Intervention Model for Stigma' (PIMS) are in preparation.

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Kristof Vaes was born in Leuven in 1972. After finishing secondary school at the Sint Pieters College in Leuven, he studied one year at Aragon High School in San Mateo, California, as an AFS exchange student. He obtained his Master's degree in product development (with distinction) from the University College of Antwerp in 1996. The following year he entered a postgraduate training in multimedia technology at the Group T International University College of Leuven.

From 1997 onwards, he has worked for several design teams and offices in Flanders, such as Bulo office furniture (Mechelen), Achilles design (Mechelen), and Studio Dot (Antwerp). Most of his design practice is focused on human-centered design, concept development and engineering design. Since 2006, he combines his activities as a product designer with an academic career at the University of Antwerp, Faculty of Design Sciences, Product Development (previously known as the Artesis University College of Antwerp). His teaching tasks have included lecturing on the topic of Product Semantics and tutoring design projects such as 'User Experience Design', 'Exploring Interactions', 'Mechanical Design' and 'Furniture Design'. For the last six years, he has combined his freelance and teaching activities with PhD research in cooperation with the TU Delft and the University of Antwerp.

His research interests include human-product relations, product semantics, product usability and inclusive design. Kristof is currently complementing his educational activities with new freelance design adventures.

Next to a fond passion for the human side of design, he enjoys swimming, surfing, building, motorcycle adventures and a good laugh. Kristof is happily married to Jona den Aantrekker and they have two sons, Viktor (6) and Roman (3).

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