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Retail Design: Lighting as a Design Tool for the Retail Environment

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PREFACE AND ACKNOWLEDGMENTS

It is fairly easy to explain the difficult and more negative side of writing a PhD On top of the list, as mentioned by many PhD's, is that it embodies loneliness. Although this eventually proved to be true, before I started to write I was wondering how I could feel 'lonely' with all the loving and supporting people around me? Still, I did feel it, and the loving people are not the ones to blame. It comes rather from the realm of writing, I suppose. It first hit me while struggling to get my story straight. Later, the feeling escalated. The more I dived into the subject of my thesis, the smaller my world became. Compare it to the discovery of caves. The deeper you go, the smaller and darker it gets. But also typical of caving is the deeper you go, the fewer people have been there and the more interesting are the treasures you might find. Some people like it in there, others don't. Some get stuck or have trouble finding their way out and some do not even dare to enter, afraid of the dark or of getting lost. The ones who did follow me - into my cave - often got stuck in it - I apologise for that. Even I got stuck at some point. Luckily, during the digging process, some people were smart enough to hook me out on a lifeline, which helped me to keep breathing and find my way out again – thank you for that.

At the top of the list of the positive sides of writing a PhD is definitely something you only discover when it is almost finished: it is indescribable how you feel when you find yourself at the entrance of the cave with an exact floor plan of what you have discovered and accomplished before you. This will never leave you, and it forms a portal to the next step in life. It is also only now that I realize the best comparison with this thesis is not a cave, (or maybe it was), but it is now redesigned as a large supermarket, with a clear concept, proper lighting, lay-out, routing, a content list per department and proper signage. And of course, it has lots of interesting departments to shop in. Therefore, as the designer of this supermarket, I am proud to show you around. So, please take a look at the content and browse as much as you like. For I made sure you won't get lost. Also for a quick, functional errand, you can have a look at the content and get what you came for.

Another positive aspect of the course this PhD took is that it has also been a time when I came to appreciate the people around me most. At some points, for some of those people, the struggle (with me) must have been as hard for them as it was for me.

I would like to thank the following people who have made their contribution to what the supermarket is today:

Building contractor: PHL, University College and University Hasselt.

Wharf commander: Koenraad Van Cleempoel, who never lost faith in me and who has put a lot of effort into helping me see the light, especially during the writing process.

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Safety instructor and engineer: Jan Vanrie, who not only analysed the data, I would dare to state that he was my guide and mentor during these last years.

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-All other students who have been involved in some way
-All the respondents who were willing to participate in the experiments.

Of course, what you see is not only what matters in the retailing world. Everybody knows that it is the branding and corporate identity of a supermarket that is indispensable. Therefore, the following people are gratefully thanked:

Corporate identity support: my husband Ward Bergen, for his love and care, good cheer, moral support and most of all, his patience and understanding. In our case, behind this strong woman stands a strong man.

Branding support: my family, friends and colleague-friends. Every cheer, every concern that they expressed, helped me to keep my spirits up.

Finally, I would like to thank my late mother (+ 05-01-2010) for everything that she was to me. Even though she could not be with me any more during the last years, I could imagine exactly what she would have said when things got rough. And now, now the PhD is completed, I know she could not be more proud. I dedicate this 'supermarket' to her.

Katelijn
Hasselt, 14 oktober 2011

ABSTRACT

There are three main parts in this thesis: Retailing, Retailology, and Experimental Research. The first part tackles the complexity of retail design and tries to understand why shops are what they are. Now and in the past, some of the most innovative developments and interiors can be seen in the retail sector. Therefore a closer look at the history and development of shops and shopping is made, with a focus on two aspects: the retail architecture (i.e. the building and interior design) and the managerial aspects. Three types of stores are described: the department store; the chain store and its derivative the boutique chain store; and the supermarket. A graphical timeline is designed to visualise the trends and innovations, and the influences of all three types on each other and other retail environments. Next, a clear set of definitions of related terms to the retail design discipline is provided, together with an explanation of the added value retail design can provide.

Retail design is a multidisciplinary field of study, which includes scientific research. However, interior design in general and retail design in particular only recently started to develop a proper body of knowledge. The second part of this thesis focuses on this emerging development. Two important challenges are explained: first, communication to the field of designers (from all related design disciplines) and other stakeholders involved. The second challenge is of a more methodological nature: how to find a harmonious reference framework that combines three different research disciplines that study spatial features – design, environmental psychology, marketing and communication. Therefore, a theoretical framework is introduced as the basis for our research set-up for experiments discussed in the last part. Important for discussion here is the designer's perspective to be considered when conducting experimental research. Next, within this framework, lighting is outlined as a case study and its empirical possibilities are explored by focusing on atmospherics. A brief historical contextualisation of lighting retail spaces is sketched, followed by a list of lighting related terms and concepts. The justification for such research is provided by interviews with experts and a literature review concerning lighting spaces.

The final and third part of this thesis focuses on describing the experiments conducted regarding lighting food. Five experiments are set up that deal with questions on the impact of lighting on the appearance of products, product preference and sales – from the product point of view -, and the way lighting influences the perception of atmosphere, and customers' affect – from the spatial point of view. A gradual shift from a photograph of products over a controlled lab-supermarket towards a real supermarket is made. The results indicate that lighting plays a crucial role in how the atmosphere of a retail space is perceived and experienced. What is more, lighting can be used as a tool to communicate a message (e.g., image). Furthermore, it is argued that

there is a correlation between affect and perceived atmosphere, and the resulting behaviours. To conclude, the results of the experiments are set back to the context of this thesis. Finally, the limitations and implications are discussed.

SAMENVATTING

Deze thesis bevat drie grote delen: Retailing, Retailology en Experimenteel onderzoek. In het eerste deel wordt de complexiteit van retail design toegelicht en wordt er gezocht naar verklaringen waarom winkels zijn zoals ze zijn. Enkele van de meest innoverende interieurs en technologische ontwikkelingen komen, zowel nu als in het verleden, vaak uit de retail sector. Daarom wordt er een overzicht gegeven van deze ontwikkelingen gekaderd binnen de geschiedenis en evolutie van winkels en het winkelen. De focus ligt daarbij op enerzijds de (interieur) architectuur en anderzijds op de management aspecten. Er komen drie winkeltypes aan bod die elk een grote rol gespeeld hebben doorheen de beschreven evolutie: het warenhuis, de winkelketen met daarbij de afgeleide boetiek keten, en de supermarkt. Om de onderlinge invloeden van deze drie types te visualiseren heb ik een grafische tijdslijn ontworpen. Daarbij worden ook de archetypes, trends, innovaties, en de evolutie van de winkelervaring vanuit het standpunt van de consument voorgesteld.
Vervolgens gaat de aandacht naar de discipline van retail design zelf met de ontwikkeling van een set definities die hiermee gepaard gaan. Uiteindelijk sluit dit eerste deel af met een beschrijving van de mogelijke toegevoegde waarde van retail design.

Retail design is een multidisciplinair veld dat ook onderzoek inhoudt. Maar zowel interieurarchitectuur in het algemeen als het meer specifieke retail design zijn nog maar net gestart met het vergaren van voldoende kennis om een theoretisch kader te kunnen ontwikkelen. Het tweede deel van deze thesis geeft inzicht in deze sterk opkomende ontwikkeling. Twee belangrijke uitdagingen worden aangehaald: ten eerste de communicatie met ontwerpers uit de praktijk van alle gerelateerde ontwerpdisciplines en andere belanghebbenden. Ten tweede is er de meer methodologische uitdaging om een degelijk referentiekader te creëren dat alle disciplines combineert die op dit moment ruimtelijke aspecten bestuderen – ontwerp disciplines, omgevingspsychologie, marketing en communicatie. Daarom wordt er een theoretisch kader aangereikt dat als basis dient voor ons eigen onderzoeksopzet voor onze experimenten. Dit theoretisch kader is opgesteld vanuit het standpunt van een ontwerper. Dit houdt in dat er, ondanks het gebruik van - voor andere disciplines - orthodoxe onderzoeksmethodes, gedacht wordt vanuit een holistisch kader. Verlichting is genomen als een casestudie om de impact op de beleving en de atmosfeer van een winkelruimte empirisch te onderzoeken. Als achtergrond wordt in dit deel ook de evolutie van verlichting in winkels besproken, gevolgd door een lijst van termen en concepten die hiermee gepaard gaan. De verantwoording om verlichting en atmosfeer te onderzoeken volgt uit interviews met experts en de resultaten van het literatuuronderzoek.

Een derde en laatste deel van deze thesis beschrijft de experimenten die uitgevoerd zijn rond verlichting in supermarkten. Vijf opeenvolgende experimenten

werden opgezet. De eerste drie experimenten blijven op productniveau door te kijken naar de invloed van verlichting op het voorkomen van de producten, de voorkeur voor bepaalde producten en de verkoop ervan. De twee laatste experimenten behandelen de invloed van verlichting op een ruimtelijk niveau: de invloed van de verlichting op de perceptie van de atmosfeer van de ruimte, de beleving (emoties) van de consument en het resulterende gedrag. Hierbij wordt er een geleidelijke verschuiving gemaakt van foto's van producten (eerste experiment) naar een controleerbare gesimuleerde supermarkt (tweede, derde en vierde experiment), tot een echte supermarkt (vijfde experiment). De resultaten geven aan dat verlichting een belangrijke rol speelt in de beleving en perceptie van de ruimte. En meer nog, verlichting kan ingezet worden om een boodschap (bv. imago) te communiceren. Verder werd er een duidelijk verband gevonden tussen hoe de consument een ruimte beleeft en hoe deze gepercipieerd wordt. Als besluit worden de resultaten van de experimenten terug geplaatst in een bredere context: die van retail design. Tot slot worden de beperkingen en de implicaties van het onderzoek besproken.

INTRODUCTION

This PhD explores the impact, complexity and importance of store design on customer appreciation. Such concepts have been approached from disciplines such as marketing and consumer research, but not as yet from a designers' perspective. I will argue that retail design is a recent discipline that lacks a proper body of scientific knowledge and a sound theoretical framework.
This PhD attempts to develop such knowledge, or at least to establish the conditions for generating a proper body of knowledge. As a designer, I have always tried to focus on the relevancy of my outcomes for the discipline.

I have structured my thesis in six chapters: the first one studies the historical conditions of store design by discussing several archetypes of store design, leading to the store typologies of today. Chapter 2 explains what the retail design discipline entails. I have tried to illustrate how designers work and think, as a precursor, and have given the background on how research in retail design is approached in the further course of this thesis. Although common research methods are used, Chapter 3 applies the designer's perspective in developing a theoretical framework. Chapter 4 gradually restricts the field to the case study of lighting as one aspect of the total atmosphere. Chapter 5 first explains the particular conditions of doing experimental research from a designer's perspective, before applying it to three experiments. Chapter 6 discusses the research results in a broader perspective.

The approach of this thesis and the realm of retail design involve several aspects:

1. The tone of voice: the language aims to be 'easy to read' and accessible with the designers' language as a basis. To this end, the description of the retail design discipline is based on literature written by designers and other practitioners involved in the design process. While describing research in retail design, the tone might slightly change to a more scholarly one, however, still using the vocabulary common to the design discipline. It is further aimed to maintain such a perspective when describing the results, making the rather complex subject of statistical analysis plain and understandable. Within Chapter 4 'Lighting Retail Spaces' and Chapter 5 'Lighting Supermarkets' a section is added to define the terms used: lighting terminology and statistical terms. Those who are familiar with the terms can skip these sections.

2. As it is important to describe and define the retail design discipline and the research within it, the first part of this thesis is written from a general point of view. In other words, it does not put an emphasis on lighting at this stage since this part is written to explain a designer's point of view. Next, the research subject of this thesis is introduced step by step, shifting down from the environment as a whole to one aspect: lighting. Lighting needs to be viewed as a case study for conducting and communicating experimental research in retail design. Each chapter

is designed as a stand-alone text.

Note that the focus of the evolution of retailing and retail design, the examples and cases lie within Western-capitalistic-society. For references to quotes, photographs and images of those examples I refer to the book or text I found them in, rather than to the original source which often came from archives - especially the historical ones.

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Part I
Retailing

We have all looked through the window of another person's home, being curious or judgmental about the kind of person living there, just as we have looked, for the same reason, at the contents of another person's supermarket trolley. What we eat, the way we dress, the car we drive, the restaurants we visit, the books we read, are all an expression of who we are or how we look at life. The places we choose to shop, when we shop, what we buy and with whom we shop are all visual evidence of our lifestyle, culture and interests. Therefore, shopping is a social and personal activity.

So, next to particular products and brands, we choose to relate to particular retail environments that fit our image. This is a given and indicates the complexity of designing retail spaces: they are semi-public territory, they are a way to communicate a brand or retailer's identity, and they are places that offer an experience to which consumers can relate. To stay competitive and appealing therefore, retail spaces need to be regularly updated, so that they remain at the forefront of contemporary interior design. It is fair to state that important innovations in interior design took place – and are still taking place – in the retail sector. To grasp the complexity of retail design and to understand why shops are what they are, a closer look at the history and development of shops and shopping is valuable, as well as a clear set of definitions. Both topics are handled in the first part of this thesis. While the latter is discussed in Chapter 2, the former forms the subject of Chapter 1.

1

Chapter

CHAPTER 1
RETAIL EVOLUTION SURVEY

1.1. Introduction

Designing retail interiors was only recognised as a design discipline in its own right during recent decades. Earlier, it was more an intuitive expression of commercial acumen (Fitch, 1990). Great retailers of the 19th century, for example, were primarily commercial entrepreneurs. Consequently, the development of commercial spaces and buildings is here addressed from two angles: the architecture (exterior and interior) of the building types and specific aspects of management.

For the purposes of this thesis, only large-scale retailers[1] are discussed ('large-scale' as in multiple stores or literally as 'large' in shop space and product range), excluding the independent specialised stores, such as butchers, tool shops and boutiques. However, the influence of the latter on the development of the larger retailers will be described.

Focussing on historical precedents of contemporary large-scale retail interiors three influential types of stores can be identified:

1. the department store;
2. the chain store, and its derivative the boutique chain store;
3. the supermarket.

As this thesis describes research in supermarkets, with lighting as a substantial case study, it is valuable to understand its origin and development. Therefore, the survey addresses the influence of the design of the department store as well as the development of the chain store, which strongly influenced today's concept of supermarkets. In their turn, the supermarkets' innovative developments influenced the design of department stores and chain stores.

Literature on the architecture and interior design of commercial buildings remains scarce. Dion Kooijman (1999) indicates that existing literature often shows a marketing signature or a more technical one. He tried to combine the knowledge of architectural history, marketing and mass communication to get a better understanding of the development of retail architecture. Therefore, my analysis of the aforementioned typologies is based on Kooijman's approach. However, in addition to this descriptive approach of the architecture, interior design and managerial aspects, I want to introduce a new parameter: innovation, as I want to argue that in the past, commercial spaces have been fertile environments for generating innovation on two levels: technical and design.

I have tried to visualise this historical development in a graphic timeline. This attempt is rather novel since not only does it show the historical archetypes, but equally indicates important periods of retail history. This chapter can also operate as a textbook for retail design students - a publication to this end is envisaged in the near future.

1 This does not include large-scale retail developments, such as shopping malls and arcades which consist of grouped stores. Their history is not addressed here (see Gruen, 2005; Kooijman, 1999; Pevsner, 1976 who cover this aspect).

1.2. Graphic Timeline

Inspired by Koolhaas' timeline (2001) that serves as a visual abstract and index of his book 'Project on the City 2', I created a similar graphical timeline (see inside book cover). As mentioned before I focussed on three types: the department store; the chain store and its derivative the boutique chain store; and the supermarket. In addition to chronological developments, the following aspects are also visualized:

1. the architectural and generic characteristics of each typology and archetypes (visualized with lettering in the same colour as the type);
2. important innovative developments that influenced the development of the store (in white letters in red boxes);
3. shopping behaviour and shopping experience (in orange);
4. important evolutions in society that influenced store design (on the left);
5. the influence of the three types on one another (visualised in the timeline by the movement of the 'development lines'). When looking at the date of origin, the three store typologies occur more or less chronologically, however, the introduction of a new type does not necessarily mean the downfall of the previous one. But they do influence one another. Also American and Western European developments occurred differently and influenced one another and are therefore indicated separately.

The design of the timeline is aimed at offering guidance through the rather complex development of the three types of stores and their derivatives.

1.3. Department Store

Department stores were the most popular form of retailing in the 19th century. Henderson-Smith (2002) argues that no other commercial building type better captured the public's imagination. Moreover, no other single building type succeeded in fulfilling economical and cultural expression so effectively.
This success did not come overnight; it was the result of cleverly adopted changes that occurred in society and in industry. Most department stores grew out of smaller businesses and became larger by extending the products offered and the store grew correspondingly, usually by incorporating adjacent buildings. It was only by the end of the 19th century that department stores started to construct new buildings, specially designed as commercial spaces. During the development of the department store there was still a big difference between the smaller ones consisting of a cluster of buildings, and the newly built ones. The latter became the archetype. They were more rationally approached and had an efficient layout. Therefore, the definition and typology of the (modern) department store focuses on newly built stores.

Figure 1.1. 'I shop therefore I am', by Kruger, 1987. Posterprint (online) available at: http://www.createx.com.au/consumerisms-new-best-friends-babies/

1.3.1. Characteristics

The development of the department store shows one major change that occurred during and after the Second World War (1939-1945). The pre-war department store was a large, progressive retail institution offering a luxurious *variance of cluttered products* in a mix of shopping and leisure. They combined *'new' marketing techniques* (i.e. fixed prices, ticketing prices, free entrance, cash payment)[2] with *eye-catching product presentations* and *conspicuous architecture*[3], grouped on a large scale. Furthermore, they attracted clientele by using three key principles: variety, *novelty* and service (Dubuisson-Quellier, 2007). The implementation of all these characteristics in one company became the department store; an exceptional development at that time.

After the Second World War, the department store lost its pioneering role and a diversification of the type occurred. This diversification is still ongoing. Due to these changes, the Second World War forms a pivot in the development of the type.

1.3.2. From the Origin till the Second World War

Precursors

Based on Miellet's work (2001) three important precursors of the department store, coming from Paris, are described: the arcade, the bazaar, and the (grands) magasins de nouveautés. The arcade and the bazaar are responsible for innovation in retail since they offered a concentration of retail sites where the bourgeoisie could shop for a range of different products.

The *arcades* offered their visitors a mixture of a luxurious variety of shops, cafés, and entertainment, under one roof (Vernet and de Wit, 2007). The department store adopted this mix and offers the same variety and abundance, but now in one company.

The *bazaar*[4] (the Persian name for Eastern markets with all sorts of goods) was used in France to describe a covered space with different stalls. The bazaar was a clutter of separate stalls, with separate commercial strategies, under one roof. The department store applies this cluttering of goods technique, but under one central commercial management. Also architecturally, the arcade and the bazaar appear to be significant to the development of the department store. In particular, two Parisian establishments that looked much like department stores: the Bazaar de l'Industrie (1830) (see Figure 1.2, also used as an archetype on the timeline) and the Galéries du Commerce et de l'Industrie (1838). Both stores had windows of plate glass up to, and including the mezzanine, and a glazed roof above a central hall. These are features that are also seen in the department store.

The *magasins de nouveautés* were large shops that sold items such as fabrics, accessories, lingerie and shoes. They can be found in France at the end of the 18th century until the 1830's, when the French Revolution had freed up trade and damaged the power of the guild system[5] (Pevsner, 1976). Then,

2 These marketing techniques existed prior to the entrance of the department store, but the combination of all, is a unique feature of the department store (Davis, 1966).

3 There seems to be some discontinuity in the role of the department store in retail history. In some historical studies, the 17th and 18th century retail spaces are often described as primitive. Little effort was made, with shop furniture for example, to attract customers (e.g., Frazer, 1981, cited in Miellet, 1999). These studies see the department store as the beginning of a retail revolution. Other studies argue that the techniques that are credited to the department store, like window-shopping and using their architectural design to attract people, existed prior to the birth of the department store (Henderson-Smith, 2002). Walsh, for example, (1999, cited in Henderson-Smith, 2002) shows that high-class London shops of the 18th century used elaborate display techniques, impressive interior fittings and sophisticated shop window design. Henderson-Smith further argues that it is more valuable to see the department store as an outcome of retail evolution, rather than the primer for retail revolution.

4 In Paris a distinction between bazaars old style and bazaars new style is made. The new style (mid-19th century) resembles the department store much more: one company but smaller and selling convenience goods (Miellet, 1999). Meant here is the bazaar old style, which is also very common in England (Pevsner, 1976).

5 Each occupation had its own guild that regulated business prices, wages, hours of work, etc. to protect the stores from unfair practices and competition leading to a rather stable retail scene. Guilds had ensured spatial homogeneity.

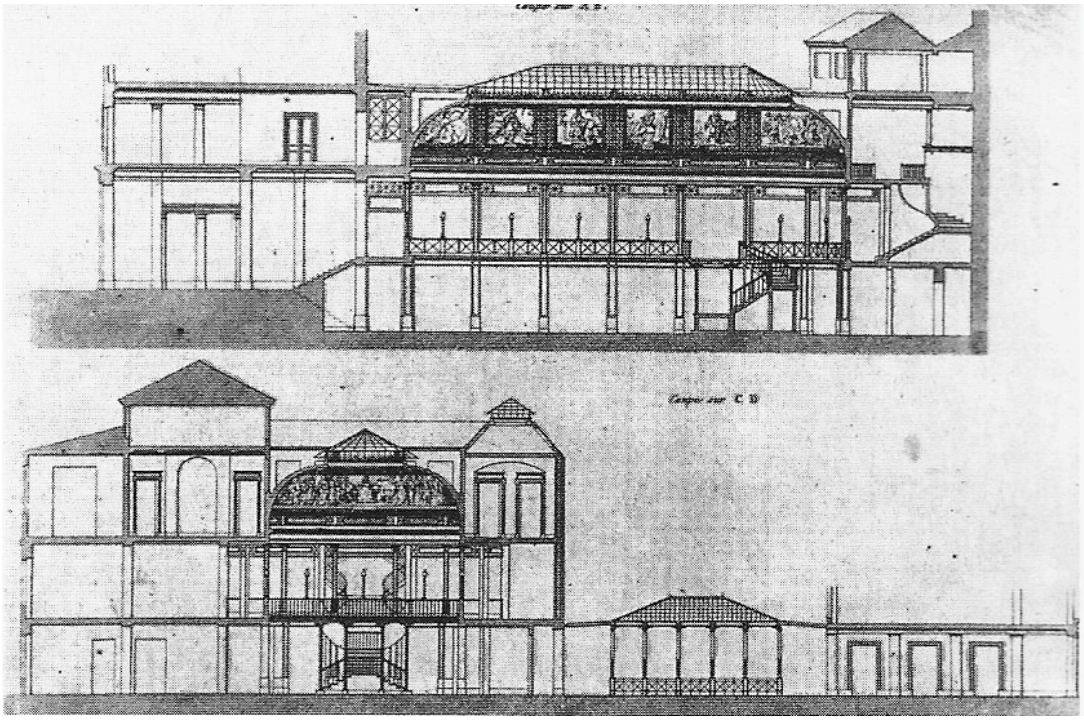


Figure 1.2. Bazaar de l'Industrie. Source: Miellet, 2001, p.18

products could be produced and transported fast and cheap. The magasins de nouveautés experimented with new sales techniques: only cash payment was accepted (without credit), tagging all products with fixed prices, and introducing a free entry concept. More importantly, a new managerial concept emerged whereby retailers re-invested their profits into the decoration and expansion of their stores. This led to the development of the *grands magasins de nouveautés* around the second half of the 19th century. They were the immediate precursors of the department store.

Context

THE WAY TO SUCCESS

There are four factors that advanced the development of the department store. Haussmann's re-design of Paris' medieval urban fabric infrastructure, which occurred during the Industrial Revolution in Great Britain, forms the first. As Prefect of Paris from 1852 till 1870, he transformed the old city with large boulevards for efficient traffic flow. This made the

development of the department stores possible, as they settled on these boulevards. Moreover, the boulevards contained wide pavements and were lit with electric lighting (Miller, 1981), conferring desirability on the stores and leading to increased patronage. Also, the socio-economic conditions were favourable as the new city centre attracted the bourgeoisie, the nouveaux riches and the upper middle class. Paris flourished and, as well as art, culture and entertainment, its luxury shops attracted the bourgeoisie of Europe.

Secondly, the Industrial Revolution (starting at the end of the 18th century in the United Kingdom and gradually spreading throughout Europe in the 19th century) strengthened the position and success of the department store. Vice versa, department stores played a vital role in the economy of industrialized society through their limitless offer of mass-produced items (Clausen, 1985). Most products were no longer manufactured manually, but increasingly mechanically so they could be mass-produced. Among other developments, the origin of steam power increased production capacity even more. Therefore product prices decreased, making them affordable for a larger number of people.

Thirdly, the change in fashion during the Great War (1914-1918) prompted the department store's development. Each social class wore its own type of clothing that also represented gender and political conviction (Kasteleijn, 1976, cited in Kooijman, 1999). During the Great War, women had to do the jobs of the men who were fighting at the front, effecting a homogenisation of all clothing. More uniform clothing and more casual wear was needed. With this change, the need to keep mass-produced and ready-made clothes in stock rose and the department store – which was able to hold larger amounts - formed the shell of that stock (Benjamin 1936, cited in Kooijman, 1999; Miller, 1981, cited in Kooijman, 1999).

Prosperity was the fourth factor to advance the development of luxurious businesses like the department store (Benjamin, 1936). As standards of living rose, shorter working hours and larger salaries created extra leisure time for a large number of people. Shopping became a leisure activity and a new social custom (Clausen, 1985). So, shops were no longer about satisfying basic needs; they also started to 'create' needs by selling products that the consumer was not even aware of needing (Grunenberg, 2002). The rise of the department store was a prominent manifestation of the new consumer culture.

The route to success for the department store was based on the skills of the retailers that managed them. Most department store owners were trained as employees in bazaars and magasins de nouveautés. They cleverly adapted these skills into their own business that grew into large-scale concerns. They also profited from the art of visual merchandising that was becoming very popular by the end of the 19th century. For the architecture of the department store they hired specialists who were involved in the design of the arcades and the magasins de nouveautés. The pioneers of the department stores re-invested their profits into their business, similar to the business model of the magasins de nouveautés. They tried everything to make shopping as attractive as possible for the higher social class-customers (Miellet, 2001). This resulted in increasingly beautiful and luxurious department stores. The development of the visual merchandise together with the managerial changes forms a first milestone in the department stores' success and prepared for their heyday[6].

With the department stores, larger-scale retailers were born. In general, their prices were structurally lower – due to buying stock in bulk – and margins were smaller, but turnover grew strongly. This renewal was so radical that Miellet (1999) speaks of a first retail revolution. This revolution was a second milestone in the department stores' success. An important player was A. Boucicaut with the creation of the Bon Marché in Paris, in 1852 (Miellet, 2001; Pevsner, 1976). The Boucicauts were owners of a magasin de nouveauté before the idea of department stores arose. The unique combination of cash payment, free entrance, fixed prices, the option to return goods, the

6 Note that there were also unsuccessful department stores, however, no information is found about those.

advertising and the construction of a new building (1869-1972) turns Bon Marché into the pioneer of the modern department store (Kooijman, 1999). Note that although entrance was free and prices were low, only the upper and middle classes were able to pay for them, because the items were luxury products and the latest industrial developments.

Until the Second World War, the department store maintained its dominant position in the retail scene (Henderson-Smith, 2002). Other types of stores simply did not offer either such a wide range, or the convenience of a one-stop-shop.

FROM HALLS OF TEMPTATION…

Department stores were named 'halls of temptation' (e.g., Rappaport, 1996), monuments to seduction of the senses through colour, material, sound and form (Grunenberg, 2002). Emile Zola's 'The Ladies' Paradise' (Au Bonheur des Dames, 1883) is a tribute to this phenomenon[7]. Department stores adapted quickly to the buying tastes of the wealthy. Samson (1981) writes that to the average person, large department stores have long been more than business enterprises: "Shopping is a part of our every-day experience. The stores we patronize become a familiar part of our lives. A particular store can be, like our home town baseball team, a civic institution: we follow its advertising in the daily newspapers, and we are interested in its every peculiarity and nuance" (p. 27).

Department stores wanted to increase impulse buying (purchases that are unplanned and happen on the spur of the moment). Firstly, they experimented with presenting merchandise with respect to impulse-sensitive items – like gloves and scarves. Also, products that had a high demand rate – children's clothes and everyday objects – were located upstairs or at the back which drew customers up and around the store, passing as many display counters as possible (Clausen, 1985). Secondly, goods were categorised and themed, for example, based on the living spaces of people's homes: carpets, drapes, light fittings, sofas and decoration for example, were placed in one department – resembling the sitting room – while other goods, such as kitchen and kitchen-related goods were grouped together in another department, preferably next to the department with dining-related products. This 'departmentalisation' not only helped customers to orientate, it tempted them to buy more than they intended (Henderson-Smith, 2002). It would also create the concept of 'customer routing' (this can be the route they choose to take, they are stimulated to take, or are forced to take in a store). Thirdly, the way of presenting products also stimulated the customers to buy more. The visual merchandising techniques that the department stores applied were different to previous techniques. Elaborate shop window displays can be traced back to the end of the 18th century in London (Henderson-Smith, 2002). Although the term was not yet in use, 'visual merchandising' products were meant to sell themselves, instead of via the patter of the salesman as before. Department stores went one step further and used elaborate presentation techniques as an important factor in a store's spatial design. They showed extravagant mock-ups of products: showing the way in which products should be used. They used lifelike mannequins, model rooms in the home furnishing departments, a mock-up of a railway coach to present travel accessories etc., giving the customer information about products they did not know anything about. Moreover, the products were lavishly displayed with all sorts of possible accessories, in a way that was sometimes even educational (Henderson-Smith, 2002). This concept of display is 'narrative' and involves the consumer

7 *The high door... was all of glass, surrounded by intricate decorations overloaded with gilding, and reaching to the mezzanine. Two allegorical figures... their bare breasts exposed were unrolling an inscription: Au Bonheur des Dames...' Later in the book Zola writes: 'The architect was a young man in love with modernity. He had made use of stone only for the basement and the corner pillars and for the rest all was iron - an 'ossature en fer'- except for the ceiling vaulting which was of brick. It was a cathedral of modern business, strong and yet light. Inside, the lifts were clad with velvet, but the main route to the upper floor was the iron staircase with double spirals in bold curves. Bridges ran across high up, and the detail of the ironwork is compared with lace. The summing up is a temple to Woman, making a legion of shop assistants burn incense before her'.*

more actively with the presented article. The element of fantasy, showing the customer the pleasure that can be derived from possessing such goods, resulted in higher purchasing levels (Wannamaker, 1906, cited in Henderson-Smith, 2002). So, the dialogue – oral culture – between the seller and the customer was partly exchanged for visual marketing strategies – visual culture - (McLuhan, 1995, cited in Kooijman, 1999; Reekie, 1993, cited in Kooijman, 1999).

…TO SOCIAL SIGHTING

Increasing competition between department stores stimulated innovation. Hybrid functions, such as restaurants, reading rooms with newspapers and journals, and parlours with art exhibitions, were added. Also, concerts and fashion shows were organised to change the department stores into places where social behaviour mixed with commercial activities. Seeing and being seen became the new hobby. In the earlier arcades, these functions were separate. 'Seeing' was in store and 'to be seen' was in the arcade. These manifestations caused an immense flow of customers creating a new type of space that is added to the existing public space: a semi-public territory. This territory, almost exclusively for woman, offered a labyrinth between goods instead of an urban labyrinth, as was previously the case with shopping stalls in city centres (Benjamin, 1936, cited in Kooijman, 1999). During these events, often themed, the store was decorated spectacularly. Huge advertising campaigns were used to attract customers to the stores. But these new features increased the running costs of the department store and increased prices. Before the Great War their prices had not differed significantly from the prices of other retail businesses.

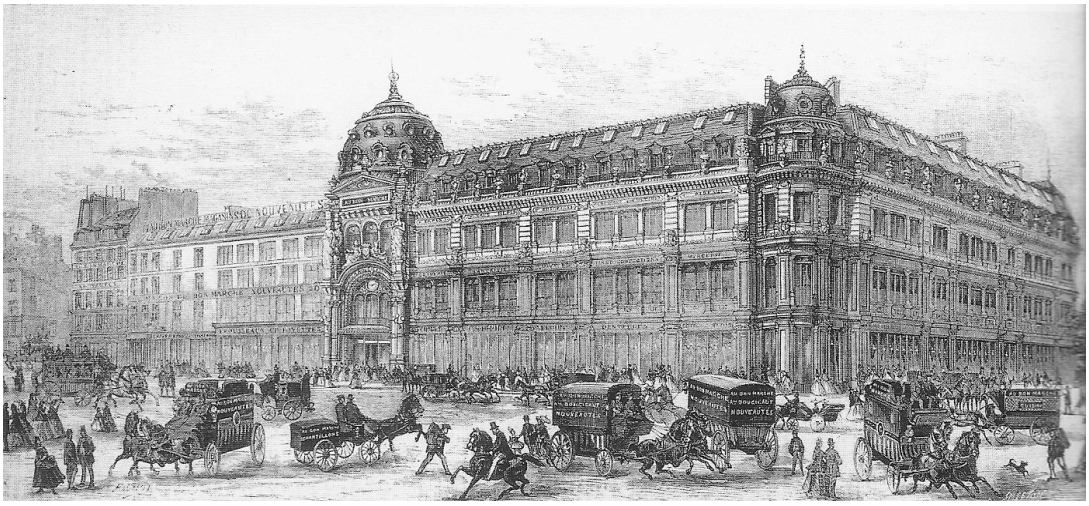
Architecture

The development of the architecture of the department store type is complex because the disciplines of architecture and management interchanged. Three phases can be distinguished (Kooijman, 1999).

In a first phase, which occurred in the 19th century, the exterior of a department store was designed to attract consumers, and the interior to keep them close to the products for as long as possible (Clausen, 1985). The newly built Bon Marché is taken as an archetype (see timeline). Designed by Laplanche, it was built in Paris in 1872. The exterior has a strong vertical articulation and consists of shop windows and domed corner rotundas (Figure 1.3). The rotundas, situated at each corner of the building, were heightened and richly ornamented. Signs, integrated into the design of the building's façade, showed the department store's name and made the wide diversity of its products visible. This would become a typical feature well into the 20th century (Clausen, 1985). Clausen describes another conspicuous element of the 19th century department store: the large public entrances (Figure 1.4). They were designed to communicate free access. Late in the 1880s, lightweight ornamented glass-iron marquees became fashionable and they were added to the entrances. They offered a protective and eye-catching purpose.

The design of the interior was contemporary but coherent, creating uniformity in a dozen diverse departments (Göhre, 1907, cited in Kooijman, 1999). The richly decorated interior was similar to the arcades: several galleries around a light court – a glass roof, most often round or oval rather than rectangular – revealed an intriguing glimpse through all the departments. These galleries were transitional spaces that directed the customers' movements and attention to strategically placed displays in a sequential way (Henderson-Smith, 2002). The light courts were larger than the ones in the arcades due to technical improvements in glass and iron. Majestic staircases connected each floor. The shop furniture consisted of square counters with sales clerks and a cash register in the middle (Miellet, 2001).

Very often famous buildings were used as an inspiration for the department store's design. When Louis-Auguste Boileau (1812-1896) extended Bon Marché in 1876 with the help of the engineer Gustave Eiffel (1832-1923) the Paris Opéra (Figure 1.5) was used as an inspiration. The design of the staircase shows this clearly (see Figure 1.6).

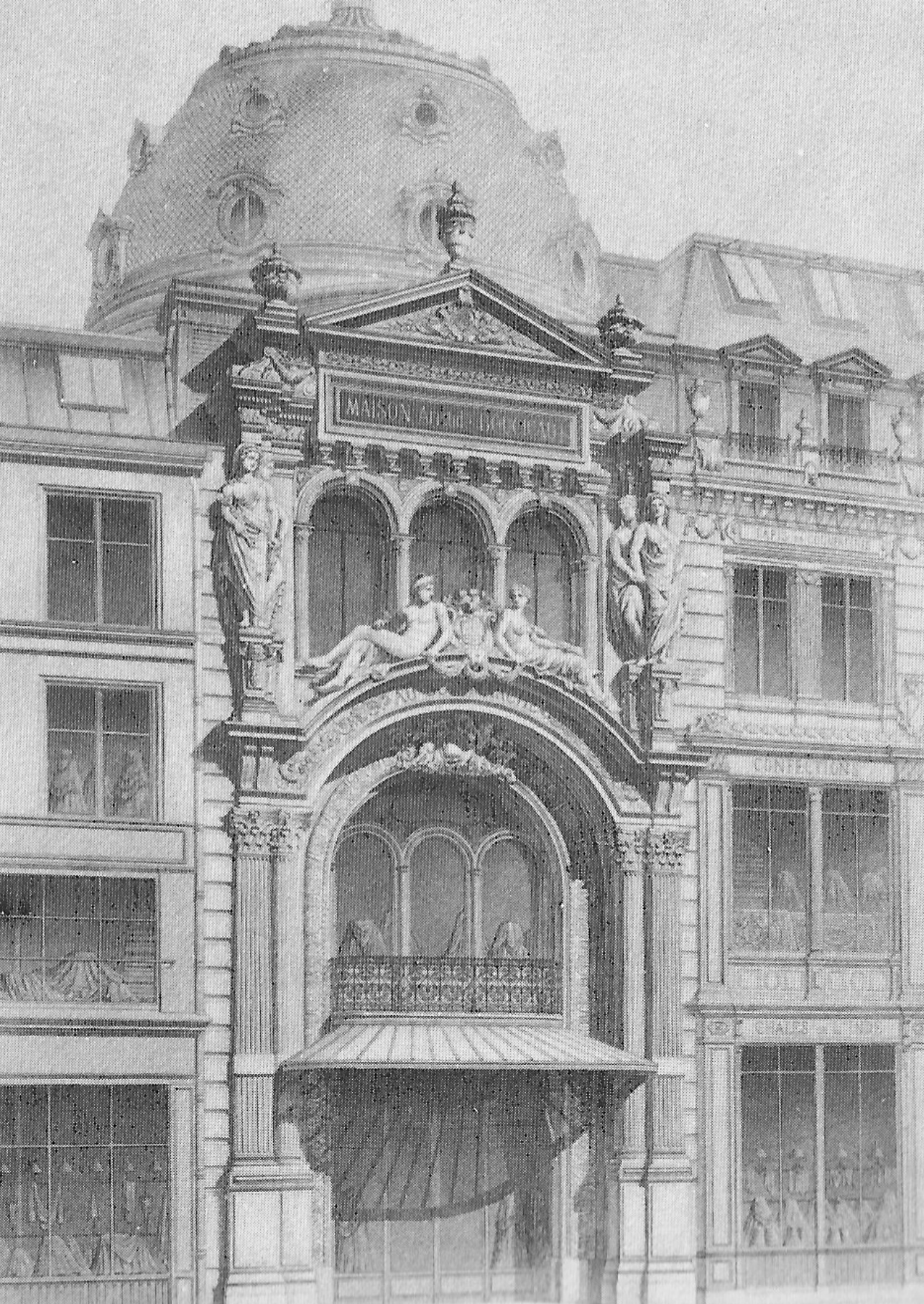


(top) Figure 1.3. The façade of the Bon Marché. Source: Miellet, 2001, p. 24

(next page) Figure 1.4. The portal of the Bon Marché. Source: Pevsner, 1976, p. 266

(left) Figure 1.5. The interior with the grand staircase of the Paris Opera (1860). Source: Clausen, 1985

(right) Figure 1.6. The staircase of the Bon Marché. (online) Available at: www.fotobank.com



The luxurious design was intended to compensate for the relative mediocrity of the mass-produced products it offered for sale (Reekie, 1992, cited in Kooijman, 1999). It contained three floors, a lower ground floor and a basement. The store was an elegant construction of glass and iron; especially the glass and iron cupola in the middle of the store was remarkable. It recalled the glazed arcades of the beginning of the century and the unambiguous spaces of the glass exhibition halls. The cupola and the many glass windows flooded the interior with natural light. Boileau created complex spaces and perspective views with striking contrasts of light. Immense galleries and balconies gave the customer the opportunity to view the activity below. To maximise the openness of the skeletal metal structure, lightweight aerial footbridges were added. The building was designed as a stage set, as an elegant theatre for the public (Clausen, 1985).

Also influential for the further development of the department stores are the new built Wertheim building and Tietz building in Berlin (Pevsner, 1976). Germany opened its first department stores, called 'Kaufhauses', late in the 19th century. These were different from the French models because they aimed at a wider target group, including educated labourers. As a result, the architecture was designed to impress the wider audience. In 1899, Tietz (founded in 1879) constructed a new building designed by Sehring & Lachmann (1899), and Wertheim (founded 1877), opened their new building that was designed by Messel in 1904. Also Wertheim reconfigures the medieval open market hall (Grunenberg, 2002). The building that was extended by Schmohl in 1927 was late Gothic and had a long façade with granite pillars (Figure 1.7 and Figure 1.8).

The monumental façade showed high open arcades with windows stretching over several floors. Even more influential was the end-pavilion with its giant mullions. Wertheim was four stories high with a decreasing floor height over the different levels. Everyday mass-products were sold on the higher levels. The fourth floor contains offices. Görhe (1907, cited in Pevsner, 1976) describes three characteristics of the department store with Wertheim

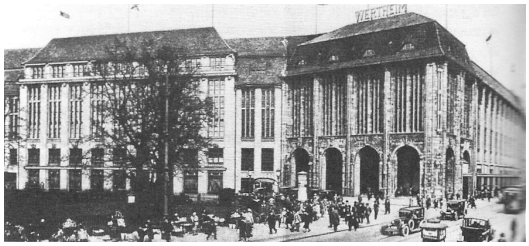
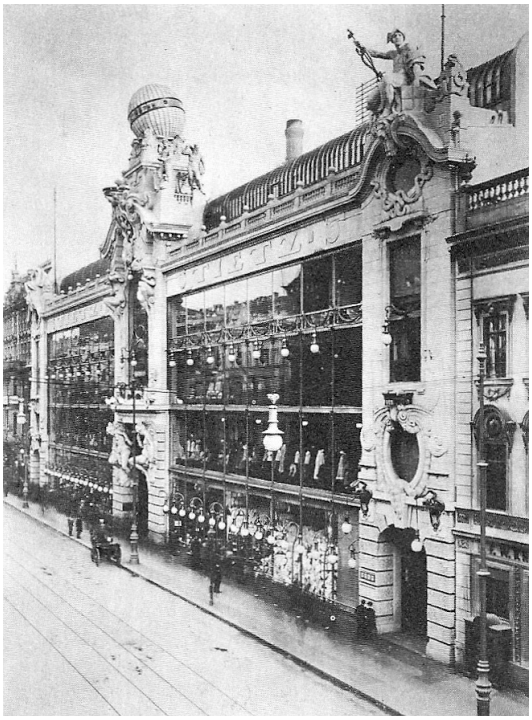


Figure 1.7. The Wertheim new built department store, 1904. (online) Available at: http://upload.wikimedia.org/wikipedia/commons/8/8c/Warenhaus_Wertheim,_Berlin_1900.png

Figure 1.8. The interior of the Wertheim new built department store, 1904. (online) Available at: http://www.worthpoint.com/worthopedia/berlin-wertheim-department-store-interior-view



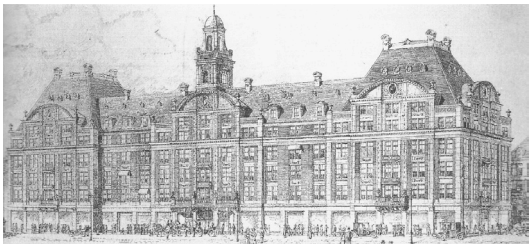


Figure 1.9. The façade of the Tietz's building in Berlin, 1898. Source: Pevsner, 1976, p. 270

Figure 1.10. The façade of de Bijenkorf in Amsterdam. Source: Miellet, 2001, p. 205

as the archetype: verticality with the use of pillars in the façade, the arcade, and the glass fronts. He describes the interior as 'typical' with its statues in the patios, wide stairs and high staircase walkways.

Hermann Tietz built a daring architectural building in 1899 (Figure 1.9). The store replaced the support of the façade to the inside of the building resulting in a gigantic glass façade. This type of architecture transformed a mundane shop into an imposing shopping palace. The Tietz building served as an inspiration for the second phase of the department stores' architecture.

In The Netherlands department stores were constructed during the second phase of architectural development (1890-1920), but they resemble the first phase of German architecture (see Figure 1.10). The development of new build department stores happened later due to the economic and social climate (Miellet, 2001). De Bijenkorf and Vroom & Dreesman in Amsterdam were the first[8]. De Bijenkorf, formerly known as 'Magasin de Bijenkorf' evolved from a sewing requisites shop to a department store in 1912 and a new store was built. Van Straaten jr. (1862-1920) designed the exterior of de Bijenkorf and the German architect Schlöndorf designed the interior. This shows the increasing attention given to specifically designed commercial interiors. The building is designed as an oasis of tranquillity in an urban environment. The architecture is imposing and the aesthetics function to serve the commercial issues of the department store.

Department stores with several floor levels created new opportunities. While Wertheim applies the difference in quality per level, Dutch department stores use the difference in rate of circulation. The products with the highest rate are placed on the ground floor. The restaurant is always on the top floor. In a one-layered store the restaurant is situated in the back. The difference in quality per floor that occurs in German stores is spread between different formulas – De Bijenkorf at the top, Vroom & Dreesmann for the mid-segment and HEMA, (a subsidiary of the Bijenkorf, cf. infra) at the bottom (Kooijman, 1999).

8 There seems to be some confusion about the date that design commenced and the date the building was completed. According to Miellet (2001) 'de Bijenkorf' opened his new store in Amsterdam in 1914, making it the first newly built department store. According to Hondelink (1992, cited in Kooijman, 1999) Vroom & Dreesman (founded in 1887) built the first one, claiming that it opened in 1912. Miellet argues that Vroom & Dreesman only published their design in 1912.

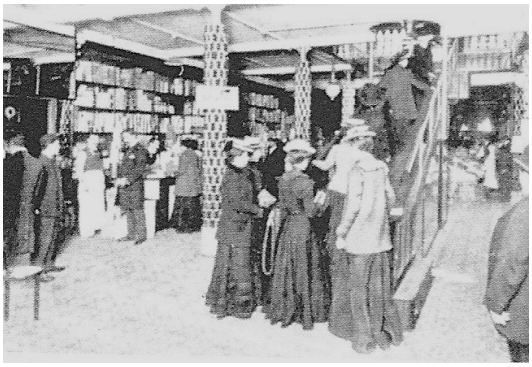
Kooijman (1999) cites that during the second phase (1890-1920) 'Jugendstil' or Art Nouveau determined the architecture of the department stores. Modern materials were introduced, such as steel, to create spacious, open façades. Steel was used before, but rarely in full view. Horta's l'Innovation (archetype on timeline) in Brussels (1901) is a typical example of such architecture (Figure 1.11). Specific are the huge glass windows over the different floors and a glass roof over the central hall. The idea of the glass façade was to make the whole store's interior visible from the outside. The downside of these enormous windows was, once inside, external daylight flooded in giving less focus to the items. Once electric lighting was introduced (see Chapter 4 'Lighting Retail Spaces' for more information), these windows disappeared as will be explained in the third phase of architectural development.

In Britain, one department store with Art Nouveau windows is worth mentioning. Although, most department stores grew out of fashion houses, Harrods in London was a luxury grocer that followed the trend (Davis, 1966). Although London had its first department store, Whiteley's, in 1875 (Miellet, 2001), Harrods opened its first new build store in 1901 – after the smaller store burned down on the same location in Knightsbridge. It is an eclectic building with French Renaissance terracotta characteristics designed by Stevens and Hunt (Figure 1.12). The store became the colossal building it is today in 1939 (Miellet, 2001).

Starting in the 1920's, the third phase in architectural development occurred. The voids and façades were closed. Also electric lighting and air-conditioning was used. The most important invention was the moving staircase: the escalator in Bloomingdale's in New York (1892) and in Harrods Brompton Road store (1898) (see Figure 1.13). This technical masterpiece, widely adopted around 1910, enabled easy consumer access to all floors, increasing the fuller store experience.
Up to this point most architectural modifications were a consequence of technical innovations, such

Figure 1.11. The façade of the l'Innovation.
Source: Miellet, 2001, p. 168

Figure 1.12. The façade of Harrods, 1949.
Source: Miellet, 2001, p.126



A SINGLE ESCALATOR CAN MOVE 7,000-8,000 PEOPLE PER HOUR
(WEISS AND LEONG, 2001, P. 339)

as the invention of plate-glass and iron, that opened up the façade (Davis, 1966). During the third phase, management pulled the strings and a rationalisation of the department store started (Kooijman, 1999): even though globe lighting from the cupolas were recognised to improve the feeling of spaciousness, they were closed because of the need for greater sales display surfaces. For the same purpose the open façades were closed as well so that more shelves could be used. White incandescent light bulbs replaced the incoming daylight (cf. Chapter 4 'Lighting Retail Sapces', p. 96), which was seen as an improvement for sales. Instead of a look in the store, shop windows were created again. Their powerful lights reached the street and bathed it in warm light. This made the shop window as effective in the evening as in the daytime (Grunenberg, 2002). De Bijenkorf in Rotterdam, designed by Dudok in 1927, is an example of such rational architecture (Figure 1.14 and Figure 1.15; archetype on timeline).

Figure 1.13. The first escalator in Harrods, 1898. Source: Koolhaas, 2001, p. 341

Figure 1.14. The interior of the Dudok building, 1931. Source: Kooijman 1999, p. 71

Figure 1.15. The exterior of the Dudok building, 1931. Bombing largely destroyed the building in 1940. Photographer: Jenkins, M. R. (online) available at: http://www.artandarchitecture.org.uk/images/conway/c1aedb18.html

Dudok used the metaphor of a ship as a modern social phenomenon (Van Bergeijk, 1995, cited in Kooijman, 1999). In the interior, the floors were like ship's decks with balconies. With the design of the interior, Dudok wanted to create an atmosphere of being on a cruise, away from the daily grind. The entrances were situated in the corners to connect the flow of people outside to the spaces inside more easily. The exterior was particularly designed to appeal to the local bourgeoisie (Van Bergeijk, 1995, cited in Kooijman, 1999).

The American Department Store

In America, Macy's opened the first department store in 1858. However, it was only in 1904, that a specifically designed department store by Louis Sullivan (1856-1924) was constructed in Chicago for Carson Pirie Scott. The wealth of the bulk of the population in the Americas and its strongly developed industry was greater than in Western Europe. This consumer demand contributed to the success of the American department stores (Pevsner, 1976). Soon, they were larger in number and turnover than the Parisian ones. During the inter-war years Western Europe's department stores considered the American ones to be models of strategy and organisation (Miellet, 2001).

NICKEL AND DIME STORES

Another type of department store developed in America at the end of the 19th century: the 'nickel and dime' stores, referring to the uniform prices of the products being five cents (a nickel) or ten cents (a dime). Frank Woolworth founded this type of stores in 1879 (Miellet, 2001). Quickly more stores opened and in 1890 Woolworth had 12 stores, in 1899 already 54 and by 1919, 1,081 stores are recorded[9]. The difference between European department stores and the American ones rests precisely on this kind of development. European department stores remained large-scale retailers – only having one or just a handful of stores – while the American ones were chain retailers.

Afraid of the settlement of Woolworths in Germany at the beginning of the 20th century, German department stores launched their own 'nickle and dime' stores as subsidiaries. For example, Tietz opened Ehape (1925). In The Netherlands de Bijenkorf followed the German trend and launched its Hema in 1926. And in France, Nouvelles Galéries started Uniprix (1928) and Au Printemps launched Prisunic in 1931 (Miellet, 2001). This evolution was beneficial to the department stores because, during the economic crisis of the 1930's, in many cases it was the profit of the uniform price chain stores that enabled the department stores to survive. These stores gradually departed from the uniform price model and evolved into variety stores.

1.3.3. After the Second World War

Context

During the Second World War demand surpassed supply and the retail industry struggled to survive. But recovery after the Second World War happened very fast. Miellet (2001) links this recovery with the overall increasing standard of living. Expenditure rose and all classes achieved a similar consumer life-style. Also, an increasing diversity of products arrived on the market. Due to technical innovation, there were all sorts of new products (e.g., portable radios, nylons). But the spectacular increase in consumer demand did not create an equal increase among the department stores. A possible explanation is that more money was being spent on holidays, catering and health services. This increased spending on leisure eventually caused the consumer to save on commodities. Consequently, the department stores were forced to a radical return to 'small profit and quick return' (Davis, 1996). In other words, a lower profit per product but with higher turnover was traded to appeal to the cost-conscious and critical consumer. Still, department stores struggled and they lost their pioneering role. There are also other reasons:

Firstly, the target group changed from bourgeois women to a more diverse group of men and women, from all age groups and different social classes.

9 Having that amount of stores, Woolworths can also be seen as a type of chain store (cf. infra).

Figure 1.16. De Bijenkorf. (online) Available at: http://lanternslide.wikispaces.com/Belgium+%26+Holland

Shopping became the new recreation for all. The department stores had to adapt their product offer to the new clientele resulting in changing their luxurious image to a more mainstream one.
Secondly, in the 1950's, the increasingly successful discount stores[10] took over new lines of business that the department stores had developed. Departments such as do-it-yourself, sports articles, household appliances etc. suffered. Fashion and furniture departments faced similar challenges since discount fashion stores and boutiques[11] also emerged (Miellet, 2001). The department stores' restaurants on the other hand, in spite of their origin as an additional service for customers, flourished and became quite profitable in their own right. The introduction of the self-service concept (originated by groceries, cf. 'supermarket' infra), the development of the supermarket, and the discount sales were spectacular enough to mark a second revolution in retail (Miellet 2001) .
Thirdly, while the location of the department stores on the boulevards in the city centres was initially beneficial, as the modern era of the car grew, city centres became crammed and a lack of parking resulted. Some department stores built parking lots but soon they realised that relocation would be a better option. They opened chain stores in newly built suburban shopping malls (Miellet, 2001)[12].

Architecture

DIVERSIFICATION OF THE TYPE

A rationalisation of the department store occurred, resulting in changes in the architecture: daylight was again used, either via glass façades or with the use of light domes and voids; shop windows disappeared and the glass façades offered a view into the shop. Most new department stores were built as simple blocks. In Dutch department stores escalators are placed in the void. This type of store can be seen as a combination of the (static) 19th century void with a (dynamic) early 20th century escalator (Kooijman, 1999). The best example of this type of department store is de Bijenkorf in Rotterdam, designed by Marcel Breuer in 1957 (Figure 1.16; archetype on timeline).

As the department stores adapted to the new

10 These stores applied extremely low prices due to buying large stocks in bulk and to keep exploitation costs as low as possible by exploiting multiple stores or large-scale stores. This type of store is explained in the paragraph on chain stores.

11 The boutique, first founded in the 19th century arcades of metropolitan cities, were small specialised outlets with carefully crafted interiors. Later they became fashion designer stores selling ready-to-wear clothing (Pimlott, 2007). The evolution of the boutique is defined in the paragraph on chain stores.

12 In America this revolution occurred in the inter-war period, and in Western Europe only after the Second World War.

consumerism, a diversification occurred. Firstly, the architecture changed when the department stores adopted the self-service system in response to mass consumption and the increasing remuneration of its staff. This demanded a new type of shop furniture, changing the interior completely (Kooijman, 1999; Miellet, 2001). Shelves, shelving and other types of furniture that offered the self-service concept replaced the counters. Only jewellery, perfumes, new foods and other luxurious products remained staff-serviced. Payment was made at separate cash registers. The route through the store for customers, who were now encouraged to browse, had to be carefully designed. In the early 1970's, after Western European department stores had adopted the self-service concept, they launched superstores. These stores combined the product range of a department store with a large variety of food products (just like supermarkets did, as described infra). This caused a further despecialisation and diversification of the type (Kooijman, 1999). These stores were never successful and by the end of the 1970's many of them completely disappeared, while others changed to another supermarket formula (Kooijman, 1999).

A second variation occurred due to the fast change in trends. Retail struggled to keep up and especially department stores could not continuously adapt to current demand. Consumers bought products as an extension of their life-style, increasing the importance of brands and image (Miellet, 2001). Target-group oriented strategies proved to be more profitable. This caused the traditional department stores, subdivided as per type of product, to be overtaken. Therefore the 'Galleria' emerged. This new type of department store subdivides its departments based on target groups by creating certain atmospheres that appeal to them. The German Kaufhaus, the Belgian Inno and the Dutch de Bijenkorf were precursors (Miellet, 2001). The importance of brands continuously increased and the department stores adapted to this very well by introducing the shop-in-shop[13] concept. Consequently, less uniform interiors appeared because most department stores rented their space to brands that were allowed to design their own mini-shop.

So, the development of the department store in the post-war period is best described as a continuing differentiation of the type.

CONTEMPORARY DEPARTMENT STORES

An increasingly complex retail scene forces department stores to reposition or reinforce their position in the market. They changed – and are still changing – to maintain their own place in the current diverse retail scene. Along with that, the architecture changes: the role of daylight, shop windows, escalators, etc. in the department store varies depending on the retailer. The dynamics of design show the strong link to their economic motivation (Kooijman, 1999).

Not all characteristics, as defined by the pre-war department stores, apply any more. Firstly, department stores are still progressive, and big retail institutes offer a mix of shopping and leisure. The product offer is still wide and luxurious in character. But they have lost the tradition of innovative marketing techniques. The key principles: variety, novelty and service, vary with the positioning of the retailer in the current market.

Secondly, eye-catching product presentations are still credited to some department stores. Selfridges in Oxford Street has a history of bold initiatives. Art, fashion statements, themed events, etc. have been part of Selfridges' window designs, which received and still receive a lot of media attention (Figure 1.17 and Figure 1.18).

Thirdly, there are some newly built examples that still justify the use of conspicuous architecture. Next to the authentic department stores that were built in the past and are still architectural icons (e.g., le Bon Marché, Selfridges, Harrods, Breuer's de Bijenkorf, etc.), new icons arose. Selfridges in Birmingham is such an example. Selfridges tries to renew its image with high-end architecture. Up until 1998, it was a one-location business, then, it opened a second store in Trafford, Manchester. In this marble covered building each floor was designed by a different

13 This is creating small shops or kiosks of other brands within a store that hosts them.

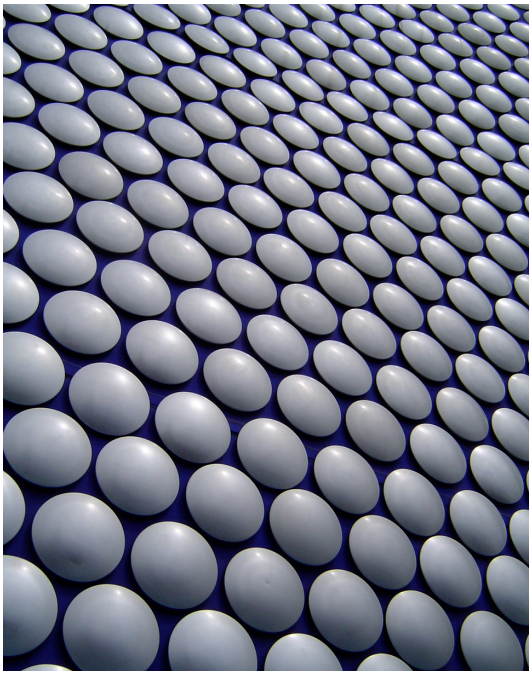
Figure 1.17. One of the shop windows of Selfridges London (March 2010). Author's collection, 2010

Figure 1.18. One of the shop windows of Selfridges London (March 2010). Author's collection, 2010

architect to give it a unique look. But the state of the art example is their latest store in Birmingham's Bullring shopping complex. The store was designed by architects Future Systems and opened in 2003. The building was also designed to function as an architectural landmark for Birmingham, fitting its urban regeneration plan. So, just like Bon Marché served as a tourist attraction in Paris in 1872 (Clausen, 1985; Miellet, 2001), Selfridges plays the same role in Birmingham. The building is organically shaped in one continuous movement and it is covered in 15,000 spun aluminium discs (Figure 1.19). The architects shaped the building to resemble the falling of fabric over the soft lines of the body. The discs look like the scales of a snake or the sequins of a Paco Rabanne dress. Although the architects state: "*we have re-interpreted the notion of a department store, not just in its form and appearance but also in the social function such a building now plays in our society. Its relationship to the church is significant, representing the religious and commercial lives of the city that have evolved side by side over hundreds of years*" (www.future-systems.com[14]), generic characteristics still occur. The façade is closed to optimise the shopping surface, as was done in the 1930's. A beautiful atrium with a glass roof contains high-glossed escalators, placed criss-crossed to enhance the dramatic feeling of the space (Figure 1.20 - Figure 1.22). Unfortunately, little attention went towards the rest of the interior and shop fittings. The shop-in-shop concept is used for the fashion department. Even though most brands designed their space in detail, the overall look and feel of this branch of Selfridges lacks coherence and the finishing leaves room for improvement.

The nickel & dime stores gave up their uniform pricing and evolved into variety stores. However, though most of them disappeared, the Dutch Hema survived and evolved into a very strong brand in the Netherlands and Belgium. Because department stores and variety stores are continuously competing in all retail categories, they are struggling to survive. Joye and Mitchenall (2004) even question whether both types of store will survive in the next ten years.
PLAN STRATEGY

14 This London based architectural design practice no longer exists since its founder died, but the website remains available.



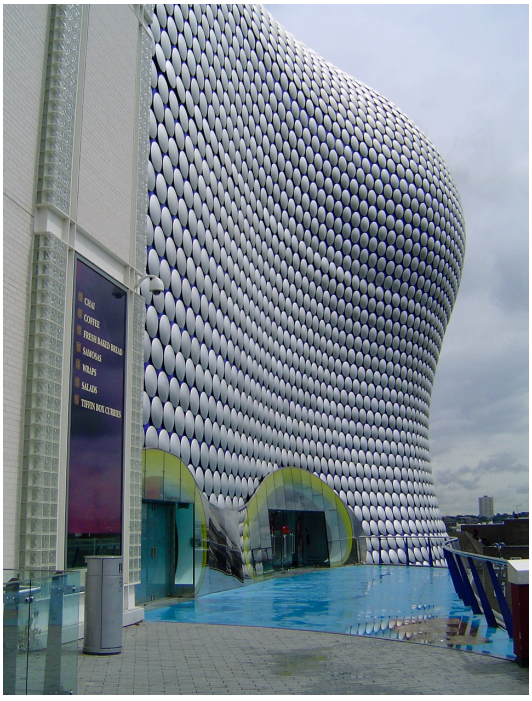


Figure 1.19. - Figure 1.22. Selfridges in Birmingham. Author's collection, 2005

Although department stores differ widely and infinite variations are and can be made, some typical plan strategies can be found. Based on Israel's theory of floor plans in current department stores (1994), seven types are described:

Open Plan (Figure 1.23): This type of plan offers a continuum of open space. Physical separations between selling departments are rare (in some cases service-supporting spaces are separate). Only mobile fixtures, by means of a change in height or direction, indicate the different departments. Signing and graphics are vital to help the customer oriententate himself. Flexibility is key to this store plan. This asks for continuous floor materials and ceilings.

Centre Core Plan (Figure 1.24): this type of plan is orientated around a core in the store. The core can contain central escalators, an atrium or an open vertical court, possibly crowned by a skylight. This core is used to define a central base from which the customer can move to all parts of the plan.

Loop Plan (Figure 1.25): In a sense this plan is a combination of the open-air plan and the centre core plan. This plan assures a traffic flow throughout the whole store. And it limits the depth ratio per department. The departments or circulation can be indicated by differences in floor finishes, ceilings or lighting fixtures. Nowadays this technique is used less because it limits flexibility.

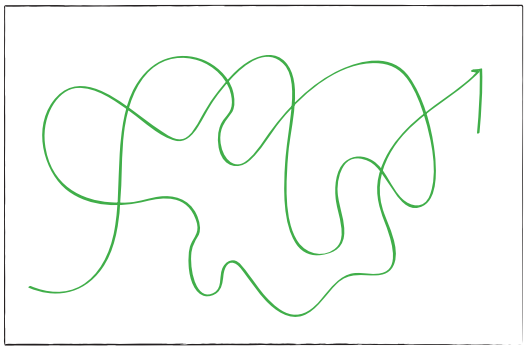
Free-Flow Plan (Figure 1.26): this plan forces customers to browse. The use of curvilinear, amorphous forms adds interesting perspectives at every turn. The customer is guided via attractive, highlighted selling points.

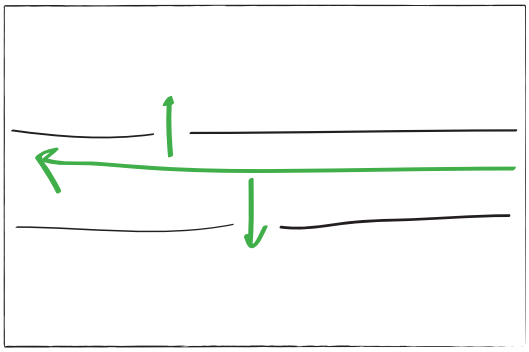
Linear Plan (Figure 1.27): a central traffic avenue divides the store into two sides with smaller traffic pathways. Straight on the main path, it can subdivide each side. This type provides clear access and visibility throughout the store space. Sometimes the path is clearly visible by a change of floor material. But as mentioned, this reduces flexibility.

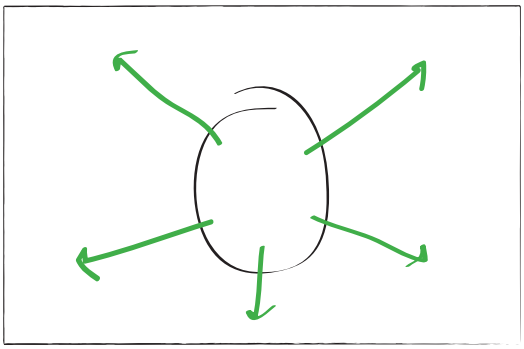
Zone and Cluster Plan (Figure 1.28): associated products are clustered together in separated, physically divided zones. Within the zones flexible aisles are used. The zones provide the opportunity to create variety, for example life-style related, between the zones. This type of plan is often used in large-scale department stores.

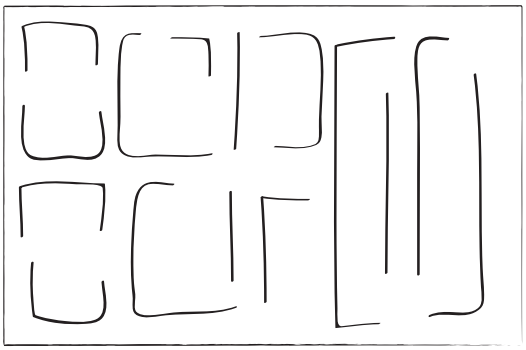
Shop Plan (Figure 1.29): the ultimate expression of each department is key. Each zone or department is designed as a separate boutique or shop. Another possibility is defining each brand separately, resulting in a shop-in-shop concept. This is clearly the most expensive and the least flexible of all types previously described.

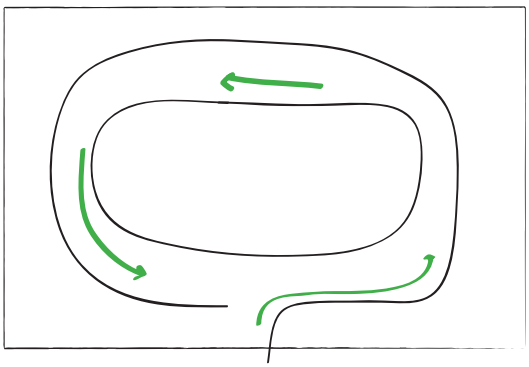
These types of floor plans do not only serve the department stores, also other large stores or supermarkets have adopted them (cf. infra).

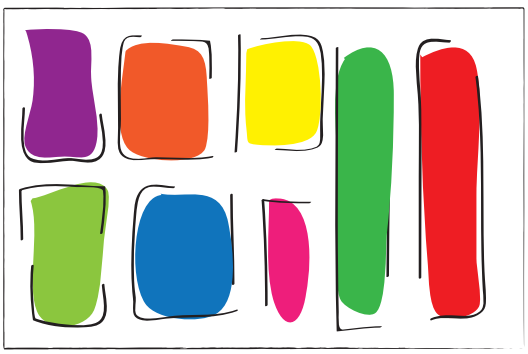


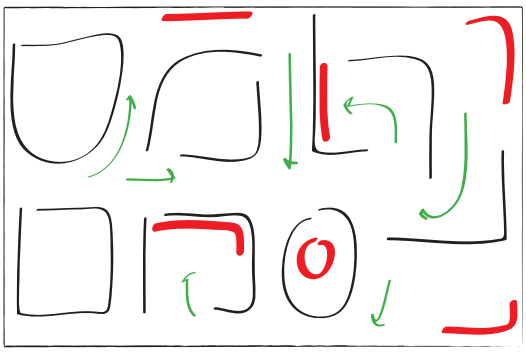












(left top-bottom)
Figure 1.23. Open Plan
Figure 1.24. Centre Core Plan
Figure 1.25. Loop plan
Figure 1.26. Free-Flow plan

(right top-bottom)
Figure 1.27. Linear plan
Figure 1.28. Zone and Cluster plan
Figure 1.29. Shop plan

1.4. Chain Store

Early forms of chain stores can be traced back to the middle of the 19th century in Britain. W.H. Smith started a chain of small shops selling books, newspapers and magazines in train stations. It was only during the inter-war years that this type of store came to be fully exploited. In America, small chains adopted the modern capitalist strategy of 'small profit and quick return' as was seen in the department stores (Woolworths, supra). To this end, Pevsner (1976) credits the department store as a precursor of the chain store. The description of the development of the chain store is focussed on the modern type. It went through a continuous development from its origin till today. One interesting type of chain store is the boutique chain (cf. infra).

1.4.1. Characteristics of the Modern Chain Store

The characteristics of the modern chain store altered gradually over time. In the beginning, bulk purchasing, a simple operating policy, the small profit/high turnover idea, and store uniformity formed the essence of the modern chain store. To this end, a retailer owned a great number of stores. Gradually, the characteristics changed and the chain store type evolved into a much more diverse type of store. Due to globalisation, chain stores operate worldwide and they develop strong brands, with services in each product branch, from discount to high-end prices. Fashion houses, high-end brands, the car industry, the service industry, etc. are some examples. Nevertheless, the current discount chain stores still conform to the characteristics of the modern chain store (as it is defined supra). At the end of this chapter, a break down of the current retail scene is proposed (Table 1.1, p. 42). The table shows, among other things, a more detailed market segmentation and definition of the chain store type.

Figure 1.30. The Great Atlantic and Pacific Tea Company, 1930's. Source: Miellet, 2001, p. 71

1.4.2. Origin

The first modern chain store originated in the Unites States of America, shortly after the middle of the 19th century (Miellet, 2001), as a result of the increased demand for day-to-day commodities in densely populated cities. Enterprising retailers, mostly grocers, knew how to adapt to this demand by starting high tempo chain stores. Having multiple stores increased the stock volume, making the retailer able to re-order at higher discounts. So, the prices in these large-scale specialised chain stores were lower than other traditional local shops that were eventually forced to close.

An example of one of the first modern chain stores is the Great Atlantic and Pacific Tea Company (A&P) (Figure 1.30). What started as a small teashop in New York in 1859, soon developed into a concern with 200 chains in 1900, 4,000 chains in 1914, and 16,000 chains in 1929 (Miellet, 2001). The secret to their success was low costs due to the fact that they imported tea direct from China and Japan themselves. Then, they became a grocery shop by extending their range into dry good products. By the end of the 1930's A&P introduced self-service into their stores (Kooijman, 1999). Their simple working operation, high turnover, bulk stock, and uniform store layout inspired other merchants to also start large multiple-store businesses. The chain store type expanded drastically in the US after the Second World War when the return of many soldiers and the subsequent baby boom increased demand for all types of products (Vernet and de Wit, 2007).

Although the British chain stores (W.H. Smith and others) were ahead of the pack, the adoption of the modern capitalist idea only occurred at the end of the 19th century. In Belgium, Jules and Auguste Delhaize, two academics, came up with the idea of using the advantages of mass production to the fullest, by exploiting a large number of uniform stores with a central supply. Their first chain Delhaize 'De Leeuw', a grocery store at that time, opened in 1867. It is only in the second half of the 20th century that they became a supermarket (cf. infra). The two brothers were also the founders of franchising (1880), meaning that established entrepreneurs could voluntarily become part of a chain organisation (Miellet, 2001).

1.4.3. The Boutique Chain

The increasing demands of fashion after the Second World War (as explained supra) had an impact on the development of the boutique. The boutiques, first founded in the 19th century arcades of metropolitan cities, were small, independent outlets with carefully crafted interiors selling specialised merchandise. They were soon joined by the prêt-a-porter concerns of haute couture houses in the early 20th century (Vernet and de Wit, 2007). The boutique was like a microcosm offering its customer something exclusive; advice, service, warmth, exclusivity and uniqueness are its characteristics.

When the arcades lost their glory and the mass market established, the boutique-concept was challenged. To survive, they had to relate to mass markets without losing the uniqueness that characterised them (Pimlott, 2007). Examples of such an adaptation are designers like Mary Quant and Coco Chanel. At first, they sold their non-conformist designs in a small shop, reflecting their particularity and uniqueness. Customers identified with these products, the boutiques they were sold in, and their owners (Pimlott, 2007). Pimlott continues by saying that, with the increasing mass market, designers realised that the ideal relation to the consumer was one that communicated that uniqueness was for everyone. So, in 1929, the single boutique became several boutiques, located in different cities and countries, even in entirely different markets. Still, they retained the aura of uniqueness due to designed outlets particular to the location. To secure their position, the relatively small-scale designers also sold their products in department stores, in a shop-in-shop concept, as was seen in Britain in the 1950's. These market placement strategies were inspiring to larger concerns like Benetton. This family concern was able to operate at the scale of the department store, but its targeted young audience responded to boutique-styled stores. To this end, in the late 1970's, Benetton started using the boutique as a motif (Pimlott, 2007). Each store design resembled the boutique-style but was still recognisable worldwide. Their centralized marketing, and the almost uniform stores with a boutique's look and feel, introduced a new type of chain store: the boutique chain. Retailers cleverly adopted the traditional characteristics of the boutique, to increase the attractiveness of chain stores, masking the global management behind it (Vernet and de Wit, 2007). These characteristics seem to offer a hold-all concept with benefits such as advice, service, warmth and exclusivity. This semantic evolution – the meaning of 'boutique' that changed from a single unique shop to a motif appears unique – tells something about the evolution of retail itself. There is a contemporary chain store example that established the boutique motif well: Camper.

Camper resembles a boutique from the best of the 1930's. This Spanish shoemaker serves innovative, yet casual products with a strong ecological brand image. By letting each store be designed by another leading designer, Camper succeeds in creating chain stores with the typical aforementioned boutique characteristics. So, different from Benetton, each store is unique (Figure 1.31 - 1.34). To preserve the Camper philosophy, the stores are organised with a central marketing management. Furthermore, just like Coco Chanel and Mary Quant did, the products are also sold in other stores, most often in small shop-in-shop concepts. Something specific to Camper is the unique 'walk in progress' stores (launched in 2000). These stores, located where a new store will be opened, are built in expectation of the new design. Marti Quixé (2002), the developer of

the concept, designed construction cards with rules covering the façade, walls, lighting and displays, with the possibility of adapting to any location (see Figure 1.35). The materials to build such a store are easily available and are recyclable. The customer is invited to participate in the design by simply writing on the walls with markers, resulting in an ephemeral art happening (Figure 1.36 and Figure 1.37) (Van Cleempoel, 2008; Vernet and de Witt, 2007). This makes each store unique and is a powerful marketing tool.

(top) Figure 1.31. Camper Berlin (designed by the Campana Brothers). Author's collection, 2009

Figure 1.32. Camper London (designed by Tokujin Yoshioka). (online) Available at: www.camper.com

(right) Figure 1.33. Camper New York (designed by the Campana Brothers). Author's collection, 2010

Figure 1.34. Camper Rome (designed by Alfredo Häberli). Author's collection, 2008

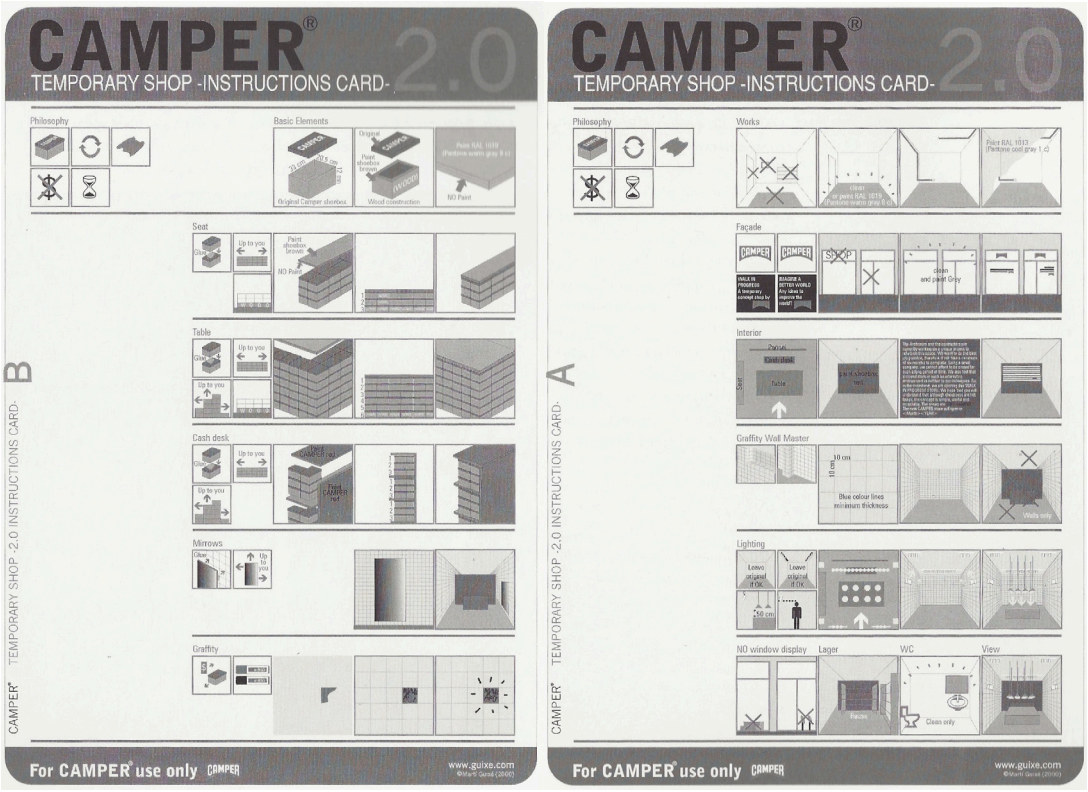


Figure 1.35. Camper temporary shop-instructions card. Source: Guixé, 2002

The boutique as such is not the subject of this chapter: they are less subjected to complex target groups and designs (compared to large-scale chain stores). Boutiques have more freedom to create brand environments that ignore all established spatial, functional and social codes, to create a one-off environment. They challenge the consumer in his or her reactions. Take the Viktor & Rolf boutique in Milan as an example. The store is designed completely upside down, the customer walks on the 'ceiling' and the lighting hangs down from the 'floor', only the clothes are presented straight. It is designed to attract media attention. By presenting the product in a revolutionary way, completely overturning conventional wisdom, or by creating uncanny retail environments that create a new set of relations between customer and retailer, it remains unique.

1.4.4. Contemporary Chain Store

The chain stores of the 19th century, by means of bulk purchasing, a simple commercial operation, a small profit/high turnover idea, and store uniformity, have evolved into multiple store developments. The typology of the chain store[15] has become so diverse that it is necessary to look deeper into its current forms. Multiple chain retailers apply different formats within one chain.

The following formats might be used:

15 Although, it remains ambiguous to define an independent retailer who only owns two stores as a chain retailer, in this thesis a strict division is maintained. A store is either part of a chain, when a retailer or brand has more than one store, or it is an independent proprietor. In case of a franchise, the store is seen as part of a chain.

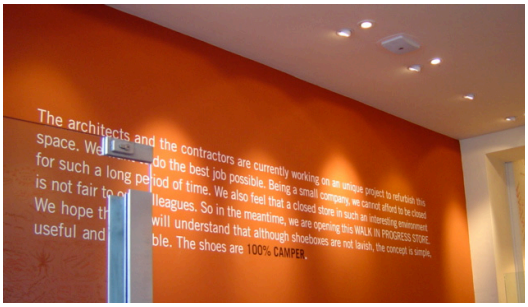


Figure 1.36. - 1.37. Walk in Progress store, Notting Hill London (due to its success, the store is still there). Author's collection, 2003

Flagship store

Flagship stores are located on key retail sites – so-called A-locations in larger cities – and designed to impress their visitors and offer them a brand experience. Although these stores, of all other stores of the same retailer, are usually larger and hold the most volume of merchandise, their main aim is not selling the products but selling the brand.

The Samsung Experience store in New York (Time Warner Center) is such an example. This store shows the latest development of Samsung's digital vision in a playful fashion: all products can be tested and played with as long as the customer wants, even schools can book an experience tour. This way, Samsung hopes to build up a relationship with the player, rather than just selling products. Those who do want to buy are referred to their nearest Samsung retail outlet.

Concept store

A concept store often serves as a place where new retailing ideas are tested or promoted. The concept is to test new ideas and to learn if they are adopted positively by the clientele or can, indeed, generate a new clientele (Mesher, 2010). If the clientele adopts the new ideas positively, the store might serve as an archetype for roll-outs. Ikea, for example has a concept store in Delft (The Netherlands). In cooperation with Delft University of Technology, new ideas, developed by students, are tested for viability (Christiaans, 2010, Personal Communication).

Roll-out

As seen in the early form of chain stores, multi-store retailers might opt for uniform stores. In this case, a concept is developed that can be implemented in different locations. Only minor changes need to be made depending on the location and/or the spatial features of a building. These uniform stores are roll-outs of the original concept. Typical examples are cost-conscious fashion chains that have a clear look and feel and recognisable design all over the world, or in some cases per country. H&M is such an example. Their stores look the same in each country, despite regional differences.

Guerrilla store or pop-up store
This format holds a store that is temporarily present in larger cities or shopping malls. This idea allows retailers or brands to create a unique experience, by its location (e.g., abandoned premises), its ephemeral character or by selling exclusive products developed to this end. Brands tend to apply this format to lift the status of the brand. The concept handles the 'in crowd' idea, meaning that if one does not know about it, one probably does not need to know about it (Mesher, 2010). Comme des Garçons was among the first to launch this format in 2004 (Trendwatching, 2004). Also Nike and Adidas opened pop-up stores to sell exclusive lines of their products.

Boutique outlet
A boutique as it came to be known during the 1960's is a rather small store selling fashion and/or fashion-related items. The boutique is a little world in itself, offering the customer something exclusive. They often sell high-end brands. Stores of brands like Camper, are part of a chain, but are still a world in themselves because each interior is completely different, despite the unifying chain format.

Outlet store
These stores sell off excess stock at discount prices. The interior is often low budget. Whole outlet villages are constructed to offer consumers a place to shop for big brands with enormous discounts. Maasmechelen Village sets a Flemish example. In this artificial village, A-fashion brands are gathered to sell their off-season clothing at up to 70% discount prices. Although the interior of each store is rather low budget, attempts are made to create the brands' well-known look and feel.

Shop-in-shop
As the term describes this is a shop within another shop. In other words this is about a brand that rents floor space in another shop. Usually the brand is allowed to design the rented space, as it likes. This form might serve as a way of introducing a brand when the brand does not have physical stores, or it might be a way to bring the products closer to consumers without having to open stores on various locations as the fashion houses do. Department stores such as Selfridges, de Bijenkorf and Macy's often utilise this format.

Convenience store
Convenience stores are smaller stores located within concourses or in localities. These stores are very easily accessible and have the image of a local store. Very often convenience stores hold only a part of a retailer's range. Take Tie Rack with its stores in train stations, as an example. Also many supermarket chains have opened convenience stores in gas stations, airports and residential areas (cf. infra).

As mentioned, chains can apply different formats at the same time. In Belgium, a trend towards the convenience store is evident. AVEVE, for example, a Belgian agricultural and horticultural supplier, present near city centres and in rural villages, recently added convenience stores to their chain. They tuned down their assortment to open a brand new (2009) city (convenience) concept store in Antwerp (Nationaalstraat). While the larger stores sell products for agriculture, horticulture, animal husbandry, gardens, animals, and home baking, the city concept store only sells garden, animal and home baking products. The store is aiming at gathering a new clientele who are living in the city, enjoy baking, have animals or have a small garden or terrace. Nike, to take another example, handles the flagship format in their Niketown stores; they apply the shop-in-shop concept in department stores and sports retailers; they opened temporary stores like the pop-up store in London and the UNNH store, located in Munich, which was also a concept store. Toys'R'Us even used the pop-up format in large numbers. In 2010 they opened 90 pop-ups. In 2011, 600 more will follow to gain market share. These stores are temporary but, if successful, some of them might stay open. Just like Benetton used the boutique concept as a motif, Toys'R'Us applies the pop-up concept as a motif. They cleverly adopted the characteristics of the pop-up store to hype the brand. Again, this semantic change is a reflection of the retail evolution.
Next to chain stores, brands that open stores also make use of these types of stores. With this evolution,

product brands changed into retailers. The Martini pop-up store, that was located in Amsterdam for three months in 2006, and the M&M flagship store in New York, are such examples.

1.5. Supermarket

Just like department stores, supermarkets are the result of cleverly adopted changes to economical, social, technical and managerial evolutions. When the market became increasingly saturated, with products looking more alike, packaging and branding became increasingly important. Moreover, the rise of brands and the evolution in packaging was indispensable to the development of the supermarket. However, with mass products appearing, so that supermarket products were perceived as similar, supermarkets were in danger of losing their identity. The introduction of their own brands and private labelling helped them to restore and/or build their own image (Ailawadi and Keller, 2004). These private labels still form a large and important part of contemporary supermarkets. As a result of the blunt market, the importance of design increased, for both interior and exterior design. With this trend, the supermarket changed from a rationally developed store to a more social one. Gradually changing from small local stores to large-scale concerns, most supermarkets are now part of multi-chain concerns. To better understand the supermarket typology, we will discuss its origin and characteristics.

1.5.1. Characteristics

There are two main characteristics that define a 'supermarket': self-service and a specific product offer. Grocers, already having been around long before supermarkets appeared, are the instigators of the supermarket type. By implementing the self-service concept and changing their product offer from commodities and dry food products to a wider variety of food products including fresh food products[16], they gradually became worthy of the supermarket name. Fresh food included bread, fruit and vegetables, and meat (Kooijman, 1999).

Self-service

In America, shortly after the Great War, progressive grocers started the self-service concept. They were the first 'stores' selling a variety of food products. Self-service decreased the operating costs drastically because fewer working hours and personnel needed to be paid for. One of the progressive heralds was Clarence Saunders who started a grocery shop in Memphis around 1917. Until then, it was usual that the grocer took the product from behind the counter. His sales talk was one of the main selling features. Many commodities – such as oats and sugar – needed to be weighed and packed since they were delivered to the grocer in large sacks. The store mainly consisted of a low counter with scales and shelves behind. Saunders chose to give the customers the liberty to take the products they wanted from the shelves and then make their purchases. This added the touching and feeling of products to the shop experience. At first, he weighed and packaged everything himself and displayed it in his shop. In the next stage, as a result of the revolution in the packaging industry, products were delivered perfectly weighed, the expiry date was clear and hygiene was assured. This was beneficial for the break-through of the self-service concept (Kooijman, 1999).

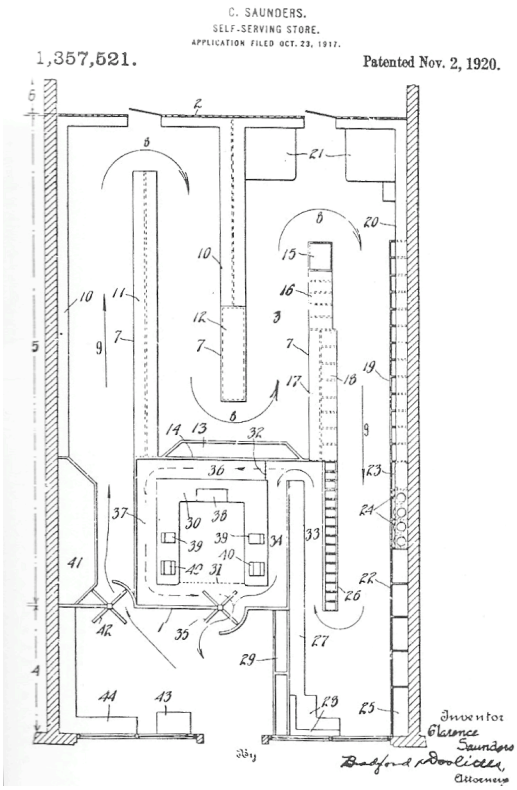
What Saunders did not foresee was that his self-service concept increased theft. To counter this problem, he separated the entrance from the exit. Next, he put the cash register in front of the exit. The shelving islands were placed straight on to the cash desk so the shop attendant had a clear view over the store (Figure 1.38 and Figure 1.39). In principle, this system required only one shop assistant since the weighing of the remaining bulk products was combined with the cash desk. So, high-cost personnel were replaced by relatively low-cost equipment (Kooijman, 1999), revolutionizing the relationship between customer and client (Du Gay, 2004). This formula was such a success that Saunders opened a chain store named Piggly Wiggly (Kooijman, 1999; Miellet, 2001) (Figure 1.40). Saunders adopted the chain store features and prescribed every chain to

16 Due to the current technology, the freezing process of fresh products preserves their quality. Therefore, retailers that changed their fresh product offer into frozen products are still seen as supermarkets.

be the same: a standardised colour scheme (blue, white and yellow), the size of the store (about 200m^2), etc. (Kooijman, 1999).

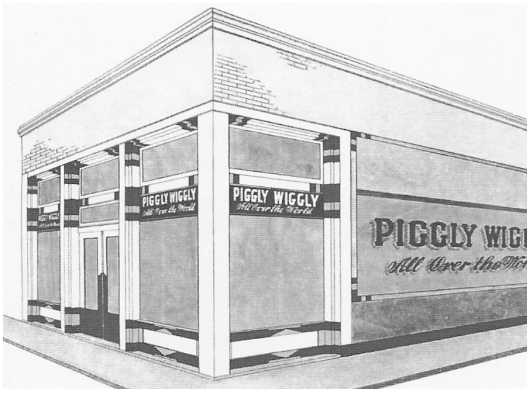
The growth of self-service stores increased dramatically; in 1922 already 600 stores are recorded in the US (Gurtner, 1958, cited in Kooijman, 1999) and in 1928, 2,500 stores (De Smit, 1939, cited in Kooijman, 1999). This was not surprising since the self-service system could double turnover due to an increase in impulse purchases (Kooijman, 1999).

These American innovations were adopted in Western Europe as grocers took the first step in introducing the self-service concept around the 1950's. The customers enjoyed the freedom of browsing and shopping at their own tempo (Miellet, 2001). At first, multiple store concerns hesitated, but in 1951 and in 1952, the grocery stores Simon de Witt and Albert Heijn respectively adopted the system in the Netherlands (Kooijman, 1999).


C. SAUNDERS.
SELF-SERVING STORE.
APPLICATION FILED OCT. 23, 1917.

1,357,521. Patented Nov. 2, 1920.

Inventor
Clarence Saunders
By Bedford & Doolittle
Attorneys



(left) Figure 1.38. Floor plan of Piggly Wiggly self-service store. 1931. Source: Kooijman, 1999, p. 93

Figure 1.39. Interior of Piggly Wiggly self-service store, 1917. Source: Kooijman, 1999, p. 92

Figure 1.40. Design for the uniform façade of Piggly Wiggly chain, 1919. Source: Kooijman, 1999, p. 95

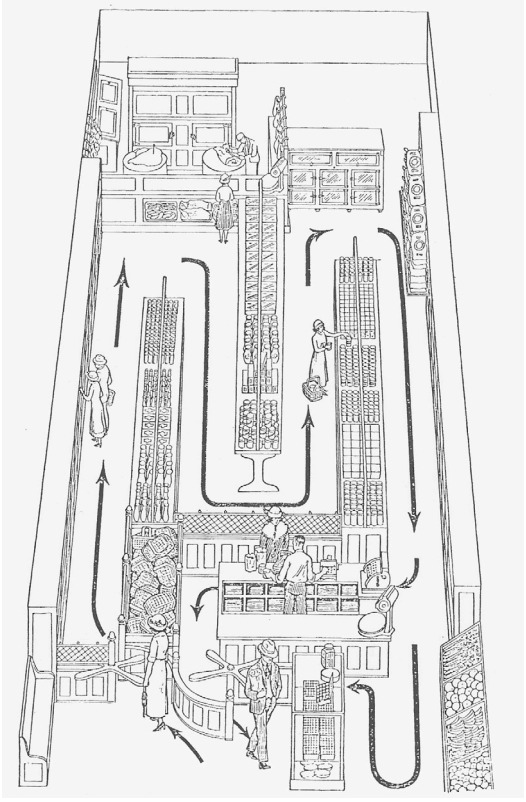


Figure 1.41. Isometric of Piggly Wiggly supermarket. Source: Kooijman, 1999, p. 94

Figure 1.42. Interior of Piggly Wiggly supermarket. Source: Kooijman, 1999, p. 88

Product Offer

The second generic characteristic of a supermarket is the selection. It is a combination of a grocery store, a greengrocery store, a butchers and a bakery. Also in this evolution, Saunders was pioneering. Adapting to the needs of society he added fresh produce to Piggly Wiggly's product range in the 1920's. Kooijman (1999) defines Piggly Wiggly as the first supermarket after Saunders completed his range with a butchery outlet a couple of years later (Figure 1.41 and Figure 1.42; archetype on timeline). However, the origin of the supermarket is often placed in the 1930's (e.g., Koolhaas, 2001). The addition of fresh products enriched the shop experience with their aromas (and the tasting of products in some cases).

The number of grocery stores turning into supermarkets increased in the 1930's. From the 4,500 recorded American supermarkets in the 1930's, only a limited amount were actually part of a chain. Later the chain stores bought up a lot of independent stores (Kooijman, 1999).

In Western Europe the supermarket concept was first deployed in the 1950's, a couple years after the adoption of the self-service concept. Some self-service stores changed their product offer to a supermarket one. Scandinavia and Britain moved ahead in this development (Kooijman, 1999). At first, only small supermarkets 'superettes' existed, but due to the growing demand of the European consumer, chain supermarkets arose, eventually outplaying their competitors (Miellet, 2001; Davis, 1966). In 1953, Albert Heijn opened his first 'Super Market' in Rotterdam, being the first chain supermarket (Figure 1.43; archetype on timeline). In Belgium, Delhaize opened their first self-service supermarket in Elsene in 1957.

1.5.2. Architecture

In the beginning, supermarkets settled in existing buildings and, just like the growth of department stores, they expanded by incorporating adjacent buildings. It is only at a later stage, when the supermarkets relocated to the edges of towns and cities that new build stores were created. However,

a new build store is not a generic characteristic; supermarkets are located in many different buildings on many different sites.

The modern supermarket – of the 1930's in America and the 1950's in Europe – is rational and efficient with the elements of the store (i.e. products, shelving and signing) placed as single compounds in a shell (i.e. the building). Supermarkets have put and still put the emphasis on their interiors, mostly leaving the exterior of minor importance. Although the décor changes continuously, Kooijman (1999), without being conclusive, listed several features of the modern supermarket. With the adoption of self-service, which shifted the attention from the salesman to the product, the counter disappeared and shopping baskets and trolleys appeared. Kooijman describes that next to the entrance a whole battery of cash registers was situated. Also, shopping trolleys and baskets are situated in this area. Management, also housed in this zone, worked in a 'fishbowl' with a view on the cashiers and the shoppers. Next, the customer had to pass a turnstile that emphasised the one-way traffic in the supermarket. The shelving and gondolas are positioned straight on the cash registers to maintain oversight. After entering, a path brings the customer to the back of the store where he can begin his 'journey' back to the entrance/exit zone. Kooijman continues by listing 'pullers' (product categories that draw consumers to the store) – fresh fruit and vegetables, as generic elements. Those elements were placed to the sides of the store making customers cross the whole store, passing all other dry food products. As a last attempt to lure the customer into buying extra products, impulse sensitive products, such as sweets and snacks, were placed at the front or at the cash registers. According to Kooijman, the exterior also contains a recognisable feature: the shop window. This window is supposed to highlight the activity in store, making the store the 'model' instead of models placed in the shop window, as was the case in department stores.
These features remained the same for decades. However, the routing and product placement varies with the retailer. For example, the idea of 'pullers' is used less pragmatically.

By the end of the 1950's, the growth in size of a supermarket had reached a plateau due to difficulties with managing the store and tracing the many products[17]. The development of the Universal Product Code (UPC) (Figure 1.44) in the 1950's made it possible to increase the size of the supermarket (Hosoya and Schaefer, 2001) (see Figure 1.45). This code is actually a thumbprint of a product, making it possible to globally orchestrate the flow of all coded goods. In the spring of 1973 the UPC was formally adopted in food retailing (Hosoya and Schaefer, 2001).

1.5.3. Discount-supermarket

While Europe was still adapting to the self-service system, in America new formulas began to develop. The discount-supermarket was such a type of store developed during the economic crisis in the 1930's. One of the heralds was Michael Cullen, an employee of the grocery chain Kroger. He came up with the idea of the 'loss leader' system[18]. He suggested selling

Figure 1.43. The first Dutch supermarket Albert Heijn. Source: Kooijman, 1999, p. 98

17 The average American supermarket offered 3,000 products in 1946 (Dreesmann, 1963, cited in Kooijman, 1999).

18 This is the selling of only a part of the assortment with almost no profit, to lure the customer to the store where they were tempted to buy other (expensive) goods. This increased sales tremendously. This system was first used in the department stores by the end of the 19th century (Miellet, 2001).

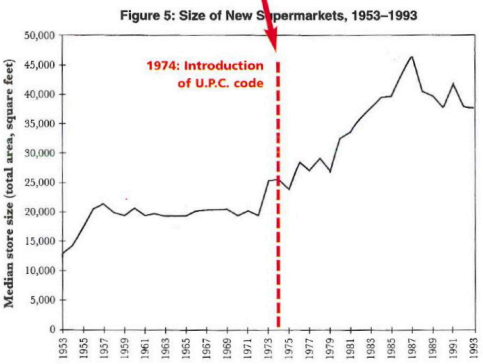


Figure 1.44. The UPC code, invented by Joseph Woodland and Bernard Silver in the 1940's. Source: Koolhaas, 2001, p. 159

Figure 1.45. Increase in supermarket size. Source: Koolhaas, 2001, p. 159

300 products, out of 1,100, with no profit and 200 with only 5% profit in a low cost self-service store. He expected that such low prices would lead to high profits due to low running costs. Kroger did not agree and Cullen started his own business. He rented a garage in the suburbs of New York and started King Kullen in 1930. The interior was very basic as the products were displayed in their delivery boxes. The formula was a success and Cullen opened fifteen stores in the next five years. The rapid spread of the discount-supermarket was unstoppable and grocers were forced to open such stores themselves to survive. First they did this in warehouses, but the strategy was so successful that existing stores were soon transformed (Miellet, 2001).

1.5.4. Superstores

In Western Europe, in the early 1970's supermarkets (just like the department stores) began to open superstores – also called hypermarkets. Because these large stores (between 5,000 and 10,000m^2) needed lots of space they moved to the edges of towns due to lower land values. This offered the opportunity to create car parks, making the superstores solid competitors to the retailers in town. In the superstore the shop-in-shop idea was integrated. A strip of small stores/kiosks, like a news stand, a wine kiosk, a flower shop, a music store, etc., occupied the entrance/exit zone. The design of the superstore remained the same as a supermarket from the 1950's, but was larger and aimed to be more efficient. Already in the 1970's the use of colour, atmosphere creators, and the level of service were already acknowledged as quality characteristics. White symbolised cleanliness, colour symbolised luxury and atmosphere (Kooijman, 1999).

This scaling up also generated a countermovement: scaling down. Following America's example, convenience stores ('local' supermarkets or supermarkets situated within concourses such as train stations, petrol stations and airports) popped up. This resulted in the multi-format supermarket brands that are common today.

1.5.5. Contemporary Supermarket

Contemporary supermarkets have a certain level of self-service. This ranges from grocery products and dry foods to a complete self-service supermarket. The latest developments even make it possible to shop in supermarkets without even having to speak to or even see a shop attendant. A computer takes in empty bottle returns, the consumer weighs fruit and vegetables themselves, all products are pre-packed and displayed, and self-scan and pay techniques complete the total self-service experience. But the core of what a supermarket is – the product offer and self-service – remains the same. Nevertheless, its role in society might be different depending on the format of the supermarket. Roughly, three segments can be distinguished: discounters, traditional supermarkets and the hypermarkets (superstores). A retailer can be limited to one of these segments, for example Aldi is a discounter, or the retailer can apply different ones at the same time, like Carrefour which has hypermarkets and supermarkets. Table 1.1 at the end of this chapter (p. 42) illustrates these segments in more detail.

Only a decade ago, it was widely believed that 'the larger the supermarket the better'. Large supermarkets were popular for their generous product offers and their one-stop-shop character and many of the smaller independent supermarkets and grocery stores disappeared. During the last decade however, this changed and supermarkets introduced smaller outlets themselves. The trend causing this decentralisation is 'convenience'. In the past, convenience used to mean timesaving (in the 1950's), now it embodies more. Simplicity, ready-to-eat, ready-to-make, and within easy reach (every moment of the day at every possible location) are current needs of the Western European consumer. Accordingly, supermarkets can be found next to motorways, stations, in city centres, in retail parks, at the airport, etc. This is of course in correlation to the supermarkets wanting to enlarge their market. So, supermarkets also adapt the different formats, as explained in the section on 'contemporary chain stores' (p. 28-29). Delhaize, for example uses roll-outs for their Delhaize Supermarket concept and convenience stores (Shop 'n Go) in gas stations. On top of that, supermarkets nowadays handle different routes for different customers at different moments: fun-and-run shopping can happen in the same store; even the offer can differ according to the time of the day. For example, in the morning croissants and orange juice are placed near the entrance, while during the evening these products are replaced with wine and snacks.

According to the retailer location and size, the store's interior changes. It ranges from rationally designed functional spaces of the 1950's dedicated to high-speed shopping, to more social environments, akin to market places. One might look like a warehouse, the other like a department store with each department having its own look and feel. The Albert Heijn in Alkmaar is a nice example of a functional, clear design with high quality signing showing what Albert Heijn has to offer and what the store is about (Figure 1.46). In Belgium, the recent (2009) opening of the Red Market, a subsidiary of Delhaize Group, is the embodiment of functionality, convenience and low price management, all of which are fulfilled via the self-scanning facility, extensive opening hours and A-brands for low prices (Figure 1.47 and Figure 1.48). The interior is minimalist, displaying shelves with products clearly presented in boxes and pallets. The Selfridges supermarket in Manchester, designed by Future Systems, is an example of a social environment, inviting customers to stroll through

Figure 1.46. Albert Heijn Alkmaar. Source: archive Claessens-Erdmann architects

while looking at and tasting the foods (Campos, 2007) (Figure 1.49). The sculptural shape of the food display creates specific circulation routes for the customer. This futuristic look with high gloss finishes expresses cleanliness. The use of mainly white accentuates the colours of the products. The curved walls are designed in such a way that they offer alcoves for different departments, resulting in enclosed zones where food and wine can be tasted and discussed.

Apart from the type of supermarket, similar floor plan types to those of the department store (cf. p. 23) are used. For example, the Albert Hein in Haarlem (1996) is a very different type of supermarket. It abandoned the familiar rectangular plan for a more interactive one (e.g., with a cookery school, and products placed to suggest dining options) with a circle in the middle (Figure 1.50).

The exterior of contemporary supermarkets does not differ much from their forebears. Large 'boxes' are still built, though perhaps with a little more attention to the façade. Belgian supermarket brands have very recognisable architecture: Aldi and Colruyt pop up next to main roads and in suburbs, usually ignoring the context. However, other examples that are attempting to blend into the environment can be found in countries like Austria and Switzerland. An interesting example is MPreis in Matrei (Austria), designed by Machné Architects. MPreis is a supermarket chain which respects values such as the natural environment, architecture, quality and tradition. This supermarket is a unique example as it combines generic supermarket characteristics with an extraordinary architecture. The architects tried to

Figure 1.47 - 1.48. Red Market. Author's collection, 2011

Figure 1.49. Selfridges. photographer: Richard Davis, in New supermarket design, p. 17

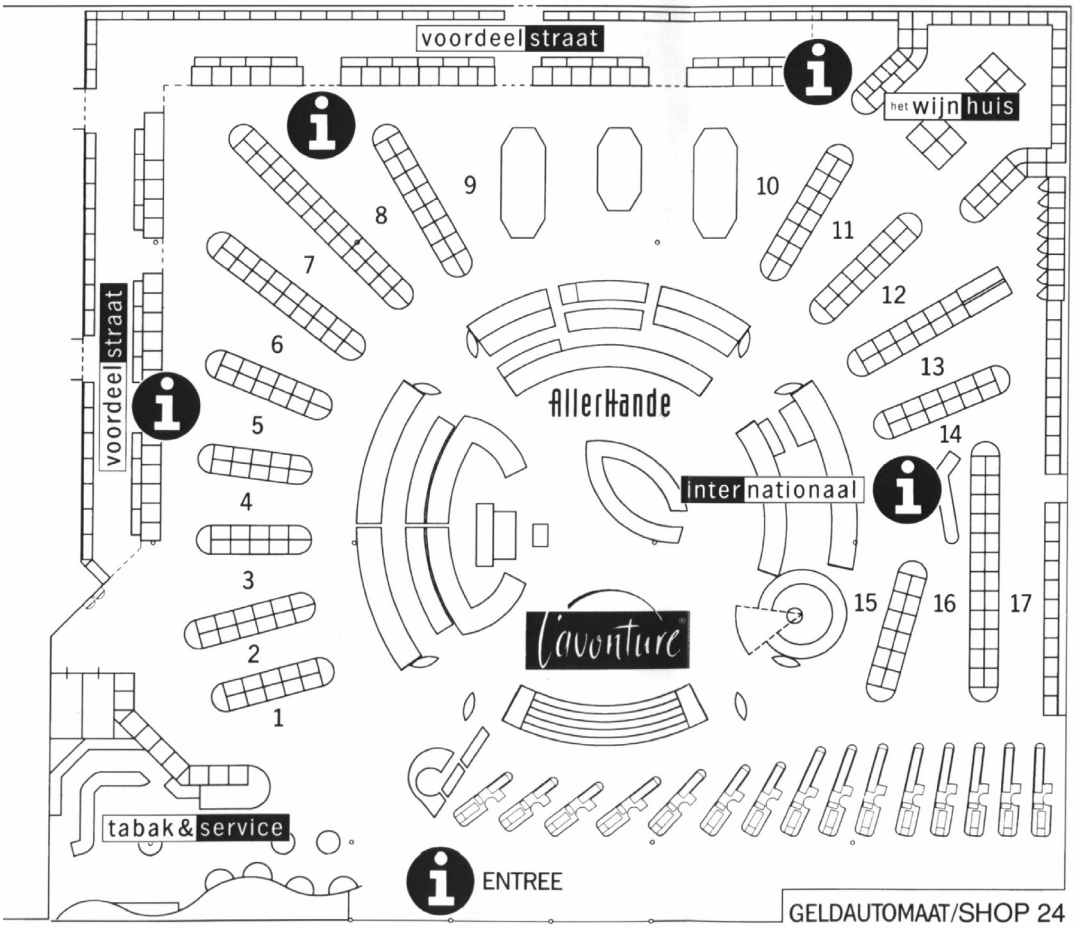
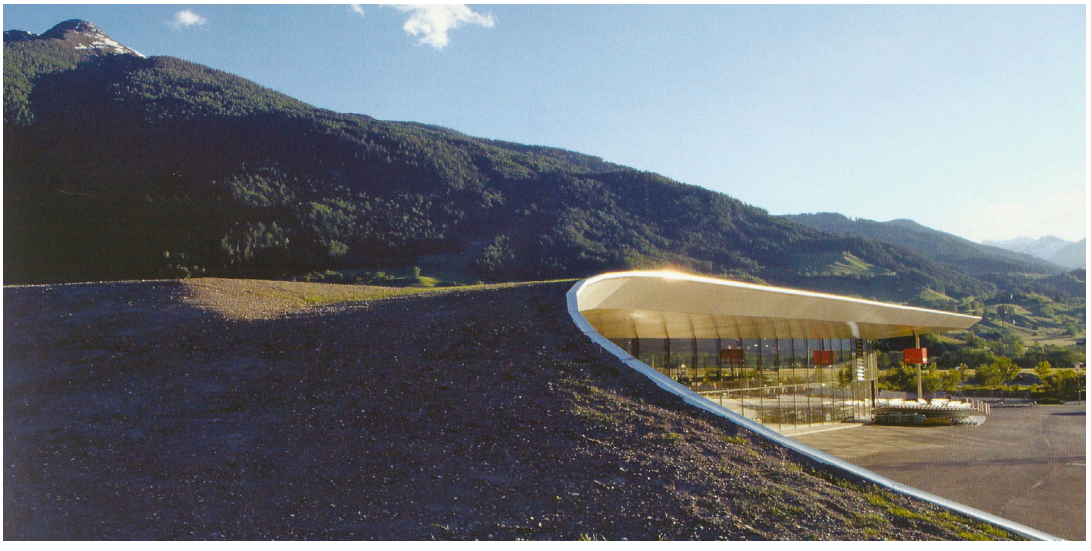


Figure 1.50. Albert Heijn Haarlem. Source: Kooijman, 1999, p. 111

blend the supermarket with its environment resulting in a discrete building with an inviting entrance (Figure 1.51). It is this inconspicuousness that makes the building striking. The green roof is designed as a fifth wall, receiving just as much attention, from an aesthetic point of view, as the four façades. From the adjacent highway only a curve in the landscape is visible (Figure 1.52). The building overlooks the village through large windows, and offers fantastic views of the beautiful scenery to its customers while shopping (Figure 1.53). This supermarket once again exemplifies the use of daylight in current supermarket design (Figure 1.54).

RETAILING IS THE MIRROR OF SOCIETY
(FITCH, 2003; KOOLHAAS, 2001)


MPREIS



(left) Figure 1.51. Entrance of the MPreis. Photographer: Paul Ott Graz, in New supermarket design, p. 195

Figure 1.52. MPreis' curve in landscape.Photographer: Paul Ott Graz, in New supermarket design, p. 199

Figure 1.53. MPreis' inconspiciousness.Photographer: Paul Ott Graz, in New supermarket design, p. 197

Figure 1.54. Daylight use in the MPreis. Photographer: Paul Ott Graz, in New supermarket design, p. 190

1.6. Conclusion

This historical outline shows that:

1. Each of the three typologies discussed influence one another. The supermarket has always stressed the time-saving aspect, while the department store focussed on spatial aspects and spending time (Kooijman, 1999). These differences became increasingly narrow. But there is still a different spatial design between both types. While department stores want to impress and lure the consumer with their buildings, most supermarkets continue putting the emphasis on their interior. The evolution of the department store went from 'halls of temptation', with the emphasis on intuitive design, to a more functional and rational one. Its characteristics changed slightly over time, but the core concept is the same. The architectural characteristics of the first department stores can still be found in contemporary stores, though not systematically. The supermarket originated from functionally based adaptations to the needs of the consumer. However, it evolved into a store that increasingly puts the emphasis on design and experience. Though functionality still rules, intuition and spontaneity in the design does generate interest. Although the supermarkets developed in many different formats, their generic characteristics remained the same. The department store and the supermarket share a similar evolution to a social sighting.

The chain store had an influence on the development of the department store and the supermarket. The American department stores adopted the chain store philosophy and became chain stores themselves. Although Western European department stores were rather large-scale concerns, after the Second World War they themselves opened chains to cope with the competition of the larger specialised chains. The supermarkets also adopted chain store characteristics after the Second World War. Different formats were created to fulfil the needs of the consumer and to increase their market share, leading to the diverse retail chains and strong brands that they are today.

2. Three important evolutions had an impact on store typologies. The introduction of the self-service concept, by groceries, eventually affected all. The interior of these stores changed from a mainly counter-based design to shelving and gondolas. The invention of the escalator revolutionised the department store, and the UPC made it possible for supermarkets to grow in size. These developments show that supermarkets play an important role in the development of innovative retailing. This remains so today. Supermarkets have the ability to react speedily to the demands of the market due to their fast moving products.

3. Since the origin of the department store, there has been an evolution in sensory experience. In the early days, with the origin of 'visual merchandising', consumers were mainly tempted by visual means. The department stores first introduced sound and music by organising small concerts in store to enrich the experience. Later, other senses like smell – with the arrival of fresh products – and touch – the self-service concept – were added. It is only during the later decades that taste has commonly been exploited in supermarkets.

A multi-sensory approach can be seen in the designs of the latest stores, by appealing to all senses (5-dimensional design). As Kooijman (2001) depicts: during the last decades more theatre is added to the supermarket, turning shopping into a favourite leisure activity. It changed from functional shopping to hedonistic shopping. As an illustration, the duration of the average American shopping expedition increased from 20 minutes per week during the 1960's to 180 minutes per week by 1980 (Crawford, 1992, cited in Kooijman). In 1998, in Western Europe the average shopping time is 320 minutes per week (Leunissen, 1998, cited in Kooijman, 1999). It has become a time to relax and to meet friends (cf. the evolution to a social sighting).

4. Obviously, retailing does not function in isolation. It is deeply embedded in the cultural, economic,

geographic and social aspects of its environment (van Hasselt, 2009). Some architects also define retailing as the ultimate form of socialization (Vernet and de Witt, 2007). It is a mirror of society, in other words, it reflects the transformations and changes, or offers a platform to communicate those transformations.

5. The department store, the chain store and the boutique chain store, and the supermarket are the three store types that have shaped the retail scene into its current form. The influence of the industrial revolution, two retail revolutions and the evolution in consumerism have made shopping and shop spaces what they are today. Therefore, they can be considered as a basis for the analysis of the contemporary retail scene. Furthermore, their characteristics and the way they were designed offer a valuable impetus to contemporary retail spaces. Along with this evolution, the complexity of designing these retail spaces increases and demands a specific body of knowledge. The next chapter explains this evolution, and what designing retail spaces entails.

As mentioned, a market segmentation is proposed (Table 1.1) for the current retail scene. This is illustrative and can be used as a guide throughout this thesis[19].

19 Fifteen interior architecture students tested the market segmentation table for its practical application. Six different shopping streets (central and on the outskirts) in Hasselt and Genk (Belgium) were mapped. The table seemed to be valuable for the classification of each store.

Table 1.1. Segmentation of the retail scene today

FOOD	
Hypermarkets	These types of outlets offer a wide assortment of products, from non food to food, but with the focus on the latter, unlike department stores. Due to the square meters necessary to present the wide product range, the scale of the store is seen as 'large'. An example is Carrefour hypermarket.
Supermarkets	Supermarkets offer a wide range of food-products, with sometimes a small assortment of non-food products (e.g., laundry and cleaning products). The scale of the store can vary from relatively 'small', like a convenience store (e.g., Spar), to a 'large' one (e.g., Colruyt).
Discounters	Discount stores are stores that handle 'price' as their core value and diversification value. For a discount-brand a cheap image is primary. The way this image is translated into the store concept might differ. Typical examples are Aldi and Lidl.
Specialised stores & independents	Stores that sell food products on a small scale as independents, or that are specialised in a single food category belong to this segment. This ranges from fruit and vegetable stores to butcheries or bakeries; including small chain stores like Vangrootloon (a chain bakery). Night shops and grocery shops also are classified within this segment.
NON-FOOD	
Drugstores	Drugstores offer diverse, mainly non-food, products. Typical products are products for personal care and home care products. Examples are Kruidvat, Ici Paris and pharmacies.
Furniture stores & home and garden stores	All stores selling home and garden-related products can be placed within this segment. A whole range of different types can be outlined: furniture stores (like Ikea), home decoration stores (like Casa), garden centres, gift shops, do-it-yourself outlets, etc
Consumer electronics and multimedia stores	This includes stores that mainly sell domestic appliances, telecom products, car navigation systems, etc. The scale of these stores might vary a lot, from big-box retailers (e.g., Media Markt) to specialised stores (e.g., local photographer or bookshop).
Cars, other transportation means and accessories	All consumer goods that have anything to do with means of transportation, ranging from bike stores to car showrooms, are included.
Sport & hobby shops	This segment includes toyshops, shops that sell camping products or fishing equipment etc. This segment does not include shops with sports fashion as their core business (e.g., United Brands).

FASHION	
Department stores	The range of products department stores offer is wide, but unlike hypermarkets, their focus lies on selling fashion. The scale of the store can vary from rather small (e.g., Hema, selling only their home brand with relatively small floor space, Hema is also called a variety store) to large (e.g., Galeria Inno, containing several departments, subdivided in brands and product categories, over multiple floor levels).
Chain stores	This type of store represents a brand name, meaning it is one institution containing multiple outlets. A general 'ideal' concept is developed which is rolled out – adapted – to the individual buildings at different locations. So, all outlets are constructed with the same elements and store furniture. Each store resembles the same brand image and brand experience. The aforementioned chain – Benetton – using the 'boutique' as a motif, belongs within this segment because all stores are alike. Other typical examples are JBC and C&A.
Discount chain stores	This type of store also represents one brand name. The brand communicates by focussing on cheap prices. Just like discounters, the cheap image of the store is primary but the way it is visualised might differ. Zeeman and Shoe discount are typical examples.
Boutique chain stores	The outlets of the boutique chain stores belong to a holding (a brand). Each store varies, but they all embody the same image. In other words, each store is designed differently with its own features, but with the same look and feel of a boutique. Clinic, a young Belgian denim store selling multiple brands, has outlets in Antwerp and Hasselt. With only two outlets, both boutique style, Clinic forms a good example.
Independents	Any store or brand with only one outlet, where the owner determines how the interior looks and which products will be sold, belongs to this segment. In other words, when a retailer owns two outlets of the same brand, he is categorised within one of the chain store segments. The product offer can vary from shoes to accessories to pearls, etc.
SERVICES (that require shop floor space)	
Financial services	This type contains banks, insurers, financiers, etc.
Relaxation & grooming	The scale of the service provision might very a lot. Hair salons, beauty consultants, etc. are rather small, but wellness centres are rather large.
Rentals	All companies that rent out physical products to consumers are seen as rental services, e.g., video shop, car-rental company.
Other services	Service-selling retailers like travel agencies, telecom services, interim offices, estate agents' offices, etc. are included.

CHAPTER 2
RETAIL DESIGN

2.1 Introduction

While the previous chapter described the evolution and origin of three influential retail types on retail design today, this chapter focuses on the evolution, the complexity and diversity of the discipline of retail design itself.

Retail design has only become a discipline in its own right during recent decades. It is intended to describe where this started and where it might be heading. Together with the description of its development, I aim to present an attempt at defining retail design.

2.2 The Increased Share of Designing Commercial Spaces in the Architectural Scene

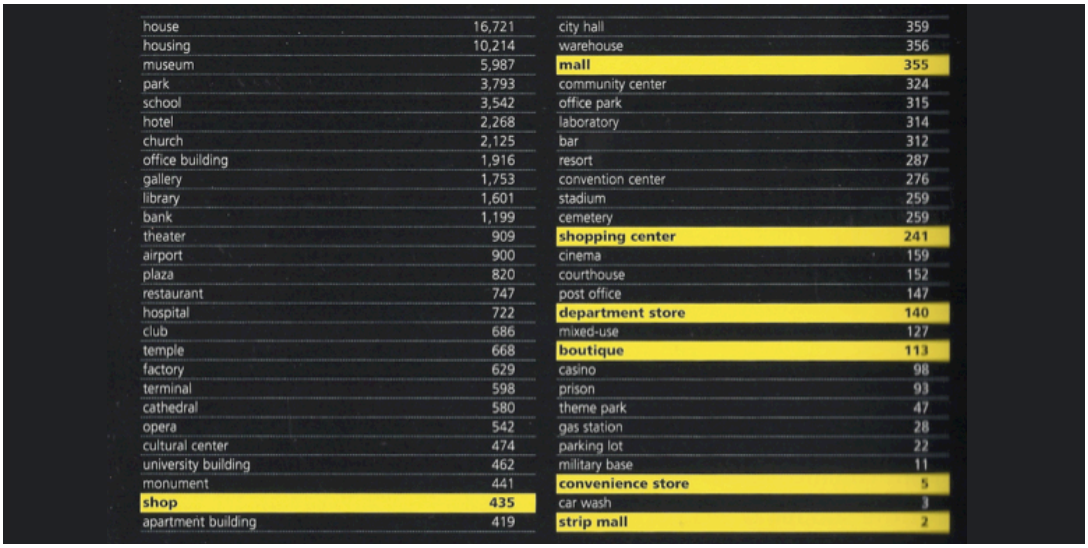
Herman (2001) concluded that shopping and shopping spaces are of little concern to architects. He based this statement on an analysis of architectural journals of different building types. As an illustration, he scanned the Avery Index of architectural periodicals (online database), for the years 1977 to 1997 – a period during which retail design was not yet recognized as a separate design discipline. Figure 2.1 shows the number of articles printed that appeared by searching the index of that time span via the listed keywords.

To examine a possible shift of attention during the last two decades, inspired by Herman and again illustratively, the same keywords were entered in the Avery Index[20]. Because during the last decade an increasing number of articles became digitalised from the time span Herman used, his numbers are not up to date any more. Therefore, to obtain a true comparison, the search is conducted again, but for two equal time periods (2x12 years: January 1985 - December 1997; January 1998 - December 2010) and the same keywords are entered in the Avery Index. Instead of searching the index for keywords in general, within the section of 'subject' only is searched to increase the probability that the yielded articles are about the building type administered. Table 2.1 shows the results.

Although the hierarchy does not change a lot, the absolute numbers of only four of the top ten building types have increased, and six have decreased when comparing both time spans. Also, five out of seven shopping-related subjects show an increase. The number of articles about shops and stores increased even with 502, which is the largest growth administered. Moreover, 'shops and stores' climbed two places. These results illustrate an increase in attention towards these building types.

Since the time that Herman studied the interest in commercial buildings, retail design has evolved to a more complex discipline with many store formats (cf. supra). To illustrate the evolution of these formats and the term 'retail design', they are used as keywords in the 'subject' field as well (for the same time spans and on the same date as the previous tables). Table 2.2 shows the resulting numbers.

20 On the 6th April 2011. Not all of the terms are studied since only a general trend is of interest in this study.



house	16,721	city hall	359
housing	10,214	warehouse	356
museum	5,987	**mall**	**355**
park	3,793	community center	324
school	3,542	office park	315
hotel	2,268	laboratory	314
church	2,125	bar	312
office building	1,916	resort	287
gallery	1,753	convention center	276
library	1,601	stadium	259
bank	1,199	cemetery	259
theater	909	**shopping center**	**241**
airport	900	cinema	159
plaza	820	courthouse	152
restaurant	747	post office	147
hospital	722	**department store**	**140**
club	686	mixed-use	127
temple	668	**boutique**	**113**
factory	629	casino	98
terminal	598	prison	93
cathedral	580	theme park	47
opera	542	gas station	28
cultural center	474	parking lot	22
university building	462	military base	11
monument	441	**convenience store**	**5**
shop	**435**	car wash	3
apartment building	419	**strip mall**	**2**

Figure 2.1. Herman's table (p. 738)

Table 2.1. Results of the Avery Index within the field of 'subject' for the two time spans. To be more complete, the keyword 'shop' is added with the keyword 'store'. When searched separately the keyword 'shop' had 348 hits in the first timeframe, and 585 hits in the second. The keyword 'store' resulted in 1,806 hits for the first period and 2,318 for the second

	Keyword in SUBJECT	1985-1997
1	House	29.156
2	Museum	9.001
3	Office building	7.593
4	Church	4.655
5	University building	2.837
6	Hotel	2.665
7	Shop+store	2.383
8	Bank	1.738
9	Restaurant	1.515
10	Airport	949
11	Warehouse	796
12	Shopping centre	612
13	Mall	604
14	Stadium	467
15	Department store	321
16	Prison	226
17	Theme park	165
18	Cinema	115
19	Boutique	15
20	Car wash	6
21	Convenience store	5
22	Strip mall	0

Keyword in SUBJECT	1998-2010	Difference
House	25.981	- 3175
Museum	9.199	+198
Office building	5.255	- 2338
University building	3.023	+ 186
Shop+store	2.903	+ 502
Hotel	2.794	+ 129
Church	2.733	- 1922
Restaurant	1.348	- 167
Bank	865	- 873
Airport	813	- 136
Mall	679	+ 75
Warehouse	663	- 133
Stadium	663	+ 196
Shopping centre	318	- 294
Department store	275	- 46
Cinema	215	+ 100
Prison	176	- 50
Theme park	143	- 22
Boutique	28	+ 13
Convenience store	7	+ 2
Car wash	7	+ 1
Strip mall	1	+1

Table 2.2. Results of the store formats as searched for in the Avery Index. The following keywords yielded zero hints for both time spans: convenience store, roll-out and shop-in-shop.

Keyword in SUBJECT	1985-1997	1998-2010
Supermarket	92	142
Chain store	15	53
Concept store	1	9
Retail park	1	3
Flagship store	0	9
Outlet store	0	2
Guerrilla store	0	1
Retail design	0	2

These numbers illustrate that there is also increased attention to these specific types of commercial buildings during the last two decades. The larger number of articles for the second time span is clearly influenced by the increasing number of high profile architects who were asked to design commercial buildings and spaces. Koolhaas' work for Prada (NY) and John Pawson's design for the Jigsaw store and B&B Italia (London) are examples. The increased attention towards store design elicited the introduction of high profile architects in the design and vice versa.

2.3 The Retail Design Discipline

Retail design has become a discipline in its own right, containing elements of architecture, interior design, graphic design, product design and web design. The word 'retail' refers to the selling of products to an end-user. So, retail design is about designing spaces to facilitate the selling of these products. Selling products also includes selling services – as do, for example, financial institutions and travel agencies. However, prior to defining what contemporary retail design entails, which is explained in the next paragraph, it is important to understand that retail design has close similarities with other design disciplines.

With the concept space in mind, retail design can include various types of spaces. Only a decade ago 'space' was a physical store environment where products/services were sold. Today, 'space' has become a broader concept with the development of e-tailing (short for electronic retailing). Space is no longer solely a physical space, but also includes virtual web shops. Although e-tailing is still evolving, two developments show an increased interest in this digital retail channel. First is the increasing share of online purchases (Close and Kukar-Kinney, 2010). Web shops like Amazon and EasyJet, who have no physical store, flourish and challenge physical store retailers. They changed their ways from just buyer-seller activities to a multi-interaction platform (Chu et al., 2007). Amazon, for example, helps customers find books that might also be of interest, based on shopping behaviour – personal and that of others. Recently, other products were added. So, when looking for a book on 'bikes', for example, also other products such as bikes, bike accessories, and bike trips are displayed. A second development shows the changing focus of retailers from a multi-channel policy to a cross-channel policy (van Tongeren, 2010, personal communication), partly as a result of the previous development. Up to now, within one company, e-tailing and physical stores existed side-by-side – referred to as a multi-channel policy. Virtual stores are often seen as an extension of physical stores (e.g., Zara and H&M who launched online stores) or visa versa (e.g., Oki-ni online store that had opened a physical 'gallery' store presenting a sample of their product offer – however this store no longer exists). Recently, these two channels have crossed each other – referred to as a cross-channel policy. In other words, retailers have the Internet in store or provide tags or codes that smartphones can scan. This is a helpful tool to provide the customer with extra product information, prices, promotions or even applications (Apps). Designers picked up on this development by including cross-channel design in their service, expanding the direction of retail design with virtual store design. This merge generates an opportunity to create physical and digital spaces that are consistent and above all, are complementary (van Tongeren, 2011, personal communication).

Secondly, it is important to demonstrate that retail design has close similarities with other design disciplines:

- retail architecture, which tends to focus on the architecture of large scale developments such as shopping malls. Architects might focus on the architectural shell, while retail designers emphasize the individual shop interiors. It is important that both cooperate and design such developments in an integrated way.

- hospitality design (hotels, cafés, restaurants,…): although in general both disciplines require their own design approach – retail interiors have more (self-service) visitors in a shorter time span, while in the hospitality business, visitors usually stay longer and require more service – they both deal with large numbers of customers who need to be satisfied. Moreover, crossovers between retail design and hospitality are inevitable, since many stores include cafés and restaurants. Vice versa, many restaurants or coffee houses sell books, mugs and other related products. And, the increasing share of shopping areas in airports and train stations, and the increasing number of takeaway food outlets, blurs both disciplines even more.

- service design: although service design is a broader notion including, for example, hospitals, museums, and package and freight services, there definitely is an overlap between both.

Next, the evolution of retail design is briefly discussed and, based on an evolving definition of the discipline, a new set of definitions is presented.

2.3.1 The Origin

Throughout history, graphics such as logos and fascia, have been used as the primary identity communicator for a retailer (Fitch and Knobel, 1990). Gradually, this development of communicating retailers' identity continued into the design of the store interior. To create a coherent image, the signage, displays, packaging and ticketing was designed with the same graphic elements as the company logo (Kent, 2003). In the 1960's, when retail design as a discipline was in its infancy, it was approached more artistically, rather than functionally (Din, 2000). At this time, the economy focussed on production, technology and availability. Since the 1980's the profession of interior designer was emancipated and became a discipline in its own right. This had also implications for retail design, which started to lose its exclusively artistic dimensions (van Amerongen and Christiaans, 2004) to more informed ones. At that time the product was king and a design was complementary and never eclipsed the products on offer (Din, 2000). During the last decade this has changed. Kent (2003), for example, argues that instead of functioning as a background to products, retail spaces nowadays have conquered their own properties. Store design is emphasized in retailer differentiation strategies (Doyle and Broadbridge, 1999) and positioning (van Tongeren, 2003). Not all retail formats place design as central to their strategy, but in flagship stores, for example, most often their visual appearance matters as much, if not more, than their mere commercial attributes (as mentioned in the previous chapter on p. 28).

Several steps led to a professionalization of the discipline, its definitions and its methodology (definition and methodology are clarified in the next paragraph). Regarding the professionalization, a first element is the urge for differentiation. In today's global market[21] it has become difficult for retailers and brands to compete. So, throughout the history of the relationship between design and marketing, one of the key roles for design has been to 'make the difference': while being aware of the merchandise carried by competitive retailers, the design of a store becomes more important when the merchandise itself is increasingly perceived as similar. Creating a unique environment can become a necessity for customer binding.

A second element concerns another shift in our economy, which makes the consumer the focus of attention. Firstly, he is no longer seen as solely a buyer of products, he is also seen as a consumer with a personality, feelings and longings. This perspective

21 The increasing economic integration between countries has led to a globally accessible market.

requires different (marketing) approaches and new retail concepts with more attention to the designed environment. Secondly, the consumer has changed his shopping behaviour. Associated with the rising prosperity that large groups of people in Western society have experienced, these people spend an increasing amount of time on shopping (cf. timeline). Shopping has become a leisure activity as part of our daily activity. Some would even argue that it is becoming the principal source of public activity (Leong, 2001). Consequently, functional shopping has evolved into hedonistic shopping and destination shopping. Also, consumers today spend a lot of time shopping on the Internet (Chu et al., 2007), searching information in order to compare products and prices, or making real purchases. This changed the consumer from a passive unaware partaker, to an informed, active participant (Prahalad and Ramaswamy, 2004, cited in Petermans, 2009a). Thirdly, society today is one where consumers are searching for new experiences. Pine and Gilmore (1999) referred to this phenomenon as the Experience Economy. This development has affected the retail scene since shopping and looking for new experiences are essential aspects of society today (van der Loo, 2004). This also embodies increasing competition from the leisure industry.

In sum, the homogenisation of products and the ever-changing expectations and aspirations of the consumer, that are above all paramount, has made retail design a fast-emerging discipline with a sophisticated design approach that has already found its way into the design world. How designers can act upon these developments will be discussed in the paragraph on 'Added Value'. First we present an evolution of defining retail design.

2.3.2 Definition

Due to its recent appearance, retail design discipline is still lacking a clear definition. Moreover, just like many other disciplines, it is still evolving, making it difficult for a definition to remain up to date. Moreover, definitions hitherto did not take the aspect of e-tailing into consideration. To arrive at a definition of the contemporary retail design discipline, a survey of recent attempts is given to explain how it has progressed.

An Evolution of Defining

A first meaningful definition comes from Kindleysides[22] (2006). His definition shows the different aspects that a retail designer needs to be aware of when designing commercial spaces. Kindleysides says retail design is:

an understanding not only of what will work aesthetically within the space, but how it will perform functionally and commercially, and how it can be built to budget and meet all of the regulations governing the use of a public space.

Kindleysides indicates that designing commercially and for public spaces requires more skill than mere interior design. On one hand, as a semi-public space, a store needs to be inclusive to different people with different social, personal and even different cultural backgrounds, each experiencing a store differently. Peek (1999, cited in de Chätel and Hunt, 2003) means the same when saying: "*It is not the amount of design that makes a successful shopping environment, but knowing of the effect of it on the consumer*" (p.101). Note that although the term 'space' is used to define the physical store space by Kindleysides, 'space' can also relate to the virtual store space. On the other hand, designing commercially is about designing spaces that eventually generate or increase turnover. In that case, building to budget is part of commercial design. In order to design a commercially effective store, an understanding of the retailer and/or brand is necessary. Van Tongeren (2003) confirms this by describing the design of a store as: "*A creative representation of the interplay of the rational and emotional elements of the brand*

22 Although this definition is no longer accessible on the World Wide Web, it is used due to its completeness and trustworthy source. The definition is written by a renowned designer and published on a respectable design institution's website (www.designcouncil.org.uk). (Kindleysides, J., 2006. About: retail design) [accessed 07/11/2006].

and its formula" (p. 12). According to van Tongeren, design shapes thoughts. So, thinking is, and should be, the primary action when designing stores. He continues by expressing that a deep understanding of how brands work, how the formats are organised and established, is necessary. This needs to be related to what consumers expect from a brand. So, a retail designer designs for the retailer and the consumer. A designer must place himself in the aura of those two. Also Din (2000) emphasises this brand value in a second definition, depicting retail design via its principles:

The role of contemporary retail design is to link instinct, art and commerce…to come to efficient (in terms of space, flexibility and cost) and effective (to communicate the retailer's brand values and encourage consumer activity) retail environments that meet the ever-tougher consumer demands. It incorporates the management of people and space to meet up to the most essential characteristic of retail: change. Therefore a designer's task is to combine his expertise and the retailer's knowledge of the market with elements of psychology, technology and ergonomics (p.10).

Din continues by saying that of the majority of industries, retail is the most susceptible to the ever-changing demands of consumers, the economy and public policy. With this description, Din considers design at a strategic level and applies it to every aspect of retail space. He also indicates that retail design is multi-disciplinary as it is a result of a contemporary design processes drawing the consumerist, psychological and aesthetic elements together.

Although these descriptions present essential aspects of retail design, they fail to answer one question: what is the purpose of retail design? Why do people shop in one store and not in another? Although price, brands, quality and location are important choice determinants (and for some stores, the most important ones), the answer seems to lie beyond. Fitch's (2009) remark "*only one store can be the cheapest, the others have to use design*" introduces that concept. What Roberts (2005) tells about products in his book on 'Lovemarks' can also be adopted by stores: it is about a relationship. To Roberts, lovemarks are brands with a special emotional connection, generating loyalty beyond reason. He refers to his lovemark 'Head & Shoulders', a shampoo that removes dandruff. Although Roberts is bald, he buys or uses nothing else. Also, Kapferer (quoted in van Tongeren, 2003) states *"a relationship is created when a retail space ceases to be merely a merchandising outlet and instead becomes a place where passion is shared"*. So, the real function of retail design can be 'adding value'. This goes beyond mere functionality and efficiency. Even more so now a commodification of products, brands and retail occurs. A retailer can never take his customer loyalty for granted (Din, 2000). He is forced to continuously seek out what will make him the retailer of choice. In order to do so, a store needs to communicate a message, and best of all, the brand message (this will be elaborated theoretically in Chapter 3). Based on the message the store projects the consumer perceives the brand image. This image is usually a direct translation of a brand's values. However, the greater proportion of these values remain imaginary and intangible so only a simplification of their total set of values is displayed. In other words, this is called retail branding. Whilst the concept of a brand[23] and branding[24] is widely spread in the context of consumer products, to the discipline of retailing this is more recent (e.g., Burt and Sparks, 2002). Many product brands have turned into retailer

23 A brand is a result of a holistic set of associations (anon, 2010). The term 'brand' originates from the Old Norse or Germanic root 'burn'. Literally this means burning a mark with an iron stamp on a farmer's cattle. This was a way to differentiate one herd from another. Along with such a trademark, the origin and the story that was involved with it, was communicated to its consumer. So, when eating a steak coming from a specific farmer, the mark had conversational value, making the steak extra special.

24 Communicating the emotional and rational values of a brand. The rational values are about what a brand really is (products, price, service level, etc), the emotional values are the human traits of that brand (mentality, behaviour, social values, etc.), what resembles personality (Ailawady and Keller, 2004). So, trademarks moved from simple name-tags to marks of reliability and trust (Roberts, 2005).

brands by opening their own stores and, vice versa, many retailers have grown into strong brands. Also in scholarly research, this perception of retailers as brands has received quite a lot of interest. This is the concept of 'retail branding', meaning that branding principles are applied to retailers (Ailawadi and Keller, 2004). From now on, the term 'retailer' is used to indicate both.

In a way, branding can still be seen as 'burning a brand', but in consumers' minds: making a lasting impression. So, retail branding is about communicating the identity of a retailer, including emotional and rational values. A store environment can be a brand statement, conveying its values, where the consumer can experience the brand, feel it, see it, touch it and breathe it.

A RETAIL BRAND IDENTIFIES THE GOODS AND SERVICES OF A RETAILER AND DIFFERENTIATES THEM FROM THOSE OF COMPETITORS.
(AILAWADI AND KELLER, 2004, P. 332)

To Define or not to Define

Defining the dynamic field of retail design is quite a challenge. Not only does it change continuously, it includes so many aspects and it is practised in so many different design disciplines – from product design, to graphic design, packaging design, architecture, interior and web design – that any definition will fall short in including all. Therefore, it is aimed to describe the retail design discipline as it is today, rather than defining it.

Retail design refers to designing spaces for selling products and/or services and/or a brand to consumers. It is trans-disciplinary in its intention to create a sensory interpretation of brand values, through physical or virtual stores. A retail designer therefore tends to conceptualise the consumers' needs into a spatial programme.

To complete this description, the methodology, all related aspects, the complexity and the diversity of retail design, are visualised. I developed a model as a structuring device (Figure 2.2). Two points are taken into account. Firstly, as the retail design discipline is historically evolved from interior design – despite the fact that it now entails more disciplines – we used it as the basis for our model.

Secondly, to describe what retail design is about, the basic assignment that a retail designer receives from a retailer or brand, is taken as a starting point[25]. The boundary conditions, as they occur in the assignments, are used to separate different design levels. Three retail designers were asked to provide input.

The model proposes three layers including the boundary conditions that occur in designing retail spaces: type of location, all different design levels/ aspects, and the type of delivery. Designing retail spaces can occur with or without the context of a given location (the first boundary condition). When no location is given, the outcome can be a physical store design on a conceptual level, or it can be a web shop. The latter means that a two-dimensional (digital) store is required, with or without the need for product and packaging design. The design of the Amazon

25 Other input, such as retail branding - designing and thinking of strategy and communication - also plays a crucial role. Most often, marketing agencies and communication specialists are called upon to conduct feasibility studies, through target group analysis, etc. to create a brand and its rules of communication (i.e. corporate identity).

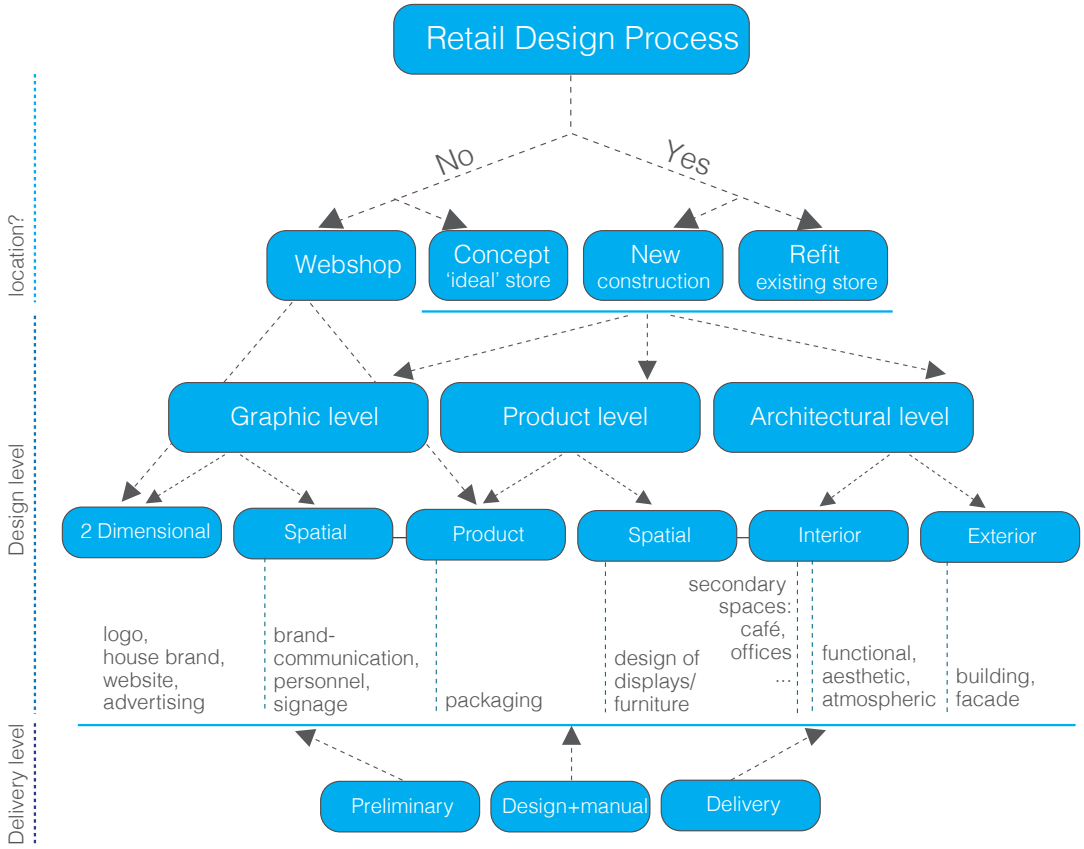


Figure 2.2. The retail design process

web shop is an example of a store that remains on a graphic level with a logo, website and advertising. The design of the online store Rituals (rituals.nl) adds the product design level with packaging design. In the case of a conceptual design, an 'ideal' store is developed in a fictitious or generic space. This type of design brief is common for chain stores. The 'ideal' store is used as a reference for the roll-out stores. With an existing location, the design brief can be to design a completely new store and new building, or to update an existing store and/or renovation of a building.

A next boundary condition indicates to what level the design should go. Three design levels are proposed – graphic, product, or architectural – each operating separately or combined (two out of three, or all three). Firstly, on an architectural level, the design of the interior – with its functional, aesthetic and atmospheric aspects – is accompanied by the design of the façade or complete building, depending on the location. Shop-in-shops, for example, remain only on the interior level, while big-box retailers require a design for the interior and for the façade. In some cases, in hybrid stores for example, also a design for the secondary spaces is required, such as bars, restaurants, offices, etc. Secondly, on a product design level, packaging in line with the company logo can be designed. In a more spatial context, sometimes brands require specific product displays, such as product brands sold in pharmacies and

supermarkets. So, product design could focus on designing such display furniture, to be implemented in different locations. Or, for unique designs, retailers might opt for specific furniture design, optimised for their products/brand. So, instead of using existing shop fittings, specific furniture is developed. Thirdly, the graphic design level can entail, next to a company logo, communication and website, a more spatial function including signing and the visibility of the personnel (i.e. clothing). Note that to achieve a consistent and harmonious design, a multi-disciplinary design team should work closely together across the different levels.

Finally, when the design is complete, the delivery can differ from a preliminary design to a complete delivery of the store or multiple stores. Some design agencies choose to only work on the preliminary (conceptual) design level. Their focus is to generate new ideas. The retailer will take such a design to an implementation designer or contractor. In some cases a design manual is produced which contains rules or guidelines for the contractor to follow. The content can range from proposed gondolas to the colour profiles of the walls, lighting, photography, the way the company logo is allowed to be used, etc. For example, in cases of roll-outs when only an 'ideal' design is delivered, this document helps the retailer to stay true to the design concept when rolling it out to other outlets.

2.3.3 Designing the Physical Store Space

For the rest of this thesis, the focus lies on designing physical store spaces for selling products and services.

Figure 2.3 visualises the different aspects of design, which a retail designer will probably encounter during the process. In most interior design assignments, understanding a building and its (future) occupants are the starting point and subject of investigation. In retail, however, the brand and its (future) consumers is the starting point and the building or site often comes later. This makes designing physical commercial store spaces so specific. As mentioned earlier, retail branding has a large impact on store design. Being a retail designer involves on the one hand placing oneself in the retailer's position – who am I, what image do I want, what am I selling and to whom am I selling it, are the questions to consider – and on the other hand involves placing oneself in the position of the consumer. Moreover, what the retailer wants to be and what the consumers expects of him, needs to be in balance. Translating the values of both into a feasible store design implies finding a design language that fits both, rather than fitting the preferences of the designer[26]. Because of the relative emergence of the discipline, retail designers would benefit from the knowledge of other specialists. Understanding the way in which retail space can affect and provoke, how people interact with it or how they behave, are only a few of the aspects a retail designer should consider. Din (2000) mentioned that designing physical stores is about the management of people and space. However, what Din did not mention and what makes retail spaces differ from other public places is the selling of products and/or services and/or image. The bottom-line is, something needs to be sold that makes a retailer profitable. A bookstore, for example, is different from a library because it needs to sell. This means that instead of placing all books with their backs on the shelves (as a library does), rather the cover of the books should be visible to make the product more appealing. Another example is the difference between a museum and a store. Whereas a museum has lots of floor space and each item is presented with the necessary surrounding space to be admired by the visitors, a store usually has smaller spaces. This requires a much more dense product display, resulting in more people being present per square meter. Therefore, retail design is about managing people, products and space at the same time.

26 Unless a very high-profile designer is asked to design a store; the choice of a high-profile designer to add value to the brand, allows that designer to use his signature. The possible danger in this approach is that when too many retailers hire that designer, the stores might become similar, promoting the designer more than the retailer.

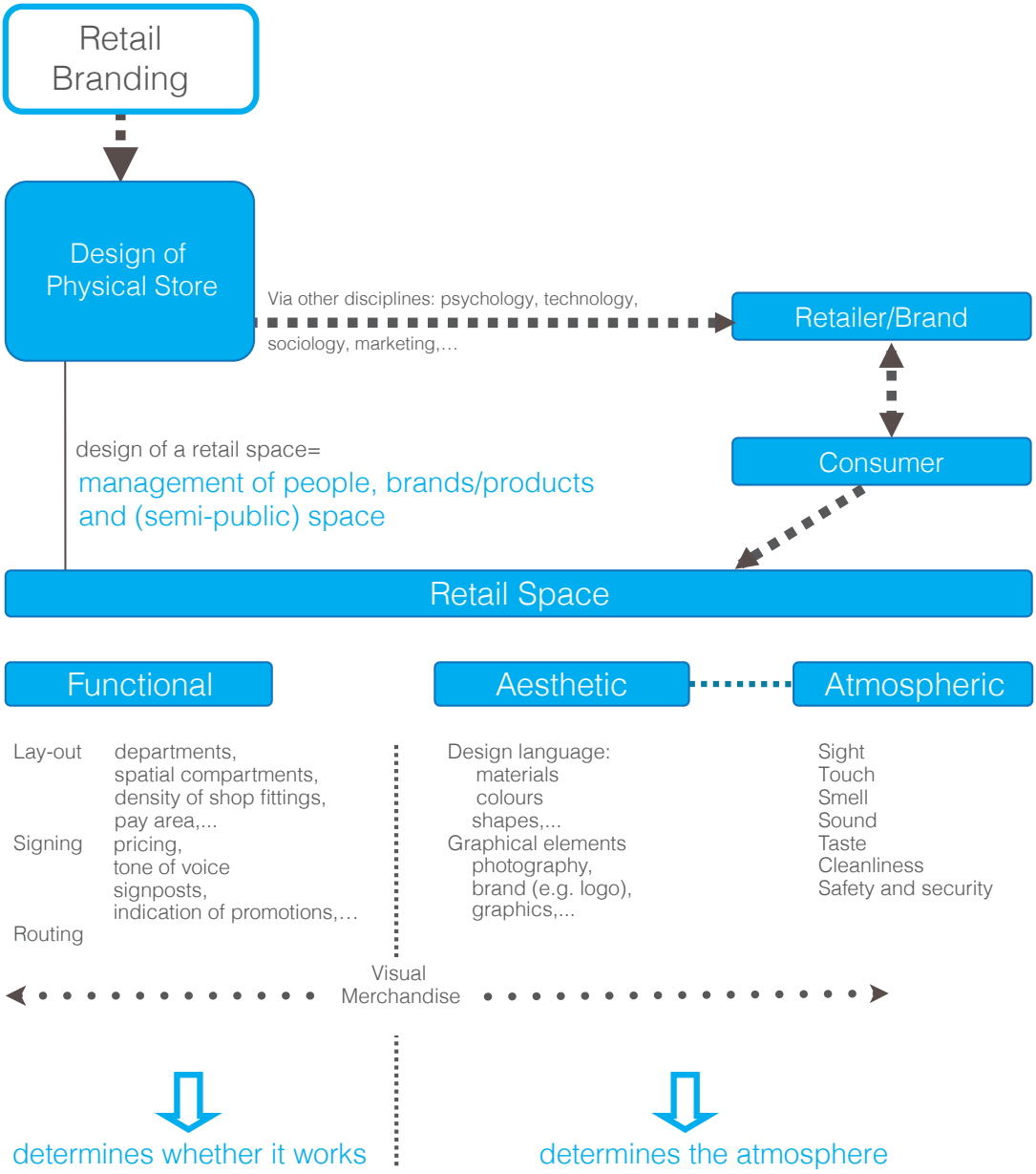


Figure 2.3. Retail design from an interior designer's view

Figure 2.4. Interior of the Hema (Amersfoort). (online) Available at: http://www.opera-amsterdam.nl/projects.php?pro_id=2

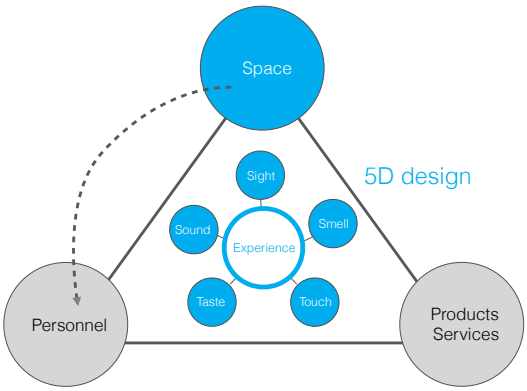
Figure 2.5. Interior of the Dover Street Market, London. (online) Available at: http://www.doverstreetmarket.com/about/

Figure 2.6. Abercrombie and Fitch store, New York. Author's collection, 2010

As mentioned previously, retail branding (including corporate identity, house brand design, communication design…) is an important aspect to deliver input. Also, the requirements of the consumer and the retailer provide input that needs to be considered while developing a concept for a retail space. The interior of that space can be clustered in three aspects: functional, aesthetic and atmospheric. Note that the division between them is not strict. Just like visual merchandising can function within all three aspects, lighting for example, can too. Moreover, these elements do not function in isolation, but generate the holistic experience of a retail space. This holistic aspect has become increasingly important and includes integrating every aspect consistently. To illustrate the difference between the three aspects, three examples of stores are highlighted that are oriented more to one of the aspects. A more functionally oriented store would be the Dutch Hema (see Figure 2.4). Although the signing and colours inside the store are pleasing to the eye, the simple layout, clear pricing and functional product display are designed to increase shopping efficiency. More aesthetically oriented stores are Comme des Garçons stores – in New York, Dover Street Market in London (see Figure 2.5) and their guerrilla stores. They all pursue highly visual stimulation. The stores are designed as a discovery through the space, with hidden corners and surprising angles. Especially Dover Street Market aims at making a (visual) statement. The invited artists each designed a level of the store showing their artistic creativity, rather than a more knowledgeable approach to the design (ultimately returning to the artistic dimension such retail design employed in the 1960's) (Van Cleempoel, 2008). Highly atmospheric stores are the Abercrombie and Fitch stores (see Figure 2.6). Apart from the store being relatively dark, which sharpens the other senses, they all have a particular atmosphere. Even before entering the store their typical music and scent welcomes the visitor. Once inside, well-designed spot lighting makes the bright colours of the clothing immediately noticeable. The particular atmosphere created stimulates a feeling of high-arousal for those receptive to it.

However, what determines the perception of a store is more than the architecture (aesthetic, functional and atmospheric aspects) alone. It is the – preferably harmonious – combination of architecture (interior and façade), the products and the staff as visualised by Senta in Figure 2.7. Nevertheless, a retail designer focuses on staging the 'space' domain. Although sometimes the presentation of personnel (e.g., clothing) and the products/services (e.g., packaging) are included, the products or services that are sold are a given, though the personnel hired and the way they behave is beyond his control. However, the design of a store does have an influence on how the staff feels and behaves as a result (Underhill, 1999). For example, if a store lacks efficiency through bad design, this will determine the mood of staff, and in turn their interaction with the customer. The atmospheric aspects are also included in Senta's model (2007) as part of a retailer's identity communication. As mentioned previously, Din (2000) says that a retail brand can communicate its identity with the consumer on a three-dimensional level. But retail spaces evolved from a three-dimensional space to a five-dimensional space, including the five senses[27] – scent, sound, touch, taste, and sight.

In our historical survey we already referred to the importance of addressing all the senses, but more recently retailers and designers have started to use this intentionally as a means of differentiation by creating 'added value'. The following paragraph explains this more fully, among three other developments that offer opportunities to create added value.



Olfactory: next to the scent of products, the space or the materials used might release an odour that determines the atmosphere in the space.

Touch: touching the door handle when entering, touching the curtain of the fitting room before trying out an outfit, feeling the material of the cash desk when paying, etc. are all moments that the sense of touch addresses, next to handling the products.

Hearing: the sound of high heels on a floor, the sound of shopping trolleys, the hum of the ventilation system, the echo of voices, etc. all determine the atmosphere of a store.

Sight: most visual aspects have some level of determining the atmosphere and the experience.

Taste: this remains mostly within the food sector.

Figure 2.7. The retail experience. Adapted model of Senta (2007)

27 Note that the exclusion of the appeal to one of our senses might be a conscious decision. So, absence of music, for example, might contribute to the perception of the store.

2.3.4 Added Value

The evolution that led the retail design discipline to its current level – a restless search for something new, something better or something different – also challenges the retail designer to create unique shop spaces. There are several important developments to be considered when developing new concepts. Four are described:

- Experience economy
- Sustainable design
- Authenticity
- Innovation

One of the roles of a retail designer is to create added value. This is closely related to adding emotion (Piët, 2006). How this plays a role in the four developments is explained as follows.

Experience Economy

The concept of the experience economy was first described by Pine and Gilmore in 'The Experience Economy: Work Is Theater & Every Business a Stage' (1999). They describe the current society of that period as one of consumers eagerly searching for new experiences. This development has affected the retail scene. As a possible differentiation strategy, retailers started offering unique experiences for shop visitors. Since the launch of their bestseller in 1999, the experience economy has already been through two phases. In the initial one, it led to shopping environments that were designed to 'impress' the consumer. Nothing more than a passive participation was required. This first development mainly occurred in the United States. Europe responded more cautiously to the trend. This can be explained by Dewey's statement (1934, cited in Petermans and Van Cleempoel, 2009b) saying that experiences are always context and situation specific, implying that this concept does not necessarily work in the same way for everybody. The American examples of the M&M flagship store (Figure 2.8 and Figure 2.9) and the Toys'R'Us flagship store (Figure 2.10), both on Times Square, illustrate the concept of passively experiencing the store. Both stores are based on impressing the visitor and immerse him/her in the retailer's world. Only a few European retailers adopted this concept. Then, second-generation experience stores arose, challenging the role of the customer to keep on exceeding their expectations and to leave a memorable personal impression (Prahalad and Ramaswamy, 2004, cited in Petermans and Van Cleempoel, 2009b). The second generation places the customer in a central role, instead of the brand. The customer is seen with all his/her facets and aspects as a human being (as explained supra), creating their own form of meaning. The dialogue between customer and business forms the basis for co-creation of values, meaningful and unique to each consumer (Petermans and Van Cleempoel, 2009b). Designing retail environments as such can be the key to long-term success (Hirschman, 1984; Sweeny and Soutar, 2001). However, Verhoef e.a. (2009) points out that literature on how to create and direct those experiences often lacks usable concepts or definitions. In the current retail scene several implementations of this second generation are visible. An example where the customer is invited to participate in determining the shop experience is the Build-A-Bear Workshop. This American retailer, founded in 1997, sells the experience of making and customizing your own teddy bear. Customers can choose a bear, how it is stuffed (Figure 2.11), what sound it will make, how to wash it (Figure 2.12), what clothes it should wear, to finally naming it and receiving a birth certificate. The experience of the customer is one of co-creation. This second-generation penetrated (in America and Europe) even the smallest (independent) stores such as jewellery and fabric shops that, next to selling the product, offer workshops to design and create your own customised product, whether a piece of jewellery or a garment, in each case. Previous examples show the participation process on a product level. However, this is also visible in the design of the store. For example, whereas the first generation is often designed as the world of a brand, aiming to impress its visitor, the second generation focuses on getting the customer to participate. This requires a different design; a design that makes this message visible and understandable, so that it stimulates the visitor to act. The store's interior can aid such a message. In

(left) Figure 2.8. Façade of the M&M flagship store, New York. Author's collection, 2010

Figure 2.9. Interior of the M&M flagship store, New York. Author's collection, 2010

(next page) Figure 2.10. Toys'R'Us flagship store, New York. Author's collection, 2010

(right) Figure 2.11. Stuffing a bear at the Build-A-Bear Workshop, New York. Author's collection, 2004

Figure 2.12. Washing a bear at the Build-A-Bear Workshop, New York. Author's collection, 2004


BEN
ALIEN

the Build-A-Bear Workshop, for example, the interior is designed as a well run machine: the steps the customer needs to follow and the necessary tools/ machines that are needed to build the bear, are all clearly visible and linearly positioned. Signage throughout the whole store communicates the complete process. In the case of a jewellery store, for example, workshop areas are positioned in the store so customers can watch the action or, when no workshop is happening, become curious about what that area entails.

The above examples are about customizing products, however not all products give the opportunity for customization. So, on a store level, a possible way to change the design of the store by means of the experience economy is becoming more 'theatrical'. In other words, staging the customers' shop experience in such a way that he or she can determine his/her own level of involvement is key. There are several ways to do this, three examples are proposed: creating consistency, offering a holistic sensory experience and adding extra features that draw out the experience. These ways can be adopted all together or separately.

The first example, **creating a consistent store environment**, should be carried through to the smallest detail, since committed customers will pay attention to such detail. To obtain such an environment, not only the products and the people need to be in line with the brand, but also all functional and aesthetic aspects have to express the retailers' brand values and personality[28]. When the store looks and feels consistent with the retailer's image, i.e. the way the customer perceives the retailer and bases an expectation on that perception, the customer is immersed in the retailer's world. In other words, from A to Z the retailer tells his story via all the channels that reach his customer. An example of such a coherent and consistent story is Ikea. This retailer succeeded in creating a strong brand. Their website, advertising and store design all present the same values and personality. Even more so, they constantly interact: what is promoted on the website and in their advertising is also clearly indicated in store. The website, also being an online store, even tells you which products are available or not in your nearest store. Regarding the store design, this represents what Ikea stands for: offering creative and affordable solutions (i.e. products) to create a home for each family. The whole store environment is based upon this. For example, the functional aspects such as layout, routing and the density of shop fittings (placed wide) are organised to fit their family clientele. In the first part of the store layout and routing are clear and, by clustering and presenting the products in rooms, (e.g., bedroom, bathroom, etc.) they aim to inspire the creation of individual environments. When the customer proceeds to the buying area, the products are displayed in categories (e.g., lighting, drapery, etc.) in the second part of the store[29]. The tone of voice used and signing emanate their creative and playful image (e.g., see Figure 2.13).

Figure 2.13. Entry for the kids department saying 'for the most important people of the world'. Author's collection, 2007

28 A retailer's 'personality' (the emotional values) consists solely of values that correspond to human traits.

29 To increase impulse purchases, home decoration products are also displayed in bulk and available in the inspirational part of the store.

The aesthetic aspects such as the design language used in the store are an extension of the brand: relatively cheap materials, the creative solutions displayed in the mock-up rooms, the bright colours, etc. To complete the Ikea experience everything is staged; from the moment you enter the store and any contact with the outside world is cut off, to the routing you are guided to follow through all the mock-ups and furniture displays. The restaurant is strategically placed between the two parts so the customer can think about all he or she has seen and can decide what to buy. Although some contact with the outside world is allowed (through the large windows in the latest concept of the store) Ikea makes sure you do not forget about what the brand stands for: all furniture and accessories in the restaurant are products Ikea sells, even the restaurant's food ingredients can be bought just before you leave the store. The food, free coffee for Ikea members, filling your own ice cream cone, all represent Ikea's creative home and family philosophy.

(right) Figure 2.14. The refined interior of the Rituals store Hasselt. Author's collection, 2011

(top) Figure 2.15. Testing display of Rituals. Author's collection, 2011

The second example, **creating an environment for the senses**, includes the appeal to all senses – olfactory, sight, touch perception, hearing and sense of taste. This is a tactic to immerse the customer in a brand's world, not only by telling and visualising its story, but to create an atmosphere that offers a five-dimensional experience. For example, the tasting of products has reached another level since supermarkets installed cooking displays to offer freshly cooked snacks for the customer to taste, prepared with the products from the store to promote them. But also fashion brands started including taste. To appeal to more senses, Armani developed a chocolate line, which is presented in his latest New York store. The stores in Milan and New York also have Armani restaurants where the designer's personality is projected onto the food. Also, scent is appealed to more often due to new technologies. Next to supermarkets that have already been vaporising artificial odours of freshly baked bread for a long time, other fragrances are being developed and studied for their impact on customer behaviour (Douce, 2011). Examples of a consistent sensory design are the brand stores of Rituals. As well as the music that puts the customer in the right mood, the odour of their products fills the store. The materials represent the refinement of their products (Figure 2.14). Some of the cosmetic products can be tested which, in a way, can be seen as tasting the product (Figure 2.15). The touch of those products and the touch of the wooden cash desk when paying for those products complete the look and feel of the brand. With selecting the sound, scent, look and materials that fit the brand, a holistic experience is evoked.

A last example, **prolonging the store experience**, is adding extra features that exceed the mere presentation of the product. Elements like offering a place to play with the products or to take a break add to the experience, but also lengthen it. When customers spend more time in the store, they are more exposed to the brand experience, possibly resulting in buying more products (Underhill, 1999) or indulging in the brand. To this end, retailers include coffee corners and book kiosks into their store. The Apple flagship stores, for example, try to engage the customer by offering multiple services. All products can be tested in a relaxed way and as much and for as long as the customer wants. The genius bar (Figure 2.16) and the lecture space (Figure 2.17) are places where store personnel and Apple users can exchange information. A kid's corner offers the young consumer the possibility of experimenting with the products as well. So, it is not hard to spend a couple of hours in an Apple store. Apple believes that their products are the easiest to work with and the most playful on the market, so they want their customers to become convinced. Hence, the best way to make people believe in the brand is spending quality time with their products.

Figure 2.16. Apple's genius bar, London. Author's collection, 2009

Figure 2.17. Apple's lecture space, New York. Author's collection, 2005

Adopting all three suggestions in one store is also possible, as Whole Foods Market does. On the product level, customers can compose their own meal, hot or cold (Figure 2.18), or ask the chef to prepare it for them (e.g., pizza). On the store level, the functional and aesthetic aspects are coherent and are a visualisation of the Whole Foods Market philosophy (selling the highest quality natural and organic products). The design language, the materials used and the presentation of the history of the retailer represent honesty and transparency (Figure 2.19 and Figure 2.20). Their informative website is an extension of the store, offering a lot of information on recipes, nutrition, etc. Their blog also streams new music releases of, in their opinion, exceptional artistic quality. The smell of fresh products, the tasting of new products, and items presented in an artisanal way, are some aspects that determine the Whole Foods Market atmosphere. The tone of voice adopted and the friendly and helpful personnel make the customer feel welcome. Staff are also recognisable by their uniform, wearing dark green aprons – expressing their active role – worn over black clothing – leaving space for a personal touch. Furthermore, the materials used and the resulting acoustic quality, are all well considered and complete the Whole Foods Market experience. Finally, extra services, such as a restaurant and a Fresh & Wild shop-in-shop, lengthen the customer's stay. By profiling themselves with organic products they focus on sustainability at product level, as will be discussed in the following paragraph.

(left) Figure 2.18. Take-away meal counter, Whole Foods Market, New York. Author's collection, 2010

(top) Figure 2.19. Overview of Whole Foods Market, New York. Author's collection, 2010

Figure 2.20. Whole Foods' cheese counter, New York. Author's collection, 2010

WE DO NOT INHERIT THE EARTH FROM OUR PREDECESSORS,
WE BORROW IT FROM OUR CHILDREN
(AN ANCIENT PERUVIAN PROVERB)

Sustainability

Sustainability is a term used in many disciplines, ranging from politics to engineering. Also in the design culture the word is widespread and it covers many outcomes. The concept was introduced in the 1970's following a much-discussed report 'The limits of growth' produced by the Club of Rome (Kruithof, 2004). This report associated the production of rich industrial nations with the effects on the environment and the exhausting of natural resources. Kruithof described sustainability as "*to be about maintaining and propagating human dignity and about taking responsibility'"* (p. 123). Moreover, it has become a determining force behind physical and psychological aspects of shopping and retail design (Cha, 2001, p. 306). Two sustainable design points of view are relevant for a retail designer.

The first viewpoint concerns the ecological aspect of designing and building a retail store. Whether the store is newly built or not, the choice of the materials used and the technical installations have an impact on the environment. With some delay, compared to the interest in green buildings in the arena of public buildings and commercial offices (Yudelson, 2009), the concept of sustainability has finally been picked up by the retail scene as well (ICSC, 2008). Though the construction sector as such is not eco-friendly (e.g., the power that is necessary to build and to produce and transport materials; an increase in land underlying buildings and structures means a decrease in green land), Yudelson shows an increase in green retail projects since 2004. He states consumers even expect leading companies to handle this. There are two important institutions that provide help and guiding principles to green (commercial) buildings: The BREEAM (Building Research Establishment Environmental Assessment Method) operates from the UK for the rest of Europe and the Green Building Council's LEED (Leadership in Energy and Environmental Design) system operates in the US. They discuss guidelines to reduce the ecological footprint, water efficiency, materials and resources, etc. Due to its highly technical nature, and retail designers turning to specialists for this, the matter is not further discussed here[30].

The second viewpoint is about creating retail environments that are 'timeless' and flexible and hold their value far into the future. By designing the stores' architecture as a neutral shell, open for transformation and disconnected from trends, it offers the opportunity to add or remove items as required. For example, Topshop in London. Topshop succeeds in following trends without changing anything in its interior architecture. By switching the place of departments, by changing graphics, by adding simple elements (such as a curtain wall) and by changing lighting levels the store changes its appearance almost every season (Figure 2.21 - Figure 2.23). An example of design that is so neutral that you might never get bored is the Antwerp store of Yohji Yamamoto. Located in the 'Modenatie' and designed by Wim Goes, this store embodies a white box filled with Yamamoto's black clothing (Figure 2.24). The neutral environment with subtle differences in material and a play with translucent fabrics is a sophisticated design communicating the Yamamoto brand[31]. Examples of old stores that have stood the course of time and are still successful are Boon (originated in 1920) in Antwerp (Figure 2.25 and Figure 2.26), selling gloves, and Tierenteyn-Verlent (started in 1790) in Ghent, selling homemade mustard (Figure 2.27 and Figure 2.28). Though the designer/builder of these stores probably had not aimed at constructing a store that would last decades, a timeless design was achieved. What is more, the revival of these stores and the appreciation for their

30 There is also a lot going on in ecological bags and packaging design, but this is also not discussed here.

31 Unfortunately, the store was recently closed as a result of major restructures of the company.

Figure 2.21. Top Shop London. Author's collection, 2004

Figure 2.22. Top Shop London. Author's collection, 2004

Figure 2.23. Top Shop London. Author's collection, 2004

Figure 2.24. Yohji Yamamoto Antwerp. Author's collection, 2009

Figure 2.25. Façade of Boon. Author's collection, 2009

Figure 2.26. Interior of Boon. Author's collection, 2009

Figure 2.27. Façade of Tierenteyn-Verlent. Photographer/source: Plevoets, 2009

Figure 2.28. Interior of Tierenteyn-Verlent. Photographer/source: Plevoets, 2009

old interiors is related to a third evolution in current society: the urge for authenticity as discussed later.

An exemplary retailer that conforms to all levels of sustainability – from product to store design and green buildings – and even adapted some principles of creating unique experiences, is Freitag. The core of Freitag is their ecological product design (Freitag.com). Two Zurich brothers, back in 1993, inspired by the colourful lorries passing by their flat started cutting messenger bags out of old truck tarpaulins. They used second hand car seat-belt webbings as carry belts and old bicycle inner tubes for the edges of the bag (Figure 2.29). These tough materials make the bag tough too. Moreover, every bag is a one-off. With their online cutting tool, one can even design a customised bag: the visitor chooses the tarpaulin, which piece of the tarpaulin and the model of bag. Freitag puts the bag together. This concept makes it a sustainable product design as well, constantly offering their clients new products. They are also responsible entrepreneurs since mainly people with disabilities work in their factory. Also in their shop concept, the same sustainable brand value is set out. Most remarkable is the flagship store in Zurich. The store, built on only a few square meters, has an asymmetric tower constructed from nine old sea transport containers (Figure 2.30). In total 17 containers were used, connected with only recycled elements from navigation. All containers were transported from Hamburg by railway, taking ecological transport into consideration as well. The interior contains simple and sustainable materials: foam glass (constructed out of recycled glass), recycled cardboard boxes and fluorescent low energy lighting (Figure 2.31). The design is pure and simple, directing most of the attention to the product. Finally, the store can be easily dismantled leaving its location unharmed, which is a classic example of sustainable design. The sustainable idea is pursued in the other five flagship shops (Davos, Berlin, Hamburg, Cologne and Zurich). They are simple shops, explaining what Freitag is about to the visitor, and using simple recycled toys like a View-Master to show the process of a Freitag bag and the materials used.

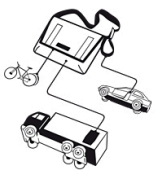
32 In a wider context, this concept is also visible at management level: the need for authenticity (for global brands and the retail scene that has become dull) led to the glocalisation trend (think globally and act locally). A global brand as McDonalds, for example, acts local by offering different burgers and sauces in different countries – Mc Deluxe in Belgium, 'frietsaus' in The Netherlands. Moreover, the different restaurant designs, according to the city and target group, are a visualisation of such thinking.

Authenticity

Authenticity is a layered concept that has been studied in different disciplines. Pine and Gilmore (2007) devote a book to it explaining that consumers these days are looking for 'authentic' experiences. Within the discipline of retail design, focussing on authenticity might serve the purpose of creating memorable experiences and possibly offers a solution to sustainable design. Two viewpoints are explained: creating authentic experiences and creating authentic retail (interior) architecture[32].

As mentioned before, retail experiences that succeed in delivering value to the customer can become key to a retailer's long-term success. Focussing on authentic retail experiences seems successful in Western economies today (Rifkin, 2002, cited in Kruithof, 2004). Consumers these days spend as much money on gaining cultural experiences as on the purchase of sustainable goods and services (Rifkin, 2002, cited in Kruithof, 2004). Kruithof (2004) sees this shift from an assets-culture to an experience-culture as a progression for our planet, decreasing the amount of products people possess. Kruithof claims enduring experiences are personal – not an 'Ooooh' moment at the cinema –, surprising, communicative and intense. He sees experiences on a social level as enduring as well. Shopping has become one of our favourite leisure activities, which we share with friends and family. In this way retail can enhance our social relations and create personal memories. Starbucks, for example, aims at offering an authentic coffee experience. However, since the authentic feeling disappeared with their increasing number of stores, they try to vary the experience with

Seit 1993 stellt FREITAG Damen- und Herrentaschen und Accessoires aus gebrauchten Materialien her, die auf der Strasse zu Hause waren: weitgereiste LKW-Planen, ausrangierte Autogurte, abgewetzte Fahrradschläuche und rezyklierte Airbags. Weil die Materialien zäh sind, sind es unsere Produkte auch. Weil wir Schweizer sind, ist es unser Qualitätsempfinden auch. Mit einem hohen Anspruch an Design und Funktionalität geben wir den recycelten Materialien eine ganz neue Verwendung. Und weil jedes FREITAG Produkt aus Originalplanen mit unterschiedlichen Farben, Aufdrucken und Ausschnitten gefertigt wird, ist jedes ein Unikat. Unsere Taschen sind im Onlineshop, in den FREITAG Flagship Shops (Berlin, Davos, Hamburg, Köln und Zürich) sowie in 300 Shops rund um die Welt erhältlich.



(left) Figure 2.29. Materials used to create a Freitag bag. (online) Available at: http://www.freitag.ch/shop/FREITAG/page/concept_page/detail.jsf

Figure 2.30. Freitag's flagship store, Zurich. (online) Available at: http://www.freitag.ch/shop/FREITAG/storelocator.jsf

Figure 2.31. Simple product presentation on cardboard boxes (Freitag Davos). Author's collection, 2009

Figure 2.32. 15th Avenue Coffee and Tea. (online) Available at: www.streetlevelcoffee.com

Figure 2.33. Look of the 15th Avenue Coffee and Tea's website. (online) Available at: http://www.starbucksmelody.com/2009/12/12/streetlevel-101-there-are-two-mercantile-non-branded-starbucks/

new concepts (streetlevelcoffee.com). Next to naming these new coffee shops after the neighbourhood they are located in, they serve wine and beer, fresh roasted coffee, tea from all over the world, artisan backed goods, and local products. They even host live music and poetry readings to resemble the spirit of the traditional coffee house. Also the interior of the store is a translation of authentic value (Figure 2.32 and Figure 2.33, 15th Avenue Coffee and Tea), which is the next subject discussed.

So, authenticity can be applied in a store's design. Plevoets et al. (2010) have studied its relation to retail design. They classified retail settings in seven groups, based on two approaches: historically 'authentic' shops and shop interiors; and 'staged historic' shops and interiors. These range from real authentic stores, interiors and products, to an authenticity used to create a world of fantasy. Two categories they mention are interesting regarding sustainable retail design: the historically authentic stores and the historically authentic settings. The really authentic stores have stood the course of time, remaining unchanged since their foundation (Grimmeau and Wayens, 2003, cited in Plevoets et al., 2010). The previously mentioned stores Boon and Tierenteyn-Verlent are examples. This is not evident in a retail scene with an increasing urge to renew stores as fast as trends move on[33]. Dubois (2004) compares retail interiors' time dimension, which is dictated by yield and depreciation, with monthly magazines that have their own rhythm. The historically authentic setting is of interest to us because of the ecological aspect. The speed at which we demolish and rebuild is astonishing. But with the decreasing free building space, particularly in city centres, the retailers' attention shifted from tearing buildings down, to moving into historically or architecturally significant buildings. The reuse of such buildings serves as a link to our cultural heritage and collective memory (Mesher, 2010). On top of that, as a differentiation strategy, this concept works (Plevoets and Van Cleempoel, 2009). Old buildings that have history offer something that new buildings cannot: the time dimension (Dubois, 2004). An example is Bookstore Selexyz Dominicanen in Maastricht (The

33 Partly due to the experience economy and partly due to the ever changing and quicker changing trends, the average lifespan of the retail interior has changed from 30 years to less than 10 years.

Netherlands). This store is located in the 13th century church of the former Dominican monastery. The contemporary design of the store's interior respects the authentic architecture of the church, both enhancing one another (see Figure 2.34). It is the layers of changed function and design that releases it from its original purpose and makes it such a successful place (Dubois, 2004). Another example, in a building with a less sublime aesthetic frame is the furniture showroom of Fabiaan Van Severen in a disused petrol station. Fabiaan succeeded in preserving the typical characteristics of the building and made them the framework in which his furniture is presented (Figure 2.35 and Figure 2.36). It is more than juxtaposition of old and new; there is a balance and a link between the past and the present. It is a design conscious of the value of continuity, making the existing a substantial part of the transformation (Dubois, 2004). It offers a solid environment with a soul. Consequently, the architecture of the building and its interior become time transient and they are no longer subject to current trends.

Innovation

As is shown in the historical review, retail has often been the driving force behind new developments, such as the development of the barcode and the escalator. Although they were not invented on the shop floor, they caused a shift in store design – the barcode made it possible to enlarge the store space and product range, the escalator made each floor level almost equally accessible. With the focus on innovation that did occur on the shop floor, there are a few interesting ones worth mentioning. These innovations stem from one specific store type but eventually influenced the rest of the retail scene. A first one occurred with the introduction of the self-service concept, as described supra. Originating in the supermarket, it influenced the pattern of shopping in other sectors as well. A second shift happened in the shopping centre development halfway through the 20th century: the combination of amusement and shopping in one building. Around the same time, destination stores like Ikea adopted this concept as well by offering a coffee corner or restaurant to serve their customers. Soon, this became mainstream.

Figure 2.34. Bookstore Selexyz Dominicanen in Maastricht. Photgrapher: Roos Aldershoff. (online) Available at www.merkx-girod.nl

Figure 2.35. The furniture showroom of Fabiaan Van Severen. Source: Van Amerongen and Christiaans, 2004, p. 23

Figure 2.36. The furniture showroom of Fabiaan Van Severen. Source: Van Amerongen and Christiaans, 2004, p. 24

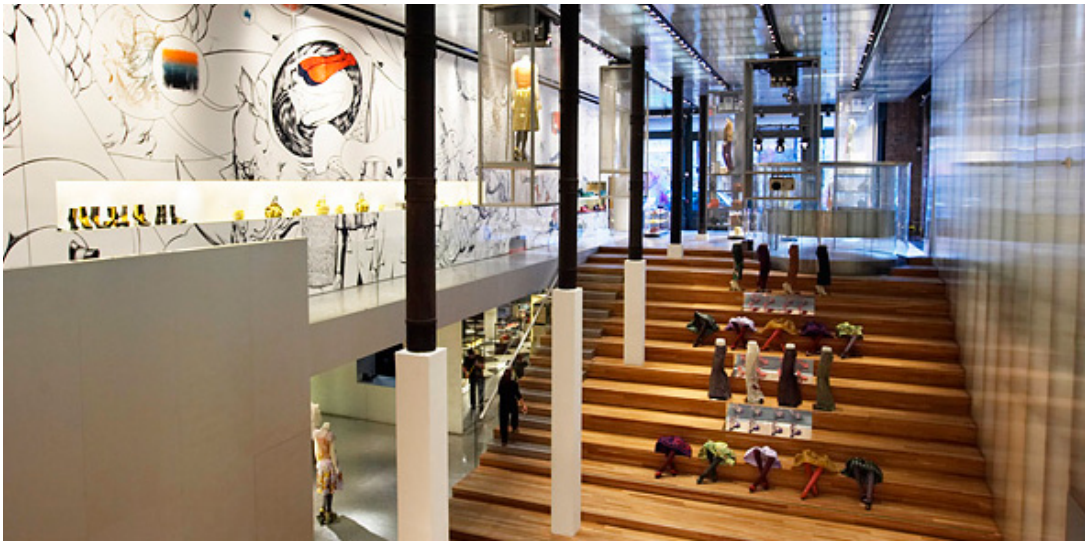
Adding leisure activities to a store eventually led to the current hybrid stores with multiple functions. For example, the Drukkery in Vlissingen (The Netherlands) is a bookstore combined with an art gallery, a coffee shop and an event space for book-related events and workshops. Thirdly, with the opening of Niketown in New York in 1996, Nike abandoned the idea that stores mainly serve to sell products and generate high turnovers. The new store offered, next to the complete product range, the chance to experience the product: a small basketball court in a cage and a soccer cage took up a large amount of the store space. The focus of this store was selling the brand, not the product (see definition flagship store, p. 28). Moreover, while the store was far from profitable, it succeeded in engaging its visitors and in building long-term relationships. Although Nike was unable to maintain this strategy and adapted the store to a more profitable one several years later, it left its mark on current retail design. The previously mentioned Samsung experience store took the selling brand strategy one step further. The store is designed only for customers to get to know the brand since no purchases can be made. Also Prada launched a store with the same ethos with their Soho flagship store, designed by Koolhaas in 2001. The half-pipe shaped wooden curve that connects the two floors visually is a strong architectural statement, even to the extent that the architecture of the store is more important than the products, which are sold in the basement in a rather cramped environment. Koolhaas aimed at creating an epicentre, rather than a flagship store. Koolhaas has put the brand Prada literally on a pedestal and a stage, elevating the merchandise to the level of art objects (Figure 2.37). Although opinions on whether this is a good store differ, it is an archetype that marks a change in store design. One of the first brands to approach product as art object is the Calvin Klein store in New York, designed by John Pawson. Pawson's minimal sensibility and Klein's modern tailoring resulted in a perfect fit (Figure 2.38).

Although it is difficult to predict which innovation will cause a shift in retail design thinking, there are some developments that might stick for a while. The aforementioned sustainability movement, for example, has already changed the way we build and consume energy. Although it is not yet common in retailing and only a few brands engage it as a differentiating tool, I do believe that this development will become inevitable. It will push retailers and designers to be creative in living up to this new paradigm, eventually changing the retail scene profoundly.

Another development generated by social responsibility, as with sustainability, is Universal Design (or design for all). The ageing population is one aspect that is pushing all design disciplines related to retail design to come up with innovative solutions. The German chain supermarket Edeka, for example, successfully opened the 'Supermarkt der Generationen', which is specially designed for seniors. Wider pathways, magnifying glasses mounted on shopping carts, larger parking bays, rest areas, clearly displayed price labels and carts equipped with a seat, are some of the benefits which are different from regular supermarkets. The success of those developments lies partly in the notion that what is beneficial to the older consumer, is beneficial for all (just like larger buttons on telephones designed for the elderly). Both sustainability and Universal Design are susceptible to legislation, which in turn might also influence or stimulate new ideas and concepts for retail design.

Also the digital world urges retail design to anticipate and work with its continuing innovation. Next to e-stores, a large part of our communication is digital. Websites like Twitter, the Twitter mirror, shop applications for mobile phones and the interactive text messaging services influence the way consumers shop. An extreme example of the impact of social media on shopping is the 'United Breaks Guitars' song from songwriter Dave Carroll. He wrote a song about United Airlines having broken his expensive $3,500 Taylor guitar without compensating him for it. After the company ignored him for 6 months he posted his song on YouTube and it received 1.3 million hits over 5 days. This event caused United a huge loss (the stock price went down 10%, costing shareholders

34 http://www.fastcompany.com/blog/ravi-sawhney/design-reach/youtube-serves-180-million-heartbreak



$180 million)[34]. The financial loss could not entirely be ascribed to this song, however it caused a negative impact on United's brand equity. This illustrates the power of social media. Although many mobile phone applications and Twitter are only transient, and will be replaced by better and newer inventions, the idea and moreover its power, remains the same. The bottom line is, maybe in the past most consumers did not complain when dissatisfied, they just shopped elsewhere (Jackson, 1999, cited in Abubakar et al., 2001). However social media consumers do complain, with a greater impact on the retailer than just losing one customer. On the other hand, word-of-mouth advertising, one of the best a retailer can get, changed to text-to-text messages, and can also have a very strong impact. So far, an effect on store design is not yet visible. Notwithstanding, retailers should consider embracing the opportunities social media offer. Albert Heijn, for example, has developed an App to be used while shopping. It helps their customers find their way around the store, locate promotions, receive extra promotions and scan the products. A next step could be using the App as a platform for members and customers. Also adapting the design of the store could stimulate this interaction. Imagine a store layout that groups specific products for App-users, or an event area to create an 'Albert Heijn Twitter hype'. Recent technological developments as

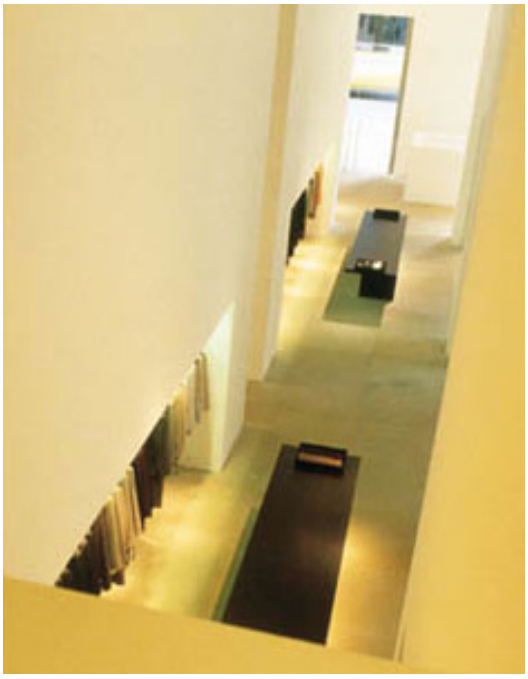


Figure 2.37. Prada, New York. (online) Available at: http://zoonggun.com/tag/Prada%20Store

Figure 2.38. Klein's store, New York. (online) Available at: http://www.johnpawson.com/architecture/stores/calvinklein/newyork

RFID (Radio-Frequency Identification: identification and tracking of, for example, products in a store, through radio waves) and the 'augmented reality' evolution (for example, augmenting realistic real-world environments with computer-generated sensory input such as sound and textual information) might aid this goal. In other words, make being part of the interactive Albert Heijn customer group worthwhile by adding value and emotion to the store experience.

Retail design is a discipline with opportunities to create innovative concepts. As in the past, retail design now has such influence that products invented infiltrate other building types, as was the case for the escalator. Both the larger budgets of the sector and the increasing time spent there by the consumers strengthen the prospects and position of retailers as innovators by acquainting people with new developments. Also design wise, the larger budgets and increasing attention given to store design, highlighted retail design as a possible trendsetter. Again, this had already been seen in the past, namely in the architecture of 19th and early 20th century department stores. It is only during the last decade that retailers again started to take on that role with conspicuous design. The examples of contemporary stores, as described in the previous chapter, illustrate this: the department store Selfridges (Birmingham) with its conspicuous façade; the boutique chain store Camper, trying to be creative with new kinds of material or old material applied in a new way; and the MPreiss supermarkets with their inconspicuous architecture, are all taking the environment into account.

2.4 Conclusion

Since retail design has grown in status in the architectural world, it is argued that the role of retail designers has progressed from plain shop fitting to adding value. This change happened concurrently with the change in the consumer from a passive partaker to an active contributor with feelings and longings. Also the importance of branding increased which means that, in order to send the right messages, retailers need to develop a personality that relates to its target group. The role of a retail designer is to understand that personality and translate it into a holistic, coherent space, whether that is a physical or a virtual store. In the light of the latest developments, adding value by adding emotion might be a way to differentiate one retailer from another. This might be through creating authentic experiences or environments; by adding experience through consistent store environments, holistic sensory experiences or extra features or services; via sustainable design; or by being innovative.

This chapter aimed to define what retail design is all about. By illustrating its development and by showing what it is susceptible to, the complexity and diversity of the discipline became apparent. This argument is used to claim retail design as a discipline on its own. Creating coherent retail spaces, which also respond to the needs of the consumer and all the demands of the design brief – and preferably more – calls for specific expertise of (among others) commercial, functional, aesthetic and public space related aspects. A retail designer should be knowledgeable in all related design disciplines – product design, graphic design, interior design, architecture and web design – in order to design, or coordinate the cooperating designers, to arrive at a holistic and consistent shop design.

Part II
Retailology

Retail-o-logy: noun; m. [ree-teyl-ol-uh-jee]
the exploration and scientific study of the design and research aspects of retail design.
(Author)

Retail design is a multidisciplinary field of study, which, in addition to strong ties with practice, also includes scientific research. Disciplines with more established tradition in research have expressed lateral interest in retail design where it applies to their interests from a marketing research, consumer behaviour (Falk and Campbell, 1997) or product development point of view. Interior design in general and retail design in particular only developed a coherent body of knowledge recently (Abercrombie, 2000), and research into retail design could give welcome assistance in this process.
At the same time, it might provide a basis for interdisciplinary collaboration. Research can also help to 'emancipate' the retail design discipline per se. The coveted body of knowledge will only increase if the discipline establishes an environment for accommodating methods and a vocabulary for setting up research.

Depending on the type of research, its results can provide concrete guidelines and/or relevant parameters to assist designers in general and retail designers in particular.

Different types of research are: research into retail design and research on retail design. The former concentrates primarily on the practical aspect of retail design and often displays an empirical orientation. But the desired result can also be theoretical whereby research assumes a more reflective character. This could, for example, include hypothesized anticipation of new directions. As always, reality teaches us that the line between both types of research cannot be drawn so firmly.
In Chapter 3, I would like to dwell on this reflective aspect of research, while Chapter 4 explores the empirical possibilities by focussing on atmospherics with lighting as a particular case.


Chapter

CHAPTER 3
RETAIL DESIGN RESEARCH

3.1 Introduction

Retail designers – and designers in general – are not easily induced to support their projects with scientific research. This may be partly due to the hermetic language in specialised journals not easily accessible to the practitioner, or, equally, to the reluctance of designers for gaining 'scientific knowledge'. On the other hand we also see that the logic of theoretical research sometimes lacks contemporary terms of practise. In short there is a need for crossover.

The growing complexity of the retail design discipline and similar developments in the retail landscape (Maatman, 2009) require a basis for well-founded choices during the process of designing a retail concept. An example of how scientific research can help the practice of design is providing insight into consumer behaviour. Studies that clarify what consumers expect of a retail space (e.g., Bech-Larsen and Esbjerg's study on the expectations of the fruit and vegetable department, 2006) or how the retail space contributes to the perception of a retailer's image (e.g., Burt and Sparks, 2002) can provide valuable insights.

Research can also support practise by limiting risk-taking through preliminary studies concerning the potential impact of certain factors on the consumer – such as lighting for example. In fact, the very recognition of the need for 'reliable' knowledge has set in motion the evolution of research into retail design (McCarron, 2001) and will further accelerate the developmental process (Davis, 2009).

There seem to remain two important challenges: first, communication to the field of designers (from all related design disciplines) and other stakeholders involved. The second challenge is of a more methodological nature: how to find a harmonious reference framework that combines three different research disciplines that study spatial features:

1. design (interior architecture, architecture and product design);
2. environmental psychology;
3. marketing and communication.

This chapter aims to address this by introducing a theoretical framework in which aspects of all three disciplines are combined. Although scholarly literature is used, the realm of retail design inspires its orientation and binds these three disciplines together.

3.2 The Gap…

…between Research Disciplines

Research into the consumer-retail environment link shows that collaboration between different disciplines such as marketing, environmental psychology and design might offer accurate solutions for the changing retail landscape (Barr and Broudy, 1986). Each of these disciplines has developed an understanding of how the environment affects human behaviour in seeking predictability. Marketers and psychologists had worked together before, but they often neglected the holistic dimension of space by focussing on isolated parameters instead. Approaching the

space as a whole is exactly the realm of (interior) architectural studies (Holm, 2006, cited in Petermans, 2010). Researchers embarking on this quest will soon discover that the literature does not provide them with theoretical models and terminology to bridge the three aforementioned disciplines. Retail design might provide a platform for all three by focusing on an understanding of the store environment as a whole and its possible influence on consumers.

I make a distinction between research on a micro level and research on a molar level, based on the theory of Hull and Harvey (1989). They define micro characteristics as the physical characteristics of the environment that create a particular atmosphere, such as colour, music, light and sound. Molar characteristics, on the other hand, are defined as "emergent properties" that result from the sum of the micro characteristics. For example, picture a spacious interior store with white walls and lots of daylight coming in. The furniture is placed on a high reflective white floor, with one red wall at the back. Now picture a stuffy furniture store with low ceilings highlighted with fluorescent lighting, and the furniture placed on a dark blue carpet with also a red wall at the back. Whereas the micro characteristic red in the first store tends to imply molar characteristics of trendiness and quality, in the second store it might indicate cheap prices.

Previous research in aspects of retail design, mostly in marketing and consumer psychology, focused on micro levels by analyzing effects of a single physical characteristic on customer appreciation (Lam, 2001; Massara, 2003; NG, 2003) or (buying) behaviour (see Turley and Milliman, 2000 for an overview). Recently however, several studies acknowledged the need for a more molar level (Bäckström and Johansson, 2006; Healy et al. 2007). Another concept referring to this approach, yet slightly different, is a more 'holistic' approach (Andreu et al., 2006; Baker et al., 1992). Petermans (2010) explains that 'holism' refers to all the aspects of a given system (architectural, social, etc.) that cannot be assessed by the sum of all its parts. A molar approach aims at taking all aspects of the environment into account, when studying its aspects and how they interact, whereas a holistic approach also includes moderating effects, such as consumer expectations, personal preferences, etc.
As a result of thinking at a micro level, 2D images are often used as a research method to visualize a retail space. This photo-elicitation method is often applied in marketing research (e.g., Brengman, 2002), as it allows easy manipulation of isolated factors during interviews (e.g., the colour of the walls). Although results from such an approach do give an indication of the response of consumers to manipulations of individual parameters, from a designer's point of view they remain an impoverished representation of the holistic experience of a complete store with many (molar) factors.

Another difference is the status of the results: in marketing they are valuable enough for scientific publication, whereas designers would merely consider such results as part of the design process of a retail space. This created a gap between marketers, focusing on research outcomes, and designers, favouring holistic and molar solutions with their scepticism towards these outcomes.

Finally, research by (interior) architects and product designers is more familiar with the molar approach, but to date too few studies with architectural dimensions as independent variables have been conducted in retail environments.

…between Research and Practice
There are, however, good reasons for a more practice-based research: the increased complexity of consumer demands, technical innovations, and the homogenisation of products and retail interiors.

The design of retail spaces can be considered as the hypothetical response of the retail designer to the varying aspirations of the different stakeholders. Although this entails assumptions on how customers will ultimately respond to specific design choices, practitioners generally do not rely much on knowledge from scientific research, but on their own intuition instead. So, the emerging retail design discipline would benefit from knowledge from other disciplines

such as marketing and environmental psychology that have studied the human (retail) environment link for several decades. However, this knowledge barely seems to reach retail designers who, though precisely the people partially responsible for the success of retail concepts, would find them most beneficial. There are several stumbling blocks causing this gap. Firstly, scientific knowledge is not easily accessible for two reasons: on the one hand, its communication channels are not readily available. In most cases, designers are not even aware of specialised scientific journals. On the other hand, the terminology and the way different design aspects are analysed at a micro level, as mentioned earlier, seems incompatible with a more molar and holistic designer approach (see also the interviews in Chapter 4). So despite the fact that retail design has gained in status in retail management over the last couple of years (Bäckström and Johansson, 2006) neither marketers nor psychologists seem to have been able to translate their results successfully into practicable design guidelines.
Another obstacle is that retailers or brands carry out specific research in isolation, which, moreover, tends to remain confidential. And even if it is made public it is not always approached systematically (Baker et al., 1992) nor are its results selective.

3.3 Don't mind the Gap

Research into retail design has the potential to bridge all three disciplines and narrow the gap between research and practise. In order to do this, one has to consider several aspects:

- focusing on a holistic understanding of the retail environment.
- establishing an environment for accommodating methods and vocabulary for setting up research
- establishing a theoretical framework
- using communication channels other than scholarly journals to reach all parties involved in retailing.

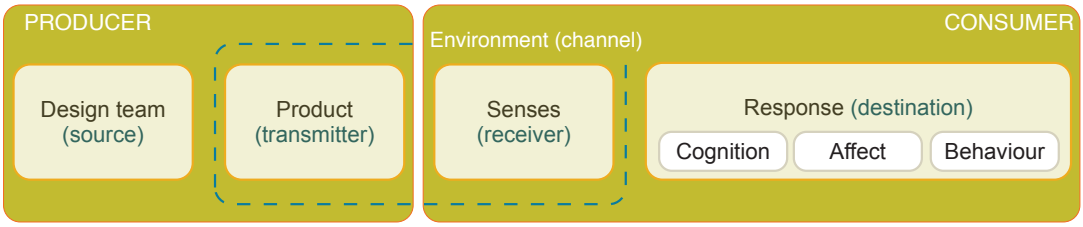
This thesis aims to contribute to narrowing the gap between research and practice by conducting experimental and scientific research from a designer's point of view. With the focus on a better understanding of the specific link between the user and the commercial space, the development of a conceptual research model illustrates what the designer's point of view could encompass.

3.3.1 Conceptual Research Model

We want to develop a conceptual research model for structuring and visualising how a retail environment might influence its visitor. This theoretical framework allows us to integrate knowledge from the different related disciplines, but also to highlight the specific approach of retail design research. It is based on two existing models. One comes from a psychological-marketing perspective and the other from communication research. The combination of these established models from different research disciplines is new. Adapting them to the realm of the 'designer' further attempts to bridge both aforementioned gaps.

The first is Shannon's (1948) basic system of communication (source, transmitter, channel, receiver and destination), which is later adapted by Crilly et al. (2004) for use in product design. In essence, the model indicates that the information source produces a message, which is encoded into a signal and transmitted across a channel. The receiver decodes the signal and the message arrives at the destination. Crilly e.a. (2004) introduced the design team as the source of the message, the product as the transmitter and the environment in which the consumer interacts with the product as the channel (see Figure 3.1). The consumer's perceptual senses are regarded as the receiver of the message and their faculty for response is regarded as the destination. The latter is hereby divided into three aspects: cognition, affect and behaviour.

A second model comes from the SOR-paradigm (Stimulus-Organism-Response) as described by Donovan and Rossiter (1982), who introduced the retail environment as stimulus in the theoretical model of Mehrabian and Russell (1974) (Figure 3.2). In essence, the model incorporates the interactions



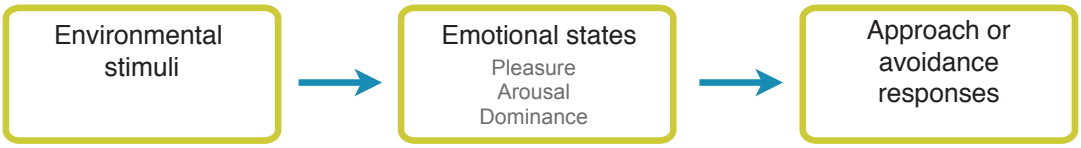


Figure 3.1. Communication model of Crilly e.a. (2004)

Figure 3.2. SOR-model of Mehrabian and Russell (1974) as applied by Donovan and Rossiter to the study of store atmosphere

between interpreted space, a consumer's mood and emotions, and behaviour in retail spaces.

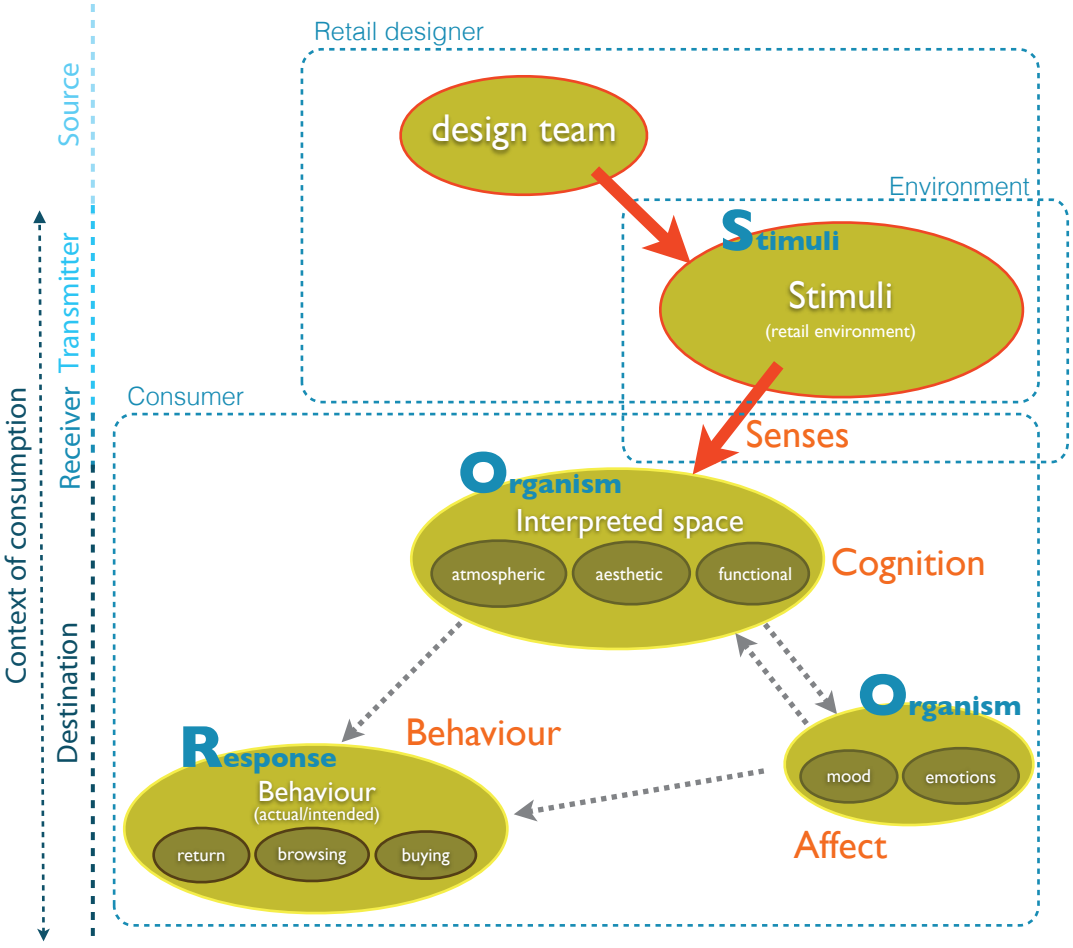
Our conceptual research model is called 'Retail Communication Model' (RC model) and it will be explained following the SOR layout with additional aspects of the communication model (Graphic 3.1).

Stimulus

The stimulus in our model is a retail environment, consisting of space-related, product-related, and people-related aspects, following the theory of Bitner (1990). In the course of my research, I focus on space-related aspects. The main categories of a store space can be classified in functional, aesthetic, and atmospheric aspects (Figure 2.3, p. 55). Whereas functional aspects determine whether a store 'works', the aesthetic and atmospheric ones determine the experience and address our five senses.

Crilly e.a. (2004) state that designers of products can communicate attributes such as functionality and social significance. Such a semiotic perspective[35] considers products – or spaces – as signs (Vihma, 1995). The presentation of a retailer can similarly be approached. Indeed, it is argued that designers – the source – can communicate attributes such as functionality, price perception and brand experience through the medium of store design – the transmitter. Design has an impact on image perception and store personality (e.g., Gottdiener, 1998, cited in Bäckström and Johansson, 2006; Kent and Kirby, 2009). This is the start of the communication chain: when the design team generates the message during the design process of the store. Markin e.a. (1976) confirm this by defining the retail space as the proximate environment that surrounds the retail

35 Semiotics offers a rich environment to analyse retail interiors because it provides tools that help in 'reading' the interior, and how designers use their tools, such as colour, material, volumes, etc., to create 'signs'. Pauwels (2004) was one of the first to adapt the terminology and theory, inherent to semiotics, to the analysis of retail spaces.



Graphic 3.1: Retail Communication model. Research can be limited to one aspect or can include every aspect of the SOR-model

shopper and that it is never neutral. They continue by explaining that the retail store is a bundle of cues, messages and suggestions, which communicate to shoppers a sense of expectations. Esbjerg and Bech-Larsen (2009) express not only that the 'message' of the designer is important, but the experience of it as well. Thus referring to the complex phenomenon of decoding meanings through our entire range of senses – not merely visual. Indeed, consumers create meaning via all perceptual senses (Kozinets et al., 2002). Aspects that are out of the designers' control can thus equally influence a retail experience, such as attitude of personnel or store location, etc.

To study store environment holistically and with a molar approach, there are some methodological challenges:

1. When studying environmental stimuli in isolation, 2D images or verbal descriptions of store spaces are offered as a current method. But this method does not allow the participant to experience the store with its typical interacting stimuli. Take Brengman's research (2002) as an example. This studied the relationship between colour, emotions, and approach and avoidance behaviour, via images of a virtual furniture store. The image showed a coloured wall with designer furniture and home decoration accessories displayed in front of it. The only variable in the picture was the colour of the wall that changed during the course of the interviews. In its way this research is valuable to offer some insight into how people might respond to different colours in the rendered store. A drawback to this research set-up, however, is the ignorance of a context, such as space dimensions, colours of the other walls, material and texture of that wall (lacquered glass or rough plaster will result in entirely different shades), lighting on the wall, etc. Designers in particular would pay much more attention to such aspects than the mere variations of colour on one wall.

2. But there are studies based on experiments conducted in three-dimensional environments, such as simulated stores or real stores. When simulated, however, they tend to lack a realistic look and feel. Yalch and Spangenberg (2000), for example, studied shopping behaviour in relation to environmental factors (two different types of music) through changes in emotional states. Although the research method is holistically approached, it lacks a molar approach. The research was set up in a simulated shop, being a classroom where 10 pieces of outdoor equipment and clothing were displayed on a table. No other effort was made to make the room appear to be a store. Although their results say something about how people react to music, they did not indicate how real customers would behave in a store environment because the image did not fit a real store.

3. Experimental research in real retail environments only varies a very limited set of stimuli at any one time. And, varies them systematically. For example, the study by Milliman (1982) on the effect of music on the pace of in-store traffic flow, sales and music awareness, was conducted in a real supermarket with real customers. However, only three different instrumental music types were played. The volume of the music was not altered or taken into account, nor the relationship to other sounds present in the store. The influence of other sounds (e.g., cash registers, rolling trolleys, etc.) and the acoustic quality of a space differs each time, making the results difficult to translate into a design. Other studies tried to find out how specific aspects interact. Matilla and Wirtz (2001), for example, tried to investigate the relationship between odour and music in a real store (gift shop). This attempt might seem to come close to a molar approach, but there are still two problems. The odour was chosen independently from the type of store. Lavender and grapefruit were selected, based on essential oil reference books. Secondly, the music was selected in a similar way and no attempt was made to establish whether the type of music matched the scents or vice versa. Although this research is a step in the right direction because it shows that atmospheric aspects should not be studied in isolation, it still lacks a molar approach, excluding the context when selecting the stimuli.

So, research on isolated aspects is valuable and helpful in better understanding some aspects of the customer-environment link. But a molar approach taking into account the experience of the environment as a whole seems equally necessary, despite the methodological challenges. The relevant selections of stimuli will therefore become important in the set-up of our research model. Indeed we argue that designers play a crucial role in selecting or creating those stimuli.

Organism

The 'organism' in our model refers to *"the internal processes and structures intervening between stimuli external to the person and the final actions, reactions, or responses emitted. Notice that the intervening processes and structures consist of perceptual, physiological, feeling and thinking activities"* (Bagozzi, 1986, p. 46). Simplified: the effect of store environmental cues (S) – whether

they are aesthetic, atmospheric or functional – on final consumer behaviour (R) is mediated by the consumer's internal state (O). How a consumer interprets[36] a particular store depends on the mentioned aesthetic, atmospheric or functional aspects. Similarly, Crilly and others (2004) state that a consumer's response to products is threefold – the same is widely accepted for the consumer's response to an architectural environment (e.g., Bitner, 1992) – being cognitive, affective and behavioural. Cognitive responses in their study are described as those judgments that the consumer makes about the store based on the information perceived by the senses, i.e. the interpretation of the stimuli.

Emotions are also important in consumer behaviour in general (see Cohen and Areni, 1991 for a review) and purchase behaviour more specifically (Bagozzi, 1986). But there is little consistency on definitions of emotion in this respect (e.g., Laros and Steenkamp, 2005). In what follows we present a modest attempt. Firstly, emotions form a background to which cognitive judgments, preferences or attitudes operate (Valdez and Mehrabian, 1994; Westbrook, 1987). Secondly, emotions are generally stronger in intensity than moods (Bagozzi et al, 1999) and they have a clear object of reference (e.g., the store environment) (Frijda, 1993). Consequently, both emotion and mood are separate concepts in our model and they need to be measured separately to grasp the full spectrum of emotional reactions to the retail environment.
In this context, different research models have yielded contradictory results regarding the emotional reaction to retail environments. Some research suggests emotions form the first level of response, independent from behavioural responses (see also Chapter 5). The emotional effect can be both a change in mood, which lasts longer, or a shift in emotions, which is of briefer duration. Alternatively, emotional and behavioural factors are hard to separate and will influence one another (Bitner, 1990, 1992; Greenland and McGoldrick, 1994). Furthermore, research shows that consumer's mood is an important personal variable that can even influence overall satisfaction with the store (e.g., Spies et al., 1997). So, it is argued that the emotional status of the consumer in a retail environment (pre-existing or elicited by the environment) can, in turn, influence how that environment itself is perceived. Other research suggests that the contribution of emotional variables to consumer behaviour is independent of cognitive variables, such as perceptions of quality, price and store selection (Clark and Isen, 1982; Sherman, et al., 1997). More research is necessary to understand the interaction of both. The interpretation of the stimuli (cognitive response) and the affective response are both part of the concept 'organism' as defined by Donovan and Rossiter.

Response

When the reaction of a consumer to a retail environment is behavioural, we speak of a 'response'. We try to develop an understanding of the complete range of shopping behaviours and therefore include purchase behaviour, browsing behaviour and return behaviour (willingness to return to the store), as visualised in Figure 3.3.

Consumers' browsing behaviour, the way they actually behave inside a store, can be used as an indicator of their appreciation of the environment. For example, a consumer might spend more time in a store when the appreciation of that store is high (Donovan et al., 1994). However, this response might also indicate the consumer is experiencing some difficulty in finding a specific product. Therefore, behavioural responses need to be interpreted in the fullest context as described in the RC model, and hence the need to also take covert (emotional) responses into account.
A consumers' willingness to return to a store indicates his appreciation of the retail environment as well, since aspects of the environment, that can induce emotional responses, are correlated to the actual 'approach and avoidance behaviour' as Donovan e.a. (1994) stated. When reviewing the literature a distinction

36 Perception is a psychological activity concerned with the process of converting sensory stimulation into meaningful sense-data (Markin et al., 1976). Through the perceptual processes, customers attempt to interpret what they see, feel, smell and hear, together with memories derived from these senses (Cuttle, 2003).

needs to be made between a prediction of behaviour and actual behaviour. Experimental research based on emotional scales typically attempts to predict so-called 'approach' and 'avoidance' behaviours, as measured by questionnaires. However, our interest primarily lies in the consumers' actual approach and avoidance behaviour, with or without the interference of emotions[37]. The latter is what is addressed in the RC model and that will be explored in the experiments.

3.3.2 Designer's Perspective

Conducting research from a designer's perspective when approached at a molar level entails some essential elements. The experimental methodology and sound theoretical bases for human-environmental interactions from traditional consumer research can be useful for retail design research and practice when that designer's perspective is taken into account. One way to do this is by using design as a method and an output. This has been described before (e.g., Cross, 1984, 2001 who referred to it as 'designerly perspective') and is different from more traditionally scientific and scholarly ways of thinking and communication (Archer, 1965, reprinted in Cross, 1984, pp. 57-82). This thesis is not restricted to using only design as a method. It is combined with the application of orthodox – in other research disciplines – research methods as Horvath (2007) describes in his 'Research In Design' methodology. The combination of those methods enables this thesis to offer a first contribution to bridging the gaps.

To conclude, design as a research method implies a shift away from systematically changing a specific physical characteristic in a reduced context, to employing manipulations, which result in stimuli that are meaningful at a molar level and at the level of the holistic interpretation. Therefore, it is argued that, in the context of retail design, designers should select or create relevant environments. What is more, the emphasis needs to be put on studies being undertaken in an actual, 3D architectural space. This can mean using readily available real stores, or realistically simulated store environments. Although there are studies which argue that working with verbal descriptions, imagery or videos (e.g., Bateson and Hui, 1992 for an overview) and which predicted behaviours, via questionnaires in which respondents report how they would behave, are good alternatives, actual in-store behaviours need to be investigated as fully and frequently as possible. The holistic experience of an actual space is the most valuable way to understand the human-environment link. Moreover, it is the only way to understand how different stimuli interact and how big the influence of one aspect is in relation to all other environmental cues that occur in a retail store. To fully grasp consumers' holistic experience, both overt (behaviour) and covert (emotional) responses need to be measured.

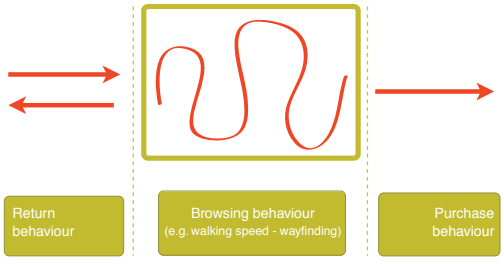


Figure 3.3. The range of shopping behaviours

37 Crilly and Clarkson (2004) also speak of moderators (cf. holistic approach). These are, for example, individual characteristics like personality traits or personal experience. They can function as moderators to alter the influence of external variables, such as environments (Moye and Kincade, 2002) and products (Bloch, 1995). Depending on the aims of the research, this needs to be taken into account.

3.4 Atmospherics as a Part of the Holistic Environment

As I have tried to develop an argument for conducting experimental research from a designer's perspective, I would now like to focus on atmospherics. As mentioned above, a store contains functional, aesthetic and atmospheric aspects. The functional aspects make a store work, while the aesthetic and atmospheric aspects determine the 'look and feel' of a store. However this is not entirely rigid, since the aesthetic aspects focus more on the 'look', while the atmospheric aspects are more responsible for the 'feel' of the store. My focus on atmospherics relates to their impact on store perception.

Some research suggests that store atmosphere has an equally strong influence on the perception of the product as the actual quality of the goods themselves (Obermiller and Bitner, 1984; Sherman et al., 1997; Underhill, 1999). Bitner (1992) also indicates that atmosphere can communicate with the type of clientele who patronize the store and who will, in all likelihood like the store's merchandise. This is consistent with our RC model that the store environment can generate a message to the consumer. Kotler (1973) came to similar conclusions, saying that the atmosphere influences buying behaviour in at least three ways: attention creating, message creating and affect creating.

There are various definitions of atmospheres. Hoffman and Turley (2002) explain that the atmosphere of a store can differ from subtle aspects such as music and scents – that are referred to as intangible aspects – to aspects of the physical environment – tangible aspects. Another term often referred to is atmospherics. Initially coined by Kotler (1973, p.48) to describe *"the effort to design buying environments to produce specific emotional effects in the buyer that enhance his (/her) purchase probability"*. He amplifies by stating that the atmosphere of a store environment is encountered through the senses and can therefore be described in sensory terms. So, Kotler later re(de)fined atmospherics as 'ambient factors'. These emphasize sight, sound, scent and touch[38]. He continues by explaining the aural dimension (e.g., music), tactile dimension (environment, not product-based; e.g., softness, temperature), the olfactory dimension (scent, freshness) and the visual dimension (environment related; e.g., wall colours). Kotler further identified 'atmospherics' as a highly relevant differentiation tool and claimed that spatial aesthetics should be used more consciously to make a unique retail environment.

Whereas 'atmospherics' are seen as the conscious designing of space, 'atmospheric aspects' could be considered as the tools a designer has at hand to create a certain atmosphere. It is targeted to measure the total 'atmosphere' – the result of all atmospheric aspects – of a store. Vogels (2008) tries to unravel this complex territory by defining atmosphere as *"a subjective impression of the environment related to the expected effect on mood, but it does not necessarily correspond to the actual effect on mood"* (p. 2). Vogels' definition of atmosphere is closer to what I call perceived atmosphere. She argues that the perceived atmosphere of a space can be considered as a fairly stable concept because it concerns an affective evaluation of the environment rather than an affective state or feeling itself. In other words, the atmosphere is more strongly linked to the anticipated than to the actual emotional effect of the environment. This, of course, results from the fact that the emotional condition of a person is usually determined by many factors, including many that are independent of the immediate surroundings. For example, a person can perceive an environment as tense, but if that person has a couple of days off, he or she can still feel relaxed. But in most cases, creating certain atmospheres in retail environments is precisely aimed at triggering certain emotional effects on the consumer. Indeed, emotions are important factors in various consumer behaviours and, more specifically, purchasing behaviour.

3.4.1 Literature

Within the field of environmental psychology, some five

38 According to Kotler, the fifth sense, taste, does not apply to atmosphere.

decades ago, it was recognised that the environment is capable of influencing a wide range of behaviours (Hoffman and Turley, 2002). But it is of more recent date that this has been accepted in retailing as well, with an influence on both consumer and the employee (Bitner, 1992; Sharma and Stafford, 2000). From the literature review of Turley and Milliman (2000) it is also clear that atmospheric effects have been measured on a wide variety of dependent variables. However, when the 'atmosphere' was studied hitherto, it was typically carried out on a micro level (in isolation) and focused upon separate characteristics. Turley and Milliman (2000) give a complete review of the influence of (micro) atmospheric aspects on consumer attitude and behaviour. They concluded that the individual atmospheric variables were shown to have a demonstrable effect on the outcome of evaluations (e.g., store image, judgments of brands, quality of merchandise), of perceptions of price and behavioural responses such as time spent and 'impulse buying'. Twenty-five out of twenty-eight reviewed studies found that atmospheric aspects have the capability to influence purchasing behaviour via the interference of emotions in shoppers in all kinds of retail stores. Several years earlier Tai and Fung (1997) already noticed, in their literature review, two important patterns: atmospheric aspects have been proven to have a variety of physical and physiological effects on people which will in turn influence consumer behaviour. They suggest that when these aspects are skilfully manipulated, they will lead to consumer behaviour favourable to the retailer. More recent studies claim the same and state that store atmosphere contributes to positive shopping attitudes and, in turn, contributes to the profitability of the store. Equally, a negative mood change in store, elicited by its atmosphere, can lead to negative attitudes, resulting in less time and less money spent on spontaneous purchases (Ahn et al., 2006; Dijksterhuis et al., 2005; Spies et al., 1997) and can engage in stronger avoidance behaviours (Van Kenhove and Desrumaux, 1997).

As has been mentioned, there is a lack of research on the experience that atmospheric aspects are able to generate and how they are perceived. So, the challenge lies in a designer's – holistic and molar – approach: to measure the importance of the retail environment via the analyses of its atmospheric aspects placed in their architectural context.

3.4.2 Lighting as a Case

Many atmospheric features, either individually or integrated, exert influence on customers in retail environments, however, our research concerns a single element due to its effectiveness in controlling and manipulating. Moreover, one variable can be used to attribute and isolate a possible influence on the customer. Additionally, it is interesting to see whether one aspect of a retail environment can influence and change the perception of a store's atmosphere. Since we were looking for a simple elicitation of different atmospheres by changing a single aspect, lighting offers an interesting case – this is backed up by literature and expert interviews in the next chapter.

In what follows experimental research is carried out to study the impact of lighting on the perception of atmosphere (Chapter 5) based on a theoretical framework (Chapter 4).

Whether lighting can be framed within the definition of 'atmospheric aspects' remains vague in research up to now (e.g., Baker, 1986). Bitner (1992) defined lighting as an interior aspect, while Turley and Milliman (2000) include lighting in their review of atmospheric research in retail environments. Both opinions are valuable, but within my research, lighting is defined as an 'atmospheric tool' that might have an influence on consumers at a subconscious level (without them seeing or appreciating the difference that is attributable to the lighting of a space/product). It is an interesting tool because it can be quite easily manipulated, while at the same time its impact on the environment is, in relative terms, potentially high.

3.5 Conclusion

I have tried to illustrate the multidisciplinary aspects of retail design. Equally multifaceted are the research methods that are applied in relation to this discipline. It is within this wide spectrum that I will manoeuvre to establish an experimental research approach that I have called 'designers' perspective'. In sum, this includes a molar approach (of one or several characteristics, studied in actual environments) holistically advanced (measuring, affect, behaviour and other moderators) and with designers selecting relevant stimuli. Closer perhaps to the realm of designers, I have tried to embed it in a more traditional, analytical manner. It is a fine line, but I see a difference in the procedures of more 'traditional' research compared to a more 'designerly' approach advocated by designers (the literature survey on lighting, p. 102, also illustrates this). Indeed, I want to argue that designers approach retail design and research in retail design from top to bottom (top-down method), whereas more 'traditional' experimental research applies a bottom-up method.

Results of research on isolated matters such as lighting should always be set against the context before they can become fully supportive to the design process. The Retail Communication model offers support in understanding the human-retail environment link (organism-stimuli link), which aims to understand actual behaviour. With the 'designer's perspective' for conducting experimental research a framework is proposed that might bridge the gap between research and practice, and different research disciplines related to retail design.

Chapter 4

CHAPTER 4
LIGHTING RETAIL SPACES

4.1 Introduction

In this chapter we develop a theoretical framework as the basis for our research set-up for experiments discussed in the following chapter. A brief historical contextualisation of lighting retail spaces is sketched, followed by a list of lighting related terms and concepts. Finally, a review of the literature concerning lighting spaces is given.

4.2 Evolution

4.2.1 Daylight: to Hell and Back

The relationship between (day)light and retail spaces has always been one of love and hate. Until the end of the 18th century shopkeepers made use (or were forced to since no other option was available) of atria to highlight goods via natural lighting (Heal, 1925, cited in Henderson-Smith, 2002). Also in the early 19th century, with the development of arcades, skylight voids[39] were utilised. In addition to the value of natural light as display illumination, it also isolated space from its natural environment, creating a void that directed the consumers' attention towards the store windows (Geist, 1983). Later, in department stores the same architectural feature was again used; a main atrium was added with smaller skylights placed within domes. The success of this feature was soon adopted in other building types, such as schools and museums (Henderson-Smith, 2002). Until the 1920's daylight was seen as essential.

After the adoption of gaslights and arc lights in department stores (cf. next paragraph), they became less dependent on daylight. Originally intended to infuse the retail interiors with abundant daylight, large glass windows also led to frustration for the retailer due to the hindering contra or undirected lighting. Together with the introduction of electric lighting (cf. next paragraph), these evolutions virtually eliminated daylight in retail spaces.

However, in the 1970's, partly due to the energy crisis, daylight became more attractive again. As electric lighting consumed about 70% of the total energy usage (Smith-Henderson, 2002), skylights were re-introduced as guiding tools in shopping malls to draw consumers deeper into the mall. Nowadays, with the increasing attention to sustainability, daylight has reclaimed its place in retail design (e.g, Delhaize, Brussels, Figure 4.1). But daylight creates extra challenges, which are now precisely the same as 200 years ago: a lack of contrast possibilities, heat regulation and strong variations in light intensity – from dull greyish light on a rainy day to bright white light on a sunny day.

So, with a correct balance of daylight, artificial light and with clever design, daylight can operate well in retail spaces. The earlier mentioned MPreis (cf. Chapter 1, p. 36) is such an example. Daylight can penetrate the store space, but the overhanging eaves deflect the sunlight.

(right) Figure 4.1. Delhaize Laeken. Author's collection, 2011

39 The glass used filtered daylight and changed it to more diffuse lighting to rule out disturbing shadow effects.


LES INSECTICIDES
INSECTENDODEND
LA LESSIVE
WASMIDDELEN
LA CUISINE
KEUKEN
LES ANIMAUX
DIERENVOEDING
L'ENTRETIEN DES SURFACES
SCHOONMAAKPRODUCTEN
DAMES HYGIÈNE
LA PARAPHARMACIE
PARAPHARMACIE
LE BEBE
BABYVOEDING
TEXTIEL
Moins cher qu'ALDI

4.2.2 Artificial Lighting

The changing Role of Artificial Lighting

By the turn of the 19th century gaslights were first used in department stores, which gradually led to the closing up of the façades (cf. the end of the second phase in the development of the department store, p. 15). Paris and London were the first cities that laid gas pipes throughout large parts of the city, making street lighting possible and available to private homes and shops in wealthier neighbourhoods (Brox, 2010). This caused a shift in urban life. The dark 'night' altered to a 'night life', also changing consumer attitudes. Stores were able to stay open longer and street lighting generated 'window shopping' (Brox, 2010).

In the late 1870's the first electric arc lamp appeared, running on steam-driven generators. In 1878 the first electric streetlamps appeared in London and Paris (Miller, 1981). Arc lamps were much brighter than gas lamps: 20 versus 800 candela, which quickly increased to a brightness of 3,000 candela. Streets no longer appeared as avenues lit with distinct and spaced spots of lamplight during that period. Rather, the light reflected off walls and penetrated houses (Brox, 2010). It took some decades before electric lighting entered homes and stores. So, Paris with its boulevards lit with electric lighting (arc lamps) and London with its lighted shop windows (Sorcar, 1987) were the pioneers – while other cities were still using gaslights. It was only with the introduction of the incandescent light source (invented by Edison in 1879) in homes, hotels and shops at the beginning of the 20th century that the brief period of gaslighting in retail spaces was over.

Developed in the 1930's, the next step was 'neon lights'. These are discharge lamps that use various gases to create different coloured light, ideal for signs and advertising. A descendent of these discharge lamps is the fluorescent tube, developed between 1934 and 1938 at the General Electric laboratories. This lamp used about a quarter of the energy of incandescent lamps. This was the first cold white light (Brox, 2010). So, by the 1940's a variety of brilliant, durable lights were available that enabled the creation of fadeouts, accents, graduated shades and differing intensities of light (Brox, 2010).

"MEN AND WOMEN SUDDENLY FOUND THEMSELVES BATHED IN A FLOOD OF LIGHT THAT WAS AS BRIGHT AS THE SUN. ONE COULD IN FACT HAVE BELIEVED THAT THE SUN HAD RISEN. THIS ILLUSION WAS SO STRONG THAT BIRDS, WOKEN OUT OF THEIR SLEEP, BEGAN SINGING…LADIES OPENED THEIR UMBRELLAS…IN ORDER TO PROTECT THEMSELVES FROM THE RAYS OF THIS MYSTERIOUS NEW SUN".

(TEXT ABOUT THE ARC LAMP, QUOTED BY SCHIVELBUSH, 1995, CITED IN BROX, 2010, P. 104)

At the beginning of the 20th century, two different forms of electric lighting make their appearance, a utilitarian form of lighting – with little or no luminaire design input – and a decorative form – with luminaire design input from decorative arts and industrial design (Myerson, 1996). Moreover, public and commercial buildings became the exclusive territory for electrical engineers due to the highly functional aspect of these spaces. Light levels were calculated with rigid scientific formulae excluding more subjective criteria (Myerson, 1996). With the development of the fluorescent light source (a gas discharge lamp) in the 1930's, and the incandescent halogen light source in the 1950's, light for (at that time) comparatively little energy was available. This led to 'the more light, the better' concept. In most cases, ceilings were covered with evenly distributed general lighting luminaires, and sometimes downlights were added to illuminate the difficult areas. Until the early 1970's, the quantity aspects of lighting in commercial spaces seemed to have the upper hand (Sorcar, 1987). This changed during the 1970's, partly due to the economic crisis and the general recession. Lighting design as a discipline took shape and there was increased attention to qualitative aspects of lighting. Indeed, subjective elements became equally important as lighting plans transcended their merely functional role. The fact that many lighting professionals took their training in drama and stage lighting also accounts for this shift

(PLDA workshop, 2007, personal communication).
In retail spaces, lighting has always been essential, but it has not always been credited with the atmosphere it can create. Although lighting design changed after the 1970's, many retailers did not integrate lighting as part of the retail concept; too often lighting was the last stage in budgeting a programme. In other words, the money left over after the completion of the design was spent on lighting. During the last two decades this has changed drastically. Nowadays the quality of lighting is highly valued and it is already integrated at the beginning of the design process. Fitch and Knobel (1990) even argued that poor lighting could ruin any retail design. And, skilful use of lighting can often improve mediocre designs. Fitch concludes, *"lighting is the single element most able to give a store its atmosphere"* (p. 76).

Lamp technology and lighting design continues to evolve. Since the introduction of electric lighting many different light sources were introduced and continued to improve. There are now so many lamps of different qualities on the market[40], that an architect or retail designer can hardly keep up. Although the retail designer determines the atmosphere of the store, including the type of light setting, the help of professionals in lighting design is often necessary.
To understand how lighting designers, retail designers and lighting manufacturers handle the design of a light plan, I conducted several interviews. But before discussing that I give a brief introduction to the terminology used in lighting to distinguish the different lamp qualities.

Terminology

I describe the terms commonly used for lighting in an accessible fashion, and refer readers with additional interest in more technical descriptions to specialised literature: Boyce, 2003 and Cuttle, 2003.

ILLUMINANCE - LUMINANCE

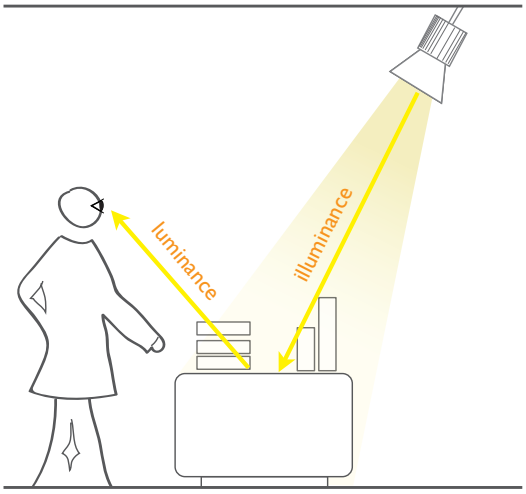
Illuminance is the amount of light, coming from direct and indirect light sources, which falls on a surface divided by the area of that surface. It is measured in lux. It is generally referred to as 'light levels'. A typical office might have an illuminance of 300 to 500 lux. In retail spaces this is more diverse. A few years ago, supermarkets and other big-box retailers were keen on having bright retail spaces. The Bijenkorf, for example, aimed at an illuminance of 850 lux. The Carrefour in Hasselt has departments, such as cosmetics, where I measured over 1200 lux. More recently, due to concerns over sustainability (among others), it is aimed to decrease lux levels or install energy efficient lighting installations.

In retail spaces it is important to consider the products offered for sale. Dark clothing, for example, absorbs a lot of light so more light is needed than for white products, such as cosmetics. The same reasoning can be applied to the colours/materials of the walls, flooring and ceiling. This phenomenon is described as luminance: that is the amount of light that reaches our eye (what we 'see'[41]). This is generally meant when one speaks of the brightness of a space. So, the light falling on a shelf is indicated in illuminance and measured in lux, while the amount of light that reaches our eye, after falling on that shelf (and that is partly absorbed or reflected) is expressed in luminance[42] (see Figure 4.2). While the illuminance is mainly dependent on the distance and type of the light source (lamp and luminaire), the luminance is also dependent on its surroundings (e.g., the colours of the shelf and the products on that shelf).

40 The most common light source in contemporary retailing are the group of the discharge lamps (e.g., fluorescent lamp – low pressure –, metal halide lamp – high pressure), the halogen lamps and the LED's (light emitting diodes). The latter fits the trend of using as less as possible energy with a maximum of light quality and illuminance. Almost a decade ago, electric lighting consumed about half of the electricity consumed in commercial buildings (Eley e.a, 1993, cited in Veitch and Newsham, 1996). Nowadays, this percentage is decreasing due to the energy efficiency regulations and concerns. Also to this end, the incandescent light source will be banned in the following years.

41 Lighting has no visible effect in space. We can only see light when it hits a surface. However, sometimes it seems like we can see light, but that is only when it is dispersed by small particles such as mist or smoke.

42 It is measured in candela per square meter. Lux levels and illuminance can be calculated beforehand.



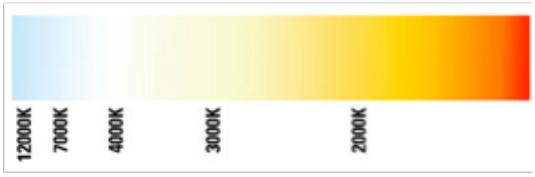


Figure 4.2. Visualisation (by author) of the difference between luminance and illuminance

(rignt) Figure 4.3. Visualisation of Colour Temperature (Kelvin). (online) Available at: http://www.mediacollege.com/lighting/colour/colour-temperature.html

CORRELATED COLOUR TEMPERATURE

Designers often speak of 'warm' and 'cold' white light. Specific numbers can be found behind these descriptive terms, expressed in the correlated colour temperature (CCT) – commonly referred to as colour temperature – and defined in Kelvin (K). Imagine a block of steel that is heated bit by bit. The steel will glow from orange to white. During each phase the temperature has been measured in Kelvin (= degree Celsius +273).

Generally, warm white light is situated below 3000K. A candle, for example, has a correlated colour temperature of 1700K, while an incandescent lamp will be around 2700K. Between 3000K and 5000K, light is called 'neutral'. Cold white light is situated above 5000K (see Figure 4.3). For fluorescent lamps, which do not have a glowing component as in incandescent lamps and high intensity discharge lamps, the CCT is the temperature of a heated body that has a colour appearance as close as possible to the colour appearance of the light source.

When looking at the technical description of a light source the last two numbers in its code (multiplied by 100) indicate the correlated colour temperature. For example, a TL830 is a (compact fluorescent) light source with a correlated colour temperature of 3000K and a CDMT945 is a (high pressure discharge) light source with a correlated colour temperature of 4500K.

COLOUR RENDERING

The colour rendering index (CRI) of a light source describes to what degree that light source is able to show (render) the colour of a set of standard test colours compared to a reference source. Light sources can have a CRI from 0 to 100. Daylight, for example, has a CRI of 100. This means daylight (>5000K) perfectly renders the colour of an object. The lower the number, the weaker the colours are represented (rendered).

The CRI is also (partly) visual in the first number of the code of a light source. The TL830, for example, has a CRI between 80 and 89, while the CDMT945 has a CRI above 90. The precise number can be found on the packaging of a light source. Note that this is one

43 Other indexes are being developed that offer an up-to-date measuring tool. With the introduction of LED's and the change of light the CRI seems to fail accurate measurement (Jost-Boissard et al., 2009). For example, a LED light source might receive a CRI of 65, while observers noted the rendering of the colours as positive.

44 The type of material the car is made of also plays a role. In simple terms, a glossy lacquer red car might be perceived as having another intensity or brightness of red than a matt red car that reflects the light diffusely.

of the existing indexes, which is used generally[43].

We see colour because a lighted object reflects the colour(s) present in the spectrum of a light source. For example, we see a red car driving by because the lacquer of the car reflects predominantly the red that is present in the daylight spectrum. The spectrum of daylight contains all possible colours, which can be visualized by a prism or a grating. The red lacquer absorbs all colours of the spectrum, except red[44]. So, each light source has its own spectrum (spectral power distribution) that will determine the colour rendering. Figure 4.4 shows the difference between the spectrum of daylight and a fluorescent lamp. The daylight has a much more continuous spectrum that will render each colour very well. The fluorescent lamp will score well for rendering green and yellow colours, but poorly for red, simply because of the low red content.

IN PRACTICE

In addition to different lamp qualities, it is important to understand how these characteristics interact with one another.

Light sources with a different correlated colour temperature can have the same CRI, and vice versa. Fluorescent light tubes, for example, come in many different qualities so a light tube with a correlated colour temperature of 3000K can have a CRI of 60 but it can just as well be 90, the latter also exists in different correlated colour temperatures. However, a more reddish white light source will accentuate the warm colours more strongly than a bluish white light source with the same CRI (Visser, 1997).

Secondly, warm lighting is perceived as less bright than cold lighting when the same lux level is applied. In other words, warm light needs higher lux levels compared to cold light when the level of brightness needs to be perceived as the same (Park and Farr, 2007). The Kruithof curve (Figure 4.5) explains this relation (IESNA, 2000, cited in Boyce, 2003).

Finally, there are many other technical specifications that determine the light source. But with the focus

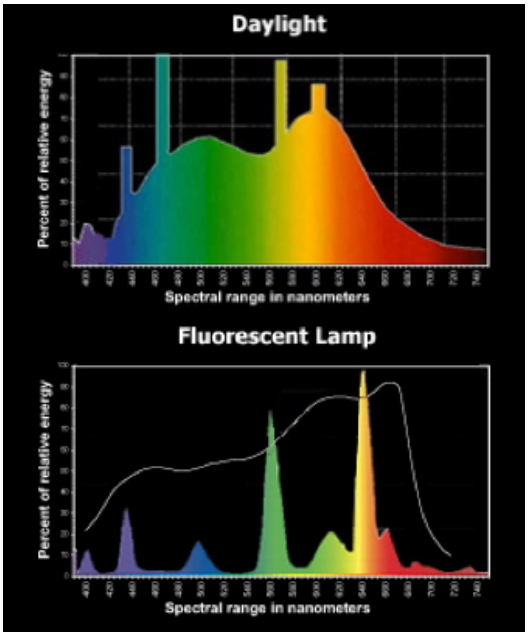


Figure 4.4. Spectrum of daylight and of a fluorescent lamp. (online) Available at: http://www.topbulb.com/find/grow-lights-bulbs.asp

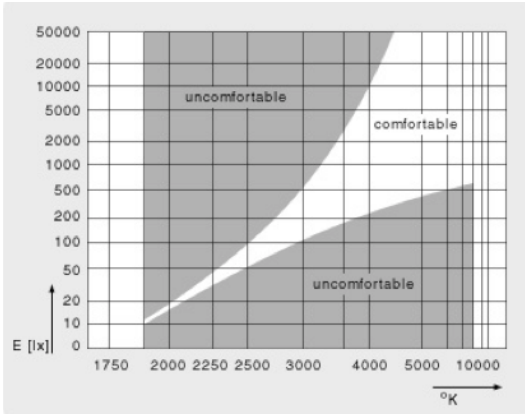


Figure 4.5. The Kruithof curve. The lower shaded area represents the correlated colour temperature/illuminance combinations that are claimed to produce cold and dull environments. The upper shaded area produces overly colourful and unnatural environments. Source: Boyce, 2003, p. 247

on the quality of the light, one other aspect needs to be highlighted: the light luminaire. In addition to the lamp, the type of luminaire determines how much light is dispersed into a space. Its shape, the shape and colour of the reflector (when present), and type of filter (when present) all influence and/or change the emitted light from the light source. For example, the emitted light of a halogen incandescent light source would spread in all directions, without a luminaire. The reflector in the luminaire can change the light beam to an optimal, directed light beam for lighting a gondola or clothing rack. The colour of the reflector (silver, gold and copper are the most customary colours) can change the colour of the light. This is commonly used in the food sector in combination with filters. Meat, for example, requires special filters that improve the rendering of the red colour of the meat on one hand, and that disperses the damaging radiation of the lamp on the other. Other filters are used to change white light into coloured light, for example, or to create a diffuse light instead of a beam of light.

4.2.3 Lighting Design Today: Interviews

To understand the role of lighting in retailing today, I conducted in-depth interviews (2006) with twelve selected experts. To receive input from different disciplines and angles, I made the following selection:

- four lighting developers stationed at four different lighting manufacturers (two Belgian, a Dutch and a German company);
- three independent retail designers (a Dutch and two British designers);
- two independent lighting designers (active in Belgium and the Netherlands);
- two people working and designing for a large retailer (a Belgian supermarket and a Dutch department store) and finally,
- one Belgian theatre lighting designer.

The initial aim was to understand contemporary lighting design, the design methods and the importance of lighting in retailing. Then, concerning the gap between research and practice, I asked for the experts' knowledge of scholarly literature and research, as well as their involvement in research. I composed a set of general questions along with questions particular to each (design) discipline (see appendix A). The interviews were set up as half-open interviews so interaction was encouraged.

Regarding **the first part** of the questionnaire on the design of retail lighting, the answers of the four consultants from lighting developers were based on a different perspective. There seemed to be consistency in the way a light plan is approached: first the overall lighting is determined, which is later added to with accent lighting, to create different atmospheres throughout a store. Two out of four even mentioned that the overall retail space needs to be lit and dark places to be avoided. Another pattern was the consistency on the role of daylight. When asked about the importance of daylight in retail spaces, almost all agreed daylight was increasingly valued, but remained difficult to work with. The suggestion was made to use daylight in combination with artificial light. With the help of daylight sensors this combination can be achieved and a constant light level can be maintained over the course of a day. This would reduce energy cost dramatically, which is seen as beneficial by the two people working for a large retailer whose main concern is reducing these costs.

The answer on the question about the role of lighting in retailing was, from all of them, that lighting is an integral part of a retail design. They also agreed that lighting can create specific atmospheres that can be used as mood inducers. One of the lighting designers mentioned that in order to do that, lighting should fit the type of shopper who visits the store. One retail designer expressed that this is not only true for the consumer but also for the staff, and that 'happy staff' are essential in the retail experience. The two lighting designers also confirmed this statement. Retail designers and lighting designers answered positively on creating more drama with lighting in retail spaces. They state that lighting should create tension between light and darkness as well as between light and shade (here they differ from lighting developers). Both lighting designers mentioned that lighting is

sensitive to trends. Interesting to hear was that the retail designers and both individuals working for large retailers require the help of a lighting specialist when managing large projects.

Finally, from the interview with the theatre lighting designer, I learned that lighting can be used to create almost any atmosphere you want. A set can be completely altered with lighting, from a dark grubby night to a wonderful, magical morning. Also the characters played by the actors become more visible with the help of the light: bright spot sidelights with a sharp downlight makes the outline of the face severe and is used for 'bad' characters, while frontal soft light, added with a little side light, is used for gentle characters. These techniques were (and others still are) invented on stage and found their way into store design in, for example, lighting shop mannequins.

The **second focus** of the interviews, the attitude towards scientific knowledge, also revealed interesting results. During the first interviews, it became apparent that there is a need for scientific input for lighting in food retailing – whether it is in a supermarket, grocery store or a specialist store. After showing the diagram (see appendix A) supermarkets were identified as the most interesting (by all but one) due to their diverse product offer. *"Supermarkets contain almost all-possible lighting technology"*, was stated by one of the manufacturers. One retail designer mentioned that the whole retail sector was under-researched. Another explained, *"I do believe the 'one brand category' is the sexy one, but supermarkets need so much more research… People buy fashion because of the brand. They will buy Prada even if candles light it. But, I won't go into a food store unless the food looks delicious… There is plenty of evidence which says a well-lit store works better than a poorly lit store, but scientifically, in a measured sense I am not aware of anything."* The two lighting designers verified this. One of them even revealed *"At the beginning of my career I used to try to convince shop owners to invest in lighting because it would increase sales. It is/was hard to put a number on that but I did believe it then. Now, I have given up on that statement."*

The interviewees acknowledged lighting has an incremental added value to the retail environment but that there is insufficient reliable data to work with. They 'feel' that lighting plays an important role in retail design, but it has never been scientifically proven that it does make a difference in, for example, buying behaviour. One of the retail designers mentioned that he would like to see scientific proof that certain lamps, which are credited with higher sales numbers by lighting manufacturers, really work in that way. This specific question caught my attention and was noted for further consideration during forthcoming interviews.

Due to the positive reactions of the experts, food lighting seemed to form a possible direction for my research. Indeed, next to the lighting manufacturers who conduct research themselves, only one designer, a lighting designer, read scientific articles. Besides, designers do not value research conducted by manufacturers: *"there is a need for impartiality! If you look at the manufacturers' reports they always look the same: one negative remark counts for one positive. After reading a whole report of 80 pages, you still don't know anything."* The other retail designers mentioned something comparable. What is more, after confronting them with the existence of impartial scientific research the responses were unanimously, that such research never reached them. For two reasons: the literature is difficult to access and, as well as the complicated language, it is written in a way that does not send out the right messages.

To conclude, during these interviews two angles of my research were sharpened: there is a need for impartial research data on lighting in (food) retailing, and such data should be communicated in a way that (also) addresses designers (thus bridging the gap). The lack of research on lighting as mentioned by the experts was further echoed in the literature. The next paragraph is devoted to a review of the scientific literature on lighting in retailing, and creating a theoretical framework. Though daylight has been proven to have a positive impact on retail sales performance (Heschong et al., 2002) it is not

integrated in this research since it is too difficult to control and is above all, absent in most regular retail environments.

4.3 Literature on Lighting in Retailing

In the past, lighting design recommendations were made but not on the basis of empirical research in the context of retailing environments. Birren (1969), for example, recommended really bright light for impulse purchases in the early days. His recommendation is repeated in the statement of Mehrabian (1976, cited in Areni and Kim, 2002), who interpreted the influence of lighting in terms of its ability to arouse people. Mehrabian suggests that lighting is an extremely important determinant of the environment since, according to him, brightly lit rooms are more arousing than dimly lit ones. Also Rook (1987) suggests that high arousal facilitates impulse buying, while Markin et al. (1976) recommends the use of soft lighting to reduce the level of stimulation and hence slow down the pace of the consumer through the store.

When reviewing the literature on the influence of lighting on consumers, two different levels are handled: one on product level (those studies are marked in blue in Table 4.1) and one more space oriented (those are coloured green). Following our RC model, the stimuli, organism (cognition, affect) and response (behaviour) paradigm is taken as a framework to indicate the type of study conducted. Table 4.1 shows an overview. In this table, orange indicates the studies based on data collected outside a genuine retail environment (various methods: videotape, photo-elicitation, lab,...), while red indicates studies conducted in real stores. The colour codes (blue, green, orange and red) are also used in the literature review as a support. Table 4.2 shows the most important results and relevancy of these studies.

> "THE PRIMARY GOALS COMMON IN THE LIGHTING OF MERCHANDISE ARE TO ATTRACT THE CONSUMER, TO INITIATE THE PURCHASES AND TO FACILITATE THE COMPLETION OF THE SALE" (REA, CITED IN SUMMERS AND HEBERT, 2001, P. 146).

Firstly, on a **product-based level**, Barbut (2001, 2002, 2003, 2004) completed a series of experiments with food products displayed on a table in a laboratory environment. The results show that the light spectrum of the lamp (stimulus) has an influence on the preference of food products (cognition). Generally it can be stated that the product on display should be lit with a lamp with a light emission in the colour of the product. For example, red sweet bell peppers were preferred under an incandescent lamp, due to the balanced light and presence of red in its spectrum,

Table 4.1. Overview of the literature and the aspects studied regarding lighting in retail

	Author	Stimulus	Cognition	Affect	Behaviour
PRODUCT	Barbut	light spectrum tested on specific products			
	Summers & Herbert	additional light (on/off) on display in 2 stores			
	Freyssinier et al.	LED background + accent light in shop window			
	Park & Farr	CRI & CCT in smaller simulated displays			intended
	Park & Farr	CRI & CCT in smaller simulated displays (for elderly)			
	Areni & Kim	bright vs. soft lighting in wine store			
SPACE	Cuttle & Brandston	ambient lighting: old vs. new in 2 furniture stores			
	Boyce et al.	old vs. new lighting in supermarket + refurbishment bakery			
	Schielke	8 light settings manipulated with computer visualisations			
	Baker et al.	ambient (lighting & music) + social (employees) cues in manipulated video			intended
	Babin et al.	light + colour+ price in described fashion store			intended
	Custers et al.	different atmopsheres of different stores			

compared to other lamps that have a lack of red light emission.

Summers and Hebert (2001) conducted research in real stores: a hardware store where tools were lit, and a fashion store where belts were lit. They studied whether more items were touched and picked up with the addition of display lighting. The lighting was determined by following the IES (International Lighting Design) guidelines for retailers. There were variations per store (number of lights and distance to the display). The setting alternated every day, between on and off lighting treatment (stimulus). They found that more products were handled (touched and picked up) (behaviour) for only the belts with the additional accent lighting. Consumers spent significantly more time at the display of tools when the light was off compared to on. Also, there was a significant difference in the main effect of display (belts or tools): belts were picked up more, handled more and a longer time was spent than on tools.
Another research in real shop environments, but taking aspects of the environment into account, comes from Freyssinier (2006) who focussed on the perception (cognition) of shop windows when the lighting (stimulus) was altered. The research aimed at a more sustainable solution for shop window lighting via blue LED background lighting. The results show that an accent lighting power reduction of 50% did not compromise the aesthetic value of the display if used with the blue coloured background. Moreover, a 30% power reduction of the accent lighting, improved the subjective responses. They also looked at sales impact (behaviour), but no results were found.

Park and Farr (2007) also focussed on the perception (cognition) of a display, but added the emotional response (affect) dimension and intended behaviour (behaviour). They used the Mehrabian and Russell model (M-R model, 1974, which will be explained later in more detail, see p. 140). Basically, Mehrabian and Russell showed that emotions (measured via three dimensions – pleasure, arousal and dominance), evoked by particular environments, are related to behaviour and can predict this behaviour. Park and Farr's study was conducted in a laboratory environment with small displays where the CRI and CCT (stimuli) were altered. Two different CRI's (75 and 95) and two different CCT's (3000K and 5000K) were compared in two cubicles with the same product display. All participants were shown four different lighting settings. They were able to demonstrate that the 5000K lighting was perceived as more arousing than the 3000K lighting. Regarding the pleasure experienced, 3000K was perceived as more pleasurable than the 5000K setting. However, the 5000K was perceived as more approachable. The study also showed that the CCT of the lighting affects the perception of brightness. The cold setting was perceived as brighter. However, the warm colour was evaluated as more attractive. Both lamps with 95 CRI were favoured over the 75 CRI lamps. The authors concluded with the advice that cold lighting might be good for stores that require a higher state of arousal, approach intentions and good visual clarity, while warm lighting would be helpful if emotions of intense pleasure and attractiveness are wanted.
Another study of Park and Farr (2007) was set-up similarly but with the focus on how the colour of light affects readability, by figure to background value contrast, colour perception, and overall room-light estimation (cognition), for elderly consumers. Again the CRI and CCT (stimuli) were altered: CRI's of 75 and 85 and CCT's of 3000K and 4100K were altered in four different settings, which were shown in an experimental setting presented in cubicles with the same product display. Each participant saw all four settings. The results showed that older adults perceived the higher CCT (4100K) as less cold than did younger adults. The CCT of 4100K was preferred over the 3000K by both the younger and older adults. Regarding readability, the CRI of 85 provided better readability than the CRI of 75, and especially older adults seem to have more difficulty with a lower CRI in combination with the warmer lighting (3000K).

Still focussing on lighting products, but with a larger impact on spatial level (however not measured) is the research from Areni and Kim (1994), who looked at the resulting behaviour (behaviour) in a real wine store. Their conclusions showed that under 'bright lighting' conditions bottles were more often examined

and touched than under 'dim lighting' conditions (stimulus). This was even more pronounced for bottles presented at eye level (middle level shelf). However, the difference between the two settings was never measured, Areni and Kim only mentioned that for the 'dim setting' 22 50Watt lamps lighting the products were used and for the 'bright setting' seven of those 22 lamps were replaced by 75Watt lamps. There was no significant influence found relating to lighting on sales and the time spent in store.

The first study focussing on **the spatial impact** of lighting, conducted in a real store environment, is the research from Cuttle and Brandston (1995). In this study lighting and its influence on actual buying behaviour is researched in two American furniture stores. The old lighting, an effect of filament spotlights, was partly changed to a more energy-efficient solution (stimuli). The general strategy was to provide ambient lighting by applying indirect light with the use of fluorescent lamps. Halogen lamps were used for accent lighting. Alongside the monitoring of energy used and numbers of sales made (behaviour), small questionnaires (4 questions) measuring the level of satisfaction (cognition) with the new lighting were organised among consumers and employees in both stores. The sales figures of the five-month period of the previous year of the furniture line displayed under the old lighting were compared to the five-month period sales figures of the furniture installed under the new lighting. An increase of 35 percent was found for one of the two furniture stores, while no consistent trend in the sales was found for the other store. These spectacular results need to be approached with caution: the low-volume, high price nature of the merchandise; influence of season and trends during the period; and different furniture displays. Furthermore, customer and staff attitudes were reported as positive. But despite such methodological flaws, the research is a step forward in establishing a possible correlation between lighting and (consumer) behaviour in a retail environment.
Boyce e.a. (1996) conducted a study in an independent (real) supermarket. In addition to the effect of new and approved lighting on sales performance, they also studied the impact of the lighting (stimulus) on the perception (cognition) of space and the numbers of sales (behaviour). A questionnaire was held among the consumers, one before and one after the lighting modifications. Unfortunately, more than just the lighting was renewed: a total remodelling of the bakery and an introduction of daylight through skylights was being done. However, the results show that the consumer considered that the new lighting made the store look brighter, more comfortable and pleasing to the eye. The sales increased significantly. The sales figures for the rest of the products showed no change. The authors acknowledge this might be due to the small impact of the new lighting system, placed in the rest of the supermarket. More light (lux) was projected on the products, but this had no influence on the perception of the space. This study also tries to quantify the benefits of 'good' lighting. Although the sales figures in the bakery are clear, the methodology is again compromising. It would be incorrect to solely link the increase in sales to lighting, as the entire interior was renovated. Also, asking consumers about the lighting before and after the improvements is only preference based.

Schielke (2010) also looked into the possible influence of lighting (stimulus) on the perception (cognition) of space and a store's appearance on brand level and spatial setting. She concluded that simply through different lighting, different brand identities were perceived for an otherwise identical store. But, the research was conducted with computer visualisations of virtual stores. Eight different light settings were designed (each with or without visual luminaires), however no parameters were explained to justify the selection of the light settings. Unfortunately Schielke's method is not clearly explained in this article.

On a spatial level, lighting has also been explored in combination with other variables. Baker e.a. (1992) described how lighting and background music have an influence on consumers' pleasure and arousal (affect) and willingness to buy (behaviour) via the M-R model. Baker e.a. used this model to examine ambient cues (lighting and music) and social cues (number/friendliness of employees) (stimulus). They conducted the experiment with videos of different

settings in the same store (card and gift store). Lighting and music together were changed as the ambient cue; the lighting levels were changed by manipulating the brightness controls on the television monitor. It is not indicated (via measurements or a more precise explanation) how bright or soft the lighting was and if those settings were relevant stimuli. So, no specific statements about lighting could be made. The results show that ambient cues interact with social cues in influencing the respondents' pleasure and the social cues influence the arousal. Arousal and pleasure together in their turn influence the willingness to buy.

Babin e.a. (2003) combined three variables: lighting (only described as bright vs. soft), colour and price (stimulus). He examined the effects of their combination on store evaluations (cognition) and patronage intentions (behaviour) in a described hypothetical fashion store. Regarding colour, their results indicated consumers react more favourably to cool stores – blue interior – compared to an orange interior. However, when lighting is combined with colour, the results change. They found that consumers expressed greater shopping and purchase intentions in blue interiors with either soft or bright lighting conditions, while a relatively poor reaction (evaluation, excitement, price fairness, patronage and purchase intentions) of consumers was found in the orange condition. Orange combined with bright lighting conditions even enhanced this contrast. And, orange combined with soft lighting conditions elicited a moderated reaction that is comparable with the reaction in the blue condition. Due to the method applied (with the interviewees responses relating to a hypothetical store), the 'bright and soft' lighting condition was dependant on what the respondent imagined as bright and soft. Notwithstanding, the research succeeded in its purpose, showing that consumers do process atmospheric characteristics holistically.

Interestingly Custers e.a. (2010) came to the same conclusion, but from a different approach. They attempted to measure to what extent lighting contributes to atmosphere (stimulus) perception (cognition) in naturalistic environments. Lighting attributes were shown to be related to perceived atmosphere. No clear statements could be made concerning which lighting attributes caused what kind of influence due to the diversity of the naturalistic settings. It did show that even with the large set of visual environmental cues present in all retail environments, lighting plays a significant role.

In sum, Table 4.2 shows the most important results and relevancy.

To conclude, based on the literature so far, it can be stated that the significance and benefits of lighting for retail spaces/products is acknowledged. Table 4.1, however, shows that lighting is studied in a fragmented way. It is usually approached on a micro level. And when it comes to a molar level, it is studied in relation to other atmospheric cues (so without conclusions regarding lighting) or in videotaped, described or virtual stores (looking only for intended behaviours).

In my research set-up (see Chapter 5) I have taken the following aspects from the literature into consideration:

- Lighting has an impact on perceived atmosphere (Custers et al., 2010). To know its impact it should be studied as a single aspect.
- Visuals might help to arrive at relatively quick results (Schielke, 2010).
- Additional or bright light might increase product interest (Areni and Kim, 1994; Summers and Herbert, 2001).
- The importance of a holistic approach (Babin et al., 2003; Baker et al., 1992).

It is also clear from this review that lighting does have an influence on behaviour and perception, however, a link between perception and consumers' affective state (moods are barely mentioned), a link between affective states and the actual resulting behaviour, and a direct link between perception and behaviour is lacking (Figure 4.6).

Table 4.2. Summary of the most important results and relevancy

	Author	Result	Relevancy
PRODUCT	Barbut	The spectrum of the lamp should be consistent with the colour of the product presented	This is tested on isolated products, difficulties arise when clustered products (e.g., shelving in supermarket) are presented
	Summers & Herbert	More belts were touched and picked up under additional lighting, no results for tools (belts systematically higher on pick up, touch and time spent)	Additional light might stimulate product interest, depending on the type of product
	Freyssinier et al.	Blue background and 30% reduction improved subjective response; blue background and 50 % reduction did not compromise aesthetic value. No results for sales	Ambient lighting can increase attractiveness, at least for window displays
	Park & Farr	5000K more arousing, approachable and brighter; 3000K more pleasure and more attractive. CRI of 95 more liked than CRI of 75	Cold lighting increases arousal, warmer light increases pleasure and attractiveness; results are consistent with the fact that warmer light is perceived as less bright than colder light with the same light intensity
	Park & Farr	Elderly perceived 4100K less cold than younger adults; CRI of 85 provided better readability than CRI of 75	This study shows no statistical differences for warmer light to be perceived as less bright than colder light with the same light intensity
	Areni & Kim	Under bright lighting more bottles touched and handled, but only on middle shelf. No results for sales	Light might stimulate product interest, depending on the location on the shelf
SPACE	Cuttle & Brandston	One of the two stores showed 35% increase in sales	No clear results due to the weak methodology, however, indication of possible correlation between lighting and behaviour
	Boyce et al.	Only sales for bakery increased	No clear results due to the weak methodology
	Schielke	Lighting can influence perception of different brand identities	Visuals are useful to indicate that lighting has an impact on image perception
	Baker et al.	Ambient and social cues influence pleasure, if only one of them is high, pleasure already increases	No details regarding lighting; holistic experience of characteristics
	Babin et al.	Blue interior with bright or soft light elicited higher shopping intentions than orange.	Holistic experience of characteristics
	Custers et al.	Lighting plays a role in perceived atmosphere	Lighting plays a role in perceived atmosphere

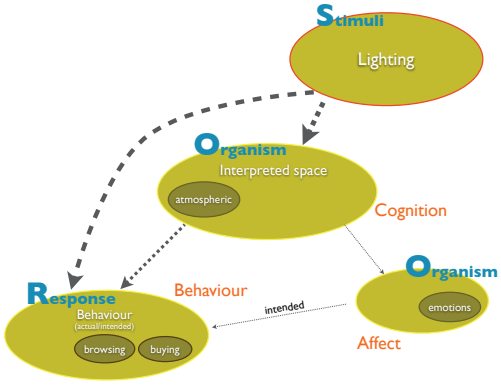


Figure 4.6. Our RC model adapted to lighting. The thickness of the arrows visualises proportionally the amount of research dedicated to those connections

Based on the literature discussed so far, it seems difficult to develop a theoretical framework with credible statements at this stage. Therefore, a broader literature study is indicated.

4.4. Theoretical Framework

I develop four arguments, based on existing literature, on mood and behaviour in retail spaces, but when it comes to lighting in particular I will also include literature that has studied the effects in other types of spaces[45] (e.g., work environments). I specifically limited the literature to those carried out in genuine spaces.

Firstly, it has been widely accepted that a change in emotion can alter a consumer's mood, affecting shopping behaviour (e.g., Babin, Darden and Griffin,

1994; Gardner, 1985). Donovan and Rossiter (1982) were among the first to apply the M-R model to store environments. With their model these emotions can be used to predict approach and avoidance behaviour in store environments. Moreover, they state this contribution of emotional variables to consumer behaviour is independent of cognitive variables, such as perceptions of quality, price and store selection (see also Clark and Isen, 1982; Sherman et al., 1997). Donovan and colleagues (1994) showed that the model was able to predict real behaviour (time spent and amount of money spent), and not only the intended one. So, shoppers' emotional states can predict actual behaviour. Regarding this actual purchase behaviour Sherman e.a. (1997) concludes that pleasure has a positive impact on money and time spent in the store and the number of items purchased. Babin and Darden found that a positive mood related positive to purchasing behaviour (increase in spending), but that an increase in negative mood did not reduce spending (see Figure 4.7).

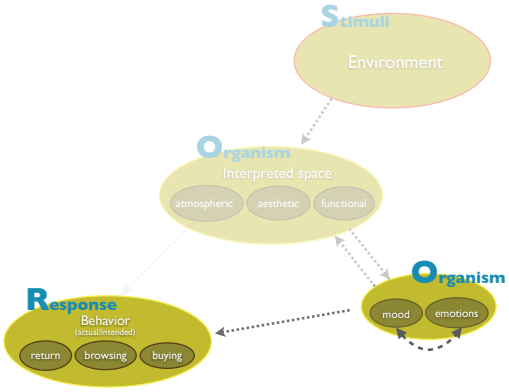
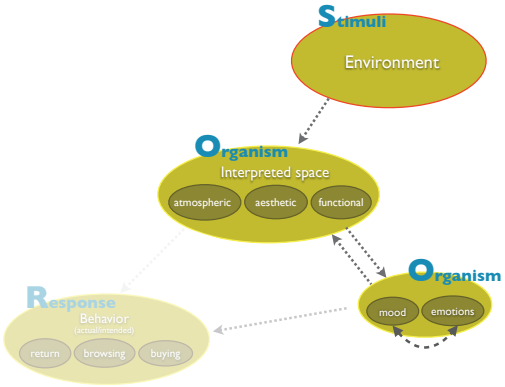
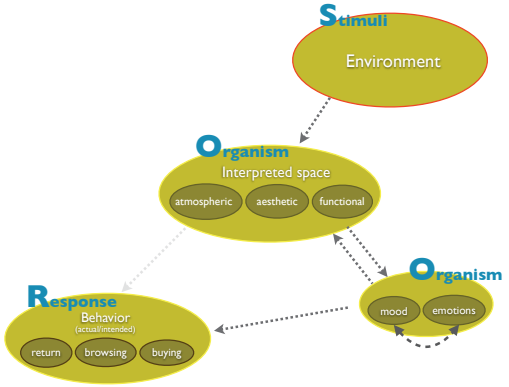


Figure 4.7. RC model showing the emotion-behaviour link as confirmed in the literature

Secondly, it is known that the visual environment is able to influence the affective state of people. Baron e.a. (1992), for example, indicates that not only the receiving of pleasant things can influence one's behaviour, but also aspects of the physical environment can lead to this outcome. Custers e.a. (2010) conclude that lighting does contribute to how the atmosphere is perceived. Sherman e.a. (1997) claim that, unless a store has a distinct product offer or pricing strategy, the retailer should distinguish their store with the help of store design, store atmosphere and influence on the consumer's emotional state. As mentioned in the RC model, affective states also influence post-shopping evaluations of a retailer (Babin and Darden, 1996) and store satisfaction (e.g., Spies et al., 1997). Babin and Darden also show that affective states influence satisfaction independently of the effect of spending. They also suggest that negative emotions are more powerful than positive ones since negative emotions reduce consumer satisfaction significantly more than positive ones increase it (see Figure 4.8).

45 In the past lighting has been widely studied in work environments, perhaps even too much as Boyce quoted (2004). In the 1980's and early 1990's the effects of lighting on the visual processes were examined. It focussed primarily on determining the necessary levels of illuminance required for the performance of tasks and even sometimes for shopping. In the late nineties and this century, the focus changed to colour temperature and spectral distribution, but still at a very functional level. Much attention was paid to the influence of lighting on the cognitive tasks done by the employees, and optimal lighting strategies were developed for that period. Afterwards, when lighting design changed and new technologies were developed, more research was done to improve work and retail environments with the first signs of the application of lighting on a more experience-based level. In recent years new research on the influence of lighting on human behaviour in work environments appeared, due to the discovery of a third photoreceptor in the human eye. This photoreceptor is responsible for changing our hormone production under the influence of light, which is defined as the biological influence of light on humans. This reaction only occurs after a long and intense exposure to specific lighting conditions and can elicit a shift of the body's circadian rhythm. Because of these terms retail environments do not fit into this category (Rea, 2002).





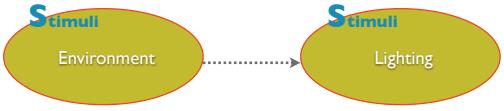


Figure 4.8. RC model showing the environment-affective state link as confirmed in the literature

Figure 4.9. RC model showing the environment-emotion-behaviour link as confirmed in the literature

Figure 4.10. The connection to be made

Thirdly, Babin and Darden (1996) relate the emotions induced by the retail environment to actual behaviour. This means, good mood-inducing stores will lead to good shopping experiences. But also, a negative mood change in store, caused by that store, can lead to less time and less money spent on spontaneous purchases (Spies et al., 1979). Donovan and colleagues (1994) conclude in their study that pleasure induced by store atmosphere appears to be a potent cause of consumers spending extra time in store and spending more money than intended. Additionally, they contend that, depending on the store, arousal induced by the store environment could intensify pleasure or displeasure to such an extent that time and spending behaviour would be increased in pleasant environments, and decreased in unpleasant ones. So, store interiors and the atmospheric aspects can be designed to create specific feelings (emotional states) in consumers and hence, influence their actual behaviour (see Figure 4.9).

Finally since, as seen in the literature review on lighting in retailing, no research has been dedicated to connecting lighting in real spaces to affective states, research in work environments is used to connect the previous framework to lighting. Although, Park and Farr's research (2007) does predict that specific lighting conditions can enhance people's affective states, (but in a simulated shop display), Baron's research (cf. Baron et al., 1992) shows a connection with real (work related) environments. Affective state enhancement, in turn, can influence important aspects of behaviour as mentioned earlier. But, contradictory responses have been found by different researchers due to the variety of experimental procedures and differences of independent variables and mood measurement instruments (McCloughan et al, 1998). So, further research is necessary to explain possible patterns (see Figure 4.10).

4.5. Conclusion

The interviews revealed that there is a need for scientific research regarding lighting retail spaces. The literature review shows the influence of lighting on how customers behave and how they perceive the

aesthetic quality of lighting, as well as its functionality. However, information about the impact of lighting on the perception of store atmosphere and how that is related to customers' emotions and behaviour is still lacking. Also apparent in the literature and equally highlighted by Boyce (2004), is the lack of understanding of lighting on a more experience-based level. In other words, information on how lighting is perceived at a spatial level, how it relates to atmosphere, or how it influences the way in which customers react, remains scarce. For example, when a store's atmosphere is perceived as 'cosy', does this imply that a customer spends more time in it? Or when a store's atmosphere is perceived as 'dull' and boring, does this decrease the number of sales?

Based on the theoretical outline the following assumptions can be developed:

Product related:
- Lighting has an influence on the attractiveness of products.
- Lighting has an influence on the way consumers behave (touching, picking up, …) towards these products.

Space related:
- Lighting has an influence on the perception of atmosphere in retail spaces.
- Lighting has an influence on the environment-elicited affect of customers in retail spaces.
- The elicited affect and/or perception of atmosphere from lighting, influences the behaviour of customers.

I have conducted three experiments to verify these statements. A first experiment handles the product related statements (Phase One), the following two experiments try to connect with the space related statements (Phase Two). As mentioned during the interviews, designers wonder whether the claims that light manufacturers make, actually fulfil what the manufacturers say they do. Therefore, the influence of specific lamps on the attractiveness of products and the resulting behaviour will be tested in the first phase. Phase two focuses on experimental research from a designers' perspective, studying the impact of lighting within its architectural context. The set-up, methods and measurement techniques of all three experiments are explained in the following chapter.

Part III

Experimental Research

After presenting the context of the evolution of retailing and defining retail design (Part I) the possibilities of research in retail design were explained via the analysis and literature review of one aspect: lighting (Part II). Of particular importance was to consider the designer's perspective. Experimental research from a **designer's perspective** entails the three following elements:

First, a **context** is needed in which the environmental manipulation can give rise to the relevant, holistic experience. Consequently, it is opportune to **use real stores or three-dimensional simulations**.

Second, there should be a selection of '**meaningful**' stimuli. This implies a shift away from systematically changing a specific physical characteristic in a reduced context. Instead, the stimuli are inspired by **what is applied and what remains relevant in practise**. This also implies that all experiments take place within the boundaries of what lighting is required to do functionally. This means we are not using lighting concepts that compromise this functional aspect and would illicit strong responses because of this, but lighting that provides subtle, acceptable changes.

Third, next to a **molar approach** of a single or several aspects of the environment, the **whole consumer experience** should be measured and interpreted within a sound theoretical framework. So, the results are not an endpoint, but by contextualising them, they rather form a bridge to understanding the impact of the total environment and become supportive in the design process.

In what follows, the experiments regarding lighting in supermarkets are described. The final chapter (Chapter 6) contains a critical reflection.


EXIT



Feed your senses









look &

OFFERS

Fruit & Vegetables
Wine
Spirits







LES INSECTICIDES
INSECTENDODEND
LA LESSIVE
WASMIDDELEN
LA CUISINE
KEUKEN








9
Groenten & fruit


FRUIT & VEGETABLES

Chapter 5

CHAPTER 5
LIGHTING SUPERMARKETS

5.1 Selecting the Research Environment

Supermarkets

Given its importance, there is only fairly limited research on lighting for (fresh) food products. Though, research on (isolated) product level, such as Barbut (e.g., 2001) did take a dominant position, research from a spatial point of view remains rather scarce. Four factors motivating the supermarket as a research case are explained.

Firstly, it seems that manufacturers still dominate the market when it comes to designing light settings for larger stores such as supermarkets (cf. interviews Chapter 4, p. 100). Moreover, they also dominate research. This increases the need for more impartial research and knowledge, which can provide insight into the (atmospheric) possibilities of lighting in food retailing.

A second factor in favour of supermarkets as a case study is the fact that they are self-serviced. Dijksterhuis and colleagues (2005) explain that food is bought frequently with a minimum of thought and effort: some product choices made in a supermarket are easy to explain, like buying detergent because you have none left at home, while other choices are probably introspectively almost blank, like buying chocolate or a pizza. Such choices are a result of the mere perception of cues in the environment (Chartrand, 2005), such as social cues (e.g., seeing someone else buying it) or product presentation. Self-service environments stimulate such behaviour even more. Moreover, research showed that up to two thirds of purchase decisions are made in stores (Lavendhomme, 2001; POPAI Europe, 1998). Inman and Winer (1998) claim that 59 percent of purchases were unplanned, 30 percent were specifically planned and 11 percent were generally planned or brand switches. Again, self-service environments do not only stimulate such behaviour; in such environments lighting has the best opportunity to play a role.

As a final factor, as mentioned in the historic survey (cf. Chapter, 1), supermarkets have changed from windowless, functional and neutral spaces to increasingly comfortable and personal environments. This development, also improved the light settings. The mainly functional lighting changed into a variety of settings – with differences between general and accent lighting, warm and cold, dim and bright lighting – that can also be used as a differentiation strategy (cf. Chapter 2: if distinctive price-management is not employed, then design is an opportune way to differentiate oneself, p. 51).

Simulated versus Real Supermarket

Conducting experiments from a designer's perspective entails a need for a holistic and a molar approach, emphasizing, among others, a three-dimensional environment. There are two ways to do this: research in real retail spaces or research in simulated retail spaces. The former might seem, for a designer, more relevant. The reason for this is twofold. Firstly, the (behavioural) response can be measured unobtrusively by observing consumers during shopping (e.g., by following them into the store and observing them from a distance; or with the help of cameras; or even with a tracking system, only following the route they take) and analysing the

products they have bought.

Secondly, results regarding behaviour in natural settings are, ultimately, more useful when it comes to estimating the degree of effects in the holistic experience of everyday shopping. The advantage of conducting research in real retail spaces is clear: all variables and their interactions are realistic, the participants behave naturally, there is an increased possibility that the sample of participants is representative, or even the whole population can be studied (depending on the time span of the experiment), leading to results that have a high external validity. However, when looking into the influence of one variable, such as lighting, on the perceived space, a real environment includes many other variables, such as crowding and promotions, which might influence the results. Usually, it is rather difficult to map all other variables during the relatively limited experiment period. So any change in the response cannot be simply appointed to one specific change in the environment. Therefore, a fully controllable retail space is valid to analyse specific variables.

In theory, by manipulating certain aspects in a simulated environment, any difference in the responses to the resulting environments can then be attributed to those specific aspects. This method can be used for most of the aspects of the environment. Dissecting the design of retail spaces into several manageable parts for the purpose of research might work. However, due to its holistic nature, the results of such research cannot simply be added up to comprehend that space. The manageable parameters (i.e. lighting) should always be referred back to their context before they can be translated into supportive guiding principles for the design process. Since these results stem from carefully designed experiments in a controlled environment, they generally have a high internal validity.
To support our Retail Communication model, the results found in the lab ought to be externally validated and generalized via experiments in real situations.

Simulated Environment
Three-dimensional simulations of retail environments that allow manipulating environmental cues and testing their possible influences on its visitors were not readily available. During the expert-interviews it became apparent that only Philips Eindhoven had simulated stores (fashion and food) that could be used in experimental research. At first Philips agreed to use their lab for experimentation. However, for practical reasons, this became impossible.

I therefore applied for funding to actually build such a research lab from scratch at our campus as a stand-alone 'box' of 9 x 9 meters. The box is constructed on the lower level of the architectural department building. Its location (see Appendix B) was chosen based on practicality (for the delivery of construction materials), accessibility (parking and accessibility for people with disabilities) and visibility (in communicating the presence of the research group and its facilities). The outside of the box is left neutral (except for the logo) to be used as a part of the exhibition area (see Figure 5.2). The box contains two smaller rooms, for conducting interviews, and a modular, fully modifiable room where any type of store can be simulated (the construction plans of the lab can be found in Appendix B). In principle, every possible detail in the simulation room can

(p. 114-115) Figure 5.1. Collage of photographs showing the diversity in supermarket lighting. Author's collection, 2006-2011 (list of photographs in the back, p.184)

Figure 5.2. The outer of the research lab. Author's collection, 2011

be controlled and monitored: lighting, products, people, etc. In this lab the participant can actually experience the retail environment holistically. The simulation room is equipped with a one-way-mirror and observation cameras. Indeed, all overt, in-store browsing behaviour, as indicated in the Retail Communication model, can be observed and recorded (e.g., route taken, walking speed, time spent…) and buying behaviour is measured by registering the customers' actual purchases during shopping tasks (e.g., number of products, type of products, amount spent…). The only exception is, obviously, the willingness of the customers' to return to the retail environment (return behaviour), which we can only measure via interview response, because it involves a simulated store, not an actual one.
To avoid distracting noise in the box, its walls are constructed with double-layered plasterboard on both sides, with insulation in between. The doors and the pathways are designed to the standards of universal design. Flush-fitting skirting boards and doors are designed and constructed to avoid obtrusive bulges when, for example, placing racks against the wall. The existing floor and ceiling of the building were kept, but the interview rooms and the entrance hall were given a new ceiling, again isolated, to optimise the acoustics. In the simulation room, suspended from the ceiling, a grid of wooden beams increases the modifiability of the room (since the existing ceiling is made of concrete).

For the purpose of this thesis, the lab was set-up as a mini-supermarket. To create a realistic simulation of a supermarket, seven product categories frequently found in supermarkets (groceries, fruit & vegetables, dairy products, bread, soda, wine, and cosmetics) were represented, as shown in Figure 5.7. The order of the different categories was determined with the help of experts. Also, for practical purposes, hard and heavy products first, so fresh products would not be squashed in the shopping basket) and what was common in Belgian supermarkets played a role. The products displayed were mainly A-brands. No private labels of supermarkets were displayed, to keep the simulated lab as neutral as possible.
The floor plan also shows that only a part of the lab is used to avoid the space becoming too large for its purpose. The atmospheric and architectural elements are designed to communicate a message of being a small grocery store so racks and gondolas of Belgian supermarket suppliers were applied. The gondolas to display fruit and vegetables are used by several larger supermarket chains, as are the wooden bread displays and the wall-racks. The wooden wine display was chosen to distinguish the wine area from the other areas. Finally, a second hand refrigerator (of which the lighting worked, but not the cooling) was used. In general, the look and feel was kept as neutral as possible (see Figure 5.3 - Figure 5.6). Also the signage was kept minimal and functional, and the products were 'priced' with credits to complete the 'natural' supermarket experience. It aimed therefore to offer a certain credibility, which should make it easier for the participants to imagine they were in a real supermarket – which was later on confirmed during the experiments (cf. infra).

In order to create different light settings two different lighting types were installed: general lighting, by using fixtures with dimmable fluorescent light tubes that can also change from cold to warm light; and accent lighting, by using spotlights mounted on several rails which allows for different light fixtures and lamps to be 'clicked on' where necessary. The general lighting consists out of seven mounted suspended fixtures. The fixtures contain three TL5 lamps covered with a micro lens optic for an optimal light distribution and to avoid glare. The rails, mounted on the wooden frame, are 3-circuit track rails that allow the mounting of different types of spots on the same rail (see Figure 5.7). Via a software package the lighting can be controlled (e.g., dimming or placing in groups) from one of the interview rooms. This also allows the installation of different lighting settings that can be changed by simply pushing a button, without physically having to change the lighting fixtures. This is useful when, for example, a quick change between different settings during an experiment is necessary.

The actual selection of the type of lamps in the spot-luminaires for the experiments was still a challenge. Therefore, a small experiment was set up as part of a



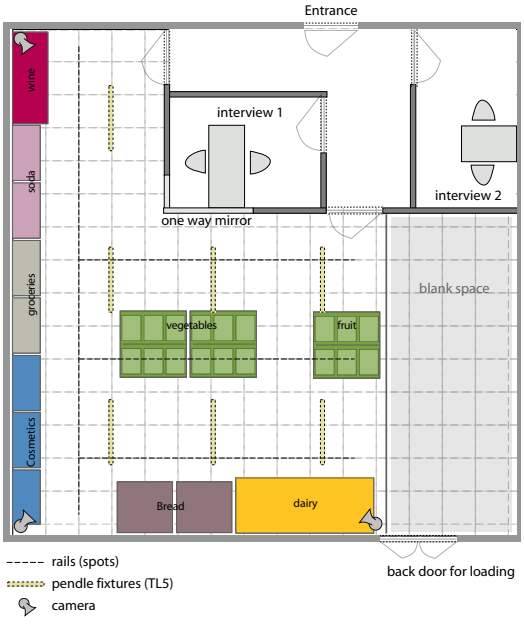



Figure 5.3, Figure 5.4,
Figure 5.5, Figure 5.6. Interior of the simulated lab. Author's collection, 2008

(left) Figure 5.7. Floor plan of the lab-supermarket and the position of the product categories and the lighting

first series of experiments (phase one) as explained next.

5.2 Common Thread through the Experiments

There are five experiments divided into two phases, with a gradual shift from a photograph over a controlled lab towards a real supermarket as Table 5.1 visualises.

The first phase is product-based. As suggested during the interviews (cf. Chapter 4, p. 100), research on specific lamps would be really helpful. Experiment 1A tries to understand whether different lighting might influence how specific characteristics of products are perceived in an extreme situation where all other environmental factors are eliminated. Next, whether a change in visual appearance (product perception) also causes a change in (buying) behaviour in a three-dimensional space is studied. To this end, experiment 1B focuses on product choice behaviour (product preference), while experiment 1C studies the possible change in buying behaviour, as measured by the amount of products bought in our simulated supermarket.

In the second phase, Experiments 2 and 3 deal with the spatial level, focussing on the perception of atmosphere and the resulting emotional response and behaviour. Experiment 2 is conducted in the lab, and Experiment 3 in a real supermarket. Comparing the outcome of both provides insight into the relevancy of conducting experiments in a lab (validation). Combining both outcomes might lead to insights into the way lighting contributes to atmosphere. Based on the Retail Communication model, there are 4 stages that function as a framework in conducting the experiments and discussing the results. The stages are visualised in Figure 5.8.

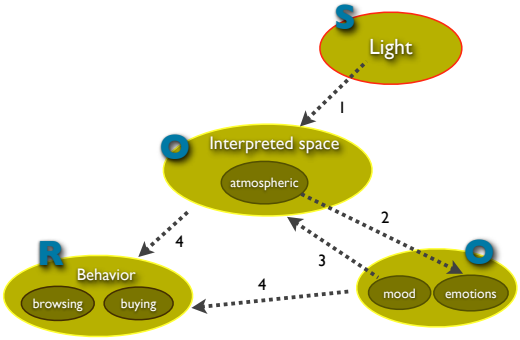


Figure 5.8 RC model with the outline (4 stages) of Experiments 2 and 3

The stages are:

1. Lighting has an influence on the perception of atmosphere in retail spaces.

2. Lighting has an influence on the environment-elicited affect of customers in retail spaces.

3. The pre-existing mood might influence the way the atmosphere is perceived.

These three stages have been discussed before (cf. Chapter 4, p. 106). I now focus on a fourth:

4. Lighting has an influence on the affect of customers in retail spaces, which in turn might influence how they behave in that retail space.

Table 5.1. Representation of each experiment with its goals, context, procedure, moderating variables and validity listed

	Product (phase 1)			**Space (phase 2)**	
Experiments	Exp. 1A	Exp. 1B	Exp. 1C	Exp. 2	Exp. 3
Hypothesis	Product preference	Product preference/ behaviour	Behaviour	Affect/behaviour/ atmosphere	Affect/behaviour/ atmosphere
Context	Photographs of single products	Simulation supermarket	Simulation supermarket	Simulation supermarket	Real supermarket
Procedure	Paired comparison (no forced choice)	Paired comparison (forced choice)	Free choice	Free choice	Free choice
Measuring preference	Stated	Revealed	Implicit	Implicit	Implicit
Presence of moderating variables	Low	Medium	High	High	Highest
Ecological validity	Low	Medium	High	High	Highest

Behaviour entails time spent (browsing) and products bought. Since it is shown that positive affect, of any kind, encourages a shopper to stay longer in store (Dawson, Bloch, and Ridgway, 1990; Hui and Bateson, 1991) it is presumed that:
4a. The lighting of a retail space has an influence on the customers' behaviour as measured by the time they tend to stay in that retail space.

Sherman (Sherman et al., 1997) found that positive moods were correlated with spending levels. Kahn and Isen (1993) even suggest that positive affect encourages the subjects to seek more variety among products in a store. Therefore it is stated that:
4b. The lighting of a retail space has an influence on the customers' behaviour as measured by the products bought.

5.3 Empirical Research, Descriptive and Inferential Statistics

In this chapter, the results of the empirical research are reported. The type of empirical phenomenon investigated here – effects of lighting on consumer emotion and behaviour – is in itself statistical in nature, meaning that the conclusions drawn about this phenomenon are not necessarily applicable for each and every consumer, but are assumed to be valid for a group of consumers[45].

The current empirical research involves experiments in which several measurements of a number of participants are collected. The analysis of these results requires the use of statistics in two distinct ways: to describe results (descriptive statistics) and to draw conclusions on the basis of the results (inferential statistics). In what follows, these terms, the related terminology, and the statistical tests used in this chapter are explained.

Descriptive statistics are quantitative measures and techniques to describe and summarize data. The current experiments entail a (relatively) large number of measurements of a **sample** of participants. This quantitative data set needs to be reduced to be able to find patterns and interpretations. For example: instead of looking at 200 numbers indicating how many items each 100 consumers at a hard discounter, and 100 consumers at a high quality store, have bought, this data set can be much more efficiently described by, for example, providing the averages (e.g., 2.4 items in the hard discounter, 1.8 items in the high quality store).

Inferential statistics, on the other hand, are used to make generalizations about a **population** based on the results of a smaller group that actually participated in the research. When a study has been done on 200 randomly selected Belgian consumers, the researcher is essentially not interested in that particular group (the sample), but in the total group of Belgian consumers (the population). For example, suppose an experiment was done in a Flemish supermarket looking at shopping times for 100 randomly chosen men versus 100 randomly chosen women. The descriptive statistics for this sample of 200 people might show that the group of men shop, on average, for 10 minutes, while the group of women shop for 12 minutes. Obviously, not all men and women shop for equal lengths of time, so if the experiment was to be repeated with another group of 100 randomly chosen men and women, the results would probably be somewhat different. So, how confident can we be that the observed difference of 2 minutes reflects an actual difference in the population, i.e. that in the population of Flemish supermarket consumers the men are indeed more likely to shop more quickly than the women, and this difference is not merely due to chance? Inferential statistics can then be used to give an indication of the level of confidence: a statistical test essentially calculates, on the basis of the results of the sample and some specific assumptions, how likely such a result was. The result is said to be 'statistically significant' when it is highly unlikely to have occurred by chance (and so probably reflects an actual phenomenon in the population).

45 If, for example, research has shown that Belgian men have a greater preference for shopping in a hard discounter and Belgian women in a high quality supermarket, this does not mean that every man in Belgium prefers to shop in a hard discounter and every woman in a high quality store. It does indicate, however, that on average a group of Belgian men will prefer shopping in a hard discounter.

Each of the inferential statistics used here, provide a so-called p-value. This is the probability, i.e. a value between 0 and 1, of finding results like the ones that have been observed (or more extreme), under the assumption that the null hypothesis (the assumption that no statistical significance exists in a set of given observations) is true. If that probability is below a certain pre-defined cut-off point, which is typically at 0.05, the null hypothesis will be rejected. Suppose a statistical test in the example above reveals a p-value of 0.03; this means that if there were in fact no differences between men and women, a result that was at least as large as the one that was observed (i.e. a difference of 2 minutes) would only be expected about 3% of the time. Because this probability is so low (i.e. lower that the previously set 5%) it is said the result is statistically significant, so the null hypothesis of no difference is rejected and we can conclude that there is in fact a difference in shopping time between men and women.

It is important to note that 'significant' does not necessarily equal 'important' or 'meaningful': a result can be statistically significant, but can show little difference. In the example of shopping times of men versus women, an average difference of 1 second could be statistically highly significant, but when a difference of 1 second is found on an average of 10 minutes, it means not that much.

In the remainder of this paragraph a number of statistics that have been used in this research will be briefly described in a non-technical way. I refer readers with additional interests in more technical descriptions to specialised literature, such as Lowry (2011).

Average, Median and Standard Deviation

Commonly used descriptive statistics for continuous data are the numerical average of a group of numbers (i.e. the sum divided by the number of data points), the median (i.e. the middle number in a sorted list of numbers meaning that half the numbers in the list are less, and half the numbers are greater) and the standard deviation and variance, which both give an indication of the spread of the data. As can be seen in Table 5.2 the average for each of the four stores is 10, but the range of data points is very different. This is reflected in the standard deviation and variance.

Table 5.2. Example of Average, Standard deviation and Variance

	Store A	Store B	Store C	Store D
pp1	10	9	0	12
pp2	10	9	0	9
pp3	10	10	10	13
pp4	10	11	20	7
pp5	10	11	20	9
pp6				
Average	10	10	10	10
Standard deviation	0	1	10	2.45
Variance	0	1	100	6

Do differences in the means of the sample generalize to the population?

The following inferential statistics allow conclusions to be drawn about the mean of groups.

The t-test

The independent samples t-test used here is a statistical hypothesis test to check whether the mean of two groups that are independent from one another are equal. Taken into account the mean, standard deviation, and size of both groups, a so-called t-statistic is calculated and an accompanying p-value.

Analysis of variance (ANOVA)

ANOVA is in fact a collection of techniques, but in its simplest form, as used here, it provides a statistical test of whether or not the means of several groups are all equal. If only two groups are compared, it is equivalent to the t-test, but it is more general than the t-test, because it allows comparing multiple groups. In this test, an F-statistic is calculated and an accompanying p-value.

Sign test

The sign test (calculates the value of M) is a (nonparametric) procedure to test the null hypothesis

that the median is different from a pre-specified value (called Mu0). It is commonly used when the sample is fairly small and some assumptions regarding the population are not met (e.g., normality). The statistic M is calculated by subtracting the number values that are less than Mu0 from the number of values that are greater than Mu0, divided by 2. Again, a p-value is associated with this statistic.

Frequencies
Are the observed frequencies of groups really different?

Chi-square
This is a test to see whether the amount of times that one lamp is preferred to the other, did not happen by chance. The chi-square test is used to see whether the variables – lamp and product choice – are connected.

Connections
Can different measures show consistent outcomes?

Pearson and Spearman correlations
A Pearson correlation is a quantitative measure of how strongly two variables are connected. This measure of linear dependence between two variables can vary from 1 (the two variables are perfectly correlated in the same direction: if one increases, the other evenly increases) to -1 (the two variables are perfectly correlated in the opposite direction: if one increases, the other evenly decreases), with 0 indicating that they do not correlate at all.

The Spearman correlation is also an indication of how strongly two variables are connected, but it is a non-parametric measure of dependence. Rank correlation coefficients, such as Spearman's rank correlation coefficient and Kendall's rank correlation coefficient (τ) measure the extent to which, as one variable increases, the other variable tends to increase, without requiring that increase to be represented by a linear relationship.

It is important to note that correlation does not imply causation: the fact that two variables are related does not necessarily mean that a change in one variable causes a change in the other. For example: when the number of ice creams sold correlates with the friendliness of the persons selling them, it is not certain that the friendliness of the personnel causes the number of ice creams sold, it might just as well be that the personnel becomes more friendly when they sell a lot of ice creams.

For both types of correlations, a p-value can be calculated to assess whether the correlation is significantly different from 0 (i.e. no correlation).

Factor analysis
Factor analysis is a statistical technique commonly used in research employing questionnaires. It is used to describe the variation in scores on individual items (i.e. the observed variables) in terms of a smaller number of variables that were not directly observed, but are assumed (called factors). For example, it can be used to look for aspects (e.g., atmosphere descriptors) that can be grouped when they correlate. This means that some descriptors show statistical relationships, being positive (e.g., when the atmosphere is perceived as more warm, for any other setting, it is also perceived as more cosy) or negative (e.g., when the atmosphere is perceived as more warm, for any other setting, it is perceived as less businesslike).

Cronbach's alpha
Cronbach's alpha is an indication of reliability and is commonly used in combination with questionnaire research (and factor analysis). In other words, do the different items of a scale indeed measure the same construct?

5.4 The First Phase: Product Oriented Experiments
To understand the different levels on which lighting might influence customers' response, the theory of Crilly e.a. (2004) is applied. It creates a framework that connects all three succeeding experiments that are part of the first phase. Crilly e.a. (2004) explain that consumers' response to products is threefold: cognitive, affective and behavioural (see Retail Communication model, p. 84).

Cognitive responses are described as those judgments that consumers make on the information perceived by the visual sense. These judgments include three aspects relevant in the present context: aesthetic impression, semantic interpretation and attention drawing.

'*Aesthetic impression*' is defined by Crilly e.a. (2004) as the resulting sensations from the perception of attractiveness or unattractiveness of products. Creussen and Schoormans (2005) stated that when products are similar in other dimensions, such as price, consumers would prefer the one that appeals the most to them aesthetically. Moreover, their experiment showed that 65 percent of the participants mentioned the product appearance as the motivation for their choice. With fresh food products this typically refers to perceived taste and freshness for example (Hutchings, 1999, cited in Barbut, 2003). Hutchings associates good quality of fresh food products with acceptable colour. So, what we like to eat is that what looks best (Barbut, 2003), with 'best' defined as most attractive, tasteful and fresh. This is also related to what we expect of the colour of products, either in memory or in preference (e.g., memory colours, Bartleson, 1960, cited in Smet, et al. 2010). As mentioned, taste and freshness can be elicited through visual cues, which will help consumers in determining the product choice. '*Semantic interpretation*' is defined here as meaningful associations or cognitions other than those involved with the mere attractiveness of the products. An example in retail could be looking at the way products are presented and what influence this has on the price perception of these products: large presentations with lots of items decrease price perception (Smith and Burns, 1996). Or, when fruit and vegetables 'communicate' that they are organic, the display often contains rattan baskets filled with a pile of fresh products to communicate the message that the products came direct from the farm. Finally, '*Attention drawing*' is recognized to be an important first step in enabling consumer product purchase. When a product display stands out visually from competing product displays, e.g., with the use of light, the probability of consumers' attention being drawn to that display are higher, thereby increasing interest and, possibly, purchase intention (Summers and Herbert, 2001).

Affective responses, in terms of emotions, moods and feelings, cannot only be considered at the level of the store environment (see Turley and Milliman, 2000, for a review), products themselves have also been widely established to elicit affective responses (Crilly et al., 2004). However, due to the nature of the product – food – only simple affective responses such as liking or disliking are expected.

The behavioural response can be considered along an approach-avoidance continuum, following the perspective employed in research on retail spaces (Bitner, 1992; Donovan and Rossiter, 1982; Donovan et al., 1994; Mehrabian and Russell, 1974). A negative response generates avoidance activities such as not buying a product. When the response is positive, the consumer will tend to engage in approach activities, such as extended viewing, picking up the product, reading the package and buying the product. In Rook's study (1987) on impulse buying, he states that buying behaviour is frequently influenced by aesthetics. Indeed, in a retail context, impulse buying might be the strongest response to aesthetics (cf. aesthetic impression).

So, three succeeding experiments were set-up:

5.4.1 Experiment 1A: Photo Elicitation

This experiment focuses on the cognitive response of the participants and their purchase intention. To this end, they indicated their preference for products photographed under different lighting conditions, on several criteria:

- 'attractiveness', 'freshness', 'tastiness', as measures of the aesthetic impression response;
- 'price perception', 'organic appearance', as measures of a semantic interpretation response;
- 'willingness to buy' as an indicator of choice behaviour.

The attention drawing value and the affective response is not measured here.

Method

IMPLEMENTATION EXPERIMENTAL DESIGN

Five food items were photographed under eight different lighting settings. The food items were selected with the following requirements:

- products that are typically available in supermarkets;
- the products needed to be (mainly) monotone (one colour), but the set of products needed to represent a sample of colours;
- products of which people have clear expectations of what the 'natural' colour of the products should be. For example, people know what the colour of red peppers should look like (Smet et al., 2010 showed that 'memory colours' play a vital role in the way people judge colour appearance).

This resulted in the choice of the following food items: red pepper, meat, bread, lettuce and orange juice. To widen the product range, we also inserted a bottle of shampoo as one non-food item. The choice of the light sources was based on current usage in retail context and advice from experts in the field. Six different lamps from a single producer (Philips) were used: two high intensity discharge metal halide lamps (CDM830, CDM942), one high intensity discharge sodium lamp (SDW825), two fluorescent lamps (TL830 and TL840), and a halogen lamp as Table 5.3 shows. In addition, the two high intensity discharge lamps (SDW825 and CDM942) were also fitted with a red filter, typically used for lighting meat, which results in a more reddish light.

Table 5.3. Technical specifications of the eight lamps used

	Lamp	CRI	CCT (Kelvin)	Wattage
1	CDM830	80	3000 (medium warm)	35
2	CDM830	90	4200 (cold)	35
3	CDM942+filter			35
4	halogen	100	2500 (warm)	35
5	SDW825	80	2500	50
6	SDW825+filter			50
7	TL830	80	3000	30
8	TL840	80	4000 (cold)	30

Keeping the average illuminance on the products as similar as possible[46], photographs were taken with the help of a professional photographer and post-edited to maximize visual correspondence with the actual visual appearance. It was opted to keep the white balance of the camera fixed, regardless of the lamp, to make the colours of photographs resemble reality as much as possible.

Two series of photographs were produced, one with a black background and one with a white background. The series of photographs with a black background resulted in differences to the products and background that were too small to see clearly compared to the differences, as they were actually visible. The white background-series resulted in photographs with relatively extreme differences in colours that were mainly visible on white background. Therefore, with post-editing the considerable difference of the background was made subtler, leaving the product itself unchanged. The photographs as shown in Figure 5.9 were used.

PARTICIPANTS

After a pilot study of 10 participants the experiment was carried out in the Flemish speaking part of Belgium. 83 people (60 woman, 23 men) aged between 18 and 55 participated. They were recruited by three interior architecture students who conducted the test on their laptop[47]. None of the participants were aware of the specific goal of the study.

(next page) Figure 5.9 The six selected products (lettuce, meat, red pepper, orange juice, bread and shampoo) under eight different lighting conditions: halogen, CDM 830, CDM 942, SDW 825+red filter, SDW 825, CDM 942+red filter, TL840, TL830. Author's collection, 2006

46 Both TL-tubes were placed at a distance of 35cm, while the other lamps were placed 60cm above the product to obtain resembling illuminances.

47 It would have been better to take the test from the same computer. But due to practical reasons, each student worked with her own laptop. However, during the analysis a possible difference between the colour rendering of the laptop screens was taken into account and showed to have no impact.

PROCEDURE

A paired comparison approach was used: two images of the same product were shown side by side and respondents were asked to indicate their preference (left or right stimulus) according to a specific criterion, with the possibility of a "no choice" option when both products were evaluated as being equivalent. Each participant was presented with all possible combinations of all lighting settings for each product, for three of the six criteria, resulted in a total of 504 choices (28 combinations x 6 products x 3 criteria). Trials with the same criterion were blocked and the order of trials within a block was randomized. Two students from Delft University of Technology (The Netherlands) have designed a computer programme to conduct this experiment.

Results

For each product (e.g., meat) and each type of lamp (e.g., lamp 1) an overall score was calculated for each of the six criteria by looking at all the trials in which that lamp was involved. For each of these trials, the lamp was given a value: if the photograph with that type of lamp (i.e. lamp 1) was chosen, it was given a value of "1", if the other photograph was chosen (i.e. lamp 2-8) it was given a value of "-1" and a value of "0" for the "no preference" option. By adding the values of these trials, an overall score per product and per lamp could be obtained for each criterion.

Firstly, it is checked to see whether there is a correspondence between the results for the different criteria. Table 5.4 shows the 'Spearman rank correlations' (cf. 5.3).

The correlations between the three criteria we considered as indicators of aesthetic impression (attractiveness, freshness and tastiness) are all 'significant' (cf. 5.3). It is clear that the aesthetic impression indicators also correlate with willingness to buy – which is in line with Hutchings (1999, cited in Barbut, 2003) – while price perception does not relate to it. What is more, the correlation between freshness and willingness to buy is the strongest one. Price perception does not seem to have a large impact because it only correlates with attractiveness. Organic appearance seems to be an independent functioning indicator.

Because the aesthetic impression criteria correlate, the overall scores of these impact criteria (freshness, tastiness, attractiveness) were grouped. The resulting rank orders for different food products, excluding shampoo is presented in Table 5.5.

Table 5.4. Rank correlations between different criteria

		QA	QF	QT	QP	QO	QB
Attractiveness	**QA**	1.00					
Freshness	**QF**	0.52*	1.00				
Tastiness	**QT**	0.49*	0.51*	1.00			
Price perception	**QP**	0.50*	0.47	0.41	1.00		
Organic appearance	**QO**	0.38	0.41	0.15	-0.02	1.00	
Willingness to buy	**QB**	0.56*	0.62**	0.53*	0.30	0.42	1.00

* p-value < .01 ** < .001

Table 5.5. Rank order per product type for the combined preference results attractiveness, freshness, and tastiness

Red pepper	**Green lettuce**	**Meat**	**Juice**	**Bread**
Halogen	SDW825	CDM942+Filter	SDW825	SDW825
CDM942	CDM942	Halogen	Halogen	Halogen
SDW825+Filter	TL830	SDW825	CDM942	TL830
SDW825	Halogen	SDW825+Filter	TL830	TL840
CDM942+Filter	TL840	CDM942	TL840	SDW825+Filter
TL840	CDM830	TL830	CDM830	CDM942
CDM830	SDW825+Filter	TL840	SDW825+Filter	CDM830
TL830	CDM942+Filter	CDM830	CDM942+Filter	CDM942+Filter

The SDW825 seems to be a lamp that is appreciated most for three products (lettuce, juice and bread) out of five, and is even appreciated well for the two other products. It is also clear that the lamps with the red filter only seem to be appreciated for what they are made for: meat. Notwithstanding, the SDW825+filter is also appreciated for the other red product – red pepper. Finally, the CDM942+filter shows to be preferred to the SDW825+filter for meat.

Discussion

Clear differences between the lighting conditions for specific products were found for the combined aesthetic impression indicators, showing that different lighting can indeed change the visual appearance of a product, hereby increasing or decreasing its appeal, in a consistent manner. The results illustrate that lighting can in fact influence the organic appearance of products independently of the aesthetic impression that they elicit. Finally, we also asked about 'willingness to buy' the presented products as a proxy for the choice behaviour of consumers. The results show that mainly the aesthetic values are correlated with buying behaviour.

Another relevant outcome is the difference in rank order of the lamps between green and red vegetables (see Table 5.5). Therefore it might be wise to present them separately in the following lab experiments.

A New Lamp

During preparations for the first lab experiment (1B), there was a unique opportunity as the manufacturer of the lamps used in Experiment 1A developed a new lamp that was specifically designed for use in the context of retail environments. Therefore, we decided to replicate the situation of the first experiment. This time, the selected products were based on the product categories that would be used in experiment 1B: groceries, soda, green vegetables, red vegetables, fruit (mostly blended colours), and wine. The different products were once again photographed under two different lamps: on the one hand, for each product the new lamp (CDM930) was selected, on the other hand, for soda and green vegetables the SDW825, which was found to be the most preferred lamp in Experiment 1A (cf. Table 5.5), was used. Although the halogen scored best in the aesthetic impression indicators for the red vegetables, the low energy efficiency and illuminance of this type of lamp makes it not opportune to use it in fresh product displays. Also, the CDM942 and the SDW825+filter (numbers 2 and 3 in the rank order) were eliminated since in practise, for practical reasons, vegetables are displayed mixed. It is almost impossible to adjust the lighting to all those different colours. Since red vegetables are not that common, it was opted (with the input from experts) to use the next in line (SDW825), which is good for a more variable colour pallet.

For groceries, fruit and wine, which were not included in Experiment 1, the choice of the second lamp was based on what was currently used in most Belgian supermarkets. Table 5.6 shows the two lamps used for each product.

Participants: 31 Participants (students recruited at our campus of which 14 were females and 17 males) performed a paired-comparison, forced-choice experiment for all product types and for all criteria.

Table 5.6. Results per lamp type and product category

	New lamp	Alternative	Aesthetic impression (New over Alt.)	p-value	Willingness to buy (New over Alt.)	p-value
Groceries (box of cornflakes)	CDM930	SDW825	0.80	.0002	0.87	<.0001
Soda (cola)	CDM930	SDW825	0.77	.0009	0.76	.0037
Fruit (apple)	CDM930	CDM830	0.65	.0192	0.61	.1892
Green vegetables (pepper)	CDM930	SDW825	0.85	<.0001	0.87	<.0001
Red vegetables (pepper)	CDM930	SDW825	0.63	.0522	0.82	.0003
Wine (white)	CDM930	SDW825	0.73	.0125	0.69	.0428

Procedure: Each photo combination was offered twice, once with the CDM930 on the left and once on the right. Trials for the same criterion were blocked, the order of blocks was counterbalanced across participants, and trials within a block were randomized[48]. Data was analyzed in the same way as Experiment 1A. The data was recoded so that for each product type and each criterion all 31 participants received a score of 0 (= the new lamp was never chosen), 0.5 (=the new lamp was chosen in one of the two trials) or 1 (= the new lamp was chosen in both trials). Next, for each type of product a 'Sign test' (cf. 5.3) was used for the combined aesthetic impression criteria ('freshness', 'tastiness' and 'attractiveness') and the 'willingness to buy' criterion to test the null hypothesis that the population median was 0.5 (meaning that both lamps are in fact equally liked).

Results: The mean values and resulting p-values can be seen in Table 5.6. This table also provides per relevant product group and averaged across participants, the proportion of trials in which the new lamp (CDM930) was preferred over the other lamp, for the combined aesthetic impression criteria ('freshness', 'tastiness' and 'attractiveness') and for 'willingness to buy'.

The results for the aesthetic impression indicate that the visual appearance under the new lamp is indeed significantly preferred for nearly all product types and that this increases its appeal, as a very similar pattern of results emerges for the 'willingness to buy' criteria. In experiment 1B, then, we tested whether this visual appeal and increased purchase intention would also translate into actual choice behaviour, in a real-life context.

48 This means that the participants viewed the photographs grouped per criterion, meaning that all photographs were shown for, for example, ' freshness', then again for 'tastiness', etc., while the order of criteria was randomly switched per participant. The order of the photographs was also randomly switched within the group (per criterion) and therefore different for each participant.

With also taking the size of the effect into account (0.85 and 0.87: the highest scores that one lamp was preferred to another for 'aesthetic impression' and 'willingness to buy' in Table 5.6), we would expect an effect is most likely to occur for green vegetables.

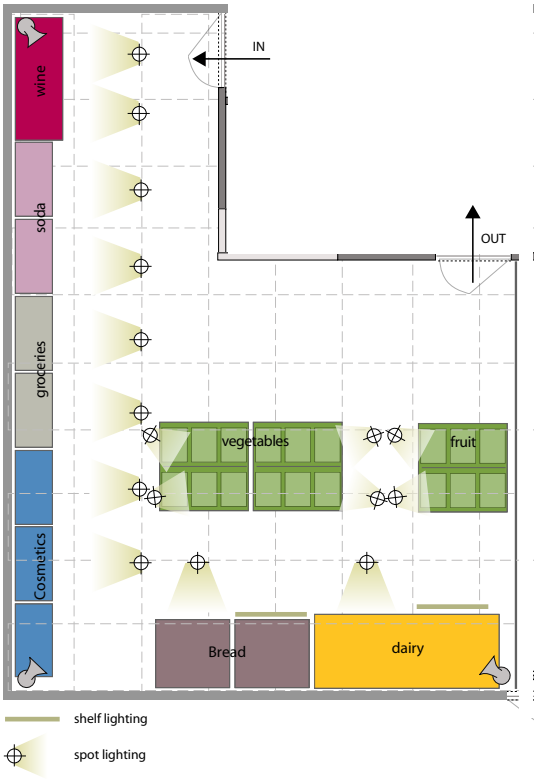
5.4.2. Experiment 1B: Product Preference in Simulated Supermarket

Experiment 1A showed that within the limits imposed by functional requirements, lighting a food product in a particular manner can influence its visual appeal (aesthetic impression), which, in turn, can affect consumers' behavioural responses (willingness to buy). However, this was found in an extremely reduced context in which the saliency of both the stimuli (photographs of isolated products) and the response were artificially increased. But how strong is this impact when the stimulus is imbedded in a less pronounced, ecologically valid context, i.e. in a real retail environment? And, how strong is the impact not only at a cognitive level but also on the behavioural response? The purpose of this experiment, then, was to test whether an increase in appeal through lighting could influence actual choice behaviour in a three-dimensional setting, with a more realistic shopping situation. To this end, next to the physical context, the shopping experience was simulated by the use of a specific shopping task.

Method

IMPLEMENTATION EXPERIMENTAL DESIGN

The same products were placed side-by-side on two different shelves but lit in a different manner (see Figure 5.10). The same lamps were used as in the second photo elicitation experiment. Since the wine display had a triple presentation on a reduced width, only two lamps could be used with a merge of both on the middle section of the shelving. For cosmetics, which were not included in the aesthetic impression analysis of the first experiment, the new lamp, a commonly used lamp in this context, and a third display lit with a fluorescent tube were all used. For bread, which was not included in the second photo elicitation experiment, the lamp that scored best in the first one (SDW825) was used, together with a fluorescent lamp, as is commonly used. Also



for dairy, two types of fluorescent tubes that are commonly used in practise were utilised. Table 5.7 shows the chosen lighting. The lamps in the CDM and SDW spots generate a comparable illuminance (see Figure 5.3) Hanging down from the ceiling, they were positioned at equal distances from the products (at a height of approximately 250cm). No other lighting was present.

Figure 5.11 shows the position of the lamps. The fluorescent lamps (TL) used for bread, dairy and cosmetics, were put directly under the shelves as this was an integrated feature of the shelf used to display these products. This resulted in a higher illuminance on the products (bread and cosmetics) on each shelf (see Figure 5.3), than on those products simply lit with an external spot, which might have an effect on attention drawing (as measured by the product choice). Although the colour rendering and the CCT were different it is most likely that the difference in illuminance might draw attention to the products, as was stated in other studies (e.g., Summers and Hebert, 2001). The location of lamps on the shelves (left half versus right half) per product category was switched at the end of each day. Only the fluorescent lamps placed in the corner rack of the cosmetics were not changed for practical reasons.

Figure 5.10. The doubled product display of soda and the tripled product display of wine. Author's collection, 2008

Figure 5.11. Floor plan of the lab supermarket with the location of the lighting used

Table 5.7. Spotlighting used per food category

	Green V.	Red V.	Fruit	Bread	Dairy	Wine	Soda	Grocery	Cosmetics
Light concept 1	SDW825	SDW825	CDM830	SDW825	TL36W/76	SDW825	SDW825	SDW825	CDM942
Light concept 2	CDM930	CDM930	CDM930	TL nafa gold 3000	CDM930	CDM930	CDM930	CDM930	TL830
Light concept 3						merged			CDM930

PARTICIPANTS

120 people, of whom 78 were women and 42 men, aged between 19 and 64 years old and from different backgrounds, participated over a three-week period. All participants were scheduled by appointment.

PROCEDURE

First, participants filled in a short questionnaire on the mood they were currently in and their emotions (see Appendix D and E, both questionnaires will be discussed in experiment 2). Then, questions were asked about their socio-demographic characteristics (gender, age, education level, left/right handedness, colour deficiency[49] and family composition) as well as shopping behaviour (shopping frequency and usual shopping locations for groceries).

Secondly, they were asked to complete a specific shopping task to maximize both the shopping experience and the relevance (to generate useful results), namely to buy one product out of each of the nine presented groups in the supermarket (forced choice). Within each group, participants were free to choose a particular product or brand so the dependent variable was in fact the rack (left versus right) from which products were bought (irrespective of brand). Furthermore, they were asked to behave as they would in 'normal' shopping circumstances. The specific products that were purchased were registered and the participants were observed.

Finally, after having completed the shopping task, they were interviewed about their motivation to choose particular products and they received a questionnaire concerning their experience of the supermarket and their mood, with some additional questions about their shopping profile and personality. As a final question their income level was requested[50].

Results

Table 5.8 shows the number of participants that have purchased a product from each lighting setting for each of the nine product categories. For every product, a 'Chi-square test' (cf. 5.3) was used to see if one of the lamps was chosen significantly more frequently.

Table 5.8. Number of participants, and results of the Chi-square test per product category

	Lighting concept 1	Lighting concept 2	Lighting concept 3	Missing	χ^2 (N, df)	p-value
Grocery	64 (CDM930)	53 (SDW825)		3	1.03 (117, 1)	0.31
Soda	68 (CDM930)	50 (SDW825)		2	2.74 (118, 1)	0.10
Fruit	62 (CDM930)	56 (CDM830)		2	0.30 (118, 1)	0.58
Green vegetables	69 (CDM930)	46 (SDW 825)		5	4.6 (115, 1)	<.05
Red vegetables	56 (CDM930)	61 (SDW825)		3	0.21 (117, 1)	0.64
Wine	33 (CDM930)	31 (SDW825)	54 (merged)	2	8.25 (118, 2)	<.05
Dairy	67 (CDM930)	52 (TL36W/76)		1	1.89 (119, 1)	0.17
Bread	67 (TLnafaGold3000)	52 (SDW 825)		1	1.89 (119, 1)	0.17
Cosmetics	48 (CDM930)	47 (CDM942)	21 (TL830)	4	12.12 (116, 2)	<.01

49 Participants with a colour deficiency were eliminated during the analysis.

50 This question was deliberately posed last, as this rather intrusive request might have had an influence on the participant's emotions.

Firstly, a significant difference is observed in the lamp-preference for the green vegetables: green peppers and cucumbers under the CDM930-lamp (warm light with CCT 3000K, CRI 90) are chosen more than under the SDW825-lamp (slightly warmer reddish white light, CRI of 80). In addition, a significant effect is found for cosmetics, which is due to the lower number of participants having bought a product lighted by the fluorescent tube. Also for wine, where more participants selected from the middle shelf, there is a significant result.
Secondly, participants show no clear motivation for their choice in the post-experiment interview. Only 3 of the 120 people indicate consciously choosing the 'better looking' green vegetables. This lack of a clear motivation is in fact found for all other product categories as well, as this is mentioned by only six people for red vegetables, four for fruit, three for dairy, eight for bread, two for soda, and by no one for cosmetics, groceries or wine.
Finally, the effect of possible moderator variables such as sex, age, handedness, or shopping profile on participants' choice behaviour was tested (cf. Bloch, 1995). However, none of the analyses revealed significant results, indicating that none of these variables significantly affect choice behaviour.

Discussion

The results confirm the notion that lighting can affect the product preference and choice behaviour of consumers. Firstly, it was found that for green vegetables the lighting that was significantly preferred with respect to aesthetic impression criteria (cf. Table 5.6) was also the one that was selected more frequently in the shopping environment (cf. Table 5.8). Secondly, the same results, however insignificant, were found for all but one (red vegetables) of the other product types. Thirdly, it was found that for wine the merged section (the middle one) of the display scored significantly higher. An explanation might be that the participant entered the supermarket in front of the wine display, making it most convenient to take a bottle out of the middle segment – people tend to avoid clear choices, the middle one is the safest one (Christenfeld, 1995). Also, a significant result for cosmetics was found where the fluorescent lamp scored less. This might be due to the positioning of the rack. It was located at the end of the product wall, in the corner of the supermarket. This might have been too far out of the route of the participants. These findings are consistent with the 'effort accuracy approach' theory by Dhar e.a. (2000), indicating that consumers select decision strategies by making a trade-off between the desire to make an accurate decision and the desire to minimize effort. However, note that the cosmetic rack had lit shelves (which resulted in higher illuminance, different CCT and CRI). So, regarding the 'attention drawing' aspect of lighting, it seems that very few participants responded to it. Normally, attention drawing does not necessarily mean that more products are picked up from those lit shelves (one can simply see the shelves, maybe even touch more products, but still buy nothing). However, since the participants were forced to make a choice, attention drawing and choice behaviour are related in this case. In this situation, the 21 people still choosing a product out of the lit shelves might be an indication that the lighting did draw the attention – with the higher illuminance as the most probable cause – only not enough to counterbalance the effort aspect. So, as also the results of Summers and Herbert (2001) show, this attention drawing value might be dependant on the type of product (they found a difference for belts but not for tools). We might state that for bread, this attention drawing does not seem to work. For the cosmetic products it remains unclear.

While performing some additional analyses, a rather unexpected parameter was revealed to have a greater influence on the choice behaviour of the respondents than anticipated: the route taken while shopping. More specifically, it was found that, not only for the cosmetics, consumers tend to select a product from the part of the shelves they encountered first, regardless of the lighting, which was switched daily. This is in line with the effort accuracy approach, which, again, seemed to dominate the influence of lighting in general. Discussions with the respondents confirmed this notion: the moment the consumers realized the doubled or tripled shelf presentations

of products, they chose the option that required the least effort, namely picking up products from the first rack. This finding can help to explain why a significant effect was found only for green vegetables. Indeed, this was not only the product type for which the strongest results were found in the experiments with the photographs, this was also located in an isle (cf. Figure 5.11), for which the routing might be less dominating.

The results might suggest that consumers are lead by the visual appeal of the products, however, not in all cases was this visual appeal the main reason. The fact that, indeed, a difference was significant for only one product type does suggest that even in a forced-choice paradigm many other factors also affect consumers, or that no difference was seen between the lighting concepts. Interestingly, the lighting-based choice behaviour does not seem to manifest on a conscious level. Although the consumer is most often aware of the outcome (what he or she chooses) when the outcome is a choice between product options, the consumer may not consciously note the environmental trigger – the lighting in this study. Not even when brighter lighting was provided. In the post-experimental interview, only 26 choices of 1,080 (120 people x 9 products) seemed to be made consciously for the 'better looking' product. 41 Of the 120 people expressed having seen 'differences' in the lighting between some of the product groups[51] (for example, between fresh fruit & vegetables and dairy), while only six reported noticing the shelf lighting in the cosmetic area and only two for the bread display.

Finally, it is important to stress that the two lighting settings were not drastically different in appearance. Indeed, the 'new' lamp was preferred in the additional experiment, but the alternative was either rated as one of the best options in Experiment 1A, or currently used in actual retail environments. So, instead of taking lamps with larger differences in quality, two of the best lamps were compared. Taking this into account, the global pattern of results (only one significant difference) seems a plausible outcome. It is even a strong result when other parameters that might play a role in choice behaviour are taken into account. Note that by using the SDW825 instead of the lamp that scored better for red peppers (halogen or CDM942), the possibility of finding strong results decreased.

5.4.1. Experiment 1C: Product Buying Behaviour in Simulated Supermarket

In this experiment we focus again on the behavioural response, still on product level, but now with a realistic shopping task with genuine free choice to see whether a difference in lighting which had demonstrated sufficient influence on choice behaviour, also has an influence on consumers' buying behaviour. More specifically, we want to investigate whether the preference for the green vegetables under the CDM930, as found in the second experiment, would lead to an increase in product-sales (as a result of impulse buying) for those vegetables as compared to the SDW825.

Method

IMPLEMENTATION EXPERIMENTAL DESIGN

The same basic set-up as in Experiment 1B was used, but with different lighting conditions. Two different light settings were created, which differed only in respect to the illumination of the green vegetables (peppers and cucumbers), namely with either the CDM930 or the SDW825. All other products were lit 'neutrally', meaning that the overall retail space was generally lit with fluorescent tubes – a CCT of 4000K was created with the suspended fixtures having each three TL5 tubes (3x49W of which 1xTL827 and 2xTL865) – and that all other products were lit as is common in midsized Belgian supermarkets (see Table 5.9). As mentioned, the CDM930 and SDW825 show no striking differences visually, leaving the overall appearance of both lighting settings similar.

51 This was asked among other questions looking for a difference, i.e. a difference in materials, floor tiles, scents and barcodes.

Table 5.9. The two light settings

	Green V.	Red V.	Fruit	Bread	Dairy	Wine	Soda	Grocery	Cosmetics
Setting 1	CDM930	SDW825	SDW825	TL nafa gold 3000	TL840	TL840	TL840	TL840	TL840
Setting 2	SDW825	SDW825	SDW825	TL nafa gold 3000	TL840	TL840	TL840	TL840	TL840

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123 People (46 men and 77 woman, aged between 18 and 64 years old, with different backgrounds) showed up to participate over a two-week time period. 46 People that had participated in the previous experiment participated again. Still, they were not aware of the specific goal of the study[52]. A between-subject design was used as each participant saw only one setting. Each day, the setting was changed so that 63 participants experienced the CDM930 setting and 60 the SDW825 setting. All participants were scheduled by appointment.

PROCEDURE

First, participants filled in the same questionnaires as in Experiment 1B. Next, they were asked to complete a specific shopping task. To come as close to a realistic experience as possible, participants were instructed to imagine that they were shopping in a real supermarket. In other words, by being asked to buy what they would buy under normal circumstances, they were given free choice of all available products in any amount they pleased, albeit with a total maximum of 20 products. Participant behaviour during the shopping task in the supermarket was observed and the specific products that were purchased were registered. After having completed the shopping task, they were interviewed and they also completed some questionnaires. The most relevant items in this context were three items in which respondents indicated on a 10-point scale: if the store was a good example, if it was typical, and how representative the store was? (see Appendix C). In the post-shopping interview, participants were also specifically asked about their motivations for choosing particular products and the amount of products, especially with regard to green vegetables.

Results

Firstly, across all participants, the difference of the average number of green vegetables (Table 5.10) bought under the SDW825-lamp and under the CDM930-lamp is not significant: $t(119) = .32$, $p = .75$ (cf. 't-test' 5.3). From the table, it can be concluded that the number of participants buying specific amounts of green vegetables is indeed very similar for both groups: $\chi^2 (4, N = 121) = 2.37$, $p > .05$. Note that during the interviews after the shopping experience, 24 people said they never buy green peppers and cucumbers.

Table 5.10. Results per lamp type: average and amount of green vegetables bought

	Average	Number of green vegetables bought				
		0	**1**	**2**	**3**	**4**
SDW825	0.70	27	27	6	0	1
CDM930	0.75	25	26	8	1	0

Secondly, the typicality measurement revealed that the simulated supermarket scored relatively well: 6.92 (standard deviation = 1.75) being a rather good example; 7.38 (standard deviation = 1.54) being typical; and 7.12 (standard deviation = 1.67) being representative.

52 Three of them found out in the meantime that the previous experiment was about lighting. During the interview, they were told that this experiment was about something else. During the analysis the group that participated for the second time was analysed separately, however no difference in behaviour between this group and the other occurred.

Discussion

The lighting on the display of green vegetables that had been shown to elicit an increased aesthetic impression (1A) and to influence consumers' choice behaviour (1B), did not lead to increased purchases. So, the expected influence of the lighting on impulse buying is not confirmed.

Because of the sequential build-up of the three experiments, the green vegetables were the logical choice to be used as stimulus for our experimental manipulation. However, increased appeal and aesthetic impression did not show any significant results with regard to impulse buying, which was inconsistent with the fairly promising results of the first experiments. This might in part be due to the limited sensitivity of peppers and cucumbers to impulse buying. This is consistent with the findings of the Point of Purchase Institute (1996, cited in Bech-Larsen and Esbjerg, 2006) stating that the fruit and vegetables department has a low share of unplanned purchases. Additionally, 54 participants said in the post-experimental interview that they bought that particular amount of green vegetables purely out of habit (e.g., following a recipe) and 24 mentioned never buying those products. Nevertheless, it is possible that a difference in lighting simply does not influence behaviour for any type of product.

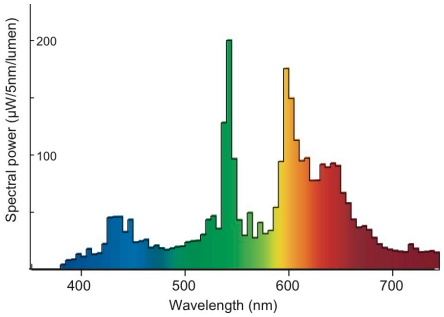
5.4.1. General Discussion of the First Phase

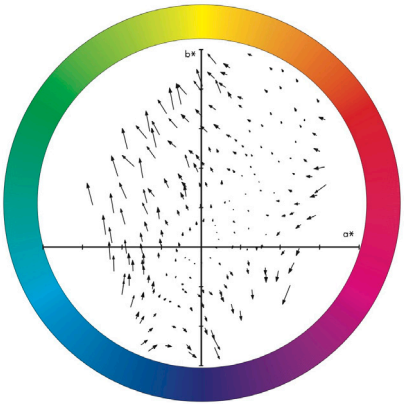
Based on Experiments 1A and 1B we can conclude that the attractiveness of products changes under different lighting conditions (1A), and that for at least one product type, this affects product preference in a three-dimensional simulated supermarket setting (1B). Clear results were found for green vegetables. One way of finding a possible explanation for this is to compare the colour spectra of the lamps used. As Figure 5.12, Figure 5.14, and Figure 5.16 show, the CDM930 has most green present in its spectrum. This is also illustrated by Barbut's (e.g., 2004) statement that the best lamp for a product is the one containing the colour of the product in its spectrum. Although this does give an indication of how the colours are rendered, it might not be precise enough. It is for this reason therefore that Philips developed colour-rendering circles. These are rather complex figures, but explained in simple terms, they use arrows to visualise how colours are rendered. The bullets in the circle are basically the colours as they are rendered under daylight when the CCT is above 5000K (CRI 100); the arrows illustrating the direction a particular colour is rendered to. For example, Figure 5.13 shows the rendering circle of the CDM930. In the upper left area, the arrows are rather long, pointing towards the green zone, indicating that 'green' colours might look greener. As for the lower left area, the arrows are moving away from the blue zone, indicating that those blue colours are rendered a bit more green for the light blue area and reddish for dark blue colours. When the colour rendering circle of the CDM930 is compared to the SDW825 one (Figure 5.17), it is apparent that the length and the direction of the arrows for 'pepper and cucumber green' are directed towards green for the CDM930, but move a bit away for the SDW825. This possibly explains the preference for the CDM930 lamp for the green vegetables.

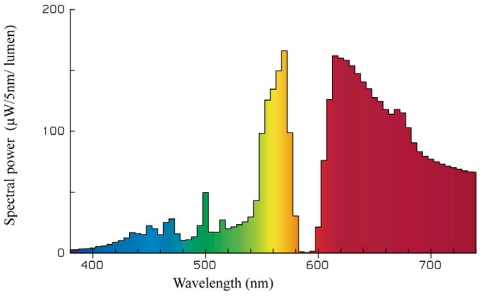
Based on the colour rendering circles, also for fruit, which contained mainly lighter green (apples and pears) and bright orange (oranges), a similar explanation might be given. The trend for a preference towards the CDM930, as opposed to the CDM830 (see Figure 5.17) might be explained by the circle showing that orange lit with the CDM930, remains the same orange colour, while orange lit with the CDM830 slightly moves towards a more yellowish orange. And, the arrows in the light green area of the CDM930 circle are longer, pointing towards light green.

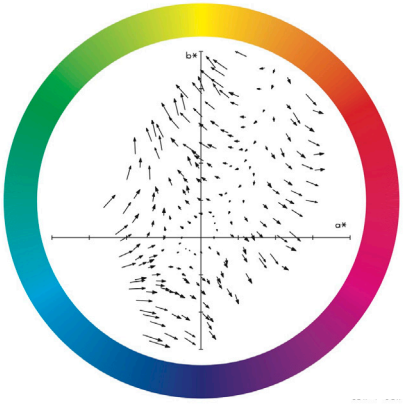
When analysing the trend of preferring red vegetables lit with the SDW825 compared to the CDM930, the SDW825 circle contains large arrows directed to red, while the CDM930 circle shows arrows moving away from red.

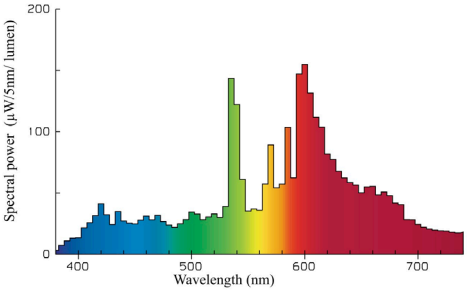
Finally, it might be expected that a 'neutral' lamp, containing all colours in its spectrum equally, is preferred for diverse products with diverse colours (i.e. groceries). Indeed, a trend towards the products











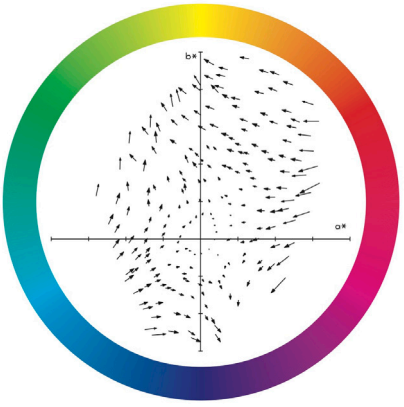


Figure 5.12. Colour spectrum CDM930

Figure 5.13. Colour rendering circle CDM930

Figure 5.14. Colour spectrum SDW825

Figure 5.15. Colour rendering circle SDW825

Figure 5.16. Colour spectrum CDM830

Figure 5.17. Colour rendering circle CDM830

lit with the CDM930, which shows the most dots – showing that the colours are rendered 100% – and arrows pointing outwards – meaning that they are rendered more 'intense' – is visible.

This possible explanation, based on the participants' preference for a product with a more intense colour (i.e. greener for green pepper, redder for tomatoes) is consistent with what is found in Experiment 1A for nearly all product types.
Although the influence of the lighting on the amount of products bought could not be shown in Experiment 1C, the results of Experiment 1 suggest that it is possible to select the 'best' lamp for a product or a product group by looking at the colour rendering circles. So, as a designer, to optimise the design, I would suggest that fresh food products are displayed by colour, which can then be lit each with their own type of lamp.

When looking at the results of all three experiments, it seems that when the procedure is forced choice and the presence of other intervening variables is low, more significant results are found than when the experiments become more realistic with a genuine free choice and a lot of other potentially relevant variables. The size of effect in the latter type of experimental settings is an important factor in reliably estimating the size of the effect in more ecologically valid situations.

As the results of the typicality questionnaire during experiment 1C show, the design of the lab closely resembles a real supermarket. What is more, during the interviews with the participants of that experiment it became clear that in many cases the participants were able to act (e.g., browsing and buying behaviour) as they would in a real supermarket. For example, when asked why they chose a particular product (e.g., green vegetables) and the amount bought, answers like 'I needed an extra tomato to make sauce this evening, I only have two left in my fridge' (22 participants out of 120 claimed to follow a recipe) or 'out of habit' (53 participants), show that the lab is capable of making the participants enter into a role. Also, one of the questions during Experiment 1B and 1C was whether they smelled anything unusual or specific in the simulated supermarket. 18 Out of 120 participants named supermarket related scents in Experiment 1B and 19 out of 120 in Experiment 1C, which is relatively high since no scent was involved (other than the natural scents of the products). These are promising results for the following experiments that place lighting in a more space related context (atmosphere) and which require close resemblance to a real supermarket.

5.5 The Second Phase: Lighting as Part of the Atmosphere

In the second phase of the experiments I try to understand the influence of lighting on the perception of atmosphere, emotions and behaviour. I believe that the applied research methods come closer to a designer's perspective for two reasons: we use a real setting and we aim to contextualise the analytical data in a more holistic dimension.

5.5.1. Experiment 2: Lab Supermarket

This experiment was set up to study the impact of lighting on perceived atmosphere, affect and the resulting behaviour. To be sure that relevant lighting settings were used (cf. designer's perspective), we opted to select lighting settings that have already been shown to 'work'. Therefore, instead of a simple linear manipulation of some isolated factors (e.g., simply increasing the overall lighting level), existing lighting settings of supermarkets from divers segments are chosen as an inspiration. The lighting of these supermarkets is an essential part of the design and contributes to the perceived image of the store. In a way, this reasoning follows the same lines as the first three experiments since the lighting is actually determined with the (indirect) help of experts from professional practise.

Method

IMPLEMENTATION EXPERIMENTAL DESIGN

The basic context in the lab was that of a small supermarket. For this experiment, three versions of this context were constructed which differed only with respect to how the space was illuminated. Three specific lighting settings were carefully designed (overall lighting level, spatial distribution, CCT…) to simulate lighting settings of three different supermarkets in Belgium, each with their own image and look and feel: a high quality supermarket (Delhaize), a discounter (Carrefour), a hard discounter (Aldi).

DESIGNING THE LIGHTING SETTINGS

The exemplar supermarkets were all located in Hasselt. The high quality supermarket (Luikersteenweg) is a 'Delhaize supermarket', a format that is owned by Delhaize – unlike the AD Delhaize that is franchised – and has a large uniformity across Belgium. The store in Hasselt is, therefore, representative of all 'Delhaize supermarkets'. Also the discounter operates via different formats, however all are exploited by Carrefour. It is opted to resemble the format 'Carrefour hypermarkets' (Kuringersteenweg) which all show great uniformity. All Aldi stores are alike, making the one in Hasselt representative.

First, in these supermarkets, the lighting of the departments was measured in terms of illuminance (Lux). Next, the CCT was identified (dependent on lamp type). The balance between general lighting and accent lighting could play a crucial role in the atmosphere of a supermarket. Therefore, this was also taken into consideration while designing the three look-alike atmospheres for our lab. The tables with the measurements and visualisation of the points of measurement of each supermarket can be found in Appendix G. Note that these measurements were conducted with a focus on relevant spots of measuring rather than a more systematic approach.

These values are not merely copied from the real stores, since it was more important to create an image that resembled the real store. Making an exact copy is of course impossible since the lab has different features, dimensions, flooring, etc. Consequently, creating the same atmosphere requires the input from a designer. Moreover, the lighting installation in our lab has limits, so creative solutions – such as using shutters to reduce the light levels – were used to design the appropriate atmosphere.

The general lighting of the high quality setting (Delhaize) and the hard discounter setting (Aldi) has a CCT of 3000 Kelvin (which is more 'warm' white light); the discounter setting (Carrefour) has a CCT of 4000 Kelvin (which is more 'cold' white light). The three settings as applied in the lab are described in Table 5.11, and visualised in the corresponding light plans and images in Figure 5.18 and Figure 5.19 respectively.

Table 5.11. The three light settings

Lux (average)	Groceries	Dairy	Bread	Cosmetics	Wine	Fruit & Veg
High quality	826	640	836	510	390	1054
Discounter	853	917	1100	1086	759	1488
Hard discounter	412	535	412	412	412	412
Accent lighting	**Groceries**	**Dairy**	**Bread**	**Cosmetics**	**Wine**	**Fruit & Veg**
High quality	None	TL830	TL830 shelves & CDM830 spot	TL830 shelves	CDM930	SDW930
Discounter	None	TL840	TL830 shelves	TL830 shelves	SDW825	CDM930 (F) & CDM942 (V)
Hard discounter	None	TL830	None	None	None	None

(top) Figure 5.18. Three floor plans of the lighting settings (high quality, discounter, hard discounter)

Figure 5.19. Three photographs of the lighting settings (high quality, discounter, hard discounter). Author's collection, 2009

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Over two weeks, 95 people took part in the experiment. 30 Men and 65 women, aged between 18 and 63 responded to a mailing. 27 People had participated in the previous lab experiments. Each participant shopped in one of the three settings (between subject design). All participants were scheduled by appointment.

MEASURES

Mood: The pre-existing mood state was measured with the Dutch version of the Short Mood Form (SMF) (Brengman, 2002) via a 7-point Likert-type scale (strongly disagree to strongly agree). See appendix D for more information.

Emotions: To measure the emotions generated by the store the Pleasure, Arousal, and Dominance paradigm (PAD) of Mehrabian and Russell (1974) as adapted to the study of store atmospherics by Donovan and Rossiter (1982), is used. It measures three basic emotional dimensions: Pleasure is defined as to what extent a person feels good or happy, Arousal is defined as the degree to which a person feels stimulated or active, and Dominance is described as to what extent a person feels unrestricted or in control of the situation. Each of the three emotional dimensions is measured via six semantic differential items. Each item consists of a seven-point scale with opposing emotional words at either end. We used a Dutch translation, validated by Brengman (2002). Appendix E shows the form.

Atmosphere: To measure the interpretation of space, we adapted Vogels' (2008) instrument, which is a tool to quantify the 'perceived atmosphere' of an environment with a list consisting of 38 atmospheric descriptors of which participants are asked to indicate the level of applicability on a seven-point Likert scale (from 'not applicable at all' to 'very applicable'). Although Vogels' list was composed in Dutch it uses a slightly different vocabulary to Flemish. Therefore five items were changed. Appendix F describes the motivation and shows the original and adapted version of the tool.

Price and Image Perception: Based on the atmosphere, the price perception, quality level and service level, together with whether the participants would like to shop in a store with an atmosphere as presented (approach behaviour) was asked on a scale from 1 (very low) to 10 (very high). Via a multiple-choice questionnaire – high quality, discounter, hard discounter, other – it was also asked in what type of store they thought they had been shopping (recognition).

Typicality: cf. Experiment 1C and Appendix C

Behaviour: the participant's behaviour was observed, time was measured and the selected products were scanned.

PROCEDURE

The aim was to study the impact of lighting on the perception of atmosphere, affect and behaviour. To this end, the participants were provided with a specific, realistic shopping scenario: buying breakfast for two people. Furthermore, participants were tested alone and were asked to behave as they would under 'normal' shopping circumstances. This means they also had the opportunity to buy other products that they might need (which are here considered as 'impulse purchases'). Each participant received a budget of 50 credits, generous enough for the participants to not make specific product choices to fit the budget. Prior to the shopping task, they were asked to complete the mood questionnaire (SMF) and answer questions about gender, age, educational level, shopping frequency, the type of stores normally used for groceries (market, specialized stores, supermarket; six different supermarket chains present in Belgium), left- or right- handedness and family composition. During the shop experience the participant's behaviour was observed, time was measured and the selected products were scanned. After the completion of the shopping task the participant was asked to complete the PAD-questionnaire and the atmosphere questionnaire in the lab supermarket. Finally, questions on the price and image perception, the typicality and some other self-report items, such as questions about impulse

purchases and their income level, were asked in one of the interview rooms.

Results

Mood: In order to be sure that differences in results on perceived atmosphere, emotional response and behaviour cannot be explained by a difference in mood, it was checked whether on average the mood scores were very similar for the three groups that saw the three different lighting settings. This seems to be the case as Table 5.12 shows. The mood of the participants differed most between the discounter and the hard discounter setting, although not significantly.

Emotions[53]: The Dominance construct is of little interest to us. The literature on store atmosphere shows that, of the three theoretical subscales for the Dominance construct, few studies show any effects (e.g., Babin and Darden, 1995, Brengman, 2002), while Pleasure and Arousal generally have been tested and validated. Therefore, the Dominance construct is not discussed.

Of the three theoretical subscales, the Pleasure dimension was clearly distinguishable ('Cronbach's alpha' = 0.88, cf. 5.3). The original Arousal subscale did not seem to form a single construct (Cronbach's alpha = 0.33) and is therefore studied in single items. Table 5.13 shows the results.

Table 5.12. Results (mean) for the SMF per setting with the p-value (one-way ANOVA – cf. 5.3)

Measure	**High quality** (n = 33)	**Discounter** (n = 29)	**Hard discounter** (n = 33)	**F(2, 92)**	**p-value**
Mood	5.75	5.72	5.95	0.47	0.630

Table 5.13. Results (mean) for the PAD-questionnaire for the three settings with the p-value (one-way ANOVA)

Measure	**High quality** (n = 33)	**Discounter** (n = 29)	**Hard discounter** (n = 33)	**F(2, 92)**	**p-value**
Pleasure	5.31	4.81	4.60	5.21	0.007
Arousal items:					
calm – excited* *rustig - opgewonden*	2.15	2.55	2.50	1.10	0.340
relaxed – stimulated *ontspannen - gestimuleerd*	3.03	3.34	3.15	0.38	0.870
sluggish – frenzied *loom - uitzinnig*	4.00	3.97	3.58	1.75	0.180
dull – jittery *futloos - zenuwachtig*	3.88	3.90	4.18	1.76	0.178
sleepy – wide-awake *slaperig - wakker*	5.18	4.83	4.42	2.44	0.093
unaroused – aroused *niet geprikkeld - geprikkeld*	3.42	3.86	3.64	0.65	0.524

* F(1,92)

53 Note that following our research model it is assumed that emotions are a consequence of the perceived space. However, there remains the possibility that this is in fact a complex interaction in which the emotions also influence how the space itself is interpreted. This mechanism is difficult to trace and it is not included in this experiment, or in this thesis.

The results show that lighting setting significantly affected the Pleasure experienced. Post-hoc comparisons showed the high quality setting to be significantly more Pleasurable than the hard discounter. The items of the Arousal construct showed no significant results.

Atmosphere: The results for the individual items of the atmosphere questionnaire are presented in Table 5.14.

Previous research (e.g., Custers et al, 2009; Van Erp, 2008) has shown that the atmosphere items can be grouped in some subscales, which allows for distinguishing between different atmosphere dimensions. Four dimensions were shown to be workable: Cosiness (consisting of items such as 'cosy', 'warm', 'safe', 'intimate', 'personal'…), Liveliness ('lively', 'stimulating', 'cheerful'…), Tenseness ('tense', 'uncomfortable', 'oppressive, 'frightening'…) and Detachment ('detached', 'businesslike', 'formal', …). Our Flemish version of the list constitutes only three dimensions - Cosiness (Cronbach's alpha = 0.73), Liveliness (Cronbach's alpha = 0.77), and Tenseness (Cronbach's alpha = 0.90) – since the items forming the Detachment construct were changed. Table 5.15 shows the details of the three atmosphere subscales for the three lighting settings. The remaining individual items for 'Detachment' can be found in Table 5.14 – *kil* (chilly), *zakelijk* (businesslike).

The light setting did not yield a significant effect for Cosiness, or for Tenseness. For Liveliness only a marginally significant effect was found between the high quality setting, which scored higher, and the hard discounter.

Price and Image Perception: The results of the questions about price perception, quality and service level show that for each of these attributes the high quality setting received the highest score – although not significant – (see Table 5.16), which is consistent with the corporate image of that particular retailer. The other two stores, however, were not perceived consistently.

Table 5.15. Results (mean) of the atmosphere subscales per setting with the accompanying p-value (one-way ANOVA)

Measure	High quality (n = 33)	Discounter (n = 29)	Hard discounter (n = 33)	F(2, 92)	p-value
Cosiness	3.73	3.32	3.34	1.72	0.185
Liveliness	3.89	3.57	3.26	2.96	0.057
Tenseness	2.29	2.73	2.73	1.17	0.314

Table 5.16. The results (mean) for the price and image perception per setting with the p-value (one-way ANOVA) of the ones that differed most

Measure	High quality (n = 33)	Discounter (n = 29)	Hard discounter (n = 33)	F(2, 92)	p-value
Price level	5.64	4.83	4.85	1.52	0.220
Approach	7.09	6.14	5.85	2.57	0.082
Service	6.88	6.24	5.76	2.02	0.148
Quality	7.57	6.76	6.82	1.99	0.142

Table 5.14. Results of the atmosphere descriptors[54]: average for the three settings and the p-value (t-test). The red numbers are significant

Atmosphere descriptors	High quality (Q)	Discounter (D)	Hard discounter (H)	p-value for the t-test for		
				Q - D	Q - H	D - H
Toegankelijk (accessible)	5.58	5.69	5.41	0.740	0.613	0.363
Ruimtelijk (spatial)	5.15	5.03	4.72	0.743	0.270	0.433
Zakelijk (businesslike)	4.82	5.14	4.91	0.394	0.820	0.563
Hedendaags (contemporary)	5.36	4.62	4.67	0.040	0.052	0.904
Ontspannen (relaxed)	4.85	4.48	4.22	0.233	0.079	0.467
Rustgevend (tranquil)	4.7	4.24	4.24	0.167	0.154	0.998
Ongedwongen (uninhibited)	4.52	4.45	4.24	0.852	0.478	0.597
Gastvrij (hospitable)	4.82	4.04	4.12	0.063	0.068	0.829
Ingetogen (reserved)	4.24	4.03	4.45	0.567	0.510	0.200
Gemoedelijk (pleasant)	4.15	4.43	4.06	0.479	0.805	0.329
Stimulerend (stimulating)	4.36	4.28	3.84	0.803	0.140	0.246
Saai (boring)	3.27	4.1	4.16	0.035	0.053	0.912
Behaaglijk (nice-cosy)	4.15	3.55	3.72	0.086	0.201	0.654
Goedkoop (cheap)	3.53	3.9	3.67	0.452	0.754	0.594
Kil (chilly)	2.91	4.24	3.97	0.002	0.027	0.553
Afstandelijk (detached)	3.33	3.97	3.76	0.136	0.288	0.611
Gezellig (pleasant)	4.03	3.31	3.32	0.051	0.051	0.976
Vrolijk (cheerful)	3.88	3.48	3.25	0.239	0.070	0.518
Geborgen (safe)	3.82	3.28	3.41	0.122	0.227	0.694
Warm (warm)	3.91	3.14	3.16	0.029	0.047	0.962
Levendig (lively)	3.75	3.34	3.09	0.281	0.073	0.497
Inspirerend (inspiring)	3.58	3.18	2.87	0.231	0.046	0.413
Luxueus (luxurious)	3.48	3.07	2.91	0.336	0.160	0.708
Knus (snug-cosy)	3.52	2.83	2.84	0.110	0.097	0.968
Ouderwets (old-fashioned)	2.48	3.17	3.48	0.106	0.029	0.484
Persoonlijk (personal)	3.24	2.83	2.82	0.291	0.226	0.981
Gespannen (tense)	2.58	3	2.91	0.318	0.461	0.824
Mysterieus (mysterious)	2.79	3.34	2.31	0.188	0.243	0.017
Enerverend (exciting)	2.64	3	2.7	0.346	0.876	0.437
Ongemakkelijk (uncomfortable)	2.52	2.79	2.79	0.476	0.509	0.989
Intiem (intimate)	3.03	2.55	2.47	0.213	0.135	0.830
Onrustig (restless)	2.21	2.9	2.97	0.062	0.052	0.861
Deprimerend (depressed)	2.48	2.62	2.67	0.725	0.685	0.915
Beklemmend (oppressive)	2.27	2.72	2.79	0.196	0.156	0.869
Kinderlijk (infantile)	2.58	2.48	2.27	0.811	0.399	0.551
Beangstigend (frightening)	1.79	2.41	2.44	0.090	0.077	0.955
Romantisch (romantic)	2.18	1.97	1.67	0.641	0.933	0.726
Vijandig (hostile)	1.88	2.03	1.91	0.536	0.076	0.386

54 Although they might be not the best translations to English, the ones Vogels proposed are used.

The results for recognition of the supermarket demonstrate that only the high quality setting was recognized as such, as shown in Figure 5.20. Note that since this question was multiple-choice, some participants pointed up several answers, resulting in a total of answers exceeding 100%.
The yellow bar visualises that more than 50% of the participants perceived the high quality setting as such. The discount setting was perceived as some other type of supermarket (green bar) by the majority of the participants. Finally, the participants show very diverse perceptions for the hard discounter; it was even the least perceived as such (pink bar).

Typicality: The results are presented in Table 5.17. The results show that, regardless of the setting, the supermarket is perceived as a rather good example, typical and representative. Although not significantly, the high quality setting scores best.

Behaviour: Behaviour was analysed to discover whether there is an effect from the lighting settings on average time spent and the products bought – the amount of products and the money (credits) spent, as Table 5.18 shows. No significant differences in behavioural response were found for the three settings.

Discussion

Following our framework the results will be discussed in four stages: the influence of different lighting conditions on perceived atmosphere, emotional state, the resulting behaviour, and the possible correlation between them, as visualized in Figure 5.8.

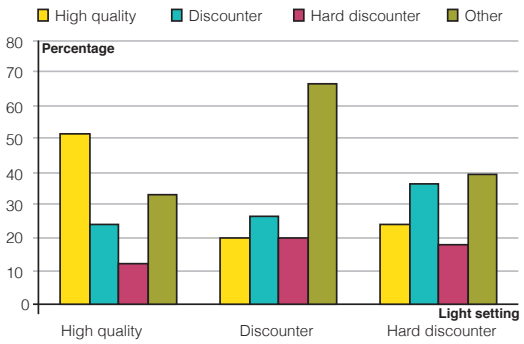


Figure 5.20. Perception of each atmosphere

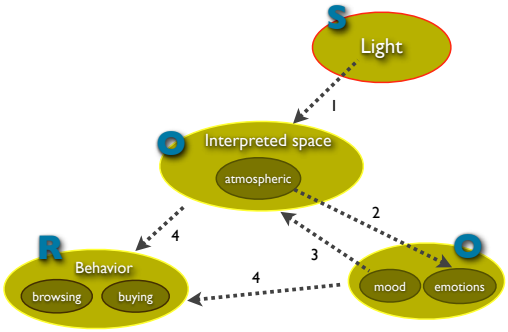


Figure 5.8 (copy). Research model with four outlined stages

Table 5.17. Results (mean, on a scale of 1 to 10) of the typicality questions, per setting with the p-value (one-way ANOVA)

Measure	High quality (n = 33)	Discounter (n = 29)	Hard discounter (n = 33)	F(2, 92)	p-value
Good example	6.94	6.55	6.33	0.75	0.477
Typical	7.09	6.69	6.88	0.31	0.732
Representative	6.82	6.45	6.55	0.29	0.749

Table 5.18. Time spent, credits spent and amount of products bought for the three settings

Measure	High quality (n = 33)	Discounter (n = 29)	Hard discounter (n = 33)	F(2, 92)	p-value
Time (seconds)	173	143	164	1.44	0.24
Credits	18.75	16.48	20.06	2.02	0.14
Products	13.03	11.31	13.76	1.87	0.16

1) Do realistic, specifically designed lighting settings have an impact on how the supermarket's atmosphere is perceived?

As Table 5.14 showed, there are significant differences for seven of the 38 atmosphere items. To visualise the differences between the settings, Figure 5.21 is designed. This figure offers another point of view for looking at the results, however, without saying anything about significance. Moreover, the items are ordered from, on average, the highest to the lowest scores.

Firstly, the most prominent differences are between the high quality store and to the other two (which in general show very similar results for almost all the atmosphere descriptors). Specifically the items *hedendaags* (contemporary), *gastvrij* (hospitable), *saai* (boring), *kil* (chilly) and *warm* (warm), which were also significant, and *gezellig* (pleasant), which was marginally significant, show the largest ones. Secondly, the figure shows that items that are clearly 'positive' score relatively higher for the high quality setting. As expected, items such as *behaaglijk* (nice-cosy), *gezellig* (pleasant), *vrolijk* (cheerful), *warm* (warm), *levendig* (lively), *knus* (snug-cosy) are clearly appointed to the high quality setting. Along the same line, it might be expected that the hard discounter scores the highest on items such as *saai* (boring), *goedkoop* (cheap) and *ongemakkelijk* (uncomfortable). These results are less clear though due to the discounter setting which is also perceived as such. Finally, looking at the order of the items, it is clear that, on average, only the first 11 items are positive (first quadrant of the circle) after that, both positive and negative items alternate.

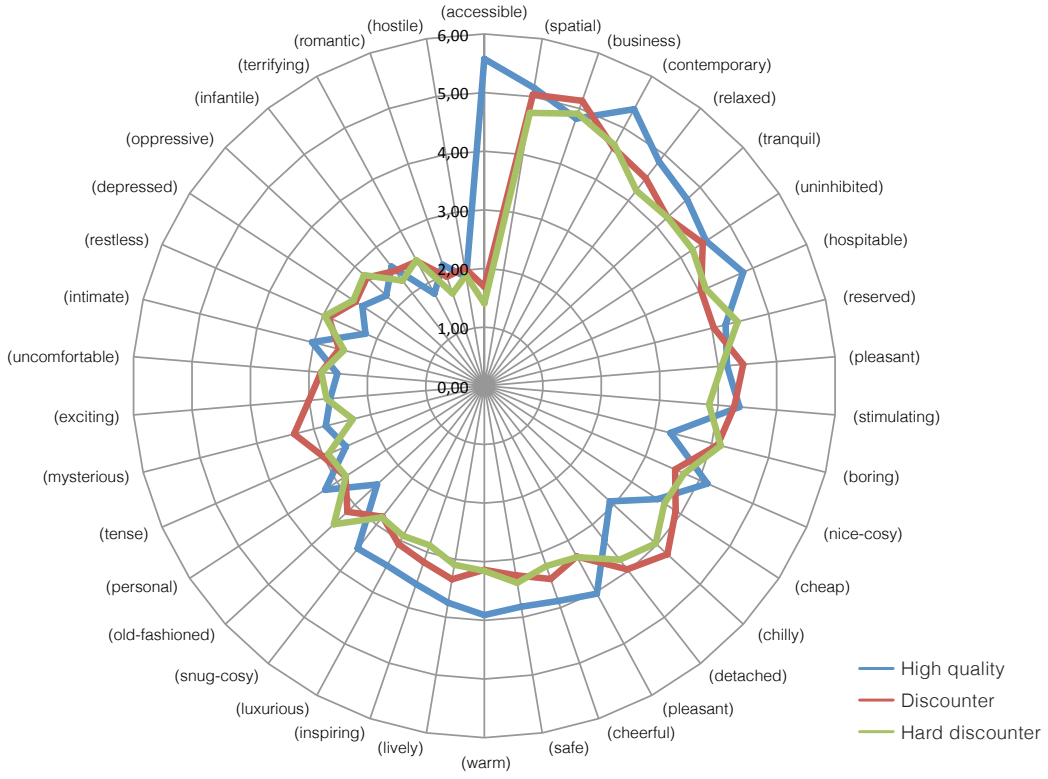


Figure 5.21. Visualisation of the results (score per atmosphere descriptor) per supermarket

Interesting to study is whether those differences in perceived atmosphere are also apparent for the recognition of the supermarket which they resembled. As might be expected, since the lighting of the high quality setting seems to be the most distinct one – as is also the case in the real supermarket –, it was also recognised as such, while the other two, who are less distinct in both the reality and the simulated version, were not. A possible explanation for the non-recognition of the hard discounter might simply be that the specific racks and gondolas in our lab are quite different from the ones that are usually present in those stores. However, the racks and gondolas do resemble those of the discounter, yet this atmosphere was also not recognised as such. Another explanation might be found in the indistinctiveness – partly due to the different formats and the plain lighting – of that discounter's supermarkets. A last factor that might play a role is that the translation of the atmosphere as measured in the supermarkets, was not designed closely enough to the resembling lab settings.

Nevertheless, it appears that even with only a relatively subtle difference in lighting, an otherwise identical supermarket environment can indeed be given a different, or even very specific, atmosphere.

2) Does the perception of different atmospheres relate to the emotional reaction?

To answer this question we checked whether there was a link between how a consumer perceived the atmosphere in terms of Cosiness, Liveliness, Tenseness, and 'Detachment' (items separately) and how the same consumer reacted emotionally, in terms of how much Pleasure and 'Arousal' (items separately) the store elicited. Table 5.19 shows the 'Pearson Correlation' (cf. 5.3) between those items.

A strong correlation is found for the Pleasure experienced and the atmospheric dimensions. As could be expected, Pleasure increased when the perceived Cosiness and Liveliness increased. Similarly, when a store was interpreted as more Tense and *kil* (chilly), the Pleasure experienced went down. As for the calm–excited and relaxed–stimulated dimensions, when the atmosphere was perceived as more Cosy and Lively, more calm and relaxed emotions were experienced, while when the atmosphere was perceived as more Tense and

Table 5.19. Pearson Correlation (coefficients, significance and number of observations) between the atmosphere scales and the emotional scales. Blue shows a significant positive correlation while red shows a significant negative correlation

	pleasure	calm – excited	relaxed – stimulated	sluggish – frenzied	dull – jittery	sleepy – wide-awake	unaroused – aroused
Cosiness	0.56	-0.47	-0.22	0.25	0.12	0.25	0.18
	<.0001	<.0001	0.0335	0.0145	0.26	0.0129	0.0832
	95	94	95	95	95	95	95
Liveliness	0.61	-0.35	-0.29	0.35	0.05	0.46	0.20
	<.0001	0.0006	0.0039	0.0005	0.5987	<.0001	0.0464
	95	94	95	95	95	95	95
Tenseness	-0.62	0.42	0.52	-0.21	-0.03	-0.37	0.04
	<.0001	<.0001	<.0001	0.0436	0.8038	0.0002	0.6776
	95	94	95	95	95	95	95
Kil (chilly)	-0.49	0.36	0.27	-0.06	0.02	-0.27	0.01
	<.0001	0.0004	0.0078	0.5623	0.8404	0.008	0.9429
	95	94	95	95	95	95	95
Zakelijk (businesslike)	-0.14	0.03	0.06	-0.02	-0.20	-0.12	-0.02
	0.1784	0.7807	0.5718	0.8534	0.0478	0.2488	0.8594
	94	93	94	94	94	94	94

kil (chilly), these emotions decreased. Exactly the opposite occurs for the sleepy–wide-awake dimension. If the Cosiness and Liveliness went up, a more wide-a-wake feeling was experienced, when Tenseness and *kil* (chilly) increased, a more sleepy emotion was experienced. An almost similar pattern is found for the sluggish–frenzied dimension, only no correlation was found with *kil* (chilly). Furthermore, a rather weak negative correlation was found for the dull–jittery dimension with *zakelijk* (business), and a weak positive one for the unaroused–aroused with Liveliness.

In other words, perceived Cosiness strongly correlates with experienced Pleasure and calmness, while Liveliness shows strong correlations with Pleasure and wide-awake emotions. Tenseness shows the strongest correlations with excitement and stimulating emotions, and an opposing correlation with Pleasure. The latter is also found for the Detachment item *kil* (chilly). Overall, Cosiness and Liveliness show similar correlations with the emotional dimensions, just as Tenseness, *kil* (chilly) and *zakelijk* (businesslike) do, however reversely and not always significantly.

Note that these correlations say nothing about the causal relationship between the two – the emotions experienced might cause the atmosphere to be perceived differently, or in contrast, due to the atmosphere, other feelings are elicited. Or they might even influence one another.

3) Does the pre-existing mood influence the perceived atmosphere?

We studied whether, across participants, a change in individual mood changes how the atmosphere is perceived or how the customers respond to the store emotionally. Pearson Correlations between the scores were calculated, as shown in Table 5.20.
There seems to be a slight tendency (not significant), for people in a better mood tend to perceive the atmosphere as less Tense, but overall, these results suggest that the mood people were in before they entered the store did not readily affect how they perceived the store.

4) Do the different lighting settings have an effect on the resulting behaviour (with or without the interference of perception and affect)?

Since no significant results were found for the resulting behaviour, the data was further explored, by examining, for example, a difference between men and women, the impact of the accent lighting on fresh products bought in the high quality and discounter setting, and the extra-shelf lighting on the amount of fruit and vegetables, cosmetics and bread purchased. However, no systematic results were found.

Next, correlations between perceived atmosphere, emotion and behaviour were studied. When the three settings were analysed separately, no significant correlations could be found. Even the comparison between the high quality setting and the other two gave no clear results. This contrasts with what was expected regarding the influence of emotion on purchase behaviour. Based on some research (Babin and Attaway, 2000; Moye and Kincade, 2002; Sherman, Marthur, and Smith, 1997) we expected that the higher degree of Pleasure experienced in the high quality setting, would translate into a significant increase in browsing or buying behaviour. But there was only a trend in the time spent shopping in the high quality setting visible, which shows somewhat consistent outcomes with the results of the atmosphere and the PAD-questionnaire: it scored the

Table 5.20. Pearson Correlation (and p-value) between mood, perceived atmosphere and emotion (N=95, except for *: N=94)

	Cosiness	**Liveliness**	**Tenseness**	**Kil (chilly)**	**Zakelijk (businesslike)***
Mood	0.02	0.17	-0.19	-0.1	0.13
p-value	0.84	0.09	0.07	0.33	0.21

highest on Cosiness and Liveliness and increased Pleasure was measured, so, as would be expected, the consumers tended to stay longer (173 seconds was the longest average shopping time).

Conclusion

There are four conclusions:

1. The experiment gives the designer's perspective applied to experimental research and the results are promising because they indicate the value of creating a suitable atmosphere, even for basic products such as food. There are links between experienced emotions (mainly Pleasure) and perceived atmosphere. Additionally, in some cases this might also be linked with time spent. Furthermore, the designed settings seem to align with what was expected in terms of experienced emotions and perceived atmosphere. So, it appears that even with a relatively subtle difference in lighting, an otherwise identical supermarket environment can be given a different, or even very specific, atmosphere.

2. Not only were the participants able to recognize different atmospheres, they also scored them accordingly concerning quality and price perception, which are highly relevant aspects when it comes to store branding and store personality. Although specific behavioural reactions were not immediately found, we do believe that creating a specific store experience by changing the atmosphere through environmental manipulation, such as lighting, can have clear benefits in the long term. This way, these results once again underline the importance of even the smallest aspect of a store's environment.

3. The Kruithof Curve (cf. chapter 4, p. 99) might help in explaining the results found in this experiment. As Figure 5.22 shows, the lighting qualities per setting (CCT and illuminance) are set out on the curve. The largest circle with a black outline resembles the most dominant lighting (i.e. general lighting). The smaller dots refer to the lighting of each department. As the graphic shows, only the hard-discount setting lies within the 'comfort zone'. The discounter's main lighting is also comfortable, while half of the lighting of the different departments seems to be indicated as 'uncomfortable' by Kruithof. The largest part of the lighting of the high quality setting is situated in the uncomfortable zone. It might be expected that visual comfort might be positively linked to emotional states or even perceived atmosphere. But, the results show that the mainly uncomfortable high quality setting is the most Pleasurable and is perceived as most Lively and Cosy. The lighting of the discounter, which is rather diverse and relatively cold, is perceived as most mysterious and boring. The hard discounter, although completely in the comfort zone, is perceived as most chilly and old-fashioned.

So, it might be that, in commercial spaces, lighting with the same CCT but having different illuminance-levels is beneficial regardless of its comfort level as indicated by the Curve. The Curve will be again tested for its value in a retail context in the next experiment.

4. Due to the simulated environment in which all environmental cues were controlled, this experiment provided results with high internal validity and low external validity – so valid for this specific situation. To generate results that have a higher external validity – results that can be generalized – a third experiment is set up in a real supermarket.

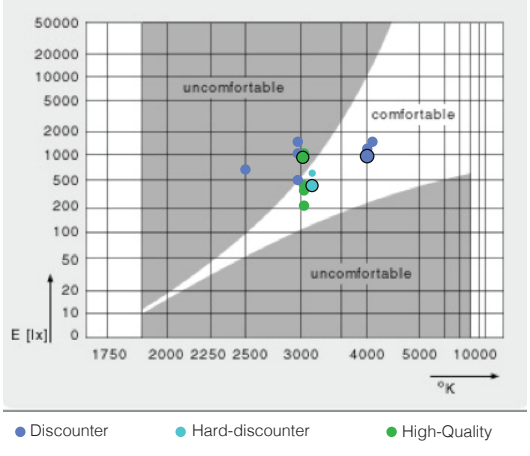


Figure 5.22. Kruithof Curve with the dots showing the setting's dimensions (CCT and average lighting level per department)

5.5.2. Experiment 5: Real Supermarket

This experiment was set up to study the influence of lighting on perception of atmosphere, affect and behaviour in an environment that has many rather conflicting uncontrollable cues (e.g., environmental influences, crowding). So, the main research question might be whether lighting has a distinct influence on consumers – compared to the other intervening variables?

While investigating opportunities to set up an experiment in an existing supermarket, the opportunity arose to cooperate with Philips in an experiment in a real supermarket, namely the Plus in Heerlerheide (The Netherlands). Philips had designed and installed a new dynamic lighting system in the 2400m^2 size supermarket. Their goal was to measure differences in browsing and buying behaviour as a result of the lighting. Philips' interest in our 'emotion and atmosphere' measuring tools led to a valuable collaboration.

Method

IMPLEMENTATION EXPERIMENTAL DESIGN

The Plus is mid-segment supermarket. The branch in Heerlerheide is franchised so the owner has some say in the design of the interior. The supermarket has an irregular floor plan (see Figure 5.23), but with a clear layout. The racks and gondolas are the same as in most supermarkets. The oval meat and cheese display (nr. 12 on floor plan), however, stands out and forms the centre of the supermarket. The floors, walls and ceiling are white and contribute to the clean, bright look and feel of the supermarket. The signage is kept functional.

Nine different lighting settings were designed and programmed by Philips. Changeable fluorescent lighting was used to vary the settings in CCT and illuminance. These settings were programmed for the lighting in the grocery department – wine, convenience foods, beverages and home care products (see Figure 5.23), leaving the other departments unchanged. Additionally, dynamic LED-lighting was installed in the back of the store. The LEDs lit up the wall (referred to as the LED-wall from now on) behind the shelves of the homecare products and wine (see Figure 5.23: zones 6,7 and 8).

Figure 5.23. Floor plan of Plus: The red tags are the zones that contained dynamic lighting. Zones 1,2 and 3 with dynamic fluorescent tubes and zones 6,7 and 8 with the coloured LEDs. Source: Philips

Four of the nine settings were programmed with the LED-wall on, either blue or red (Figure 5.27 and Figure 5.28). However, behind the wine racks, the blue and red of both wall settings gently shaded off into purple, leaving the wine department practically unchanged whenever the LED-wall was on. During the day, the lightness of the colour varied (from light to darker and back again, taking about 30 seconds). The settings as designed by Philips are shown in Table 5.21. Three of them are visualized in Figure 5.24, Figure 5.25 and Figure 5.26. Despite the functional limitations – relevancy – and the capacity of the lighting, the settings were designed with visually large enough differences. The lighting was installed one year before the experiment started so the 'novelty' impact was eliminated. The 630lux/3000K scenario was the setting that had been displayed for a year in advance. During the experiment the settings were randomized and each day another setting was displayed.

PARTICIPANTS

For our part of the research (measuring emotions and atmosphere) during a period of 11 days, 664 people were questioned, 441 after the shopping experience and 213 during their shopping. Appendix H shows the sample of participants.

For Philips' part, measuring behaviour, which lasted 21 weeks, all the people shopping with a trolley or basket at Plus became participants, and were unaware of being part of an experiment. Initially the experiment was scheduled for nine weeks (October-December 2009), but eventually the experiment was lengthened by another 12 weeks (January-April 2010).

Table 5.21. The 9 settings as designed by Philips

	Illuminance	CT	Wall
1	480	2750	Off
2	480	2750	On/red
3	870	4800	Off
4	870	4800	On/blue
5	650	5400	Off
6	650	5400	On/blue
7	500	4000	Off
8	500	4000	On/blue
9	630	3000	Off

MEASURES

Mood: Dutch version of the Short Mood Form (SMF), see Appendix D.

Emotions: Dutch translation of the PAD-scales, see Appendix E.

Atmosphere: Vogels' (2008) original instrument, see Appendix F.

Image Perception of Plus: This was measured on a 5 point-scale ranging from 'not matching at all' to 'completely matching' expectations.

Awareness of Lighting:

General lighting: Three photographs of the store were presented and participants were asked to point out the photograph most resembling the lighting they thought they had seen in the supermarket. The photographs showed scenario 630lux/3000K, scenario 480Lux/2750K and scenario 870lux/4800K, all with the LED-wall off (see Figure 5.24 - Figure 5.26).

LED-wall: When asked for the colour of the LED-wall also a choice of three photographs was offered: one showed the wall with the red lighting, one with blue lighting and one with green lighting (see Figure 5.27 - Figure 5.29).

Behaviour: A GPS tracking device was installed on each trolley and shopping basket, which could be tagged and detected every four seconds by RF-antennae in the ceiling. The tracking data can display the consumers' route, the number of visitors to specific areas and time spent (on the total shopping trip and per area). And, Plus provided Philips with the sales data of each day and the products sold located in the area with the specific settings (8500 products). As a control group, the sales were compared with another Plus supermarket, of the same owner, also located in Heerlerheide, and where no changes in the lighting were made.






(top left-right) Figure 5.24. Scenario 630 lux/3000K (LED-wall off), (see B on Figure 5.23 for location of photographs). Source: Philips

Figure 5.25. Scenario 480 Lux/2750K (LED-wall off). Source: Philips

Figure 5.26. Scenario 870lux/4800K (LED-wall off). Source: Philips

(bottom left-right) Figure 5.27. Red LED-wall (see A on Figure 5.23 for the location of the photographs). Source: Philips

Figure 5.28. Blue LED-wall. Source: Philips

Figure 5.29. Green LED-wall. Source: Philips

PROCEDURE

The consumers were tracked each day during those 21 weeks. To avoid people becoming aware of the different light settings and the fact that Philips was conducting an experiment, we were only allowed to participate during the last three weeks of their first measuring period (so at the end of the first 9 weeks). Table 5.22 shows the days and the settings studied. Saturdays were avoided due to the higher numbers of people shopping, which would make interviewing them too difficult. For practical reasons the last Monday was also not included. This resulted in studying each setting at least once, and two settings twice (3 and 6), on two different days.

All measures were conducted after the customers paid for their purchases, at the supermarket exit, so they were unaware that they were participating in an experiment until that very moment. They were questioned with their backs to the store, so it was not

Table 5.22. Days of research with the attached setting

	Day	Setting	LED-wall
1	Monday	8	blue
2	Tuesday	5	
3	Wednesday	1	
4	Thursday	9	
5	Friday	3	
	Saturday	2	
	Sunday		
6	Monday	7	
7	Tuesday	3	
8	Wednesday	4	blue
9	Thursday	2	red
10	Friday	6	blue
	Saturday	5	
	Sunday		
	Monday	8	
11	Tuesday	6	blue

possible to look back at the lighting. The awareness of the LED-wall was only measured when it was on. Also, some demographics were asked (gender, educational level, shopping frequency, the last time they visited this Plus store, colour deficiency[55], who they were shopping with, and their age). Only on the last day were the customers asked what they thought of the lighting – via a scale from 1, very bad, to 5, very good – and if they thought the lighting was different from other supermarkets.

Because people adapt to lighting (e.g., Fotios, 2006) it was expected that customers, when questioned after their shopping experience (so after they had adapted to the lighting), might result in few differences between the nine settings. Therefore, it was opted to also measure the perceived atmosphere in store (213 people). Customers were intercepted approximately one minute[56] after they entered the store to fill in the atmosphere questionnaire with the overall image question at the end.

Results

Mood: As Table 5.23 shows, there are no significant differences for mood between the settings. Note that mood was measured after they shopped in one of the settings.

Emotions: The Pleasure dimension was clearly distinguishable (Cronbach's alpha = 0.89), while the original Arousal subscale again did not form a single construct (Cronbach's alpha = -0.24). It is therefore analysed by its single items. Table 5.24 shows the results.

The lighting setting only significantly affects experienced Pleasure. The largest difference (.63) is visible between the original Plus setting (630lux/3000K) – the highest score – and setting 870lux/4800K – having the lowest score.

Atmosphere: As the original Dutch version of the atmosphere questionnaire was used, we grouped the atmosphere descriptors into the four subscales as proposed by Van Erp (2008): Cosiness (Cronbach's alpha = .74), Liveliness (Cronbach's alpha = .73), Tenseness (Cronbach's alpha = .81), and Detachment (Cronbach's alpha = .52).
As mentioned, to measure whether the time of measurement – before or after a possible adaptation effect – had an influence on how the atmosphere was perceived, the atmosphere questionnaire was taken during and after the shopping experience. A two-way ANOVA (setting * location) showed, on the one hand, a significant difference between the questionnaire taken inside Plus and the one taken at the exit of Plus for the Cosiness dimension. As shown in Table 5.25, Cosiness scores higher outside the supermarket than inside (p-value .0002).
On the other hand, the test showed also a significant difference between the general lighting settings (inside and outside data together): a small increase on the Cosiness dimension was found for the 480lux/2750K setting compared to the 500lux/400K+LED and 650lux/5400K setting (p-value .027). Setting and location, however, do not interact.
People generally perceive a positive atmosphere (relatively Cosy and Lively, not Tense).

Image of Plus store: The image-question was posed inside and outside the store. However, for the further analysis, the inside and outside questionnaires are grouped since there is no significant difference found between them. Table 5.26 shows the results.
Between the lighting settings, no significant difference was found. In general, all settings seem to fit the image of Plus well. However, worth mentioning is that the atmosphere of the original Plus setting (630lux/3000K) corresponds worst with its image.

55 The ones with a colour deficiency were eliminated (11 people).

56 There are different studies with different conclusions regarding chromatic adaptation (see Fotios, 2006, for a review). Illuminance and the spectrum of light plays a role in the duration of chromatic adaption. It seems that, on average, during the first 60 seconds exposure a relatively quick adaptation occurs, up to a level of up to 90%. After that rapid adaptation a longer period is necessary to fully adapt (this might be from several minutes to several hours depending on the light source). As long as the 100% adaptation is not reached, influences on perception (e.g. comfort level) are reported.

Table 5.23. Results of the mood per setting (ANOVA)

Measure	480lx 2750K	480lx/2750K + LED	500lx 4000K	500lx/4000K + LED	630lux 3000K	650lx 5400K	650lx/4500K + LED	870lx 4800K	870lx/4500K + LED	F (8, 431)	p-value
Mood	6.03	5.93	6.03	5.83	6.44	5.78	5.99	5.92	5.94	1.03	1.41

Table 5.24. Mean of the PAD-emotions, per setting, F and p-value (one-way ANOVA)

Measure	480lx 2750K	480lx 2750K + LED	500lx 4000K	500lx 4000K + LED	630lux 3000K	650lx 5400K	650lx 4500K + LED	870lx 4800K	870lx 4500K + LED	F (8, N)	p-value
Pleasure	6.02	5.55	5.78	5.33	6.12	5.67	5.54	5.49	5.50	2.07 (8,438)	0.04
Arousal items:											
calm – excited *rustig - opgewonden*	1.92	2.25	2.08	2.18	1.60	2.20	2.40	2.38	2.40	1.56 (8, 434)	0.13
relaxed – stimulated *ontspannen - gestimuleerd*	2.67	2.72	2.69	3.29	2.44	2.48	3.10	2.87	2.60	1.36 (8, 430)	0.21
sluggish – frenzied *loom - uitzinnig*	4.76	4.63	4.37	4.54	5.15	4.50	4.65	4.42	4.43	1.34 (8, 425)	0.22
dull – jittery *futloos - zenuwachtig*	4.18	4.11	4.19	4.05	4.00	3.90	4.16	4.01	3.85	0.56 (8, 414)	0.81
sleepy – wide-awake *slaperig - wakker*	5.65	5.40	5.00	5.24	5.68	5.35	5.05	5.23	5.18	1.01 (8, 433)	1.43
unaroused – aroused *niet geprikkeld - gerpikkeld*	2.31	2.78	2.64	3.18	2.44	3.13	3.10	3.10	2.78	1.52 (8, 432)	0.15

Table 5.25. Results for the atmosphere questionnaire taken inside and outside the supermarket

	Inside				Outside			
	Cosiness	**Liveliness**	**Tenseness**	**Detachment**	**Cosiness**	**Liveliness**	**Tenseness**	**Detachment**
480lx 2750K	4.44	4.76	1.72	2.95	4.79	5.17	1.74	3.06
480lx 2750K + LED	4.05	4.81	2.04	3.28	4.24	4.51	1.91	2.98
500lx 4000K	3.92	4.98	1.56	3.08	4.04	4.55	1.80	2.88
500lx 4000K + LED	3.73	4.63	1.83	2.98	3.95	4.46	1.99	2.87
630lux 3000K	3.72	4.25	1.98	2.77	4.54	5.03	1.81	2.88
650lx 5400K	3.53	4.56	1.78	3.48	4.15	4.57	1.97	3.05
650lx 4500K + LED	3.97	4.60	1.74	3.14	4.31	4.74	2.25	3.22
870lx 4800K	3.95	4.49	2.06	3.05	4.31	4.85	2.11	3.04
870lx 4500K + LED	3.73	4.11	1.58	2.87	4.21	4.89	1.79	2.97

Table 5.26. The difference in image perception, which was indicated on a scale of 1 to 5, per setting (inside and outside together)

Measure	480lx 2750K	480lx/2750K + LED	500lx 4000K	500lx/4000K + LED	630lux 3000K	650lx 5400K	650lx/4500K + LED	870lx 4800K	870lx/4500K + LED	F (8, 431)	p-value
Image	4.40	4.07	4.07	4.13	3.95	4.16	4.00	4.22	3.96	1.84	0.068

Awareness of Lighting:
General lighting: This was measured by the photograph recognition question, asked outside the store. Figure 5.30 shows the results.
As the blue outlined bar shows, the 480lux/2750K was also recognised as such by 71% of the participants. Also the 870lux/4800K setting (green outlined bar) shows that it was recognised by 57% of the participants. The 630lux/300K setting was not recognised at all (purple outlined bar). The remaining two settings, which were not shown on a photograph, show no clear results. So, it seems that, relatively, only the extreme lighting situations are recognised.

LED: The results show (see Figure 5.31) that only the blue wall is recognised as such (51%).
Also the red wall is remembered as blue (50%). However, when red was displayed, an additional 9% of the participants, compared to when the blue wall was on, chose red, indicating that the LED-wall did have a slight effect.

As for measuring whether the respondents noticed any difference at all in the lighting (the additional questions asked on the last day of our experiment), 25% noticed that the lighting had changed during the last three months. The change in colour of the LED-wall was noticed by 17.5% of the customers.

Behaviour: Philips generated the analysis together with CQM (the office that installed the tracking system). With CQM's database, the influence of the lighting on time spent, products bought (the amount, type, A-brands or private label, the exact location of the product) and money spent, all in store or per department, could be studied. CQM analysed the data and we only received the results. Moreover, the details about the analysis of the data were not provided so these results are discussed with caution.

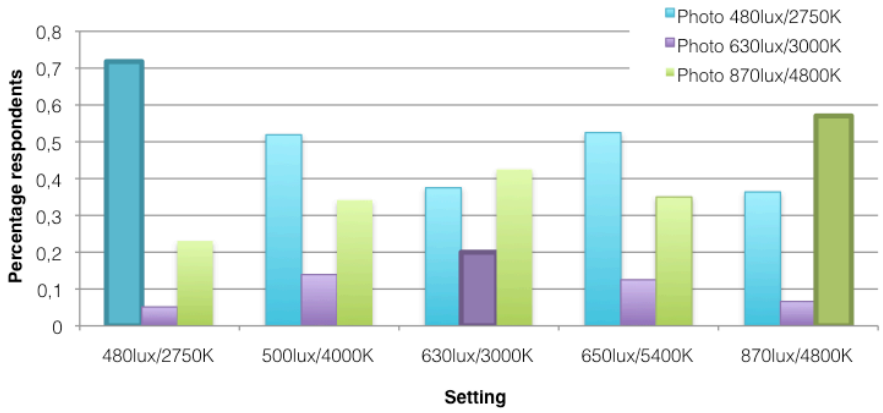
Regarding products bought and money spent, no significant differences are found. Regarding time spent, only weak significant results were found and only when trolleys and baskets are analysed separately. Figure 5.32, composed by CQM, shows this difference. The largest difference can be found for trolleys: for setting 870lux/4800K the time spent for trolleys increases, while for the same setting with the LED-wall on, the time spent decreases (62 seconds). A decrease can be found for all LED-wall on, compared to the off settings, for trolleys, however this was not seen to be significant. Customers shopping with a basket seem to spend more time when the 500lux/4000K+LED is displayed.

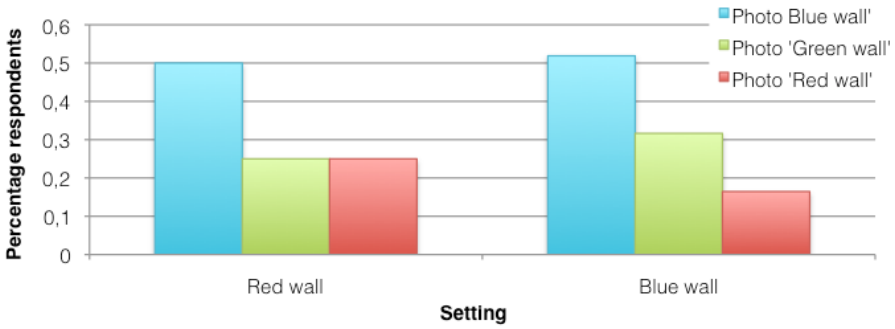
Discussion
The results of behaviour for trolley customers indicate that the LED-wall on or off might have an impact on emotions, atmosphere and image. So, this is first studied before discussing the results via the four stages of our research model.

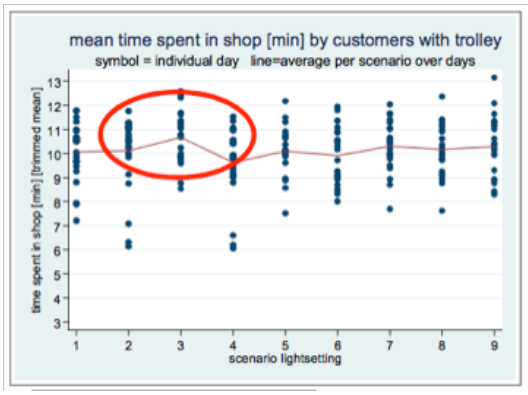
Table 5.27 shows the results of the questionnaires taken outside the supermarket, since inside, most customers had not yet seen the LED-wall. Note that for the 'off' settings the 630lux/3000K was left out since that setting has no 'on' version.
The LED-wall had no effect on Pleasure experienced, or any of the other emotion scales. For the atmosphere dimensions, the LED-wall also had no significant impact. Only for the image of Plus, a significant (small) impact is visible: the lighting settings with the LED-off seemed to fit the image of Plus better than when it was on.

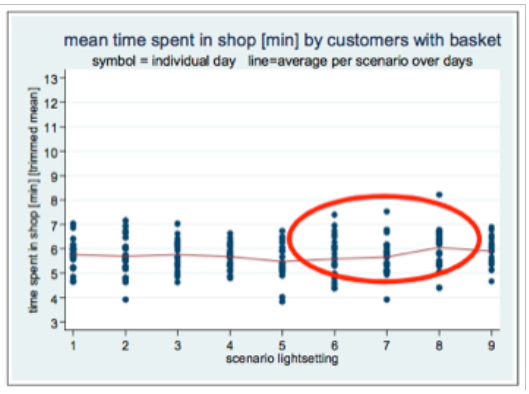
Table 5.27. Difference between LED-wall on and off for the atmosphere dimensions, for the 'inside' questionnaire

LED-wall	Off	On	F	p-value	N
Pleasure	5.69	5.49	2.54	0.112	397
calm – excited	2.2	2.33	0.78	0.379	393
relaxed – stimulated	2.72	2.96	2.16	0.142	390
sluggish – frenzied	4.49	4.58	0.38	0.536	385
dull – jittery	4.06	4.06	0	0.955	376
sleepy – wide-awake	5.29	5.18	0.46	0.499	392
unaroused – aroused	2.86	2.98	0.51	0.475	392
Cosiness	4.32	4.2	0.85	0.358	399
Liveliness	4.8	4.67	1.1	0.295	398
Tenseness	1.95	2.04	0.6	0.441	397
Detachment	3.01	3.05	0.11	0.738	396
Image	4.23	4.03	5.47	0.019	399









(top) Figure 5.30. Results for recognition of the different settings

(middle) Figure 5.31. Results of the recognition of the colour of the LED-wall

(bottom) Figure 5.32. Light setting and average time spent for trolleys and baskets. (setting 1-2=480lux/2750K led off and on, 3-4=870lux/4800K LED off and on, 5-6=650lux/5400K led off and on, 7-8=500lux/4000K LED off and on, 9= 360lux/3000K led off). Source: CQM

In line with the previous experiment, the discussion is presented in four stages, using our research model (Figure 5.8).

1) Do different lighting settings have an impact on how the supermarket's atmosphere is perceived?

Three aspects are discussed:

1. The difference found between the inside and outside results for the Cosiness dimension might be explained by the intervening variable of the friendly staff at the cash register: during the questionnaire it became apparent that it was rather difficult for the respondents to value some of the items such as 'cosy', 'pleasant' and 'cheerful' only regarding the atmosphere of the store, without including the personnel.

The relatively large difference between the inside and outside perceived Cosiness for the 630lux/3000K (Plus) setting, as Figure 5.33 shows, might on the one hand be explained by the aforementioned reason, and on the other hand, by the butcher's birthday being celebrated that day. The personnel decorated a part of the store with colourful flags and flowers. The participants questioned inside the store had not yet seen the decoration at the moment they were intercepted. The participants questioned outside the store had, which may have influenced their perceived Cosiness. The same peak is also visible in the outside Liveliness score (as Table 5.25 showed) – Tenseness and Detachment show almost no peak.

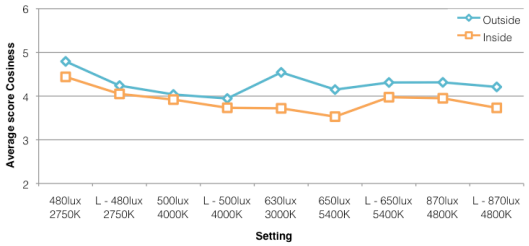


Figure 5.33. Visualisation of the difference for the Cosiness scores between the inside and outside questionnaire. 'L' is used to indicate the settings with the LED lighting

Figure 5.33 also illustrates that the same pattern (e.g., LED on versus off for four settings) for both the inside and outside questionnaire is visible. The only exception is, again, the 630lux/3000K setting. When only the 'inside' questionnaire is analysed no differences were found for the Cosiness dimension.

2. For an easy comparison with Experiment 2, a visualisation of the largest differences between the settings on item level might be opportune. For the same reason, only the results of the inside questionnaire are included.
So, the three settings that differed most (excluding the LED-wall settings – the participants largely had not yet seen the LED-wall at the point of questioning) are isolated and studied per atmosphere item. The results of the settings 480lux/2750K, 630lux/3000K (original Plus) and 650lux/5400K are shown in Table 5.28.
The 480lux/2750K seems to differ most from the other two. It scores significantly higher for *gemoedelijk* (pleasant), compared to the other two settings. Compared to the 630lux/3000K it scores higher on *luxueus* (luxurious), while if compared to the 650lux/5400K setting, it scores higher for *hedendaags* (contemporary), *behaaglijk* (nice-cosy) and *knus* (snug-cosy). When the 630lux/3000K setting is compared to the 650lux/5400K setting, only a difference for *formeel* (formal) is found: the latter is seen as the most *formeel* (formal).

Without paying attention to significance, the size of the differences between the settings are visualised in Figure 5.34. The items are ordered based on the average scores per item, from high to low.

Table 5.28. Results of the atmosphere descriptors: average for the three settings (480lux/2750K, 630lux/3000K (original Plus) and 650lux/5400K) and the p-value (t-test). The red numbers are significant

Atmosphere descriptors	480lux/ 2750K (1)	630lux/ 3000K (5)	650lux/ 5400K (6)	p-value for the t-test for		
				1-5	1-6	5-6
Gemoedelijk (pleasant)	6.00	4.85	5.15	0.006	0.031	0.498
Ruimtelijk (spatial)	5.79	4.68	5.70	0.090	0.861	0.077
Gastvrij (hospitable)	5.74	5.10	5.55	0.287	0.736	0.418
Toegankelijk (accessible)	5.60	5.11	5.65	0.394	0.925	0.294
Hedendaags (contemporary)	5.40	4.40	4.05	0.110	0.039	0.614
Luxueus (luxurious)	5.26	3.78	4.55	0.004	0.130	0.137
Levendig (lively)	5.25	4.63	5.00	0.270	0.644	0.506
Gezellig (pleasant)	5.00	4.40	4.50	0.190	0.319	0.842
Ontspannen (relaxed)	4.95	3.85	4.84	0.065	0.858	0.108
Vrolijk (cheerful)	4.95	4.20	4.70	0.221	0.643	0.397
Stimulerend (stimulating)	4.65	4.58	4.45	0.916	0.743	0.823
Behaaglijk (nice-cosy)	4.50	3.70	3.35	0.107	0.039	0.517
Warm (warm)	4.50	3.70	4.60	0.194	0.867	0.183
Rustgevend (tranquil)	4.47	3.90	4.50	0.320	0.966	0.327
Zakelijk (businesslike)	4.39	3.37	4.80	0.076	0.456	0.010
Persoonlijk (personal)	4.32	4.80	4.58	0.409	0.671	0.696
Inspirerend (inspiring)	4.20	3.32	4.10	0.130	0.854	0.156
Knus (snug-cosy)	4.15	3.70	2.95	0.422	0.015	0.150
Geborgen (safe)	4.00	3.30	3.20	0.253	0.171	0.859
formeel (formal)	3.60	2.60	4.20	0.124	0.378	0.010
Intiem (intimate)	3.55	3.05	3.00	0.415	0.351	0.925
Romantisch (romantic)	2.65	2.70	2.75	0.930	0.860	0.931
Enerverend (exciting)	2.60	3.42	3.56	0.159	0.106	0.827
koud (cool)	2.55	3.21	2.56	0.328	0.993	0.336
Afstandelijk (detached)	2.15	2.45	2.55	0.621	0.533	0.874
Saai (boring)	2.00	2.63	2.11	0.234	0.848	0.290
bedompt (musty)	1.95	2.25	1.90	0.617	0.927	0.529
Mysterieus (mysterious)	1.90	1.83	2.00	0.873	0.838	0.712
Onrustig (restless)	1.85	2.11	2.11	0.536	0.587	1.000
bedreigend (threatening)	1.83	1.80	1.47	0.950	0.488	0.493
Ongemakkelijk (uncomfortable)	1.75	2.53	2.35	0.138	0.245	0.777
Gespannen (tense)	1.75	1.95	2.15	0.663	0.450	0.647
Beklemmend (oppressive)	1.60	2.00	1.55	0.346	0.884	0.268
Kil (chilly)	1.60	2.05	2.30	0.279	0.191	0.647
Beangstigend (terrifying)	1.53	1.53	1.40	1.000	0.740	0.681
sloom (lethargic)	1.50	1.84	2.05	0.331	0.181	0.599
Vijandig (hostile)	1.45	1.40	1.95	0.886	0.331	0.254
Deprimerend (depressed)	1.35	1.25	1.32	0.695	0.901	0.739

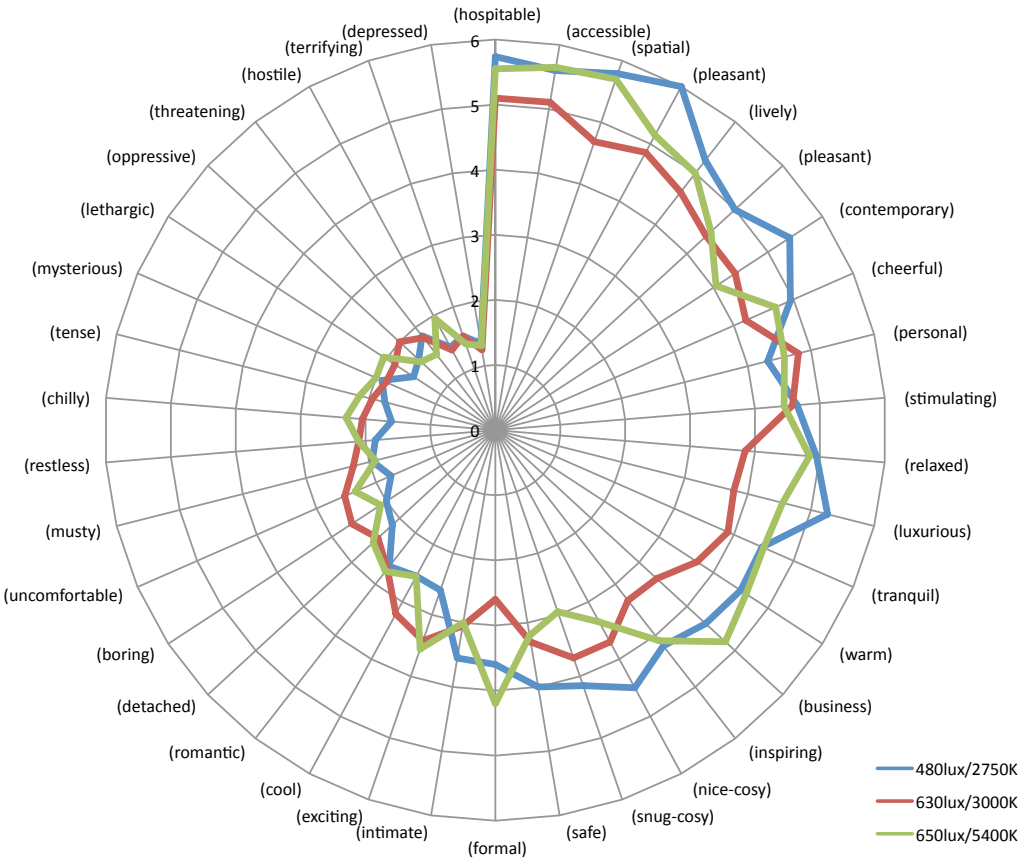


Figure 5.34. Visualisation of the results (score per atmosphere descriptor) per setting (480lux/2750K, 630lux/3000K (original Plus) and 650lux/5400K)

Figure 5.34 shows that the 480lux/2750K setting is perceived as the most positive one with items such as *gemoedelijk* (pleasant), *levendig* (lively), *gezellig* (pleasant), *vrolijk* (cheerful), etc. For the same items the 630lux/3000K setting is perceived as the least positive. This figure also shows that Plus in general scores high for the items with a positive connotation (items on the right side of the circle) and low for ones with a more negative connotation (the items on the left side of the circle). Finally, there are items that might not be expected to be perceived with large variances between the lighting settings, but that do seem to be influenced by them rather profoundly (e.g., *luxueus* (luxurious) which was also significant for the 480/2750k compared to the 630lux/3000k, and *zakelijk* (business)).

When this figure is compared to the one of the previous experiment, the differences are not that large. Both the supermarket and the lab show a similar pattern: both have the same items on the right as on the left – positive versus negative – although not necessarily in the exact same order. The differences per item are larger for the supermarket than for the lab.

3. It was studied whether the perception of different atmospheres also leads to an explicit recognition of those atmospheres. We expected that the settings that were not shown on a photograph (setting 650lux/5400K and 500lux/4000K), however similar to us, a setting that was shown on a photograph (870lux/4800K), would be recognised as the 870lux/4800K setting. This was not the case, indicating that there is some awareness, but only if the general lighting is relatively extreme. Note that photographing lighting is difficult and that the quality of the photographs might also interfere in getting clear results.

For the LED-wall, our research question was not confirmed: blue seems to be the colour people remember – even when it was red. A possible ad hoc explanation might be found in the wine department that was always lit purple when the LED-wall was on. Indeed, the area of the wine department is the one that has the highest visibility because it is the first area with LED-lighting that the customers encounter. And, they have an open view of it due to the lower aisles of the fruit and vegetables department (see Figure 5.23). Moreover, the difference between blue and purple is relatively small, so purple might be recognised as blue.

2) Does the perception of different atmospheres relate to the emotional reaction?

The link between how a consumer perceived the atmosphere in terms of Cosiness, Liveliness, Tenseness and Detachment, and how the same consumer reacted emotionally to the store – Pleasure, and the Arousal items – is checked. Since only the PAD-questionnaire is filled in outside the store, only the perceived atmosphere results of those participants can be used. Table 5.29 shows the results.

As could be expected, Pleasure experienced increased when the perceived Cosiness and Liveliness increased. Similarly, when a store was interpreted as more Tense and Detached, the Pleasure experienced went down. The same result is found for the sleepy–wide-awake scale and also the sluggish–frenzied scale, although without a Detachment correlation. Calm–excited and unaroused–aroused also correlate with the atmosphere dimensions, but conversely: when an atmosphere is perceived as Cosy and Lively, the experienced arousal and excitement decreases, while both increase when the atmosphere is perceived as Tense and Detached. The relaxed–stimulated scale shows similar results, only no correlation with Detachment is found.

Table 5.29. Pearson Correlation between perceives atmosphere and the PAD-constructs (+ p-value and N). Blue shows a significant positive correlation while red shows a significant negative correlation

	pleasure	calm – excited	relaxed – stimulated	sluggish – frenzied	dull – jittery	sleepy – wide-awake	unaroused – aroused
Cosiness	0.34	-0.20	-0.28	0.16	0.08	0.30	-0.12
	<.0001	<.0001	<.0001	0.0007	0.125	<.0001	0.0112
	439	435	431	426	415	434	433
Liveliness	0.33	-0.19	-0.25	0.20	0.01	0.26	-0.16
	<.0001	<.0001	<.0001	<.0001	0.8218	<.0001	0.0008
	439	435	431	426	415	434	433
Tenseness	-0.31	0.26	0.13	-0.12	0.10	-0.24	0.23
	<.0001	<.0001	0.0091	0.0142	0.0334	<.0001	<.0001
	438	434	430	425	414	433	432
Detachment	-0.16	0.13	0.03	-0.08	0.08	-0.10	0.16
	0.0007	0.0056	0.5838	0.1085	0.108	0.0327	0.0008
	437	433	429	425	413	432	431

Note that the number of significant results is relatively high, which might be due to the number of participants, however, not all results are meaningful. The strongest (and most meaningful) correlations are found for the Pleasure construct, the weakest results for the Detachment dimension. Also note that these correlations say nothing about the direction in which they occur – the experienced emotions might cause the atmosphere to be perceived as Cosier, or due to the Cosy atmosphere, stronger Pleasurable feelings are elicited. Or they might even influence one another.

3) Is there an influence of the (pre-existing) mood on the perceived atmosphere?

The mood was only measured outside the supermarket, so no connection with the pre-existing mood can be made. Notwithstanding, analysing the connection between mood and perceived atmosphere might be interesting. As Table 5.30 shows, mood correlates with all atmospheric dimensions, but most strongly with Liveliness in the positive direction and with Tenseness in the opposite direction. So, people in a good mood perceive the atmosphere as less Tense and Detached, but more Lively and Cosy.

These results give no idea about causation. It might be argued that the mood people were in affected how they perceived the store. However, the other way round is also possible: the perception of atmosphere might lead to a better mood.

4) Do the different lighting settings have an effect on the resulting behaviour?

Firstly, it needs to be noted that although they could not be tracked, the customers who shopped without a shopping trolley or basket (e.g., for small purchases) were included in the sales data. It might have been interesting to study whether this group shows a different behavioural response that could have influenced the sales data. Indeed, I want to argue that these customers might shop for more functional items, need fewer products and, are therefore responsible for a major decrease in the average products bought per day. So, regardless of lighting, this group of customers might always show the same behaviour. To get an idea of the significance of this group, we counted these customers for three hours a day, (the days that the interviews were also conducted). Due to the presence of a Post Office in Plus, it was also registered how many people went into the store with no trolley and how many of them came out with no purchases. Most likely, those people only visited the Post Office and were therefore eliminated during the count. Depending on the day, the group shopping without a basket or trolley was even larger than the group of customers shopping with baskets or trolleys (see Appendix I). Following our reasoning, the size of this group might have diminished any response to the lighting there was of the other groups.

Table 5.30. Pearson Correlation (and p-value) between mood, perceived atmosphere and emotion

	Cosiness	Liveliness	Tenseness	Detachment
Mood	0.18	0.24	-0.24	-0.10
p-value	0.0002	<.0001	<.0001	0.04
N	440	439	439	438

Secondly, when no significant differences were found for the individual settings, Philips and CQM started to explore the data for grouped settings. They combined the results of the warm (2750K+3000K) middle (4000K) and cold (4800K+5400K) lighting. However still no significant difference on time spent and products bought was found. Only in very specific situations could an outcome be formulated: the report of Philips (van den Burgt, 2010, personal communication) states that *"when focussing on specific areas a (weak) significant difference between the scenarios on total time spent in the area of convenience foods & food ingredients in specific timeframes of the day by customers with trolleys is found… for grouped settings, i.e. warm lighting (low CCT, low lumen-level) people stay longer in a specific area"*.

When only taking relatively extreme lighting settings into account, there seems to be a trend visible. The low lumen/CCT settings (480lux/2750K and 630lux/3000K) seem to have a lower sales number

for the first half of the week, compared to the high lumen/CCT (650lux/5400K and 870lux/4800K), while to the end of the week an increase is visible (see Figure 5.35). So, although the results are weak, this trend might suggest that during the week, when fewer people are shopping, it seems that high lumen and CCT lighting might be beneficial for sales. When more people are visiting the supermarket, lower levels might be opportune.

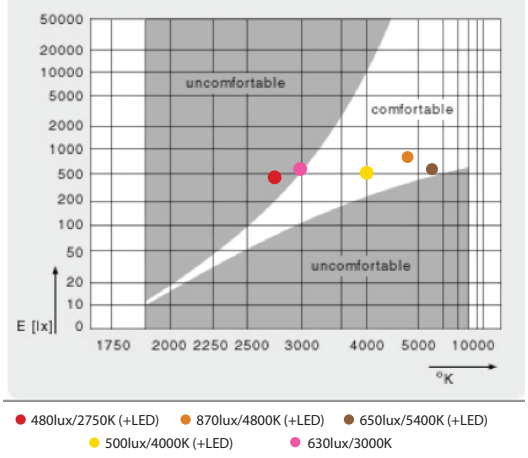
Finally, it would have been interesting to study the correlations between perceived atmosphere, emotions and behaviour. Adding a question to the 'outside' questionnaire, which requested the amount the customers had spent on their purchases, might have offered the opportunity to seek some of those correlations.

Conclusion

There are two conclusions:

1. Regarding the awareness of the overall lighting, it seems that only extreme lighting settings are recognised. The LED-wall only had a slight effect. So, it might be stated that, although for a (lighting) designer the differences in lighting might be clear, consumers do not seem to be aware of such differences.
Similarly, the awareness of the LED-wall was low, even the difference of the LED-wall being on or off, which was obvious to us, resulted in no difference for the atmosphere dimension or the emotional response. Only for image perception did the LED-wall have a significant impact – the LED-wall being off fitted Plus image better. So, based on these results, one might assume that the LED-wall does not enrich customer experience for Plus.

2. It can be concluded that the two settings that generated the strongest responses (the 480lux/2750K setting and the original Plus setting) are the ones located outside the comfort zone of the Kruithof curve (see Figure 5.36).



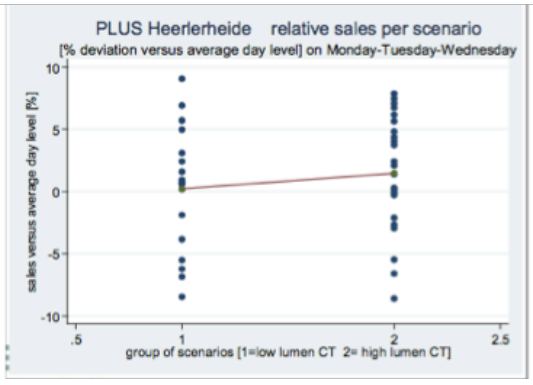
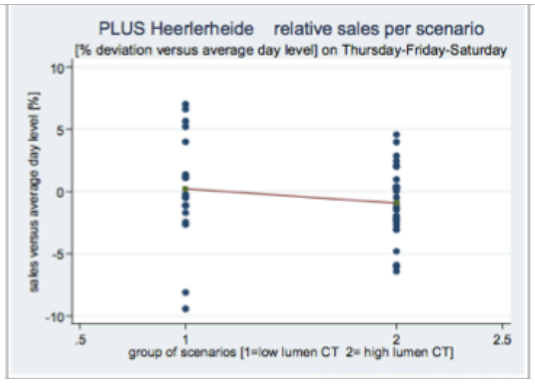


Figure 5.35. Relative sales per grouped scenarios per part of the week



(top) Figure 5.36. The nine settings visualised on the Kruithof curve

The 480lux/2750K setting scores best on Cosiness and it fits the image of Plus best. Secondly, the original Plus setting fits the image worst, but it generates the strongest Pleasurable emotions.
Both settings lay close to each other in terms of illuminance and CCT, but they generated different responses for image, experienced emotions and perceived atmosphere. A final conclusion on the applicability of the Kruithof curve for retail is discussed in the following paragraph.

5.5.3. Validating the Measurements and the Lab

Regarding the second phase, comparing the perceived atmosphere and the emotional scale results of the lab with those of Plus, might indicate the validity of our lab and research method, and might on the other hand, lead to statements or guiding principles applicable for supermarkets in general.

Validating the Measurements

Firstly, when looking at the results of Experiment 1(A-B-C), it seems that when the procedure is forced and the presence of other intervening variables is low, more significant results are found than when the experiments become more realistic with a genuine free choice and a lot of other potentially relevant variables. The last two experiments indicate that although in the real supermarket more variables intervene, comparable results are found, however, more of them were significant (probably due to the larger random sample that was studied). As Table 5.31 shows, we started with familiar, more 'traditional' research methods, slowly building up to our designer's research approach.
In Experiment 1A and 1B, the behavioural response was rather large. But in the other experiments the (buying) behaviour was nil (Experiments 1C, 2 and 3). However, regarding the emotional affect and perceived atmosphere, this is reversed: more significant results were found in the real supermarket compared to the lab supermarket.

Secondly, it is studied if the four subscales as proposed by Van Erp (2008) are relevant dimensions for measuring the atmosphere in supermarkets. A 'factor analysis' (cf. 5.3) of our data reveals that instead of those four dimensions – Liveliness, Cosiness, Tenseness and Detachment –, for supermarkets, two dimensions seem to explain more of the correlations than four do (see Appendix J). The two dimensions seem to be either more positive or more negative. So, items like *gezellig*, *warm*, *ontspannen*, *knus*, *persoonlijk*, *behaaglijk*, *rustgevend*, *geborgen* (pleasant, warm, relaxed, snug-cosy, personal, nice-cosy, tranquil, safe) – which are cosiness items –, and *stimulerend*, *levendig*, *inspirerend*, *vrolijk* (stimulating, lively, inspiring, cheerful) – which are liveliness items –, and *luxueus* and *gastvrij* (hospitable, luxurious), score high on Factor 1 (positive). Factor 2 (negative) includes all Tenseness items, being *vijandig*, *beangstigend*, *beklemmend*, *gespannen*, *deprimerend*, *ongemakkelijk*, *onrustig*,

Table 5.31. Representation of each experiment with its goals, context, procedure, moderating variables and validity listed

	Product (phase 1)			**Space (phase 2)**	
Experiments	Exp. 1A	Exp. 1B	Exp. 1C	Exp. 2	Exp. 3
Procedure	Paired comparison (no forced choice)	Paired comparison (forced choice)	Free choice	Free choice	Free choice
Moderating variables	Low	Medium	High	High	Highest
Ecological validity	Low	Medium	High	High	Highest
Dependent variables	Product preference	Product preference/ behaviour	Product reference/ behaviour	Affect/behaviour/ atmosphere	Affect/behaviour/ atmosphere
Results	confirmed	confirmed for green vegetables	no difference	difference in Pleasure/ largest difference in perception of atmosphere items for high quality setting/ recognition of high quality	difference in Pleasure/ few differences in behaviour/ difference for Cosiness, only extreme settings are recognized

(hostile, terrifying, oppressive, tense, depressed, uncomfortable, restless) and also *kil* (chilly). So, Factor 1, including more positively related items, can be referred to as Pleasantness (*Behaaglijkheid*), while Factor 2, which actually is Van Erp's Tenseness (*Spanning*), can also be referred to as such.
So, our data analysed with two factors resembles Van Erp's dimensions, only most Cosiness and Liveliness items seem to form one factor instead of two. Also the Tenseness dimension remains visible. The Detachment items were almost all eliminated when the Dutch version was adapted to the Flemish version.

Worth mentioning is our finding that when solely measuring the atmosphere of a store (without including the personnel) the atmosphere items might be confusing because they relate either to the way a person feels or how store personnel behave. The atmosphere descriptors contain a lot of terms that relate to one or other of those aspects: items like cheerful, cosy and pleasant can relate to the personnel, while items like tense and uncomfortable might relate to emotions felt by the participant.

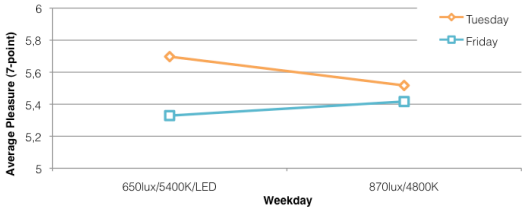
Validating the Lab

Firstly, the atmosphere results show that the lab scores a bit lower than the supermarket for Cosiness and Liveliness, which is to be expected, and higher on Tenseness. So, in terms of absolute validity, there is none. These differences might be explained by two reasons. A first reason is the difficulty of separating the atmosphere from other aspects. So, it might be that in the lab the participants felt tenser because they were taking part in an experiment and they were monitored. But, as a second reason, it would also not be surprising that the lab is perceived as a tenser environment probably due to its neutral and clean look.
What is more important is that the pattern of results of the lab and Plus is similar: Liveliness scores higher than Cosiness for all but one (hard discounter), and Cosiness scores higher than Tenseness for all.
Also the emotion dimensions show similar developments. Although, the resulting Pleasure in Plus is shown to be higher than in the lab, almost all Arousal items show analogue proportions when both are compared. These outcomes contribute to the relative validation of our lab.
The mood results are harder to compare since in the lab they were measured before entering the space, while in the supermarket, they were measured afterwards. The pre-existing mood showed no strong connection with perceived atmosphere, and also no difference was found between the pre-existing mood and the mood after having shopped in the lab (cf. Experiment 1B). In the supermarket, however, the mood indicated a strong connection to all the atmosphere dimensions. Customers in a good mood perceived the atmosphere as more Lively and Cosy, and experienced more Pleasure. A possible explanation might be that the impact of the supermarket's atmosphere on mood is larger than the one of the lab. And, that the atmosphere was able to influence the participants' mood. This is also consistent with what was argued in Chapter 3 (p.9) *"emotions are generally stronger in intensity than moods and they have a clear object of reference (e.g., the store environment)"*, indicating that moods are less subservient to the influences of the environment, let alone of a lab environment. In other words, emotions are more clearly linked to an atmosphere, and they are more intense, explaining why a difference in emotions is found for both experiments, and a difference in mood is not. What is more, if it were the mood that influenced the way the atmosphere was perceived, it is more likely that the same results would have been found in the lab.

Secondly, the results of the typicality questions generate another argument confirming that the lab is valid. The average of the results of both the typicality questionnaires (Experiments 1C and 2) show the lab, on a scale from 1 to 10, to be a good example (6,69), rather typical (7,01) and representative (6,73).

Thirdly, it needs to be expressed that the results found in the supermarket cannot always be appointed strictly to the lighting. The differences in emotional response and the perceived atmosphere might be caused by something happening that day (cf. the birthday party), or the day of measurement, rather

than the lighting itself: the influence of a confounding variable was analysed and it was found that, however insignificantly, the effect of the day was larger than the effect of the setting. We had the opportunity to study two settings twice (650lux/5400K/LED and the 870lux/48000K setting). For those two settings the effect of the day was larger than the effect of the setting for the Pleasure dimension. As Figure 5.37 shows: the average of the settings remains more or less the same, while the average of the day differs more – if it were only the day that had an impact, regardless of the settings, each day measured twice would yield the same results, which is not the case. This illustrates the difficulty of working with real store spaces where many cues and other variables cannot be controlled, while in the lab, such moderators and variables are less pronounced.



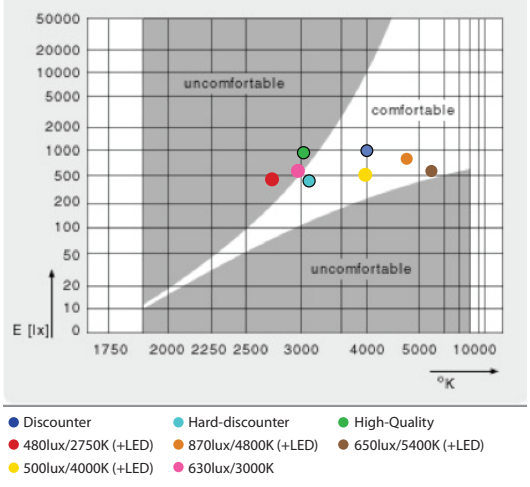


Figure 5.37. Influence of the day versus the setting

Figure 5.38. Visualisation of the general lighting of the lab settings (with black circle) and Plus settings in the Kruithof curve

In sum, the comparison of the outcomes of both provides insight into the relevancy of conducting experiments in a lab. Although the lighting was the only changing environmental cue in the lab, while in the supermarket it was only one of the many (changing) cues, the results are similar – even for behaviour which showed no significant differences. So, the size of effect in the lab seems to be an important indicator of reliably estimating the size of effect in more ecologically valid situations.

5.5.4. Towards Guiding Principles

Combining the data of the perceived atmosphere and the emotion scale results of the lab and Plus store, might lead to statements or guiding principles applicable for supermarkets in general.

A First Principle

Based on our findings, it might be stated that when designing supermarkets attention should be paid to two atmosphere dimensions: a more negative dimension called 'Tenseness', and a more positive one referred to as 'Pleasantness'. So, customers seem to perceive an atmosphere as more chilly, oppressive and uncomfortable or as more cosy, lively and relaxed. Depending on the type of supermarket it can be determined which type of atmosphere should be created, based on these two dimensions.

A Second Principle

The lighting settings that are most similar, of both the lab and the supermarket, are compared. As seen in Figure 5.38, in terms of illuminance and CCT the high quality setting of the lab is comparable with the original Plus setting. Also the hard-discount setting comes close to the Plus setting. But in terms of general lighting in proportion to accent lighting, the hard discounter does not resemble the atmosphere of the original Plus setting at all. Therefore, only a comparison between the results of the original Plus setting and the high quality setting seems fair.

Regarding the emotions experienced, the results show that the original Plus setting generated the highest Pleasure. This was also the case for the high quality setting in our lab. Although a comparison is not entirely fair, it might indicate that a CCT of

3000K and an illuminance of the general lighting between 630-830lux is one aspect of the lighting that might contribute to generating pleasurable feelings. Although Park and Farr (2007) found similar results for 3000K lighting, if only illuminance levels and CCT played a role, the hard-discount setting should have elicited the same feelings, which it did not, underpinning our statement that the proportion between accent lighting and general lighting might also contribute to this.
While a CCT of 3000K seems to elicit more Pleasurable feelings, a CCT of 2750K does not (the 480lux/2750K setting scored the lowest on Pleasure), although the balance between general lighting and accent lighting is the same as the original Plus setting. However, the relatively low illuminance level might also contribute to the less experienced Pleasure. This is consistent with the Kruithof curve, indicating that warm lighting needs higher illuminance levels to be experienced as bright and pleasant as the same illuminance levels with colder lighting.

As for the perceived atmosphere, maybe somewhat surprisingly, the 480lux/2750K setting scores best on Cosiness. In the lab, the high quality setting (830lux/3000K) scored the highest. The original Plus setting only scored medium high on the Cosiness dimension. There seems to be no consistency in the results. Besides, although Pleasure and Cosiness correlate – so one might expect that if a setting scores best on Cosiness, it might elicit very high (compared to the other settings) Pleasurable feelings, or vice versa – the 480lux/2750K setting scored the lowest on Pleasure.

In sum, it seems that the settings that generated the strongest results, are the only ones located outside the comfort zone of the Kruithof curve. Therefore, it seems that the Kruithof curve does not apply for supermarket lighting. Moreover, even within these relatively closely related values, opposites in experienced Pleasure and Cosiness are found: a lighting setting with general lighting added with accent lighting as common in mid-level to high-end supermarkets, with an average CCT of 3000K and an illuminance between 630 and 830lux, seems to lead to the most Pleasurable feelings. When the same balance between general and accent lighting is maintained, and a CCT of 2750K to 3000K, with an illuminance of 480 or 830 is handled (in between the effect even seems to fade), seems to lead to a more Cosy atmosphere. These are meagre guiding principles. So, as a guiding principle, rather than looking at the CCT, illuminance or even other objective descriptions of the lighting, the created atmosphere to which the lighting contributes, is of great importance. As was mentioned by the lighting designers during the expert-interviews (cf. Chapter 4, p. 100), the differences between light and dark, dim and bright, extra accents, etc. creates tension and differences in perceived atmosphere.

Note that because only a part of the supermarket was lit with the changing settings, all aforementioned statements need to be handled with caution. Furthermore, these statements are based on results of which we have assumed to be effects of the lighting, rather than being a result of other variables as might have been the case in the real supermarket. Finally, note that in general all settings score relatively well on Cosiness and Pleasure, so again, these statements need to be read with caution.

5.6. Conclusion

The conclusions are discussed via the concepts of our Retail Communication model (see Figure 5.39). The cognitive responses 'semantic interpretation' and 'attention drawing' on product level, as described in the first experiment, can also be adapted to the atmospheric level. The image perception and price & service level questions of Experiment 2 are a way to measure semantic interpretation. It is shown that, in supermarkets, specific lighting could be designed to create a particular atmosphere. In its turn, the perception of that atmosphere might lead to an interpretation of a specific image-related message. The atmosphere questionnaire as applied in the Experiment 3, suggests the same. Although strong results were found for Cosiness only, it does show that again by only changing the lighting, different messages (atmospheres) are perceived. So selecting and creating the **relevant stimuli** is important to

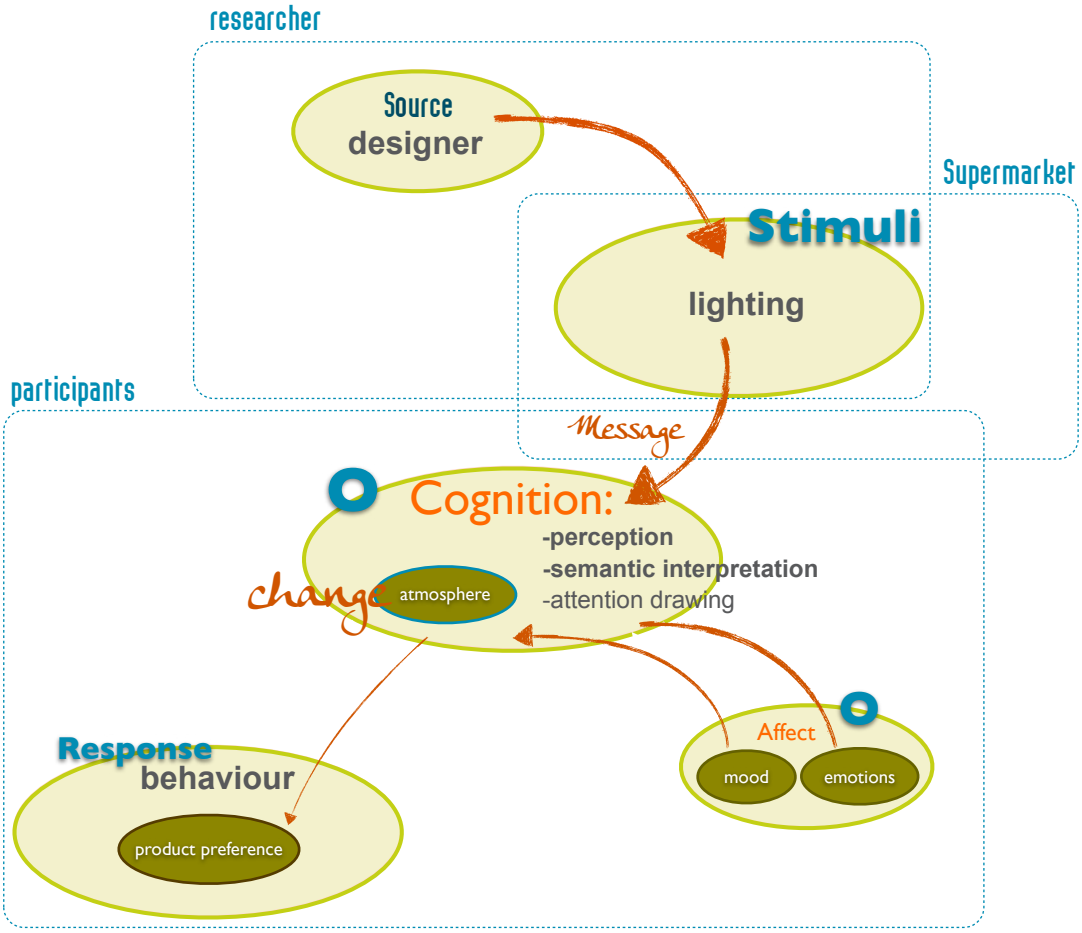


Figure 5.39. Our RC model with the results visualized. The thickness of the arrows indicates the level of response

transmit the **message** aimed at. Indeed, as argued, **designers** are familiar with semiotics, which makes them a proper **source of the stimuli**.

Also the attention drawing aspect in terms of atmosphere is measured in Plus. The LED-wall was designed to attract more customers to a specific area. However, it was not confirmed that the lighting has such an impact. Also Experiment 1B created reasonable doubt about the attention drawing value of the extra-lit shelves. Although a rather large number did choose their cosmetic products out of the third rack while it was located at the back of the lab, the extra lighting on shelving for bread had no significant impact. So, lighting might have **some**

attention drawing impact on product and space level, but with many other aspects interfering, this effect might recede into the background.

Regarding the **behavioural response**, Experiment 1B confirmed that different lighting could change the visual appearance of a product, changing its **appeal** (aesthetic impression) and **semantic interpretation**. Both in their turn affect behaviour on **product preference** level. However, in the lab it became already apparent that lighting is only one of the many aspects that plays a role, leading to no differences in buying behaviour.
The experiments of the second phase confirm this. Notwithstanding promising results were found for the affective response and atmosphere perception. Looking back at the statements that were posed, the following ones are confirmed to some degree, at least for supermarkets:

- Lighting has an influence on the **perception of atmosphere** (this is consistent with Custers et al., 2010). Even very specific settings can be designed to create a message or communicate an image.
- Different atmospheres in supermarkets lead to different **emotional responses** and the perception of those atmospheres relates to the emotional reaction.
- The **mood** of customers is related to the way the atmosphere is perceived.
- Lighting as a single aspect in a supermarket does not have a large impact on customer behaviour. Maybe in specific time frames for a specific group of customers, behavioural results might be elicited.

To conclude, the research methods commonly used in other disciplines are also useful for research in retail design. The most important aspect that needs to be taken into account when conducting experimental research is approaching them from a designer's perspective. However, the difficulty still lies in the relevance and validity of the results. If the results only have meaning in a very specific context (as most results of in-isolation studied aspects are), from a designer's perspective, they do not aid practise much. Furthermore, since conducting experimental research requires a controlled space to attribute any change in emotions, perception or behaviour to a variable, a specific environment is opportune. So, generalizing our results to specific rules or guidelines, applicable in multiple situations, seems inopportune.

In sum, we argue that the experimental methodology and sound theoretical bases on human-environment interactions from traditional consumer research can be highly useful for retail design research and practice, when the designer's perspective is taken into account.

Limitations of the Experiments

Regarding the lab experiments, a larger sample of respondents might have lead to clearer results for the lab experiments. However, being in a rather isolated location at the University campus, the amount was set for a statistical justified minimum, since it was rather difficult to motivate people to travel to the campus.

As a consequence of our designer's approach and cooperation with practitioners, I was bound to the settings Philips designed in Plus (last experiment). It was therefore not possible to include the balance between accent lighting and general lighting. It might have been nice to simulate the lighting settings of the second experiment in a real supermarket. Also, in real situations, other variables, such as birthday decorations, cannot be controlled; so that the causal interpretation of results cannot readily be formulated in 'lower-level' physical terms. However it does constitute a meaningful pattern from a designer's perspective.

It was attempted to measure holistically the impact of lighting. However, because the first experiments showed no significant results for different kinds of moderators (e.g., the participants' background) and because the questionnaires became too long, this holistic approach was neglected. However, by measuring the perception of atmosphere, the

experienced affect and resulting behaviour, I do believe that, in terms of holistically studying lighting, already a large part is covered.

Future Research

Although Kruithof developed a curve to visualise the values to be used in creating pleasing lighting, we have found that these values have no meaning in retailing contexts. Lighting values that are less pleasing according to the curve, elicited strong Pleasurable feelings and were also perceived as Cosy. Therefore, for future research, it might be interesting to study and develop a new curve, or several curves that help to visualise which lighting should be used in retail. The challenge lies to include, next to objective measurements such as CCT and illuminance, the balance between spot and general lighting and how that impacts the perceived atmosphere and/or emotions experienced.

More research is necessary for the creation of a lighting design consistent with a store or brand's image. As our experiments show, lighting can generate a message that communicates price and image. It might be opportune to look for more sustainable solutions that communicate a similar message to their less sustainable variants. With the increasing price of electricity and the laws on emissions for reducing CO2, the pressure to operate more sustainably grows. LED lighting[57] does and continuously will play an important part in such realisations. Commercial spaces can be fertile environments for generating innovation in lighting. Pioneering projects, such as the Migros Supermarket in Eschenbach (Switzerland) which, in 2006, switched to 100% LED lighting, have already set new trends in motion.

Integrating daylight also offers more sustainable lighting solutions. When controlled carefully and with clever design, daylight can again play a crucial role in store lighting design. An example is the use of daylight sensors that, depending of the amount of daylight coming in, adjust the illuminance of the artificial light to a standard. Even when direct sunlight is not wanted, inventions such as the 'tubular skylight transfers' filter the light before sending it into the store space. More research is needed to understand the benefits of daylight in retail spaces for both the retailer – in terms of decreasing energy use and creating more pleasant store spaces – and the customer – expanding knowledge of the impact of daylight on well being.

The results of the experiments suggest that what a designer intended to communicate, may not come across for the customer. The LED-wall is such an example. Although it was expected to have a large influence on the consumer, they were barely aware that there even was a coloured wall. So the intended increase in ambience did not come across. Therefore, for future research, it might be interesting to focus more on Post Occupancy Evaluations (POE): does the intended meaning of a design reach the customers? Or does the design succeed in the way it was intended?

57 LED lighting was not included in this study because it is not yet used that frequently. Moreover, the diversity of LED lighting is so wide, that it is opportune to study those differences.


6
Chapter

CHAPTER 6
WHAT WAS, IS AND WILL BE

The span between design and research has been a constant challenge in the course of this PhD project. As a designer I immediately wanted to capture the space 'as a whole', while on the other hand, my research skills pushed me in a more analytical direction. While the former aims at a holistic approach, the latter emphasizes more traditional research methods, studying the retail space via fragmented manageable parts. Narrowing down a research question to a manageable subject with clear methodological instruments is a struggle for many, but I believe that it is even more so for designers due to their holistic routine.

The thesis, I believe, has, however, also benefitted from this duality. This is most clearly seen in the research construct: the overall set-up of the experiments and the underlying concept is the result of the designer's perspective, but the actual execution and analysis are formed within a traditional methodological framework. We have tried to study lighting as part of the environment and its relationship between perception, experience and behaviour in such a way that lighting becomes imbedded in a broader context, closer to the realm of designers. That is what places this thesis at the forefront of retail design research and it carries the added value of me as a designer. In other words, making decisions intuitively as a designer made me select relevant lighting stimuli while setting up the experiments. In a more orthodox research construct, however, such a selection would have been done rather differently, also taking into account settings with extreme differences that have little meaning in realistic situations. Moreover, in traditional research such stimuli are manipulated systematically and are defined by tangible lighting values – illuminance and CCT. Although this might lead to interesting findings, it was not what I, as a designer, was looking for. This difference becomes obvious in the construct of the first experiments: I started by selecting lighting used in supermarkets and other food selling stores, rather than with specific objective lighting values. Traditional researchers might question this more intuitive approach: by using different lamps, the CRI, CCT and illuminance level changes, which makes it impossible to link the results to any one of these aspects. But I was not so much interested in these aspects. By studying only CCR, CRI and illuminances, designers are not provided with enough information to design a proper lighting plan. Also other lighting features play a major role in defining a space and the perception of that space: how and when to use spotlighting, catenary lighting, dramatic settings or basic functional lighting, etc.

I wonder whether I have been able to answer these questions: my time was perhaps too limited and the results of the experiments were less emphatic than expected. I have, therefore, not been able to formulate proper design principles. Although I never intended to develop accurate guidelines – whereby a systematic manipulation of the lighting would have been more beneficial – I had expected to be able to be more specific.

An important and meaningful result is that lighting plays a crucial role in the perception of atmosphere and the retail space, and that it can communicate

a message. But its role cannot be expressed in unambiguous objective values. This might infer that the added value of Chapter 5 remains rather limited for designers, but it does offer a theoretical framework for establishing relevant experimental research taking into account the holistic dimension of space.

My approach as a designer did not only affect the experiments, it equally coloured my historical survey, the process of defining retail design and my discussion on research in retail design, as well as the literature review of research in lighting. The designer's mindset led to several insights that might become relevant during the design process of commercial spaces:

1. In my historical survey I have tried to explain why shops are what they are, why they look as they look today. The current trend of the experience economy in combination with increased consumer-focussed design asks for clever and innovative designs. Retail designers should take the opportunity to cooperate with other experts from diverse disciplines, such as marketing, communication design, graphic design and psychology to arrive at retail concepts that are innovative, that work and have aesthetic value. Finding the balance between these three concepts might even be the hardest to implement.

The same is true for clever lighting design, which is necessary to comply with current needs. 'Clever' can mean dynamic lighting systems able to adapt to the moment of the day, week or season, or that, with the help of light sensors, responds to the amount of daylight coming in. Due to the high tempo of developments in the lighting industry, it becomes difficult for retail designers to keep up. They should, therefore, take the opportunity to cooperate with lighting experts so that, again, the functional requirements, aesthetic qualities and innovative ideas can be achieved.

2. Innovations and technological developments will always influence retail typologies. The introduction of the self-service concept changed the supermarket typology, as did self-scan and self-checkout technology in its turn. Cash registers, as we know them, are no longer necessary. Instead of paying at a counter, one can pay directly to store personnel, anywhere in the shop. Or one can pay with a smartphone. Other sectors adapt swiftly to these concepts. There is a good example in the hospitality sector: Qbic hotel in Amsterdam. During your entire stay you won't see any personnel because of online check-in and payment. You can even personalize your hotel room by adjusting the atmosphere of your choice via the lighting and music.
One could reflect on the nature of these technological applications, and whether they don't detract from one of the most significant aspects of physical stores: social contact. What will remain as an advantage of physical stores, compared to online stores, when the latter is also playing the social contact card? Take Amazon for example, which makes the buying experience social, by showing you what other buyers of the product you are interested in have purchased. Or Groupon that stimulates you to buy as a group and to involve your friends in order to get certain deals. Although physical stores have the advantage of having products you can handle, they will still have to innovate to compete with online retailers because they (the latter) are usually cheaper and, for some product groups, touching and feeling the product is not even necessary. Physical stores may, for example, reduce their stock or eliminate it by adopting the latest technological developments, leaving more space to offer improved service or to deliver a better experience. One step further, instead of applying a cross-channel strategy (cf. the example of Albert Heijn, p. 73) retailers could adopt the 'clicks and bricks' philosophy as the pilot project 'Het nieuwe winkelen' (the new way of shopping) in Veendendaal (The Netherlands) illustrates. 800 Retailers in Veenendaal have put their heads together to develop an online network. They launched a website which should contain all of their products (by February 2012). As a visitor you can look on your smartphone for available parking spaces, you can consult a personal shopper, and you can find directions to the store or a product you are looking for. Moreover, when a product is out of stock in the

physical store, you can order it, or you can look for similar products in a nearby store. If you want, you do not have to carry around your bags but you can have them delivered to your home the same day, or you can have them placed in a locker close to where your car is parked. By integrating social media channels, like Foursquare and Twitter, retailers can reward the customers who check into their store online: they can offer discounts or special offers. Such cooperation, between small retailers that function as one entity, makes them strong competitors to large online retailers like Whekamp.

Lighting design can benefit from the possibilities that online retailing and social media provide. The Starhub Company sets an inspiring example with its music campaign. Starhub applied, in cooperation with several retailers, RFID-tags (Radio Frequency Identification) on individual clothing pieces. Each RFID-tag is linked to a specific type of music and clothing style. When a customer enters a dressing room to fit the clothing, the music linked to that specific type of clothing is played. So when, for example, a customer is trying on hip-hop pants, hip-hop music is played. Customers fitting Punk style clothing will hear Punk music. While trying on the clothing, the customer receives a message on his smartphone giving information about the song being played and the opportunity to buy it. Lighting could also bring added value to this concept. When, for example, a customer is fitting a gown, the lighting could change to a dim setting, resembling the setting of an evening gala. When a bikini is fitted, a light setting resembling a sunny day helps to visualise how the bikini will look on the beach.
The latest LED-technology will help to create such environments. Philips already experimented on product level. One example is a dynamic LED-lighting system that can be applied in shop windows or product displays. With the help of a colour detector the LED lighting adjusts itself to the colour of the product on display. So, when the collection and the colours change, the shop window evolves with those changes. Maybe in the near future it might be possible, instead of adapting the colours of the display to the colour of the product, for the colours of the display to change to the favourite colour, or a colour related to the mood of, the visitor who checked in online into the store. Also restaurants might consider this option. Imagine the lighting setting of your table adjusting to the occasion; a romantic tête-à-tête requires a different setting from business dining.

3. Similar to the supermarkets' and department stores' historical urge to compete by expanding their product range after the Second World War, retailers today behave correspondingly. They expand and mix their product offer, add new services (e.g., Hema which started selling insurance) and include new functions to differentiate themselves. Cook & Book in Brussels is a nice example. Cook & Book combines selling books and comics, with restaurants, a boutique and an art gallery – a hybrid combination that an online bookstore will never match. Also retailers such as Torfs and JBC, who cooperate and are located in the same building, developed the idea of a one-stop-shop. This idea of mixing retailers/brands, functions and products might lead to new retail typologies. Imagine the city as one large department store or facility with many shops-in-shops, maybe even grouped per product category, fashion- or lifestyle. What the Veenendaal-concept accomplished online, might also serve as an inspiration for offline store developments.

Hybrid stores demand 'hybrid lighting'. A combination of rails with attached (dimmable) spots and dynamic LED-lighting or fluorescent tubes offer possibilities, however I believe other paths still need to be explored. Is there not a solution that avoids overloading the ceiling with (still expensive) lighting systems? Introducing daylight and responding to its dynamics might play a crucial role in such a solution that is, moreover, more sustainable.

4. Some of the shifts that are visible in the current retail scene seem like a revival of the past:
Firstly, supermarkets moved out of city centres due to a lack of space and parking difficulties. A similar development occurs in current chain stores. Chain stores, such as H&M, typically located in city centres,

are now opening stores on the periphery with much more available space and where they are easily accessible by car. Packed car parks in city centres and car-free city centres make it harder for customers who travel by car to visit these shops. So, again in this case the increasing use of cars has resulted in location shifts.
But, secondly, the opposite is equally true. Larger stores now choose to launch smaller outlets in city centres, often with a very specific character (cf. the example of AVEVE p. 29). This development reminds me of the development of the boutique chain store. Also the launch of pop-up stores of larger retailers, who sell exclusive product lines in such stores, can be included in this process.

In sum: the expansion of the product range, the blending of peripheral retailers and town centre retailers (cross-format), and the cross-channel strategy – 'clicks and bricks' – will eventually lead to a third retail revolution that will have a strong impact on how we shop, how shops will be designed and what they will look like in the future.

Previous observations might suggest that retailers and technological developments determine the development of future stores. Nothing is further from the truth. The ageing population, the rise of an active and informed consumer (in part due to the world wide web), social media, and the increasing knowledge about how the human (shopping) brain works, has led to a more human-centred and consumer-based way of designing. More than ever, the consumer is the centre of attention and he/she will indirectly decide how commercial spaces will evolve. As co-creation is already common in product development, the same might equally occur in store design.
Seemingly paradoxical, as the influence of consumers in retail developments increases, they will also be more affected by it. Their input, combined with the increasing understanding of their shopping behaviour and affect, leads to retail spaces increasingly answering their needs and wants, which in turn leads to more pleasing stores. This statement introduces the discussion of the ethical side of conducting experimental research in retail design.

Despite all discussions on this topic, there are no rules or assumptions of what is ethically justified. In literature, as well as in practice, there seem to be two leading opinions. One clearly states that manipulating and researching the consumer is unethical. Even worse, it is said to drain money from the consumers' pockets. I would like to bring some nuances to bear on such an assumption. A retail space, with all its different aspects, will never be able to force the customer to do anything or to buy anything that he or she does not want. A well-designed retail space might well, however, increase the desire to buy or gently lead the customer in a specific direction. For example, when looking for butter in a supermarket, by means of product placement, the attention could be diverted towards a specific brand increasing the probability that the consumer will be seduced to buy that brand. Another example is the dispersing of a specific scent, which might put the customer in a better mood thereby increasing the intention to buy. In the light of our experiments, it might be possible to stimulate the customer to go for an apple in one box instead of the other. However, in none of these examples are customers manipulated to purchase against their will.
The other opinion looks at the matter from the consumer's perspective. Research might help practitioners to design more pleasing store spaces. Should store spaces not be pleasing – since shopping is now one of our major leisure activities, resulting in consumers spending a lot of time in stores? Residential environments and offices have been studied extensively in the past resulting in spaces that we are happy to work and/or live in. Shopping as a 'third space' has earned parallel treatment, so that store spaces might become increasingly attractive and even, as we follow current trends, spaces which help to give us a sense of wellbeing.

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LIST OF PHOTOGRAPHS

Collage p. 112 (Figure 5.1)
(first row) Carrefour (Genk, B), Carrefour (Genk, B), C1000 (Eindhoven, NL), C1000 (Eindhoven, NL), Carrefour (Rome, I)
(second row) Wholefoods (NY, US), Red Market (Tielt-Winge, B), M&S (London, UK)
(third row) Tesco (London, UK), Albert Heijn (Maastricht, NL), Colruyt (Hasselt, B)
(fourth row) Waitrose (London, UK), Fox & Obel (Chicago, US), Booths (London, UK)
(fifth row) Waitrose (Westfield, London, UK), Tesco (London, UK), Colruyt (Hasselt, B)

Collage p. 113
(first row) Delhaize: (Hasselt, B), (Hasselt, B), (Beringen, B)
(second row) C1000 (Eindhoven, NL), C1000 (Eindhoven, NL), Wholefoods (London, UK)
(third row) Wholefoods (Chicago, US), Dean & Deluca (NY, US), Albert Heijn (Almere, NL)
(fourth row) Spar (Antwerp, B), Sainburry's (Bluebird, Londen, UK), Waitrose (Canary Warf, London, UK)
(fifth row) Wholefoods (Chicago, US), Delhaize (Brussels, B), Tesco (London, UK)

APPENDIX

Appendix A: Questionnaire for Experts (Chapter 4)

General questions asked regardless of the discipline (12 experts):

- Which are for you the five most important environmental (design) characteristics for retail environments? Explain why.
- Can you give an example of a project which received more than the average attention towards lighting?
- How much time, in percentage, goes to designing a lighting plan for retail environments?
- Is the help of a light specialist often required?
- What is your goal when designing a lighting plan?
- What else can light do, next to functional lighting of the environment?
- Are you aware of the existence of lighting strategies that are used to arouse certain effects among people? (for example biological, physiological, emotional)
- Are you aware of the latest developments in lighting? Such as 'ambient' lighting?
- To what extent have you used lighting as an atmosphere creator?
- How do you visualize a lighting plan for the customer?
- Do you integrate ecological and ergonomic aspects in your lighting design? Also in retail environments?
- In retailing, which other demands should lighting fulfil?
- After completing a building, do you check whether the goal you set in advance, is accomplished? Do you involve the user in this check-up?
- Do you try to be innovative in the use of light?
- How important is daylight in retail environments?
- When designing a lighting plan, do you take account of the personnel working there all day? How?
- What do you think demands further research concerning lighting in retail environments? What kind of research would it be then and how would you take that on?
- (after presenting the shop diagram as shown infra) Which categories would you exclude on the basis of the importance of lighting? Do you agree with this diagram and my choice or would you employ another strategy?
- Have you already experienced or do you believe that lighting in retailing has an influence on: interpersonal behaviour? time spent in a store? speed of ones stride? the amount bought? Explain your answer.

Additional questions for the retail designers (5 experts) and lighting designers (6 experts):

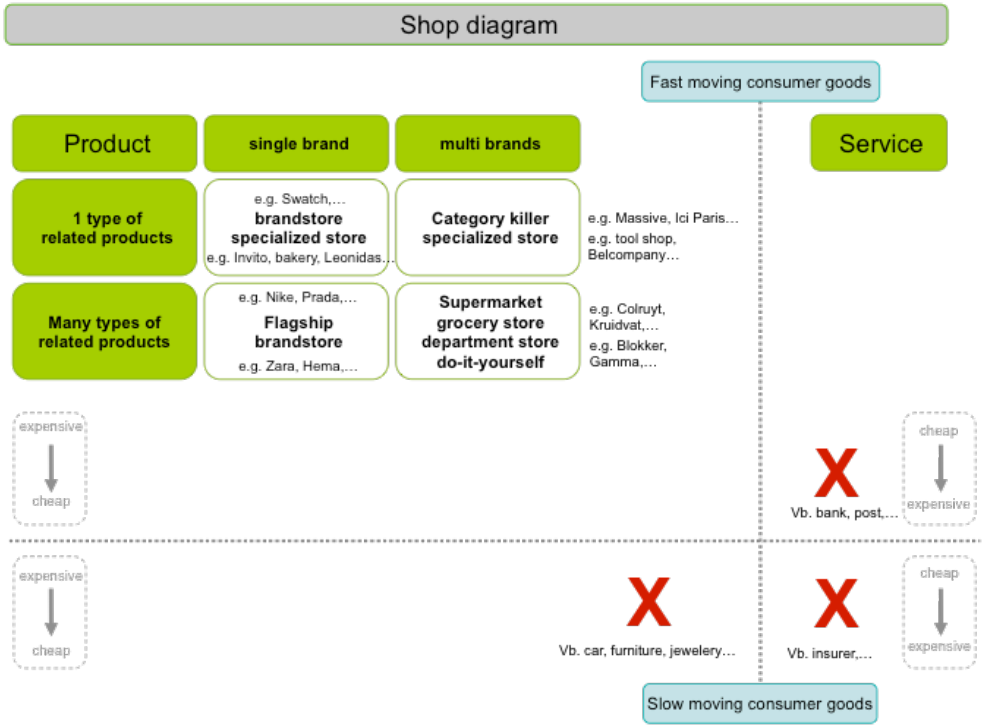
- If we are talking about lighting, do you approach each assignment in the same way, typically yours, or do you always start from a different point of view?

- Can you tell me the main differences between the lighting of a theatre, an office or a retail environment?
- Has your experience revealed how lighting can influence humans?
- How do you keep yourself up to date regarding new lighting developments? Specialist journals; scientific research; observation of colleagues,…
- Do you think scientific research is important or do you rather see it as a separate discipline that has no influence in the design practise?
- Which are the latest developments in lighting you recently used?
- Have you already designed the lighting for a supermarket? How did you do that? (question added after lighting food seemed to be of interest)

Additional questions for the lighting manufacturers (4 experts):

- To what extent does the company conduct scientific research?
- Can you describe the process of developing a new product? Does this occur on a demand basis or is it based on trends?
- What are the latest developments regarding lighting?

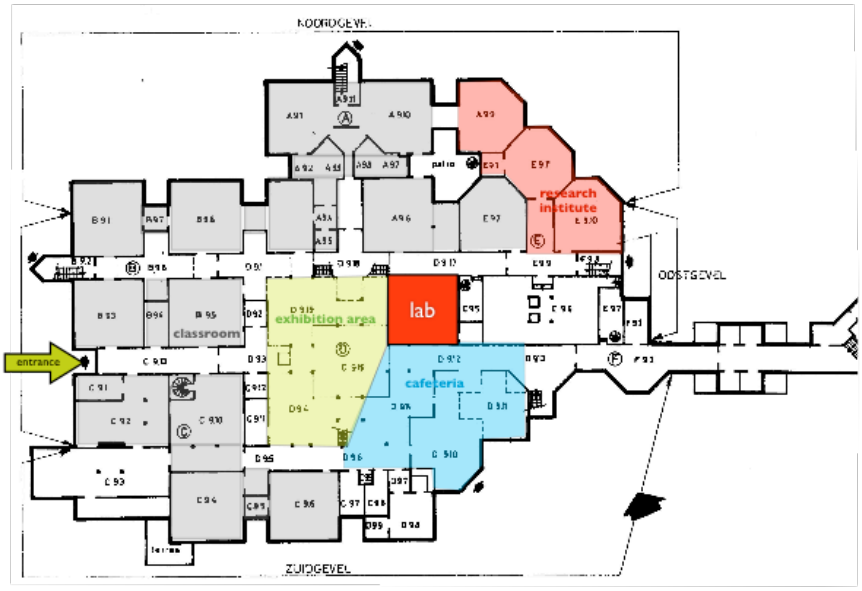
Shop diagram as used during the interviews:



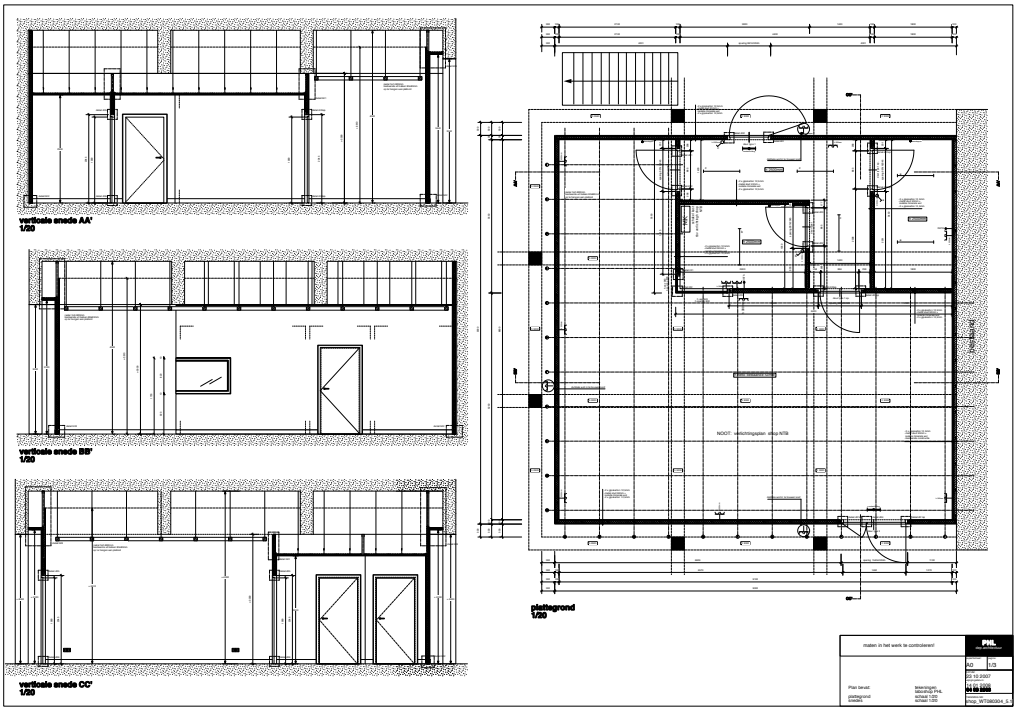
In a later stage this diagram was shown to have flaws (e.g., with the making of the segmentation and defining of the store formats and typologies – the meaning of the terms used in this model had to be changed slightly), so this is not used any more in the further course of this thesis.

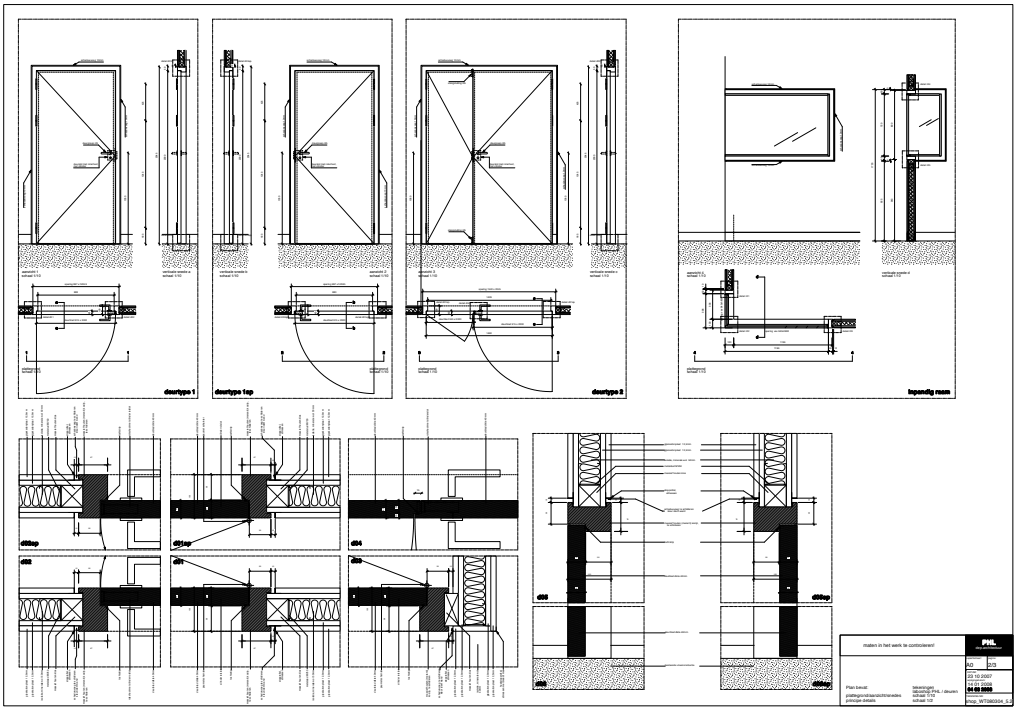
Appendix B: Design of the Research Lab (Chapter 5)

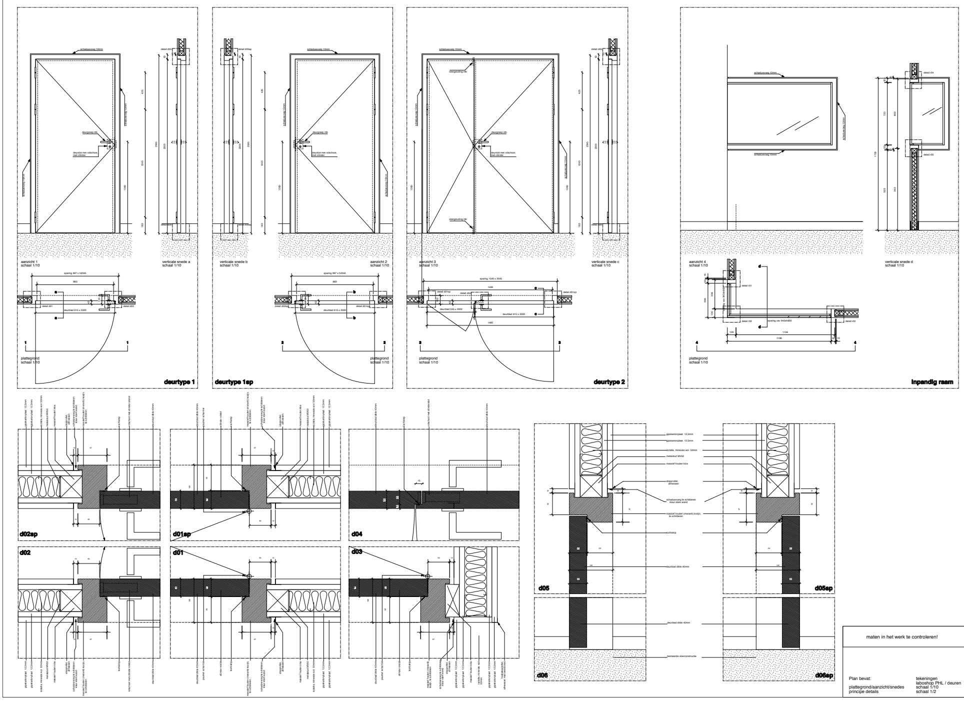
- Location of our research lab at the lower level of the building of the architectural department



- Floor plan, side views, sections and construction detail of the research lab (drawn by Ward Bergen)







maten in het werk te controleren!

PHL
dep.architectuur

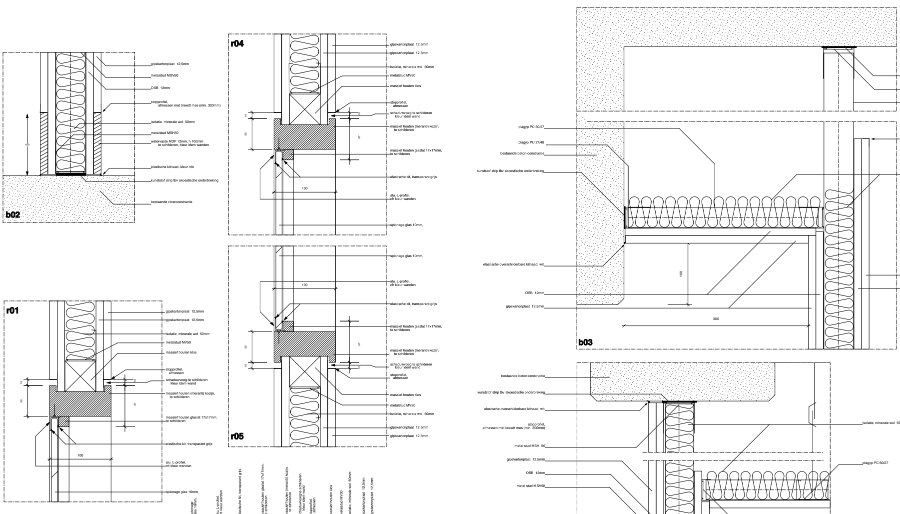
papierformaat:	pagina:
A0	2/3

23 10 2007
14 01 2008
04 03 2008

Plan bevat: plattegrond/aanzicht/snedes, principe details

tekeningen laboshop PHL / deuren, schaal 1/10, schaal 1/2

shop_WT080304_5.2



maten in het werk te controleren!

PHL
dep.architectuur

papierformaat:	pagina:
A1	3/3

DATUM
23 10 2007
14 01 2008
04 03 2008

Plan bevat: principe details

tekeningen laboshop PHL, schaal 1/2

TEKENING NR
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Appendix C: the Typicality Questions (Experiments 1C and 2)

To measure whether the supermarket lab is a good representation of a real supermarket, three questions were used. On a scale from 0 to 10 the participants were asked to answer the following question:

Regarding the interior and the atmosphere of a supermarket, I find this store:
a very bad example (0) – a very good example (10) *very atypical (0) – very typical (10)* *not at all representative (0) – very representative (10)*

Appendix D: Short Mood Form (SMF) (Experiment 1B, 1C, 2 and 3)

The Short Mood Form, originally composed by Peterson and Sauber (1983) and adjusted by Baerden and Netemeyer (1999). The items were measured on a 7-point Likert-type scale (from -3: strongly disagree to +3: strongly agree). The Dutch version was retrieved from Brengman's PhD dissertation (2002). The Dutch and English form:

1. Currently, I am in a good mood. *Ik ben momenteel in een goede bui.* 2. As I answer these questions I feel cheerful. *Bij het invullen van deze vragenlijst voel ik me opgewekt.* 3. For some reason I am not very comfortable right now. *Door omstandigheden voel ik me op dit moment niet erg op mijn gemak.* 4. At this moment I feel edgy or irritable. *Ik voel me voor het ogenblik gespannen en prikkelbaar.*

Appendix E: PAD Emotion Scale Measurement (Experiment 1B, 2 and 3)

The Pleasure, Arousal, and Dominance paradigm (PAD) of Mehrabian and Russell (1974) as adapted to the study of store atmospherics by Donovan and Rossiter (1982), is used. This is used because several studies had already compared several emotion-measuring tools of which the PAD was shown to offer the most suitable tools in measuring emotions in retail environments when the focus of interest lies on the architectural and atmospherical features (Brengman 2002; Machleit and Eroglu, 2000). Also Petermans e.a. (2009) found similar results and showed the PAD-questionnaire to be a valuable measuring instrument.

Mehrabian and Russell (1974) proposed a model that indicates the relationship between the physical environment and behaviour within that environment via the stimulus-organism-response (SOR) model. It is based on the belief that emotional states intervene between the environmental stimulus and the reaction to that environment. So, the behavioural reaction is a consequence of a stimulus given to any organism and the reaction followed by that organism. Until the introduction by Donovan and Rossiter (1982) of this model in store atmospherics, researchers were unable to document strong effects of environmental factors on retail patronage behaviour. Since they showed the model to work and measure these effects within retail and service design it has been widely used in marketing and consumer research.

PLEASURE
depressed – contented (*een bedrukt gevoel - een aangenaam gevoel*)
unhappy – happy (*een ongelukkig gevoel - een gelukkig gevoel*)
unsatisfied – satisfied (*een ontevreden gevoel - een tevreden gevoel*)
annoyed – pleased (*een geërgerd gevoel - een behaaglijk gevoel*)
bored – relaxed (*een verveeld gevoel - een ontspannen gevoel*)
despairing – hopeful (*een wanhopig gevoel - een hoopvol gevoel*)
AROUSAL
relaxed – stimulated (*een ontspannen gevoel – een gestimuleerd gevoel*)
calm – excited (*een rustig gevoel – een opgewonden gevoel*)
sluggish – frenzied (*een loom gevoel – een uitzinnig gevoel*)
dull – jittery (*een futloos gevoel – een zenuwachtig gevoel*)
sleepy – wide-awake (*een slaperig gevoel – een wakker gevoel*)
unaroused – aroused (*een niet geprikkeld gevoel – een geprikkeld gevoel*)
DOMINANCE
controlled – controlling (*een geremd gevoel – een vrij gevoe*l)
influenced – influential (*een gemanipuleerd gevoel – een ongedwongen gevoel*)
cared for – in control (*een geholpen gevoel – een autonoom gevoel*)
awed – important (*een minderwaardig gevoel – een superieur gevoel*)
submissive – dominant (*een onderdanig gevoel – een dominant gevoel*)
guided – autonomous (*een begeleid gevoel – een zelfstandig gevoel*)

Appendix F: Atmosphere Measuring Tool (Experiment 2 and 3)

The tool was shown to be a robust and sensitive measure. In a follow-up study De Vries and Vogels (2007) investigated the applicability of the tool to distinguish between lighting settings as well - which was confirmed. However, the study was held with six rather strongly different lighting settings in an empty room. Intensity, colour temperature and spatial distribution of the lighting were varied. Also Van Erp (2008) looked at how general lighting influences the perceived atmosphere in a space with the descriptor tool of Vogels.

Vogels' (2008) original list:

Atmosphere term	*Translation*	*Atmosphere term*	*Translation*
afstandelijk	*detached*	levendig	*lively*
beangstigend	*terrifying*	luxueus	*luxurious*
bedompt	*musty*	mysterieus	*mysterious*
bedreigend	*threatening*	ongedwongen	*uninhibited*
behaaglijk	*cosy*	ongemakkelijk	*uncomfortable*
beklemmend	*oppressive*	onrustig	*restless*
deprimerend	*depressed*	ontspannen	*relaxed*
enerverend	*exciting*	persoonlijk	*personal*
formeel	*formal*	romantisch	*romantic*
gastvrij	*hospitable*	ruimtelijk	*spatial*
geborgen	*safe*	rustgevend	*tranquil*
gemoedelijk	*pleasant*	saai	*boring*
gespannen	*tense*	sloom	*lethargic*
gezellig	*pleasant*	stimulerend	*stimulating*
inspirerend	*inspiring*	toegankelijk	*accessible*
intiem	*intimate*	vijandig	*hostile*
kil	*chilly*	vrolijk	*cheerful*
knus	*cosy*	warm	*warm*
koud	*cool*	zakelijk	*business*

At the end of this experiment some descriptors needed to be changed to make more sense to Flemish people. Note that this is more than a mere 'translation'. To get a grip on the applicability of the Dutch descriptors, the list was sent out to five experts (interior architects, a specialist in semiotics and Germanic languages, and an environmental psychologist). Their comments and suggestions for alternative descriptors were, then, tested in Google for hits: "a …(descriptor) atmosphere" was tested within the Belgian list. Eventually, five words were eliminated and replaced by alternatives:

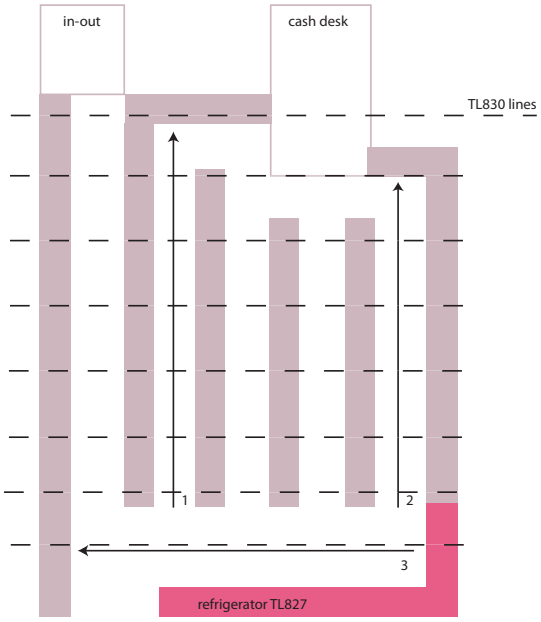
Removed Dutch Atmosphere terms	**Added Flemish Atmosphere terms**
formeel *(formal)*	goedkoop *(cheap)*
sloom *(lethargic)*	hedendaags *(contemporary)*
koud *(cool)*	ingetogen *(reserved)*
bedreigend *(threatening)*	ouderwets *(olf-fashioned)*
bedompt *(musty)*	kinderlijk *(infantile)*

Before the adapted tool of Vogels could be implemented, it needed to be tested. Therefore, the adjusted version of the tool was pre-tested in Experiment 1C for its applicability.

Appendix G: Tables with the Measurements (illuminance and CCT) and Visualisation of the Points of Measurement of each Supermarket on its Floor Plan (Experiment 2)

Aldi (hard discounter)

Floor plan: following the three lines, every meter the illuminance was measured at a height of 85cm. The table shows lux-values:



3 lines
measuring hight: 85 cm
distance: every meter

Aldi TL830 (general lighting)						
					luminance	
line 1	490	line 3	850		gondola	59,91
	450		720		fridge	288
	505		760		floor	65,52
	487		700		ceiling	35
	425		730		wall	95,34
	494		735			
	436		708			
	386		705			
	487		730			
	430		748			
	371		718			
	454		725			
	457		610			
	392		450			
	450		401			
	465		430			
	413		421			
	447		382			
	496					
	430					
line 2	710					
	560					
	500					
	400					
	383					
	456					
	420					
	385					
	454					
	424					
	475					
	441					
	428					
	377					
	460					
	462					
	412					
	458					
	average dry food 451,8		average fridge 640,2			

Carrefour (Discounter)

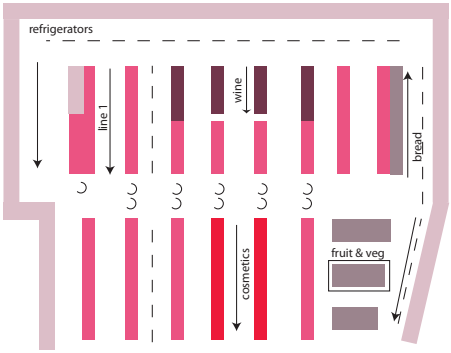
Floor plan: for general lighting, following the three lines, every meter the illuminance was measured at a height of 85cm. Per department, a line is shown indicating the points of measure. The table shows lux-values:

3 lines
measuring hight: 85 cm
distance: every meter

Carrefour TL840(general light TL827/ TL840						830/942 1m hight		
		bread	cosmetics/TL840	wine K2500	fridge TL840	Fruit & Veg	luminantie	
line 1	1100	592	1240	923	1312	1412	gondola	144,2
	1175	549	1306	1160	1453	1151	floor	147
	1233	490	1173	807	1207	2676	ceiling	66,77
	923	602	1412	605	1134	984	bread	67,16
	835	436	1435	680	1337	1835	wine	40
	985		1335	1028	1043	2765	fridge	177
	826		line 1	1255	1132	1277	1487	fresh	94,12
	749			1257	734	1486	1070		
	636			1273	888	1233	1306		
	912			1270			1090		
	787			1077			1690		
	875			1000			1976		
	1024			915					
	990			860					
	1000			931					
	1100			1018					
	1286			915					
	1390			858					
line 2	1043			908					
	1100			981					
	1108			883					
	904			970					
	1025			1111					
	955		line 2	866					
	837			1121					
	1101			1021					
	1165			1030					
	1084			970					
	1136		line 3	1125					
	1127			1135					
	1488			1196					
	682			1440					
	340			1313					
	758								
	744								
line 3	1000								
	1372								
	1371								
	1490								
	1457								
	1334								
	1341								
	1160								
	996								
	1130								
	1264								
	1343								
	1279								
	1177								
	Average 1064,02	533,8	1109,09	884,111111	1275,77778	1620,16667		

Delhaize (High quality)

Floor plan: following the lines, every meter the illuminance was measured at a height of 85cm for each department. The table shows lux-values:



3 lines
measuring hight: 85 cm
distance: every meter

DELHAIZE			830 comp fluo		spot830		TL830		
TL830(general lighting)			3000K spot	(HID 830)	TL830	0,85m hight	frdiges		
	fridges	TL 830	cosm TL835	wine	bread	F&V 2500K		luminance	
line 1	617	504	283	410	536	1732		floor	189,97
	870	835	356	400	387	929		ceiling	17,13
	990	1017	407	202	472	1588		cosm floor	123,9
	1000	1041	445	143	488	1163		cosm ceiling	59,78
	1045	1149	422	234	518	1020		cosm gondo	116,8
	1026	1336	351	166	298	877		wine/ceiling	3,7
	1026	1447	295	162	326	971		wine/floor	23,45
	1002	1464	316	340	492	790		wine/shelves	47,9
	1006	1347	378	203	416	864		fridge/floor	220,8
	1020	1392	416	107		1300		fridge/ceiling	32,7
	1000	1417	378	288		1496		fridge	335,3
	1002	1490	332			1128		bread	177
	1013	1404	396			1020	cooled F&V	bread/ceiling	23,75
	1074	1533	492			1052		bread/floor	92,1
	1082	1471	694			1124		fresh F&V	102,7
	1115	1320	949			925		fresh/fridge	149,2
	1105	1514	1047			1055			
	1048	1483	1040			1013			
	1056	1475	885			1150			
	1038	1314	497			1360			
	1060	1289				1455			
	1076	1253				1430			
	1012	1222				1592			
	984	1069				1378			
	889	830				1420			
	905	800							
	758	780							
	552	700							
		569							
	Average								
	977,5	1188,4483	397,4	241,363636	437	1193,28			

Overview (with the averages per department) of the measures of the three supermarkets:

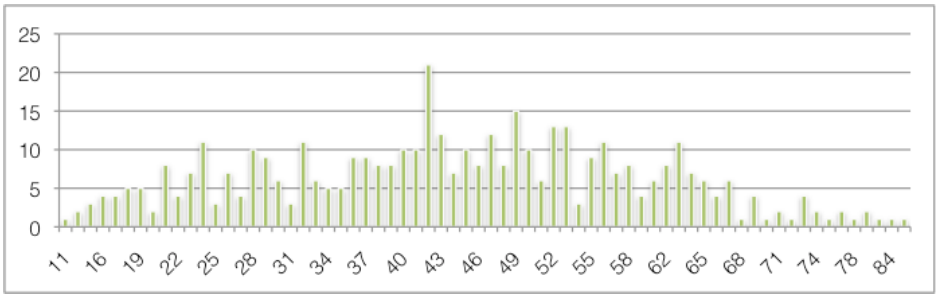
Lux (average)	**Groceries**	**Dairy**	**Bread**	**Cosmetics**	**Wine**	**Fruit & Veg**
High quality	978	1188	437	397	241	1193
Discounter	1064	1276	534	1109	884	1620
Hard discounter	452	640	452	452	452	452
Lighting	**Groceries**	**Dairy**	**Bread**	**Cosmetics**	**Wine**	**Fruit & Veg**
High quality	TL830	TL830	TL830 +spot 830	TL830+spot3000K	spot 3000K	spot 2500K+ TL830
Discounter	TL840	TL840	TL827+TL840	TL840	spot 2500K	spot 3000+4200K
Hard discounter	TL830	TL830	TL830	TL830	TL830	TL830

Appendix H: the Sample of Participants of Experiment 3 (PLUS supermarket)

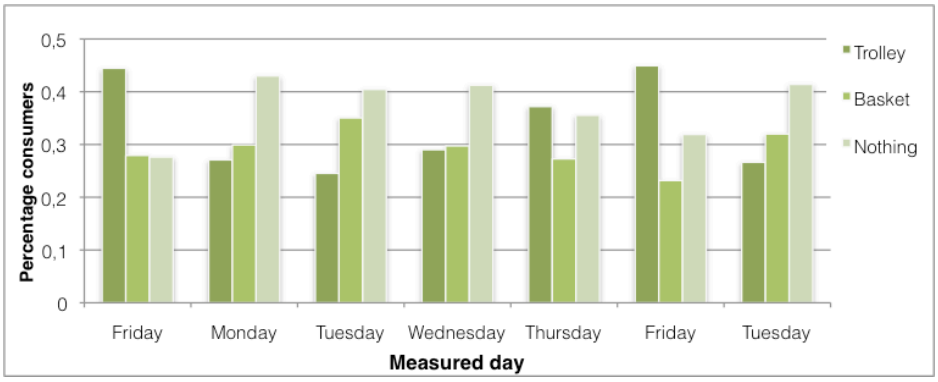
Gender	Frequency	Percent	Cumulative Frequency	Cumulative Percent
male	120	27,59	120	27,59
female	315	72,41	435	100
Educational level				
none	2	0,46	2	0,46
primary school	20	4,62	22	5,08
secondary school	286	66,05	308	71,13
high school	116	26,79	424	97,92
university	9	2,08	433	100
Shopping frequency				
daily	72	16,67	72	16,67
2 to 3 times a week	238	55,09	310	71,76
1 a week	112	25,93	422	97,69
less than 1 a week	10	2,31	432	100
Last visit to this Plus				
0	1	0,23	1	0,23
yesterday	116	26,79	117	27,02
less than a week ago	200	46,19	317	73,21
about a week ago	86	19,86	403	93,07
more than a week ago	30	6,93	433	100
Shopping frequency*				
1	227	52,91	227	52,91
1 - 2	20	4,66	247	57,58
1 - 3	7	1,63	254	59,21
1 - 4	2	0,47	256	59,67
1 - 2	1	0,23	257	59,91
1, 2 - 3	1	0,23	258	60,14
1, 2 - 3	15	3,5	273	63,64
1, 2 - 4	2	0,47	275	64,1
1, 2, 3 - 4	3	0,7	278	64,8
1, 3 - 4	4	0,93	282	65,73
1 - 3	1	0,23	283	65,97
2	75	17,48	358	83,45
2 - 3	1	0,23	359	83,68
2 - 3	4	0,93	363	84,62
3	29	6,76	392	91,38
3 - 4	1	0,23	393	91,61
4	36	8,39	429	100

**1: alone, 2: with partner, 3: with kids, 4: with others (friends,…)*

Figure of the age deviation (X: age, Y: frequency)



Appendix I: the Percentage of Customers shopping with a Trolley, a Basket or Nothing (including those who brought their own trolley, bag) (Experiment 3, Plus supermarket)



Appendix J: Factor Loadings of each Atmosphere Item, based on two Factors

The loadings higher than .60 are highlighted in blue (Factor 1) or orange (Factor 2). The relation with Van Erp's (2008) subscales is indicated in the last columns (Cosiness, Liveliness, Tenseness, Detachment). The items that are included to define a factor are determined based on their factor loading. An item with a loading of .60 or larger is considered as an item with a 'high' loading and therefore contributes to that factor if it also has a low loading on the other factor.

Reminder: five words from the Dutch list were replaced with five Flemish ones. These words are therefore eliminated, leading to a list of 33 items instead of 38.

Item	Factor1 Pleasant	Factor2 Tense	C	L	T	D
Gezellig (pleasant)	0.80	-0.24	1			
Warm (warm)	0.75	-0.22	1			
Ontspannen (relaxed)	0.73	-0.29	1			
Knus (snug-cosy)	0.73	-0.08	1			
Stimulerend (stimulating)	0.70	-0.10		1		
Levendig (lively)	0.67	-0.33		1		
Gastvrij (hospitable)	0.67	-0.26				
Persoonlijk (personal)	0.66	-0.18	1			
Behaaglijk (nice-cosy)	0.66	-0.14	1			
Inspirerend (inspiring)	0.65	0.00		1		
Rustgevend (tranquil)	0.64	-0.04	1			
Geborgen (safe)	0.64	0.07	1			
Vrolijk (cheerful)	0.63	-0.23		1		
Luxueus (luxurious)	0.62	-0.06				
Intiem (intimate)	0.58	0.08	1			
Romantisch (romantic)	0.57	0.21	1			
Ruimtelijk (spatial)	0.53	-0.25				
Gemoedelijk (pleasant)	0.52	-0.26	1			
Toegankelijk (accessible)	0.51	-0.33				
Ongedwongen (uninhibited)	0.45	-0.14				
Enerverend (exciting)	0.42	0.29		1		
Mysterieus (mysterious)	0.27	0.55				
Zakelijk (businesslike)	0.09	0.25				1
Vijandig (hostile)	-0.08	0.70			1	
Beangstigend (terrifying)	-0.13	0.69			1	
Afstandelijk (detached)	-0.14	0.51				
Beklemmend (oppressive)	-0.14	0.68			1	
Gespannen (tense)	-0.14	0.70			1	
Deprimerend (depressed)	-0.16	0.75			1	
Ongemakkelijk (uncomfortable)	-0.20	0.70			1	
Onrustig (restless)	-0.22	0.64			1	
Kil (chilly)	-0.27	0.66				1
Saai (boring)	-0.43	0.57				

The internal consistency (Cronbach's alphas) found in our lab and Plus supermarket are consistent with the findings of the factor analysis. For the Cosiness dimension we found a Cronbach's alpha of 0.73 (lab) and .74 (Plus), and a Cronbach's alpha of 0.77 (lab), and .73 (Plus) for Liveliness, which indicates that these factors were consistent. It only seems that they might explain even more when they are grouped. Concerning Tenseness, the Cronbach's alpha was 0.90 (lab) and .81 (Plus), being both extremely high, indicating that it is a strong construct, which becomes even more clear during the factor analysis. The Detachment dimension, as far as its items are included, is a not that strong dimension due to its lower factor loading.

For more information, publications, CV and contact details (www.retailology.be):