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The effects of in-store layout- and shelf designs on consumer behaviour

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Abstract

This study aims to point out the most important effects both store layout and shelf design have on consumer behaviour. In this paper currently available scientific knowledge on store design and shelf design are presented. It is well-known that store layout designs can have positive effects on both consumer behaviour and consumers' overall store perception. This paper points out the effects of the three most commonly applied layout types: grid, freeform and racetrack. Furthermore this paper explains why shelf space allocation factors such as horizontal and vertical product placement, the amount of facings, product adjacencies and category arrangement have effects on product sales and –perceptions. This paper concludes with an overview of current knowledge gaps in scientific research, together with a recommendation for future research on layout and shelf designs.

Introduction

One of the biggest concerns for every store retailer is the store layout. In his research on pathway design, Juel-Jacobsen (2015) argues that well-established principles of urban retail designs are very important for retail managers, in particular for supermarkets and larger retail stores. According to Lewison (1994) the store layout influences both shopping atmosphere and shopping behaviour of consumers visiting the store. A well designed store layout can contribute to a positive shopping atmosphere, which results in the kind of shopping behaviour a retailer wants to achieve. However, currently lots of stores tend to build on traditional and repetitive designs for their store layout, resulting in outdated store layouts (Juel-Jacobsen, 2015).

Another important store layout aspect retailers should consider carefully is the allocation of products on shelves. Efficient shelf space allocation management does not only minimize the economic threats of empty product shelves, it can also lead to higher consumer satisfaction, a better consumer relationship (Fancher, 1991), and even more importantly; it can have a significant positive effect on product sales (Hwang et al., 2005).

In this first part, the relevance of both research variables this study will entail: aisle design and shelf design, will be discussed. Subsequently, the objectives of this study will be explained, just as the managerial and theoretical relevance of the research.

Aisle design

The first considered main determinant of a shop design is the structure of shopping aisles. To describe the importance of a well-designed aisle structure, Juel-Jacobsen (2015) states that a consumer-centric space management should not start with the arrangement of shelves and categorization of products, but with emphasis on the customer behaviour and the customer experiences the retailer wants to achieve. Despite the importance of a well-designed aisle structure, the way shop aisles are organized is currently easily overlooked by most retailers. The main explanation for this is the fact that most retailers consider space as one of the most expensive investments in their stores, so structuring of pathways is considered less important. Another explanation of this focus may be also the ease with which shelf space management and psychological merchandise can be measured on performance, in contradiction to the pathway design. Pathway design is almost automatically considered as a side effect of the way the shelfs are arranged (Vedamani, 2004).

Shelf design

The second main issue for retailers in shop design is to optimize the allocation of products by the way the shelves have been designed. For example when retailers allocate their products well; not only the retailers' product sales will increase, on top of that the consumer will leave the shop more satisfied. These factors are resulting in a better overall consumer satisfaction (Fancher, 1991). In their research on shelf space, Drèze and colleagues (1995) strengthen Fanchers' statements by concluding that a retailer can increase sales and profits by better managing the existing shelf space. They state that there are two different ways to improve the profits for retailers: by customized space-to movement planograms and by product reorganization. They expected that retailers can increase their sales by improving their product positioning and space allocation at that time.

A current problem for retailers and manufacturers is that consumers have a different expectation of the presentation of products in shelves than the retailer does. Consumers think that retailers order products by using meaningful criteria such as price, popularity and promotional status. This results in the fact that consumers may infer information about the product, without having additional information about these products (Valenzuela et al., 2013). Additionally, Valenzuela et al. (2013) conclude that at their turn, retailers and manufacturers don't take advantage of the consumer expectation of product placement. They state that consumers expect retailers to place the most popular brand at the centre of a shelf, whilst retailers don't place their highest market share brands on these central positions. Contrarily to these consumer expectations, products placed at the end of an aisle are given much more "face time" by consumers than the products that are placed at the centre of an aisle. (Sorensen, 2003; Larson et al., 2005). These findings illustrate the fact that many retailers may not have a correct view on the effect their shelf design has on consumers' shopping behaviour.

Objectives

The objective of this paper is to review the current situation of scientific research on store layout. In this research the main emphasis will be specified based on the two different variables discussed before: the structure of the pathways (store layout) and the design of the shelves. In scientific research, there is still a lot to examine in terms of shop layout and shelf design (Valenzuela et al., 2013).

This paper provides a framework of the current state of scientific research on these facets and suggests possible starting points for further research. The practical objective of this paper is to provide retailers and manufacturers an overview of the current known applicable theories on shelf design and store layout. Furthermore, this paper aims to make them aware of the missing information about the effects of these two factors on consumer shopping behaviour. Both retailers and scientists will have an insight in the existing knowledge on store design up till now, and a recap of which areas of research on store design are still to be explored.

This research consists of a literature study, in which the relevance of both aisle design and shelf design will be illustrated for both researchers and retailers. Ending the literature study, Table 2 provides a theoretical framework of the currently available scientific knowledge about store layout and aisle design. The paper concludes with a discussion of the interpretations of the knowledge obtained by literature and will end up with an overview of the lacking information and implications for further research, for both managers and scientists. This final part recommends these two parties what parts of knowledge are applicable to use in practice.

Literature study

Shop layout designs, as stated before, consist of multiple important components. In this paper, there will be a focus on two main components of shop layout; shelf design and aisle design. In this literature section, these two components will be discussed more comprehensively. The first part of this literature study provides an overview of all types of store layouts retailers nowadays use. These layouts will be separately discussed based on their characteristics. Subsequently, two types of in-store product promotions will be reviewed in relation with product sales effectiveness.
The second part of this literature study discusses all shelf designs retailers can use in terms of in-shelf product placement and presentation.

Aisle design

One important determinant for a consumers' comfort experience inside a store is personal space. According to the observations of Bittner (1992) and Turley and Miliman (2000), personal space can both influence the retail experience as well the actual choices people tend to make within a store. In their research on the effect of space experience on purchase behaviour, Levav and Zhu (2009) state that the amount of perceived space a consumer has influences the choice the consumer makes inside a store. They conclude that consumers that are in spatial confinement are more variety-seeking in their purchases. When this spatial confinement is generated by a high density within a store, consumers tend to "reaffirm their identity as independent and unique individuals" (Levav and Zhu, 2009; Xu et al., 2012). They also state that this results in purchase behaviour in which consumers tend to choose more products that they can use to carry out their distinctive identity. Adding to these conclusions, Maeng et al. (2013) suggest that people who are in a crowded shopping environment are more likely to focus on prevention, resulting in safety-related product choice.

Store density levels can also be described in terms of store traffic and customer traffic flow. The difference between these two concepts is that store traffic entails the amount of consumers that is visiting the shop at a certain point of time, whereas customer traffic flow is determined by the movement the consumers have within the store. Previous studies found that both store traffic and customer traffic flow are determinants of the overall store performance (Anic et al., 2010). The importance of a well-organized customer traffic flow is elaborated by several studies concluding that creating store traffic doesn't always generate accessory sales (Lam et al., 1998; Beemer, 2003). On the other hand, low store traffic doesn't automatically mean low sales, provided that retailers manage their customer traffic flow in a proper way (Hasty and Reardon, 1997).

In their research, Anic et al.(2010), tried to reveal a correlation between both store traffic and customer traffic flow on consumers' spending in supermarkets. They found that a combination of these two factors has positive influence on the amount of money consumers spend. However, they state that although store traffic and customer traffic flow influence product sales positively, the biggest influence on sales is caused by other factors. If retailers want to achieve a bigger effect on product sales, they will have to make sure that consumers pass much as possible aisles during their store visit, but also make purchases in more different aisles. They can achieve this by a careful consideration on which layout type to use in their stores.

Overall store layout

In current retailing, there are three common conventional layout types that stores nowadays use; freeform, grid and racetrack layout. (Vrechopoulos et al., 2004) For retailers, the type of layout chosen is of great importance regarding the image the store has on consumers (Baker et al., 1994). Store image is an important factor affecting the in-store consumer behaviour (Erdem et al., 1999). Furthermore, the internal traffic patterns and operational efficiency of the store are strongly dependent on a well-designed store layout (Lewison, 1994). Store layout design also contributes to consumers' satisfaction (Cil, 2012), and even can create and alter the wants and preferences a consumer has (Simonson, 1999). But most importantly, an efficient store layout design both contributes to product sales and store profitability (Cil, 2012). In this section on aisle design, all currently known retailing store layout forms will be discussed separately. To start, all three layout design structures that are mentioned above (freeform, grid and racetrack) will be introduced by a short definition.

(1) Grid: this layout contains long pathways which are placed parallel to each other. Retailers are in favour of this layout style because the rectangular arrangement of the shelves fits well in the shopping behaviour of consumers, and it facilitates an efficient and fast shopping experience. Grid layout form is universally the most preferred layout style by supermarket retailers (Levy and Weitz, 2001; Lewison, 1994; Vrechopoulos et al., 2004).

(2) Freeform: in contradiction to the grid form, the freeform layout is, as the name already reveals, a layout form containing a unstructured arrangement of aisles, shelves and displays. The freeform layout is mostly used by clothing stores (Levy and Weitz, 2001; Lewison, 1994; Mason et al., 2001; Vrechopoulos et al., 2004).
In this design, the emphasis is on increase the ease with which shoppers can find products throughout the store, which is illustrated by the fact that most freeform stores have low shelves. Another characteristic of this store layout is that consumers tend to spend more shopping time in stores using this form. Interestingly for retailers; previous studies argue that extended shopping time can be an important factor to determine how much consumers will spend whilst being in a store (Anic and Radas, 2006)

(3) Racetrack: this store layout contains one central main aisle, leading the consumer along the complete store. The function of that main aisle is to guide the consumer through as much as possible store areas. The store is divided in several departments, each with an own product category. Using a racetrack layout form results in an unusual and interesting shopping experience (Lewison, 1994; Vrechopoulos et al., 2004).

Studying the effect of the amount of effort a consumer has to deliver to find products they want to buy, Titus and Everett (1995) state that there are both a possible positive as well negative aspects of the consumers' in-store search process. They argue that an in-store navigational challenge in some cases might be very enjoying and challenging. Whereas on the other hand, consumers can become easily frustrated due to the fact that they are not able to find the products they are looking for, resulting in the effect that consumers tend to break down their search effort (Donovan et al., 1994). In their research on the effect of store layout on online shopping behaviour, Vrechopoulos et al. (2004) conclude that consumers visiting a supermarket prefer shopping in a grid layout store

environment, which can be easily explained by the fact that grid layouts enable efficient shopping behaviour. The authors also state that freeform layout is considered as the most entertaining kind of layout, which can be easily traced to the challenging effect the freeform layout has due to the amount of effort a consumer has to make to find products.

Summarizing all layout design characteristics stated before, Table 1 gives an overview which characteristics are distinctive for the three layout designs considered. It should be noted that not every characteristic is applicable in every store example, therefore it is a rough interpretation of layout characteristics.

Table 1: Layout design overview

	Grid	**Freeform**	**Racetrack**
Shelf arrangement	Structured Rectangular shelf arrangement	Unstructured, random shelf arrangement	Shelves and displays organized by 'product themes'
Shelf height	Mostly high shelves	Mostly low shelves	Varying shelf height
Pathways	Long pathways, a clear rectangular pathway pattern	No distinctive pathway pattern	One main pathway guiding through the whole store
Kind of shops using layout form	Mostly supermarkets	Most clothing stores	Mostly large department stores

In-store product promotions

In this part, the emphasis will be on the location of in-store product promotions and their effects on product sales. Two kinds of in-store product promotions will be discussed in this part: in-store product display and in-store product demonstration.

In-store product display

In-store displays are product shelves that are often placed at the end of an aisle with mostly price reduced products. Consumers see these displays as special bargains of products which they are not initially intended to buy (Chevalier, 1975). For retailers, these displays are used to increase the unit sales of certain product temporarily (Wilkinson et al.,1982).

In his research on the attention-capturing effect of store displays, Nordfält (2011) distinguishes two types of communicative effects a product display can have. First, he comes up with the combination effect, that can be achieved in two different ways; by combining two products with each other or by combining products with atmospheric clues, such as music, scent and lightning (Fiore et al., 2000; North et al., 1999; Summers and Herbert., 2001).
The second communicative effect that Nordfält comes up with is the design effect: the way a special display is structured. This effect is illustrated by the research of East et al. (2003), who found out that display size has a positive effect on the products' sales placed at that particular display. In addition to

that, he points out the research of Razzouk et al. (2002). This study argues that, due to empty shelf space within a product display, consumers get the impression that previous store visitors already chose a certain product. According to Razzouk et al. (2002), this has a positive influence on the consumers' perception of product attractiveness.

There are several ways in which the effectiveness of a product display can vary. In their research, Nordfält and Lange (2013) conclude that the position of product displays has a great influence on the promotions' effectiveness. They state that the best place to put a product display is a central store location, where a lot of traffic walks by. Perhaps this is not the most surprising finding, whereas retailers should actually be very careful in deciding where to locate their displays. To illustrate; a promotion display somewhere near the stores' entrance seems to be effective, however consumers might forget about the promotion at a certain point of time when they have moved on. This might well be explained by the theory of Stilly et al. (2010), which argues that consumers react less to 'early promotions' due to the fact that consumers first focus on their planned purchases written down in their shopping list.

In-store product demonstration

Another way to increase sales on a specific product is by in-store product demonstration. Product demonstration is a way of product promotion by providing consumers product trials, free samples and free gifts (Heilman et al., 2011). Especially for food products such as wine, product promotions can have a positive influence on the products' sales, even more effective than other ways of advertising (Vlachvei et al., 2009). Although product demonstrations turn out to be increasing sales, little research is done about the most effective demonstration methods (Philips et al., 2015).

To investigate the effect size of product promotions in stores, Philips et al. (2015) conducted a research design in which they combined promotional product demonstration with end-of-aisle product display. They come up with the statement that the best way to promote products is to both give them a place to be demonstrated, as well place them on a product display. Though, retailers should consider the location of the demonstration to generate an effective product demonstration. They state that product demonstrations are most effective if they are placed not too close to the product displays at the end of an aisle. Furthermore, they state that product promotions are most effective when the two promotions (both product demonstration as well product display) are conducted on the same product.

Shelf design

A well-structured shelf design can be advantageous for both consumer and retailer. This statement is explained by the fact that consumers' overall shopping satisfaction increases when the in-store shelf design is structured well. As a result, greater consumer satisfaction leads to an increase of sales (Fancher, 1991). Subsequent to these findings, Drèze et al. (1994) come up with the fact that 1/3 of all consumer decisions on purchases are planned in advance of visiting the store. This means that 2/3 of all consumer purchases are made by rule-of-thumb decision making processes, showing low involvement (Dagnoli, 1987). The in-store decisions consumers make, follow quickly after a minimal product search and price comparison (Hoyer, 1984; Dickson and Sawyer, 1990). Drèze et al. further state that managing the way products are presented in shelves might have a significant effect on consumers' in-store shopping behaviour. Subsequent studies revealed that visual attention, resulting from in-shelf product visibility, actively influences consumers' brand consideration set (Pieters and Warlop, 1999; Allenby and Ginter, 1995). These outcomes are empowered by the study of Chandon et al. (2006), arguing that point of purchase consumer behaviour is influenced by in-store factors, such as shelf position and the number of facings. These factors can create a so-called "visual lift" for their brands, which means that products are more likely to be added to a consumers' consideration set in case they get in-store visual attention (Chandon et al., 2006). But how can retailers accomplish a well-designed and effective shelf structure? There are a lot of factors retailers should consider when designing a shelf allocation. In order to investigate the influence of shelf design on product sales, four different shelf components which are likely to affect the effectiveness of shelf design: the number of product facings, product placement on shelf, product adjacencies and category arrangement are determined.

Number of facings

The effectiveness of shelf design is often determined in terms of shelf space elasticity. This elasticity is a parameter that indicates to what extend additional shelf space has influence on product sales. (Eisend, 2014) In their research on the influence of shelf space allocation on products' sales, Desmet and Renaudin (1998) came up with some important conclusions on shelf space elasticity. Their first finding was that the type of product purchase influences the effect of shelf space allocated to a particular product. They concluded that shelf space allocation is most effective on impulse purchases, which means that shelf space has a causal effect on sales. In addition to this conclusion the paper also states that the amount of space given to a particular product in relation to the product category within the whole shelf gives a positive effect to the products' sales. Moreover, not only product sales will increase as a result of an efficient shelf space allocation, also consumer satisfaction will increase. This is because an efficient shelf space allocation will decrease the chance of products being out of stock (Lim et al.,2004). So; the more facings assigned to a product, the less likely it is the product will be out of stock.

However, these positive effects for products are bounded to constraints. The effect of extra shelf space will decline when the amount of facings reach a certain point, dependent on the type of product (Chandon et al., 2009). In the same research by Chandon et al., they conclude that shelf space allocation can have a positive effect on product consideration by consumers. They found that doubling the amount of product facings could help a product on three elements of consumer decision making; noting the product, considering the product and choosing the product. According to

their results, especially low-market-share brands benefit from product facings; consumer brand choice can increase by up to 67% due to doubling the amount of low-market-share product facings.

Display incompleteness

As stated before, emptied shelf space can also have a positive influence on consumers' perceptions and buying intentions of certain products. For example, study of Van Herpen et al. (2009) showed that people are intended to choose products that they consider to be scarce. In their research example, they asked people to choose a rosé wine from a wine shelf. They found out that the type of rosé which had the least amount of bottles remaining, was significantly chosen the most often. This effect is better known as the Bandwagon effect, which occurs when people are intended to buy products that were chosen by other consumers (Van Herpen et al., 2009). In line with the study of Van Herpen et al., Razzouk et al. (2002) earlier revealed that consumers have the intention to pick promoted products more frequently when they are presented in display stacks that are visibly picked from (actively suggesting that the stack was missing products). In their study, they conducted three different in-store experiments testing whether incomplete product displays have a positive impact on promotional sales. Using complete stacks as control variable, they found out that a significant majority chose the same product when presented on an incomplete stack above the products presented on complete stacks.

Product placement on shelf

Another way in which retailers can increase their sales on products is to provide attracting shelf displays. In this section, there will be a closer look to which factors are considered when retailers have to determine the ideal position within shelves for their products. Four different characteristics of product placement on shelves will be discussed in this chapter: (1) horizontal positioning; (2) vertical positioning; (3) product adjacencies and (4) category arrangement.

Horizontal positioning

When we look at the ideal placement of products within a shelf, the research of Valenzuela et al.(2013) comes up with the fact that consumers consider products that are placed in the centre of a shelf as the most popular ones. A study of Sorensen (2005), concludes that products placed at the end of shelves are given more so-called face time than products placed more centrally. This means that products at the horizontal extremes of shelves attract far more attention of consumers than products placed more in the middle of the shelves. On top of that, Sorensen argues that when familiar products are placed at the end of a shelf, this results in far more traffic in those specific paths. Another advantage of products placed at the horizontal extremes of a shelf is the ease with which products in those places are more easily reached when consumers come from the main aisles. (Van Nierop et al., 2008) Considering these facts, Chandon et al. (2009) surprisingly revealed that products that are placed at the centre of a shelf are more likely to be noticed, and that this position helps the products' sales.

But are the statements of Sorensen and Chandon et al., just as contradictory as they seem to be? There are several possible explanations that can explain these differences. The most important way to look objectively to both statements in in terms of the research design. For example, the research conducted by Sorensen was done by using a tracking system mounted under consumers' shopping

carts. Using these instruments, they monitored the traffic routes of consumers within supermarket paths. On the other hand, Chandon et al., used an eye-tracking system to determine which factors are of influence on product attention. They asked their respondents to look at a shelf planogram, and used eye-tracking to determine to which products the respondents were looking at. After doing so, they asked their respondents to either name one of the product brands, or say which product brand they would consider buying. The different research types stated above might well be important indicators for their dissimilar outcomes.
When using a tracking system such as Sorensen used in his research, placing your shopping cart at the extremes of an aisle doesn't automatically mean that the products placed at those extremes are given the most face time by consumers. Moreover, the position of the shopping cart doesn't always determine the position of the corresponding consumer. When interpreting the research design of Chandon et al., an important remark is that using a fixed planogram of a product shelf is not completely applicable in the way a consumer experiences a shopping path faced with in supermarkets. As consumers don't face supermarket shelves the way the respondents of this study do, the results of Chandon et al. might well be influenced by the different consumer experience. Instead of facing the shelves as a fixed picture, in practice, they walk along them. These currently occurring paradoxical seeming findings indicate that there is no unanimous knowledge about the optimal horizontal shelf place to put products on (Chung et al., 2007). Thus, in this area of scientific research, there is a lack of empirical evidence to prove with certainty which effects different horizontal product locations have on consumer behaviour and product sales.

Vertical positioning

According to Raghubir and Valenzuela (2008), the effects of vertical product positioning on shelves are much stronger than the effects of horizontal product placement. This statement is strengthened by the research of Hansen et al. (2010); in their research on retail shelf allocation, they conclude that vertical location effects have twice more impact on sales than horizontal shelf lengths. When determining the best vertical location for your product, previous studies show that eye level is the most effective location for product placement (Van Nierop et al., 2008). This might be the case due to the fact that products placed at eye-level are seen with less far less effort than products placed on the vertical extremes of a shelf (Sigurdsson et al., 2009).

There are several ways in which retailers can influence the consumers' perception of products using vertical product placement. For example, a research on the optimal arrangement of products in a particular shelf concludes that when retailers want their products to be considered cheap, the best place for their products is at the bottom of the shelf, and luxury products are perceived to be on top of the shelves. (Raghubir and Valenzuela, 2008).
Not only the price orientation is caused by the vertical positioning of products. Previous studies on the effect of vertical positioning on affect and evaluation proved that higher placed variables are evaluated as being more positive (Meier and Robinson, 2004). Despite the fact they used words instead of products in order to test the influence of vertical positioning on evaluation, they might well have found a relevant relationship between vertical positioning of words on evaluation. During their research, they asked people to evaluate words placed on random places on a computer screen. In their conclusion section, they state that the words placed on top of the computer screen were evaluated more positively by their respondents than the words placed at the bottom of the screen. Moreover, a study of Schubert (2005) revealed that high vertical positioning of variables can

influence the evaluation of those particular variables in terms of the perception of power. In this study Schubert conducted 6 different studies which showed that not only the speed of powerful judgments was higher on the top of the screen, also the judgments themselves were more powerful when the variables were placed on top. Similar to the study of Meier and Robinson, Schubert used screens to test the speed and judgments of his respondents.
Although these studies were conducted with variables different from products, further research on vertical positioning might yield relevant outcomes for vertical product placement.

Product adjacencies

Another way in which retailers can influence consumers to buy particular products is by efficiently structuring product adjacencies within shelves. To illustrate; a research of Chen et al.(2006), came up with the fact that retailers can improve purchases by up to 70% by using visual product adjacency. They state that retailers currently are not fully aware of the fact that product adjacency can improve combined purchases by carefully putting products side-by-side on shelves.

One way in which product adjacencies can influence product sales is by the way in which consumers perceive products presented next to each other. To illustrate: in their research on brand equity dilution, Buchanan et al. (1999) come up with some interesting findings on product perception based on adjacency . Their research was emphasized on the effect of display conditions on the consumers' perception of products, divided in two products: high-equity brands and unfamiliar brands. Out of their research results, they conclude that there are some ways in which the consumers' expectations can have implications for both the high-equity brands as the unfamiliar brand. They state that the way in which consumer perceive a certain product, is influenced by the way the products are presented on the shelves, in relation to other products. When, for example a high-equity product and an unfamiliar product are placed within the same shelf, there are several factors that can determine how the consumers' pre-existing product evaluation will be affected; such as price and package design differences between the two products. From the high-equity product perspective, it is undesirable to be compared with unfamiliar brands. In order to be dissimilar to the unfamiliar option, Buchanan et al. (1999) state that the high-equity brand should both:
1) Be the preceded choice option above the unfamiliar product.
2) Not be placed in a way that the unfamiliar product is easily compared with the high equity brand product.

Category arrangement

Not only the consumers' willingness to locate products can increase by managing product categories well. In their research on the 'mere categorization effect', Mogilner et al.(2008) found out that the number of categories provided by retailers within shelves have a positive influence on the overall consumer satisfaction. Their statement is that a greater amount of categories on shelves both influence the consumers' perception of variety, as well the evaluation on the choice they have made. Aside from expanding the number of product categories, another way to assess consumer satisfaction is to provide a store layout that is congruent to a consumers' internal product structuring (Morales et al.,2005).

These internal product structuring schemas help consumers to avoid losing track on all different product categories provided in supermarkets (Alba and Hutchinson, 1987). According to Stayman et al.(1992), retailers can use these consumer schemas. They state that when retailers conform their product arrangement to the internal schema of consumers, it becomes more convenient for consumers to internally process the shelves, which leads to both a greater consumer satisfaction and positive affection with the assortment.

According to Desai and Ratneshwar(2003), there are two specific ways in which retailers can arrange a product category within a shelf. First, they can use a taxonomic product shelf, this means that products of the same nominal category (e.g. regular crisps next to light crisps) are placed within the same product shelf. Second, a goal-based shelf display, containing several products that determine a common consumer goal (e.g. fair trade)(Desai and Hoyer, 2000; Ratneshwar and Shocker, 1991). These two categorical product structuring methods are also described in terms of benefit- and attribute-based product categories (Lamberton and Diehl, 2013). Using light crisps as their research variable, Desai and Ratneshwar (2003) state that products placed in a goal-based category shelf are more likely to be bought by consumers than products that are arranged based on taxonomic characteristics. However, they state that most retailers will be cautious to implement these findings, regarding the fact that it might well be very complicated to alter all shelves this way. Moreover, they argue that it's very questionable in which extent consumers are willing to put effort in locating all products when placed in goal-based category shelves.
A study by Lamberton and Diehl (2013), conducted on consumer shopping behaviour resulting from category arrangement sums up some insights about goal-based product categorization versus taxonomic categorization. In this study, the authors tested the effects of both taxonomic and goal-based categorization in terms of similarity perceptions and assortment organization on construal level. To do so, they conducted multiple studies with different products to guarantee that participants did not have any expectations about assortment organizations in advance. The first conclusion they come up with is that a goal-based product categorization leads to greater perception of similarity within the product category than taxonomical-based product categorization. Second, this paper argues that for consumers that are not high-variety-seeking, the perception of similarity a goal-based categorization generates avoids the assortments to be too overwhelming to consumers. Considering the statements these earlier studies have yielded, retailers should be most of all very careful using these conclusions. For example due to the fact that the research of Desai and Ratneshwar was conducted using light crisps as research product. As this is a very narrow product category, it is unlikely that these statements hold for all products presented in supermarkets.

Summarizing this paper, Table 2 gives an overview of all findings that are yielded. Both the characteristics of store layout as well the shelf characteristics are expressed in terms of four different outcome variables: (1) Product sales; (2) Product perception; (3) In-store consumer behaviour and (4) Overall store perception.

Table 2: The effects of in-store designs on consumers

	Product sales	**Product perception**	**In-store consumer behaviour**	**Consumers' overall store perception**
Store Layout			In-store traffic patterns are dependent on an efficient store layout.	Can have a positive influence on the overall store perception of consumers.
Grid			Efficient in-store consumer behaviour.	Structured store layout.
Freeform			Consumers tend to browse more	Stores are more easy to overview.
Racetrack			Consumers are challenged to put a lot of effort in searching products.	Mostly perceived as an unusual and interesting shopping experience.
Shelf characteristics	Managing well can have a positive influence on product sales.			Has a positive influence on the consumers' overall shopping experience.
Product facings	The more space is given to a particular product, the higher the products' sales.	The amount of facings determines the importance a retailer assigns to a product.		Managing facings well has a positive influence on the overall store perception of consumers.
Horizontal positioning		Products placed at the extremes of shelves are perceived to be discounted. Central position of product is related to perceived popularity		
Vertical positioning	Eye-level is the most profitable location.	Products placed on lower shelf parts are expected to be cheap, products placed on high shelves are perceived to be expensive.		
Product adjacencies	Product adjacencies can improve products' sales	Product adjacencies influences the perception of both products.		
Category arrangement	Goal-based product categorization increases products' sales.			Goal-based arrangement diminishes consumer feelings of overwhelming amounts of products.

Discussion

Conclusions

This paper aimed to point out which in-store layout designs influence in-store consumer behaviour. With respect to layout forms, this paper argues that grid layout is best used when retailers want their consumers to have an efficient in-store behaviour. Consumers perceive this layout form as structured, and prefer this kind of layout when they want a fast shopping experience(Levy and Weitz, 2001; Lewison, 1994; Vrechopoulos et al., 2004).
With respect to freeform, this paper states that this layout has the property of being more easy to overview than the grid layout form, due to its low shelf heights. These low shelf heights lead to the tendency of consumers browsing more easily between pathways. This layout form is far less structured than the grid layout discussed before. (Levy and Weitz, 2001; Lewison 2004) In this layout form, the emphasis is on facilitating an easy way to browse through the store because of the low shelf heights. This results in the tendency of consumers spending more time in stores, which leads to higher consumer spending (Anic and Radas, 2006).
The third known retail store design is racetrack form, which is characterized by one central pathway leading the consumer through the store, passing by much as possible store areas, each with an own 'store theme'(Lewison, 1994; Vrechopoulos et al., 2004). This layout form is known for its unusual and interesting shopping experience, coming from the large amount of effort a consumer is forced to put in searching for products. Retailers who consider this layout form should be aware of the risk of making the consumers' search process to complicated, resulting in feelings of frustration and anger(Titus and Everett, 1995).

When looking at shelf designs, previous studies argue that an overall well-structured shelf design can contribute to a greater consumer' shopping satisfaction, which is positively related to product sales (Fancher, 1991).
The first dimension of shelf design is the amount of facings a retailer assigns to a certain product. This paper argues that up to a certain amount, increasing the number of facings assigned to a product can makes it more likely that consumers will buy a certain product (Desmet and Renaudin, 1998). Additionally, a larger amount of products also affects the perception of consumers about a particular product. According to consumers, the amount of facings assigned to a product by retailers, determines the level of importance the retailer attributes to that product. The last finding regarding the effects of product facings is that managing shelf allocation well can have a positive influence on consumers' overall store perception, due to the fact it decreases the risk of products being out of stock (Lim et al., 2004).
The only important finding in relation to horizontal product placement is that products that are placed at the horizontal extremes of a shelf are perceived to be discounted. At the same time, products that are placed more centrally are perceived to be considered more popular by retailers (Valenzuela et al., 2013).
Vertical product positioning, however, have much stronger effects on sales than horizontal placement (Raghubir and Valenzuela, 2008; Hansen et al.,2010). This part also comes up with the finding that eye-level product positioning is the most effective vertical product allocation in terms of product sales (Van Nierop et al., 2008). Moreover, vertical product placement also affects a consumers' perception about the product. Products placed on the higher shelf parts are perceived to

be expensive and powerful, whereas products on the lower parts are associated with cheapness (Raghubir and Valenzuela, 2008; Meier and Robinson, 2004; Schubert, 2005).
The importance of product adjacencies is best described by the fact that it can increase product sales by up to 70% (Chen et al., 2006). Retailers should carefully consider how to allocate their product adjacencies, because of the fact that it affects the consumers' perceptions of all products presented adjacently. High equity products are in favour of being placed in a significantly distinctive way from their unfamiliar brands, whereas the level of comparability is advantageous for the unfamiliar brands (Buchanan et al., 1999).
In terms of category arrangement, this paper shows that the amount of product categories presented in stores positively influences the overall consumer satisfaction due to a greater perception of variety and more positive evaluation on choice afterwards. This concept is better known as the 'mere categorization effect (Mogilner et al., 2008). However, it should be noticed this holds up to a certain point. The best way to categorize products is by goal-based categorization, which is likely to positively affect product sales. Furthermore, goal-based category arrangement can also have a positive effect on consumers' overall store perception by diminishing feelings of an overwhelming amount of products presented in a certain store (Lamberton and Diehl, 2013; Desai and Ratneshwar, 2003).

Theoretical implications

This study aims to reveal the current state of scientific research on the effects of in-store shelf design and layout on consumer behaviour. To summarize; there is still a lot to reveal in terms of scientific research on the effect of in-store designs on consumers. This paper points out on which areas of scientific research are still to be studied upon. **Table 2** indicates which areas of scientific research on shelf design and shelf layout already have been revealed, but more importantly, which areas of research are still unknown. The most prominent conclusion to draw from the table is that both the effects of store layout design on product sales and perception has not been discovered yet, along with the effects of shelf design on in-store consumer behaviour and overall store perception.
It's quite logical that not all gaps presented in **Table 2** are equally relevant and feasible to study, but considering all findings the literature study yields, there are some gaps that could generate new important insight. For example, it seems very unlikely that any store layout can have a direct significant influence on product perception, but due to possible inefficient layout designs, product sales might well be influenced by the type of layout a certain retailer assigns to his/her store.
When discussing all types of shelf characteristics, the table shows that scientific research on the effects of shelf designs are possibly not fully covered by the studies that are currently available.

First, when looking at the effects of product facings on the four outcome variables, it is easily noticed that there is already a lot scientific knowledge on this subject. Yet the knowledge gap regarding in-store consumer behaviour resulting from product facings should be considered as possibly researchable.
Moving on downwards, **Table 2** reveals that horizontal product positioning is the subject least is known about. There is still no scientific research on whether horizontal product positioning might have influence on product sales, whereas it is thinkable that there might be positive effects. On top of that, the ways in which the current knowledge on horizontal product positioning has been gathered is in some ways very questionable. The research designs used in earlier surveys generate a questionable application in practice. As a result, the effects of horizontal product positioning stated

in these surveys should be used carefully, and should be considered as a possible subject for future research.
In contrast to horizontal positioning, much more is known regarding vertical product positioning. However, it is very uncertain whether either horizontal or vertical product positioning can have any effect on in-store consumer behaviour or the overall store perception. It seems unlikely that the horizontal or vertical place of products affects the way consumers behave in-store, besides the likelihood that consumers will move their focus to other shelf parts, when they maintain their fixation on the same products. It seems therefore not very beneficial to study elaborately.
Regarding product adjacencies, the effects of this shelf arrangement strategy on both product sales and product perception seem large. Still there might be some possibilities for scientific research on this subject as well. As managing product adjacencies seems likely to affect the way in which consumers experience their shopping time, future research might reveal interesting insight in the effects of adjacencies on the overall shopping experience, together with possible in-store consumer behavioural effects.
Furthermore, it is thinkable that category arrangement not only has effects on the overall store perception, but also on the in-store consumer behaviour. Still little is known about the in-store consumer behaviour resulting from category arrangement. On top of that, although earlier studies did mention the fact that a goal-based category arrangement has a positive effect on consumers' product-structuring processes, the main effects of different category arrangement methods on overall store perception could be examined more elaborately in future studies.

Managerial implications

For managers, this research provides an overview of which in-store shelf designs are applicable in different types of stores. Carefully adapting the product allocation within shelves as well the way in which shelves are arranged in stores to the retailers' goals might well have a significant effect on product sales. However, as stated before, managers should be aware of the fact that not all research designs presented in this paper are perfectly applicable in practice. The most important findings this paper provides for managers are separable in two different areas: store layout and shelf layout.
First, when retailers consider which store layout is most effective, the best possible option strongly depends on their type of store. As said before, grid layout forms are the most effective if the stores' visitors are planning to have an efficient store visit. However, when a retailers' goal is to provide consumers an interesting and enjoyable shopping experience, freeform or racetrack are more effective.

The second part of this study examines how retailers can allocate their products most effectively within their shelves. This part comes up with the fact that both the vertical position of the product as the amount of facings a product has is of big influence on the products' sales. Product positioning at eye-level is by far the most effective product placement in terms of product sales and visibility (Hansen et al., 2010; Van Nierop et al., 2008). Of course it is impossible to place all products at eye-level, so for retailers it is key to allocate products in such a way that the products the retailer considers as being most important in obtaining the stores' business goals are placed on these shelves. As well as product positioning, the amount of facings a certain product is given, influences that products' sales (Eisend, 2014). Moreover, for retailers, managing the amount of product facings is an effective method to avoid products being out of stock (Lim et al, 2004). Considering the fact that

retailers have to deal with a limited amount of shelf space, retailers can manage the amount of facings they assign to their products well by carefully analysing all products' sales quantities.

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