The Impact of Consumer Navigation Behaviour on Visual Attention to Online Advertising

An eye tracking study

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Abstract
The wide use of Internet has opened up many opportunities for advertisers. This has resulted in a multitude of ads in different format and contexts on everything from entertainment sites and online newspapers to search engine result pages (SERPs) and e-commerce websites. However, it has been shown that when surfing online, the consumers are more engaged in the current task and thereby also more goal directed than when consuming traditional media. This has, in combination with cluttered websites and ads sharing bandwidth with content, resulted in the phenomenon banner blindness, which indicates that consumers purposefully ignores everything that looks like advertising.

A factor that in previous studies has shown to have a large impact on the allocation of visual attention on a website is the consumer’s current task, which directly affects their navigation behaviour on the website. A consumer that is browsing apply a different behaviour and is affected by other factors in the visual scene than a consumer that knows what s/he wants and therefore uses goal directed search as the searching strategy.

Through a literature study and an eye tracking experiment this thesis investigates the impact of the consumer’s task on visual attention to advertising on websites, with the focus on internal advertising (merchandising ads) on e-commerce websites. The tasks used in the eye tracking methodology were designed to create a more realistic visual navigation behaviour compared to previous studies in the field.

The results show that when browsing, the consumers are generally more receptive to peripheral stimuli, which in many cases also includes advertising. When the consumer has a specific goal in mind, s/he gets more goal directed and uses stored searching strategies to efficiently find the wanted target and/or clues about where the target can be located. The visual behaviour is thereby controlled by higher cortical centres and does not get affected by peripheral stimuli in the same extent as when the consumer is browsing.

It was also found that it is very challenging to create a natural browsing behaviour in a study environment. This is due to several factors and is a very critical problem for studies investigating visual attention since a realistic task is the key to create realistic behaviour and thereby also an accurate and usable result.
Effekten av konsumentent naviagtionsbeteende på visuell uppmärksamhet av online-reklam

En eye tracking-studie

Sammanfattning

Den utbredda användningen av internet har öppnat många möjligheter för annonsörer. Detta har resulterat i en uppsjö av online-annonser i olika format och sammanhang, placerade på allt från underhållningswebbplatser och online-tidningar till "search engine result pages" (SERPS) och e-commercewebbplatser. Det har dock visat sig att konsumenter som surfar på nätet är mer engagerade i den aktuella uppgiften och därmed också mer målinriktade än konsumenter som konsumerar traditionella medier. Detta har, i kombination med webbplatsernas plottrighet samt att annonserna delar bandbredd med det huvudsakliga innehållet, resulterat i fenomenet "banner blindness". Detta innebär att konsumenter medvetet ignorerar allt som ser ut som reklam.

En faktor som i tidigare studier har visat sig ha en stor inverkan på fördelningen av visuell uppmärksamhet på en webbplats är därför konsumentens aktuella uppgift, eftersom den direkt påverkar naviagtionsbeteendet på webbplatsen. En konsument som "browsar" använder ett annorlunda beteende och påverkas av andra faktorer i den visuella miljön än en konsument som vet vad han/hon vill ha och då använder en mer målinriktad typ av sökning som sökstrategi.

Genom en litteraturstudie och ett eye tracking experiment undersöker denna avhandling effekterna av konsumentens uppgift och mål på den visuella uppmärksamheten av reklam på webbplatser, med fokus på intern reklam (merchandising-annonser) på e-commercewebbplatser. Uppgifterna som användes i eye tracking metodiken var designade för att skapa ett mer realistiskt navigationsbeteende jämfört med tidigare studier inom samma område.

Resultaten visar på att när konsumenterna "browsar" är de i allmänhet mer mottagliga för perifera stimuli, som i många fall även omfattar reklam. När konsumenten har ett specifikt mål i åtanke blir han/hon mer målinriktad och använder då lagrade sökstrategier för att effektivt hitta det önskade målet och/eller ledtrådar om var målet kan lokaliseras. Det visuella beteendet styrs därmed av högre kortikala centra och påverkas inte av perifera stimuli i samma utsträckning som när konsumenten "browsar".

Det konstaterades även under undersökningen att det är mycket svårt att skapa ett naturligt browsing-beteende i en studiemiljö. Detta beror på flera faktorer och är ett mycket kritiskt problem för studier som undersöker visuell uppmärksamhet, då en realistisk uppgift är nyckeln till att skapa ett realistiskt beteende och därmed också ett korrekt samt användbart resultat.
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Introduction

In this chapter the background and the subject fields of the thesis will be introduced. The aim and objectives will also be presented as well as the limitations and problem formulation of the thesis.

Thesis background

During the last two decades, Internet has grown to play an important part in commerce and advertising. (Cho & Khang, 2006; Ha, 2008; Kim & McMillan, 2008; Spilker-Attig and Brettel, 2010) The first online ad was displayed in 1994 (Berthon et al., 1996) and has been followed by a multitude of ads in different format and contexts on everything from entertainment sites and online newspapers to search engine result pages (SERPs) and e-commerce websites. (Cho & Khang, 2006) Consequently, the consumers are nowadays more or less constantly exposed to online advertising when surfing the web. Many times with a large amount of ads on one single page, which creates a cluttered environment. (Ha & McCann, 2008) Unlike traditional media, such as TV or newspaper, the web is a so-called “lean forward medium”. This implies that the consumer is engaged in the current task and goal directed. (Nielsen, 2008) In a cluttered environment like the Internet it is important for the consumer to be focused on the task at hand to avoid distractions. Since ads usually are irrelevant for their current task, consumers have learned to ignore them. Based on their previous experiences the consumers have thereby developed the habit to automatically avoid everything that looks like advertising. This phenomenon is called Banner blindness. (Benway & Lane 1998; Bernard 2001; Kuisma et al., 2010; Nielsen, 2007) Early web design guidelines suggested that magnified size and salience would attract more consumer attention. (Hsieh & Chen, 2011) However, the remark of banner blindness first made by Benway (1998) claims that visual distinction of advertisement might today actually decrease the attention to the ad.

Visual attention to ads has shown to depend on several additional factors except from size and salience. One important factor is the amount of advertisement clutter on the host website, since it directly affects the competition for attention for each ad on that site. (Ha & McCann, 2008) Other factors are: type of host website, ad content (Calder et al., 2009), frequency of exposure as well as the individual needs and the level of involvement from the consumer. A very important factor that in previous studies have shown to have a large effect on the visual attention to ads on a website is the subject’s current navigation behaviour. (Kuisma et al., 2010) This is a very critical factor since the navigation behaviour on a website is directly affected by the consumer’s current task on that web site, and the fact that consumers most of the times visit a website to perform some kind task. (Nielsen & Pernice, 2009) Rough categorizations of navigation behaviours created by tasks that the consumers are engaged in on websites are: browsing and goal directed search. Previous studies have shown that the visual attention to ads on a website have varied during these navigation behaviours and the general findings have suggested that consumers pay more attention to ads while browsing than when searching. (Pieters & Wedel, 2007; Pagendarm & Schaumburg, 2001; Janiszewski, 1998; Danaher & Mullarkey, 2003)

A widely used measurement for online advertising has been Click Through Rates (CTR) (Drèze & Hussersh, 2003), which is defined as the number of clicks on an online ad divided by the number of exposures of that specific ad. (Google, 2012) However, this measurement has been criticised by researchers in the field that argue that CTR is misleading and an ineffective measurement of banner effectiveness. (Drèze & Hussersh, 2003; Hsieh & Chen, 2011) The reason for this is that even though online advertising allows direct interaction it can also, similarly to advertising in traditional media, increase the consumers’ awareness of the advertised product or brand without the consumer actually clicking on the ad. (Drèze & Hussersh, 2003) Perhaps the consumer saw the ad but was not interested or s/he looked at it but
did not consciously perceive it. These attention-related matters can partly be analysed with eye tracking studies. (Guo, 2009)

Most research dedicated to online advertising have so far concerned external ads (third-party ads) while fewer studies have concerned internal ads (merchandising). (Guo, 2009) On e-commerce sites, external ads face the problem that the consumers visit the host website to buy or look at products located on that specific website. When exposed to ads with unwanted products on unwanted websites their experience might turn negative, which is a disadvantage both for the advertiser and the host website itself. (Guo, 2009) Internal advertising does not face the same dilemma since they refer to local products and offers. If used right they will not only boost sales for the website but also increase the consumers’ shopping experience and satisfaction. (Jin & Park, 2006) However, even though the ads regard local products and are thereby increasingly relevant for the consumer, they usually still have similar design and placement as external ads and are thereby not reprieved from banner blindness. If used too aggressively they can therefore also have negative effects on the consumers’ attention. (Guo, 2009)

Tobii Technology AB

The submitter of this thesis is Tobii Technology AB. Tobii is the world-leading vendor of eye tracking products. Their technology is widely used in various research fields, such as usability studies, shopper and design studies, advertising research and neuroscience. (www.tobii.com)

Aim

The aim of this thesis is to investigate the navigation behaviour’s impact on the consumers’ attention to internal ads on e-commerce websites using eye tracking. The objective of the study is to develop and evaluate an eye tracking methodology that will create and capture a natural visual navigation behaviour of consumers when performing realistic tasks on an e-commerce website. This is required for getting a realistic and analysable result when studying the visual attention to internal advertising on the website. The developed methodology could additionally work as guidelines for future studies of both external and internal advertising and/or consumer behaviour on websites in general.

Problem formulation

The main research question of this thesis is:

*What impact does the consumer’s navigation behaviour on an e-commerce website have on their visual attention to internal advertising on that website?*

In order to answer the question, it has been broken down into several sub-questions and divided into three major research areas:

Consumer online behaviour:

• What different types of visual navigation behaviours exist when visiting a website?

Visual Attention:

• What affects the consumers’ attention to online ads?

Methodology:

• How should an eye-tracking methodology be structured to generate realistic results?

Methodology

The literature study will include research of online advertising, human visual attention, online consumer behaviour, banner blindness and research methodology. The navigation behaviour’s
impact on visual attention will be further investigated through an eye tracking study on a chosen traditional e-commerce website.

**Delimitations**

The thesis will focus on *internal ads on e-commerce websites*. The reason for this narrow focus is that attention studies of internal ads are underrepresented in both marketing- and eye tracking literature. However, the wide use of internal ads on e-commerce websites, banner blindness and the unique challenge that internal ads face compared to external ads makes it an area worth investigating further.

The study will also focus on how the consumer’s task at hand affects the visual attention. Even though introduced to the understanding of the influence, placement, design and content of the advertising – these are areas that will not be discussed on a deeper level in this thesis.

Due to limitations in time and resources as well as the focus on eye tracking, this thesis mainly focus on *attention* to ads rather advertising *impact*. This is an important distinction that will be explained further later in the report.
Background theory

This chapter will present the theoretical background needed to understand the subject areas and to answer the objectives of the thesis. The relevant areas are: online advertising, human visual attention and consumers’ goals on websites. The different areas will be presented individually and thereafter connected in sections describing attention to online advertising, navigation behaviour and banner blindness.

Advertising online

Online advertising - different from advertising in traditional media

Television vs. Internet

Watching a program on a TV and surfing the web on a computer are both activities where the user gets information or entertainment in form of text, audio and moving or static pictures, from a digital screen. However, how the information/entertainment is consumed is actually very different between the two mediums. Nielsen summarizes the differences by introducing the lean-forward and lean-back mode. (2008) On the web the consumers use their lean forward mode, since they are active, engaged and goal directed. When watching TV on the other hand, they are in the lean back mode since they are more passive, relaxed and want to be served with information or entertainment. (Nielsen, 2008) Because of these differences, advertisers are facing a completely different situation when advertising on the Internet compared to traditional media such as TV. The new situation may involve opportunities and strengths but unfortunately also challenges and weaknesses.

When using TV as the advertising medium the advertisers get the possibility to interrupt the consumer in his/her activity. During this interruption they get to use the full bandwidth to broadcast their messages, and if not making an active decision to leave the TV or zap away from the channel the consumer will see the advertising message. (Drèze & Hussherr, 2003) Since most people are in a passive mode when watching TV, they choose to keep on watching instead of actively reaching for the remote control and zapping away. Studies have shown that zapping rates during commercial breaks are below 3%. (Siddarth, 2002; Drèze & Hussherr, 2003) Online advertising on the other hand very seldom get the full bandwidth for themselves, instead they have to compete with other elements on the website for the user’s attention. This competition takes place in a cluttered environment where the consumers are task-oriented and where the ads usually are irrelevant for the consumers’ information search or processing goal. (Benway & Lane, 1998; Bernard, 2001; Kuisma et al., 2010) Just to capture and retain the consumers’ attention is therefore much more of a challenge for online ads. However, sharing the bandwidth with the relevant information or entertainment can also bring opportunities. The consumer can choose to leave the TV or zap to another channel (even though only a few do) but when surfing online these possibilities does not exist (except from the usage of ad-eliminating software). The consumer can, and will probably, avoid looking directly at the advertising, but peripheral attention might still be captured. (Kuisma et al., 2010)

Online ads are typically located in the periphery in relation to the editorial content. Since online ads seldom are targets of information search on the Internet, consumers may use an active navigation behaviour (see top-down p.14) to try to avoid them. Nevertheless, consumers are still exposed to ads and may process them pre-attentively. (Janiszewski 1993; Ryu et al. 2007)

Unlike TV-ads that only are broadcasted for a limited amount of time, online advertising can exist within the consumers’ visual field for an unlimited amount of time. Another important factor when comparing online advertising to traditional advertising is that online ads can be targeted in a completely new way. TV ads are broadcasted in connection to programs that target the same audience as the product or brand in the ad. When advertising online the ads can be closer connected to every individual consumer based on their- and/or other consumers’ previous
surfing behaviour. This gives online advertising large possibilities to target the very specific audience that is most likely to be influenced by it. (Yan et al., 2009) However, relevant or not - the challenge of capturing the visual attention still remains.

**Print vs. Internet**

Several previous studies have also studied consumers’ attention to advertising in print media. (E.g. Pieters & Wedel, 2007; Rayner, K. et al., 2007) Attention to advertising in print media might be seen as more comparable to online advertising than TV-commercials since the ads usually have to share the “bandwidth”, in their case a page, with the main content. Consumers can then decide not to look at the ads, like ads online. However, in most previous studies it is full page ads that have been studied which puts the consumer in a new situation. The consumer can no longer use his/her peripheral vision to decide to avoid or pay attention to the advertising. (E.g. Pieters & Wedel, 2007) S/he will notice the ad when turning the page and thereafter make the decision to stay or move on to the next page.

**Differences between online ads**

Online advertising does not just differ from advertising in traditional media. Online advertising can also differ a lot from each other, both when it comes to objective of the advertising as well as their format and design. Below, the most common advertising differences are introduced together with previous findings on how attention is affected by these differences.

**Website type**

The type of website on which the ad is displayed is very crucial for how (and if) the ad is going to be perceived. Different types of websites comes with different intentions from the consumer as well as certain expectations on how and where the information is going to be found on that specific type of site. Depending on the purpose of the website they also use different layouts, design elements and structures, which in their turn affects the visual attention of the consumer. Online advertising can be found in different forms on several website types, however, in this report the main focus is put on advertising on e-commerce. To get an idea of how advertising on e-commerce sites relates to advertising on other types of websites two common website types that usually contains advertising will shortly be presented in this section: Web portals/online newspapers and Search engine result pages(SERPs).

**Web portals and online newspapers**

Web portals and online newspapers are usually cluttered and contain high information density. Information, articles and advertising are often mixed without any obvious distinction. This creates what Nielsen and Pernice call a “guessing game” for the user deciding where to look. The peripheral vision usually helps them to avoid everything that looks like advertising and instead focus on their current task. (Nielsen & Pernice, 2009)
Search engine result pages (SERPs)

A SERP has a different appearance and function compared to other website types which also creates unique consumer behaviour. This entails other “rules” for online advertising on SERPs that generally get much more attention compared to advertising on any other type of website. The reasons for this are found in the fact that the consumer is scanning the results looking for a solution or certain information, and since the advertising usually are based on the search query they may actually provide this for the consumer. (Owens, 2011; Nielsen & Pernice, 2009) The format of the advertising is additionally most commonly text based sponsored links. These have a very similar appearance to the actual search results on the SERP and are thereby not as affected by banner blindness. (Nielsen & Pernice, 2009)

![Figure 1](www.aftonbladet.se)  
Typical cluttered online newspaper with a mix of text, pictures and ads.

![Figure 2](www.google.se)  
Google SERP with sponsored links above- and to the right of the organic search results.

Source:

www.aftonbladet.se

Source:

www.google.se
E-Commerce

Advertising on e-commerce websites have, like ads on SERPs, also been found to generally attract more attention than advertising on web portals or online magazines. Reasons for this are argued to be that the users are very conscious when it comes to discount and offers, which they might expect to find in ads on the shopping site. The advertising are also usually contextually relevant to the content of the website. A consumer’s goals on an e-commerce website are according to Nielsen and Pernice: to find the desired product, to find related products and to find the best offer. Advertising on an e-commerce site might help them with that, alike ads on SERPs and unlike advertising on e.g. an online magazine where the user is interested in reading articles. (2009)

Internal vs. External Advertising

Advertising that links to offers, products or services on a third party website will in this report be referred to as external advertising. The advertisers goal is clear: to attract attention to the ad and then generate clicks and/or lasting impressions of the brand, product or offer. (Turigas, 2012) However, for the host site the displaying of the advertising comes with a dilemma, especially if it is an e-commerce site. The business objective for displaying the ads is to generate advertising revenue paid by the advertiser. Most commonly they are charged either by the “pay-per-view”-model, where the advertiser either pays a cost per the number of views/impressions by the consumers, or by “pay-per-click”-model, where they pay for the number of times the ad has been clicked (Moon & Kwon, 2011). The objective for the website itself is to sell products or services and provide a satisfying user experience so that the consumer will return to the website. External advertising could antagonize both these goals by stealing attention from the main content of the website and thereby contribute to a less satisfying user experience and perhaps also less sales of the own merchandise. (Guo, 2009) Since the products promoted in the ads refers to external websites, the consumers might even leave the host website and in worst case buy the wanted products in a competing e-commerce store. For e-commerce sites displaying external ads it is therefore important to find a balance between the business objectives and the user experience objectives which means to both
improve the noticeability and/or the click through of the ads while causing as little harm as possible for the user experience and product sales. (Guo, 2009) Additionally, on Internet pages containing high ad clutter and ads that are irrelevant to page content, the advertising effectiveness decreases significantly (Ha & McCann 2008; Kuisma et al., 2010)

Display advertising promoting merchandise and offers locally sold on the website are in this report referred to as internal advertising. This type of advertising does not provide any extra revenue for the website. The goal is instead to promote specific products, create desires, quickly move the consumer to the product pages or make additional sales. Unlike external advertising, this does not interfere with the goals of the website itself. However, if advertising too aggressively the user experience might still turn negative and the user satisfaction will go down. (Guo, 2009) When investigating the attention to ads on the website it is therefore also important to study how the ads affect the usability and the user experience of the website. Internal advertising is not reprieved from banner blindness, even though it could actually help the consumer in some cases. The reason for this is that internal and external advertising tend to have similar design and placement. (Guo, 2009)

**Advertising design**

**Text vs pictures**

A clear distinction between ads when it comes to design is whether they contain pictures or only consist of text with hyperlinks. Although text advertising on SERPs have been proven to be relatively effective the answer is not as clear when it comes to other types of websites. In 2003 Nielsen first remarked that that text advertising was more effective than picture-based advertising since these kinds of ads not were subjects to the same extent of banner blindness.

The consumers had not yet trained themselves to avoid or ignore this text advertising, which gave them a temporary novelty-effect that, however, would fade in the long term. A lasting advantage that text-based ads might have is that they have a low-end media format, which might make the consumers take them more seriously. Additionally, when using text-based advertising the message of the ad have to be concluded in only a few words. This often makes them more communicative and concrete in their message – how the consumer can benefit from the promoted product or service. (Nielsen, 2003) After conducting an eye tracking study on the subject four years later Nielsen still argued that plain text, (along with images of faces and “private body parts”) were design elements that attracted attention. (Nielsen, 2007) This finding is challenged by Owens et al. that in their study found that text advertising were subject to the same blindness as banner advertising. (2010)

Previous studies have shown that ads containing pictures with a separate text attracts more views than when the text is integrated in the picture. A possible reason for this is that the ads look more “ad-like” when the text is integrated in the pictures and when separate from the picture it looks more like page content. Other reasons are that people are generally attracted to plain text and that the text is not as readable when it is placed on a picture, unless it is a plain background with contrast to the text. (Nielsen & Pernice, 2009)

**Consistency with web content**

One of the advantages of text advertising on SERPs is that the ads match the content. It is thereby harder for the consumer to distinguish the advertising from the content and thereafter avoid it. The same effect can be reached for advertising on other types of websites as well, if they contain contextually relevant offers or products and are designed in consistency with the website. The consumers probably have some kind of trust in the current website, so if the ads match the site it is probable that they will trust that info as well. They might not even think of it as an ad, but rather as content or helpful offers. (Nielsen & Pernice, 2009) Advertising that matches the rest of the website is easier to achieve and more morally justifiable when it comes to internal advertising. Then it is a way to for the website to be able to promote certain products or services already offered on the website without facing the effects of banner blindness. When it comes to external advertising on the other hand, it could be perceived as unethical to design
the ad to blend in with the host website. The consumer might believe that the ad actually is a part of the website and feel deceived when being transferred to another website when clicking on it. This can lead to increased avoidance of all ads and mistrust to both the promoted brand as well as the host website. (Nielsen & Pernice, 2009)

**Animation vs. static ads**

Advertisers sometimes choose to use animated display advertising in an attempt to capture more attention from the surfing consumers. This is based on the wide acknowledgement that motion attracts attention in human–computer interaction and visual search. (Wolfe, 1998; Kuism et al., 2010) Duchowski explain the peripheral motion detection as a kind of early warning system to quickly react on moving targets that enter the visual field. (2007) However, when it comes to how effective animation is in the specific case of online advertising, the findings from previous studies have been inconclusive. Several studies indicate that animated ads attract more clicks than static ads. (Kuisima et al., 2010) A positive relationship between the levels of animation and the amount of attention have also been found. (Yoo, et al., 2004; Yoo & Kim, 2005) In contrast, other studies have shown that animation does not increase the visual attention to online ads, especially when the consumers are performing goal-directed search tasks. (Drèze and Hussersh, 2003) Some studies reached findings that go even further when implying that animated objects in ads can disturb and irritate the consumers while performing a task. Animation thereby devalues the ads and makes the consumers ignore them in a larger extent. (Tavassoli, 2008) Kuism et al. takes a middle road in a more recent study stating that animation increase attention for certain ad formats, such as skyscrapers but not horizontal banners. (2010)

**Obtrusive vs. not obtrusive**

Some techniques that advertisers can use to force the consumers to see the ads are: pop-up ads and having the ads take over the whole page. (Goldfarb & Tucker, 2011) In this report these kind of ads will be referred to as obtrusive ads. Similarly to the effects of animations, previous findings on the effectiveness of obtrusiveness are inconclusive. It has been found that the obtrusiveness of the ads actually increase the purchase intent. (Spalding et al., 2009; Goldfarb & Tucker, 2011) However, when the obtrusiveness was combined with targeting - the ads became ineffective. The reason for this was believed to be that if the consumers feel that the advertiser is trying to manipulate them, it will have a negative effect on the purchase intention. (Campbell, 1995; Goldfarb & Tucker, 2011) Obtrusive ads will increase the attention to the ad and thereby also highlight the strategy of targeting, which in a larger extent leads to the perception of manipulation. (Goldfarb & Tucker, 2011) These findings are not consistent with other findings that provide evidence that the consumers experience online ads as distracting (Nielsen, 2000), hindering visual search and are intrusive (McCoy et al., 2007; Kuism et al., 2010)

**Format and placement**

The format and placement of design elements and ads are among the first features that get identified by the peripheral vision when entering a new website. (Wedel & Pieters, 2008; Kuism et al., 2010) The most typical formats on ads are horizontal rectangular-shaped banners and vertical skyscrapers. Banners are usually placed in the very top area of the web page (Kuisima et al., 2010) but can also be found in the content area. Skyscrapers are usually placed on the alongside of the content area, most commonly on the right side. (Kuisima et al., 2010)

Previous studies have shown that out of these two formats, skyscraper is most favourable. (Burns & Lutz, 2006) This goes in line with the findings that stimuli closer to the informative content area attracts more attention than stimuli further out in the peripheral vision. (Kuisima et al., 2010) It is also consistent the with the banner blindness theory - since banners are widely used the consumers expect ads to be placed in the top area of the website and have learned to avoid them more easily than ads found on lower parts of the same site. (Benway & Lane, 1998; Bernard, 2001; Kuisima et al., 2010) Previous studies have shown that skyscrapers have an advantage over banners also when it comes to memory and recognition of the ads. (Drèze & Hessersh, 2003; Kuism et al., 2010)
Targeting of ad content

Even if the ads are targeted and somewhat relevant for the consumer, it will probably not affect their initial attention to the ads since the consumers are banner blind and have learned to ignore everything that looks like advertising. However, if matching ads to the content of a website the exposed consumers might get increased purchase intent. (Goldfarb & Tucker, 2011) This is called contextual targeting and implies that the ads are adapted to match the context of the current website. Another way to target advertising is through behavioural targeting, where the ads are based on information collected on each individual consumer’s browsing or searching behaviour. In this way the ads might not be as relevant for the context of the website, however, very relevant for that specific consumer. (Yan et al., 2009) As mentioned before, if targeting is combined with obtrusiveness it can have a negative effect on the consumer.

Visual attention

The Eye

The rear inner surface of the eye is called the retina. This area contains photoreceptors that are sensitive to the light that comes in through the pupil and converts the light into neural signals that leads to deeper visual centres of the brain. The photoreceptors can be divided into rods and cones. There are approximately 120 million rods, which are more light sensitive than cones but only provide black and white vision. The approximately 7 million cones are functional in daylight and then they provide the perception of colour. (Duchowski, 2003; Wedel & Pieters, 2008) The cones are mainly concentrated on the central yellow spot in the retina called the macula. In the centre of the macula a 0.3 mm diameter rod-free area are found called the fovea centralis (or just fovea). This area has a high density of cones and is located opposite the pupil, which enables a high visual resolution in the very middle of the visual field. It is therefore sensitive to highly spatial frequencies, such as local features, fine details and edges of objects. (Wedel & Pieters, 2008) However, this centre is very small and covers only about two degrees of the visual field, which is approximately 8% and can be visualised by the size of a thumbnail on an arm’s length. (Wedel & Pieters, 2008; Nielsen & Pernice, 2009) This part of the visual field is called the foveal vision. The rest of the visual field, the greater majority, is called the peripheral vision. (Nielsen & Pernice, 2009) Due to an increase in size and a decrease in density of the photoreceptors on the rest of the retina (the periphery), the visual acuity is much lower for the peripheral vision. Instead this area is sensitive to low spatial frequencies, such as global features and large objects. The periphery can also process information much faster than the fovea. (Wedel & Pieters, 2008)
Vision

The eye is often compared to a camera because of all the similar elements. They both contain lenses, the camera’s aperture is comparable to the adjustable pupil, and the retina can be compared to the camera’s film or sensor. (Nielsen & Pernice, 2009) However, a big difference between a camera and the eye is that a camera can provide a more or less equal sharpness on the entire sensor. The eye on the other hand can, due to the limited foveal vision, at any given time only register an image where the middle 8% of the visual scene is sharp and accurate. The rest is registered by the periphery. However, this is not how we humans experience it. Even though we can only fixate at 8% of the visual scene at once, we believe that we have a clear and sharp image of the entire scene. This illusion is called complete vision and is due to the fact that everything we focus on in an entire visual scene is in fact clear. The instant we pay attention to something noticed by the peripheral vision, we point our foveal vision straight at it and it is perceived as clear and sharp. The brain then stitches together the sharp images and creates a mental picture of the scene that is much more detailed than the image we actually see at the moment. This gives us the impression that much more detail of a visual scene can be provided through the peripheral vision. (Wedel & Pieters, 2008; Nielsen & Pernice, 2009)

To create this mental picture of a scene the eyes are rapidly moving across the scene using the foveal vision to identify stationary objects of interest. These are not smooth panning movements, rather a combination of fixations and saccades. (Duchowski, 2003; Nielsen & Pernice, 2009) Fixations occur when the eye is holding still and focusing on an object or area of interest. The duration of a fixation range from 150 ms to 600 ms and constitutes approximately 90% of the total viewing time. (Duchowski, 2003) Saccades are the rapid movements of the eyes when repositioning between fixations. (Duchowski, 2003; Nielsen & Pernice, 2009) Saccades have a much shorter duration than fixations that ranges from 10 ms and 100 ms (Duchowski, 2003), which is fortunate since we actually are effectively blind during these short movements. (Nielsen & Pernice, 2009) We can only see during fixations when the eye is holding still, and when it moves we can actually not see what the eye is moving across. However, since these movements only occurs 10% of the total viewing time and we have this mental picture that the brain created for us, we do not notice this temporary moments of effective blindness.

Eye movements and visual attention

It is mainly the fixations that are registered in eye tracking studies and used to generate statistics and/or visualizations. This means that an eye tracker only tracks the foveal vision and cannot track the indirect peripheral vision. This might not sound like a problem given that we are effectively blind during saccades and cannot see clearly with the peripheral vision. However, there are two known problems when it comes to visual attention and eye tracking:
1. It is possible to look without seeing
2. It is possible to see without looking
(Krugman, 1977)

In this context “look” refers to what we fixate on with the foveal vision and “see” refers to what we perceive with the visual attention. In other words, we can look at something without paying attention to it. Just because the eye is resting on a specific item does not mean that the same object is consciously perceived by the brain. (Theuner, 2008) The person can in fact think of something else during the fixation or react on something in the periphery. (Gentry, 2007) The brain can also perceive objects with the peripheral vision without directly fixating on it with the eyes, (Kuisma et al., 2010) especially if the object is large and/or familiar. (Bojko & Adamczyk, 2010)

There are currently no scientific solutions to these problems. A very important assumption that therefore has to be accepted in eye tracking studies is that attention is limited to the foveal vision. (Duchowski, 2003) In practice this has shown to work well. (Theuner et al., 2008)

However, it is important to still acknowledge that it might not always be so. (Duchowski, 2003)

**Consumer goals**

**The importance of consumer goals**

When performing an eye tracking study it is important to pay great attention to the choice, formulation and presentation of consumer-tasks. (Duchowski, 2007; Nielsen & Pernice, 2009) The reason for this is that the intention of the consumer have a large impact on how s/he behave and react on the website and the advertising on it - thereby also on how the eye tracking data will turn out. (Wedel & Pieters, 2007) Already in 1967 Yarbus researched how the task affects the attention to a visual stimulus. Yarbus investigated how the subjects distributed their visual attention on the same painting, depending on what their current goal was. In other words, the visual scene was consistent and the nature of the tasks changed. This was his finding:

“Depending on the task in which a person is engaged, that is, depending on the character of the information that he must obtain, the distribution of the points of fixation on an object will vary correspondingly, because different items of information are usually located in different parts of an object” (Yarbus, 1967).

A more recent study by Pieters and Wedel investigated if the Yarbus implication was applicable on advertising as well. (2007) Their findings supported Yarbus implications:

“The different patterns of attention for each of the processing goals were striking and reveal how the informativeness of ads and the objects contained therein, rather than being universal, depends on the specific processing goal that is activated.” (Pieters & Wedel, 2007)

The advertising used in the study was printed advertising and the advertisements were viewed under free-viewing conditions as the subjects where told to: “Explore these freely as you would at home or in a waiting room”. The goals used were ad learning, ad evaluation, brand learning and brand evaluation. During the ad learning-goal the subjects were asked to memorize the advertisement, during the ad appreciation goal to determine how attractive the ad was etc.

This study provides valuable knowledge about visual behaviour and attention, and that the task matters in studies of visual attention. However, they are not directly applicable on online advertisement. Competition for attention is much larger for display advertising on a website compared to an ad on a full page in a paper magazine. “Free viewing” is not a common behaviour online. Users usually have some kind of goal (Nielsen & Pernice, 2009), which is not in line with “ad-appreciation” or “ad-memorization”. Therefore it has to be researched further to give any practical implications about online advertising.

Since previous studies implicate that the goal has a large impact on the visual behaviour on website it is important to know which task the subject had during a study to be able to interpret
the results. It is also important that this goal is in line with the goals that users have in reality, otherwise the eye tracking results will not reflect reality and thereby be unusable. E.g. “free viewing” as a task on a bank website, an e-commerce website or a search engine site will not give a result reflecting how their users actually look at, react on and navigate on the website. (Nielsen, 2007) Additionally, goals on websites are rarely the same for every consumer, neither for the same consumer at different times. It is therefore important to investigate the consumers performing several tasks. (Guo, 2009)

Consumer goals on e-commerce websites
When consumers visit an e-commerce website they usually have some kinds of intentions or goals. (Nielsen, & Pernice, 2009) Previous studies on e-commerce behaviour have identified these intentions and divided them into two major types of e-consumer shopping tasks: goal directed search and browsing. (Hong et al., 2005) Based on the goal that the user will apply, a certain search strategy and navigation behaviour will help them to reach their goals. If the consumer has an idea what s/he is looking for, s/he usually possess some kind of information about the product or service and will choose search strategy thereafter. (Rowley, 2000; Berthon et al., 1999) The search strategy might change during the task depending on what information the consumer obtains on the way. (Rowley, 2000)

A goal directed search task implies that the consumer has a specific goal in mind that can be fulfilled by finding specific information or a specific object. S/he is then motivated to use a search strategy to efficiently gather information and/or finish the task. These strategies can be a general search strategy stored in the brain (e.g. scanning from left to right) or specifically generated for the current task (e.g. concentrating on feature “yellow” to locate a bottle of mustard in a store shelf). (Janiszewski, 1998)

When the consumer have a more general idea of what s/he wants and a less precise view of the information that might be available they will use browsing as their search strategy. This strategy can either work as a screening process for identifying possible candidates for goal directed search, when the goal directed search strategies are inadequate (Janiszewski, 1998), or when the consumer lacks enough information to be able to define the goal. (Rowley, 2000) Browsing is a moment-by-moment activity that is very dependent on human perception. When recognising objects of potential interest, browsing can defer to goal directed search if the consumer consciously choose to do so. (Janiszewski, 1998; Rowley, 2000)

Furthermore, goal directed search and browsing represents two ends of a spectrum of search strategies and have been identified in several studies on e-consumer behaviour. (Hong et al., 2005; Janszewski, 1998; Pagendarm & Schaumburg, 2991; Rowley, 2000; Berthon et al., 1999)

Top-down and bottom up
How consumers allocate their visual attention on a website is determined by two primary mechanisms: bottom-up processes that are affected by the visual stimulus and top-down processes that is controlled by the individual behaviour. (Wedel & Pieters, 2006) These two mechanisms combined decide what elements that will attract attention, what navigational behaviour to use and thereby how the visual behaviour on a website will turn out.

Bottom-up mechanisms are affected by the properties of the visual environment itself and are thereby not directed by the consumers themselves. (Theeuwes, 2010; Wedel & Pieters, 2006) Highly salient objects or elements may get an immediate attention priority over the less salient ones. The salience does not only concern the intensity of the individual object, rather how it contrasts from its environment. (Wedel & Pieters, 2008; Theeuwes, 2010) Attributes that undoubtedly attracts attention are according to Wolfe and Horowitz: color, size, motion and orientation. (2004)

Top-down mechanisms are individual for each consumer and grows from higher cortical centres that includes memory, goals etc. (Wedel & Pieters, 2008). These mechanisms are completely under control of the intentions of the consumer, which means that s/he can choose what
elements to focus in a visual scene depending on their relevance or informativeness for their current task. Top-down decisions are in other words based on the consumer’s previous experiences and current goals, and enable him/her to direct the visual attention to areas of the website where s/he expects to find the wanted information. (Theeuwes, 2010; Wedel & Pieters, 2008)

**Navigation behaviour**

The top-down and bottom-up mechanisms combined will decide how visual attention will be divided on a website. The consumers’ attention to elements on a website therefore depends on the perceptual salience of the objects (bottom-up), on their contrast to the surrounding (bottom-up), and on their perceived goal relevance or informativeness in the scene (top-down). (Wedel & Pieters, 2008)

The general findings from previous studies are that even though the mechanisms combined determines the visual behaviour on a website, the bottom-up factors have a larger impact when the consumers are browsing and top-down factors affects more during goal directed search tasks. (E.g. Kuisma et al., 2010; Hong et al., 2005; Pagendarm & Schaumburg, 2001) More specifically, during goal directed search tasks, the consumer can use the top-down mechanisms to direct the attention to areas of the website where the information- or clues about where to find the wanted information are expected to be found. The information is thereby voluntary selected guided by a higher cognitive process. (Pagendarm & Schaumburg, 2001) Browsing on the other hand is a more stimulus driven process than goal directed search tasks. (Janszewski, 1998)

**Attention to online advertising**

**Advertising impact**

Since the widely used measurement for online advertising impact - Click Through Rates (CTR), has been criticised for being misleading and an ineffective measurement of banner effectiveness (Drèze a& Husserr, 2003; Hsieh & Chen, 2011), traditional brand equity measures can be seen as more reliable. (Drèze and Husserr, 2003) The benchmarks measured are then *brand awareness, brand recognition, unaided advertising recall and aided advertising recall*. (Drèze and Husserr, 2003) Studies have shown that it is possible to unconsciously store visual representations of objects in the visual memory without explicitly remember seeing them. (Kuisma et al., 2010) This is something that cannot be analysed neither by CTR nor recall and awareness. It is moreover not possible to know if the consumer saw the ad but was not interested or if s/he looked at it but did not see. These attention-related matters could instead be revealed and analysed by eye tracking. (Guo, 2009)

It is important to distinguish attention studies from ad impact studies. Impact is definitely linked to attention; however, consumers’ attention to an ad does not necessarily imply that the ad had a real impact on them. An eye tracking study will measure the attention (noticeability and interest) to the advertising while its impact is more subjective and cannot be measured by analysing where the consumers look. Combining impact- and attention studies will thereby provide more information about the how the ad is perceived by the consumers.

**Elaboration Likelihood Model (ELM)**

A conceptual framework that is considered to be the most comprehensive model for explaining advertising effects is the *Elaboration Likelihood Model* (ELM) developed by Petty et al. (1983). According to this model there are two routes where elaboration can take place; either the central processing route or the peripheral processing route. The consumers take the central route when they are highly motivated to process the ad and the ad thereby speaks to the active thinking of the consumer. The peripheral route is taken when the consumer’s motivation of involvement is
low and the ad thereby speaks to the consumer’s emotions. (Spilker-Attig & Brettel, 2010; Kuisma et al., 2010)

The ELM model that have been recognised by many has also criticised for being oversimplifying the advertising processing. (Kuisma et al., 2010) The model has also been modified by Cho (1999) to be more suited to the processing of online advertising. (Cho, 1999; Kuisma et al., 2010) He argues that in an online environment the consumers get exposed to advertising both voluntary and involontary. However, when surfing online the consumers are more focused and goal oriented than in traditional media, which results in that they in most cases treat the online ads under low involvement conditions, through the peripheral processing route. (Kuisma, 2010; Cho, 1999)

Banner blindness

In the introduction of this report it was mentioned that users almost never look at anything that looks like advertising whether or not it actually is advertising. However, the extent of banner blindness can be affected by several factors. These factors will be introduced and discussed in this chapter.

Goals and banner blindness

Since bottom-up- and top-down factors determine how the consumer allocate their visual attention on a website they also determine the extent of banner blindness that the consumer will experience on a specific website with a specific goal in mind. Previous studies have shown that users ignores banners to a greater extent when performing a goal directed search than when just aimlessly browsing the website. (Pagendarm & Schaumburg, 2001; Janiszewski, 1998; Danaher & Mullarkey, 2003) The reason is explained by the above mentioned theory that since the users do not have a specific goal they are aimlessly navigating around on the site they are more likely to respond to appealing or salient stimulus, which in many cases can be the display advertisement. (Pagendarm & Schaumburg, 2001; Janszewski, 1998)

Time and banner blindness

The extent of the banner blindness can also be affected by where the consumer is in the time frame that a certain task implies. This phenomenon is called attention inertia and implies that the allocation of attention that takes place during a task not is uniform throughout the whole task. (Wang & Day, 2007) Findings from previous studies hints that ads placed in the beginning and the end of a task’s time frame will capture more attention compared to the ones exposed to in the middle of the task. (Wang & Day, 2007)

Competition for attention

When a consumer enters a website all the objects and elements(including ads) can be seen as potential candidates for the consumer to direct the visual attention. When one object is fixated on with the foveal vision, all the other objects displayed on the screen constantly compete for the visual attention. (Hong et al., 2005) Factors that have shown to give advantages in the competition for attention are:

- Contrast
- Size
- Closeness to object of focus

(Hong et al., 2005)

The closer the unattended object is to the current object of focus the more likely it is to compete for the consumer’s attention. This is due to the fact that an object further away from the point of focus is projected on a part of the retina with a lower density of cones, which will aggravate its signal to the brain and make the object less prominent. Larger sizes and more contrast can compensate for the aggravated signal. A larger size of an object means that the projection of the object is disseminated over a larger amount of cones and consequently generates a stronger signal to the brain. More contrast on an object activates the cones more, which also results in a stronger signal. (Janszewski, 1998)
Except from the competition for attention within a website, the competition between websites is much larger than the competition between magazines and TV-channels. There is an infinity of websites that could provide the user with the same information or offers. The users know this, which makes them picky, disloyal and impatient. It is therefore a challenge for the website itself to not only attract users to the site, but also to keep them there.

**Advertising on SERPs**

Advertising on SERPs (Search Engine Result Pages) do not face the same competition for attention that other kinds of online advertising do. This is due to several factors: The format of the advertising, the content of the website and the informativeness of the ad and the users’ behaviour on the website. (Nielsen & Pernice, 2009) The text format of the advertising is easy to register and does not look like the kind of (salient) online advertising that the consumers have learned to avoid. The content on the website is a long list of results on the query, which means that there are no objects or design elements that captures attention stronger than others. There is still a competition for attention between the results, however, not as strong as on other more graphical types of websites. (Nielsen & Pernice, 2009) The ads on SERPs are furthermore based on the search query, which makes them relevant and informative for the consumer. The goal is to find suitable information among the results given to him/her. Since the ads might contain relevant information, it is more common that the user at least look at the text advertising on SERPs. (Nielsen & Pernice, 2009; Nielsen, 1997)
Methodology background

In this chapter eye tracking methodology-theory will be introduced. It will be presented why, when and how eye tracking studies are conducted, which must be described to understand both what to study and how to study it.

Eye tracking: why and when

Eye tracking in usability studies

Eye tracking is not a research method for itself, but rather a complement and enhancement to other studies. Eye tracking has grown to be a usable tool for e.g. usability studies, where the usability study then provides a context for the eye tracking. (Lew, 2009) The question is thereby not: “Should we do a usability study or an eye tracking study?” but rather: “Should we include eye tracking in our usability study?”

In usability studies there are three dimensions that can be studied to provide feedback of the how the users act and react on a website:

- **Behaviour**: What people do. This is studied by giving the subjects context, task and visual stimuli and then observe how the act.
- **Attitude**: What people say. This is studied by think out loud methods and or interviews reveals how the react on visual features and how their purchase intent get influenced.
- **Attention**: What people focus on. This is harder to study since it happens inside the users head and is a process that the user him/herself is unaware of. However, a tool that can measure this better than other known methods is eye tracking. (Lew, 2009)

Usability testing, without eye tracking, can answer practical questions that reveal how users behave on a website as well as their attitude towards it. Usually this is much cheaper than involving eye tracking and enough to find most usability errors. (Nielsen & Pernice, 2009:2)

However, while usability testing can reveal the outcome of an interaction, eye tracking can reveal factors that contribute to these outcomes and can be used for more detailed analysis. The eye tracking data can thereby help in the understanding and illustration the usability problems (Lew, 2009) E.g. if in a usability study the subject was asked to find the contact information of the company and successfully finds it, however, after a whole minute, that will give the insight: it was possible to find the information but it took quite a long time. An eye tracking study can probably also answer why. Where did they first look to find the information? Or did they see the link but did not understand that it was the right one?

Eye trackingless usability studies will reveal most usability errors on a shorter time and a much lower budget. The eye tracking can be useful after several usability studies have been conducted to visualize the usability error and/or to analyse why the usability error occurs.(Nielsen & Pernice, 2009:2)

Usability vs. attention to ads

In usability studies, differences that are related to performance are usually measured. This includes measurements of cognitive workload, ease to complete a mission etc. When studying online advertising user performance is not as important since the study does not focus on usability; instead attraction-related differences are measured. (Bojko, 2012) Attraction-related differences stronger links to attention, which implies that eye tracking has a larger role in these kinds of studies.

Except from the fact that there are different things that are being measured in usability- and advertising studies, the usage of interactive elements on a website is very different from the usage of ads on the same site. The reason for this is that the consumer does not have any particular use for ads in the same way as for navigation elements, product information and
editorial information on the website. Consumers go to the website to perform a task – not to look at the ads. (Guo, 2009; Nielsen & Pernice, 2009) In a usability study, the task given to the consumer can directly regard the information, element or function that is being studied. In an advertising study, the task given to the subject cannot directly regard the ads since it would not be a realistic task to perform on the website. Consumers do not usually notice ads and tasks focusing on them would therefore bias the subjects and draw attention to parts of the site normally would not be interesting. (Guo, 2009; Nielsen & Pernice, 2009) To measure how attractive advertising is an eye tracking study can provide information about the consumers’ attention, interest and emotional arousal regarding the advertising studied. (Bojko, 2012)

The “So what?”-problem

Eye tracking can provide insights and answer several questions about how consumers use, perceive and navigate on a website. It can answer questions about the overall design or layout of a website as well as for specific elements. (Bojko, 2012) These are all very interesting insights. However, how usable is an interesting insight if it does not result in an improving action? Bojko calls this the “so what”-problem. She argues that the research should be conducted to inform decisions and that an insight should be actionable rather than just interesting. (2012)

Qualitative- and quantitative insights

The actionable insights that can be reached with eye tracking studies can be divided into two main categories: qualitative- and quantitative insights.

Qualitative insights are reached by formative eye tracking studies and can help explaining how usability problems occur. (Bojko, 2012) Live-viewing and analysis of visualizations, e.g. heat maps and gaze plots, are ways to get these kind of insights. Qualitative studies can explain known or anticipated problems as well as to detect unanticipated problems. (Bojko, 2012) The insights reached from these kinds of studies are actionable in that sense that it will provide knowledge about what in the interface of the website that caused a problem, and thereafter make specific recommendations. (Bojko, 2012)

Quantitative Insights are reached by summative studies that will provide statistically significant data and explain typical behaviours. (Tobii, 2012) It can answer yes/no questions rather than why?-questions and measure differences between versions of websites or advertising. (Bojko, 2012)

Measurements of attraction

Eye tracking raw data, such as a heat map might prove a point and make the findings easier to interpret. However, a result consisting of just a heat map will in most cases not provide any actionable insights and thereby create the “so what”-problem. (Duchowski, 2007; Bojko, 2012) When it comes to quantitative studies, metrics have to be used to get these more usable and actionable insights. The results from an eye tracking study will not only show what the subjects looked at, it will also provide more detailed information that can give insights concerning how deep the attraction for the advertising was. Bojko have divided the concept of attraction into three stages: noticeability, interest and emotional arousal. Depending on which stage that is being studied different metrics can be used. (2012)

Noticeability

To be visible and get noticed by the consumer is the first challenge for all online display-advertising. Factors that can affect the visibility of an ad are primarily its appearance (design, size, style) and placement. (Nielsen & Pernice, 2009; Turigas, 2012) The noticeability of an ad can be studied through eye tracking by following metrics:

• The percentage of participants who fixated on the advertising
• How long the time before the first fixation on the advertising

These two measurements show how well and how fast the advertising captures attention compared to other objects and elements in the visual scene.
Interest
Once the consumer has noticed the ad, the next step is to arouse and maintain interest. This can be made by being relevant/informative to the consumer’s task or creating a new desire. How interested the consumer gets by an ad can be measured with following eye tracking metrics:

- Number of fixations on the advertising
- Total visit duration on the advertising

These metrics will show if the consumers actually look at the ads or if they just notice them and then move on. Both noticeability and interest are crucial when determining if an ad is attractive or not and should therefore be reported together. (Bojko, 2012) E.g. 80% noticed the ad and fixated at it the ad during approximately 2 seconds.

Emotional Arousal
When studying emotional arousal with eye tracking, it is usually done by measuring variations in pupil diameter. (Bojko, 2012) This is an immature area that still is being researched. (Wedel & Pieters, 2008)

Eye tracking: How?

Equipment
There are several kinds of eye tracking equipment to use when performing eye tracking studies, both head mounted and connected to the monitor of use. The modern version of head mounted equipment is so called eye tracking-glasses. The glasses are mobile and allows the subject to move around and interact with objects in real world environments which is required in e.g. shopper-studies and studies of out-of-home advertisement. (tobii.com) In studies where the stimulus can be presented on a screen, e.g. web studies; the trackers that are directly connected to the monitor are a better alternative. These eye trackers record the action on the screen and connect it with the eye tracking data. The software can thereafter, based on the data from all participants of the study, automatically create gaze plots, heat maps and statistics based on marked areas of interests (AOI’s). It is also possible to watch the eye tracking data live on another monitor while the subjects perform their tasks. A microphone and web camera can be connected to capture the user’s reactions during the study. These eye trackers are today not much larger than a normal computer screen, which makes them portable and able to use both in laboratories and in environments that are more contextually relevant for the study. (tobii.com)

To read more about the technology behind eye tracking:
- www.tobii.com

Environment
Eye tracking studies are usually performed in a lab environment. The lab does not have to be advanced, however, it is important that the environment and possible distractors can be controlled and are consistent between the participants of the study. For most studies, an office or conference room will work as a complete lab. (Nielsen & Pernice, 2009:2) The study would gain ecological validity if it was conducted in a more realistic place, such as the subjects home, but it would also lose internal validity since it would add more uncontrollable variables. (Duchowski, 2007) Factors to think about when preparing a lab are:

Lights
Eye trackers are sensitive to sunlight since it contains a lot of NIR(nearby infrared) light. The lab should therefore be located indoors and preferably in a room without windows. If the lab has windows they should not directly face the participants nor the eye tracker. (Tobii, 2012) Nielsen
It is also important to check the lights in the lab, since some halogen lamps also can emit NIR light. (Tobii, 2012)

**Chair**

The chair should preferably have an adjustable height so that all the subjects are within the eye tracking height while seated comfortably in the chair. The chair should not have wheels since this could result in the subject moving around and thereby ruining the calibration. (Tobii, 2012; Nielsen & Pernice, 2009:2)

**Distractors**

The amount of distractors exposed to the subject should be minimized or eliminated. (Nielsen & Pernice, 2009:2) Unnecessary objects located in the visual field should be removed. The subject should furthermore not be distracted by anything in the peripheral vision since this could lead to “seeing without looking” and “looking without seeing” (see p.12). For the same reason the moderator’s screen should be located out of site, preferably the moderator as well since a present moderator could encourage unnecessary conversation while the subject watches the screen, since looking without seeing might occur.

**Study design**

**Within-subject or between-subject**

When several conditions (e.g. different tasks or designs) are investigated in eye tracking studies, there are several ways of how to do this. The two most common approaches are *within-subject* or *between-subject* designs. With a within-subjects design, also called repeated measures design, one single group of participants will be investigated during all the conditions. In a between-subjects designed study, each condition is assigned to a different group of subjects. The most conspicuous problem with the within-subject design is called *order effects*, which means that the order of the different tasks might affect the analysis of results. To compensate for this, the tasks can be assigned to the participants in random order. A common way to do this is to use a Latin square. (Duchowski, 2007)

*A Latin square is one way of mixing tasks during a within-subject study to avoid order effects. Participant 1 starts with task A, then B, and C. Participant 2 starts with task C, then A and B. Etc. When the Latin square is finished it should start from the beginning again.*

![Figure 6](image)

The order effect problem is avoided in a between-subject design, which instead comes with other disadvantages. Firstly, for every condition investigated a new group of subjects have to be recruited, which is both costly and time consuming. Secondly, there might be variances between the different groups, which can complicate the analysis of the data. When performing between studies it is therefore important to avoid accidental homogeneity in the groups. (Duchowski, 2007)

**Tasks**

**Task design**

As mentioned earlier in the report, the task performed in a study is very critical for the outcome of the eye tracking-data. Tasks should therefore be chosen with consideration and care. (Duchowski, 2007) There are several factors that should be considered when designing and formulating tasks:

- **Realism:** To get realistic results the tasks have to be based on realistic tasks performed by the real target group. (Nielsen & Pernice, 2009)
• Clarity: To avoid misinterpretation of the tasks the have to be clearly defined to the subject. (Duchowski, 2007) It is therefore important to work on and try out the formulation of the task.

• Consistency: To make sure that the subjects get the same understanding of the task the instructions should be scripted, so that every participant gets exactly the same instructions. (Duchowski, 2007)

• Amount: The subject’s performance can be affected by learning how the website looks and/or work. A good idea is therefore to use as few tasks as possible a draw conclusions from these. (Tobii, 2012)

Since the tasks affect the results of an eye tracking study it is important to include the tasks, with the exact task formulation, in the report. (Tobii, 2012; Duchowski, 2007)

**KISS-principle**

When it comes to designing tasks for eye tracking studies, Duchowski recommends the KISS-principle: *Keep It Short and Simple.* (2007) This implies that tasks should be short in time and thereby limited to minutes rather than hours. Eye tracking recordings consists of a lot of information and longer recordings will require a lot of memory space. Keeping the recordings short will make the data more manageable. Short tasks will also allow more frequent calibrations, which will ensure more accurate eye tracking data. To keep the tasks as short as possible, longer tasks can be divided into sub-tasks. (Duchowski, 2007)

The KISS-principle cannot be applied in all scenarios. In some cases shortening of tasks will affect the realism of the behaviour on the website. An example of this that is relevant for this report is during *browsing.* (Duchowski, 2007)

**Warm-up task**

The subjects should preferably perform a warm-up task on another type of website before starting with the original eye tracking test and recalibrate after the warm-up task. This will give the subjects “wet feet” and they will become more comfortable in the situation of performing tasks under observation. They will also become more confident and relaxed after successfully completed a task. (Tobii, 2012) The reason for the recalibration is that the subject might have gotten more comfortable and changed seating position. (Bojko & Adamczyk, 2010) A website that is not similar to the website being studied when it comes to design and the consumer’s intention on the website is better for the warm-up task since it will not affect the subjects visual navigation behaviour on the original test website.

**Recruiting**

**Target group**

How users act and react depend on a lot of factors. It is therefore important to analyse the right target group in eye tracking studies. If the wrong target group is analysed this will generate results that does not reflect how the real users act and allocate their visual attention on the website. (Nielsen & Pernice, 2009:2)

**Sample size**

The sample size(number of participants) needed for a study very much depends on which research method that is used. In e.g. eye tracking usability studies there are large differences between qualitative and quantitative studies. (Bojko & Adamczyk, 2010; Nielsen & Pernice, 2009:2) Nielsen and Pernice argue that for qualitative usability studies using eye tracking 5 participants is enough (2009), while for generating a stable heat map the sample size should be around 30 participants This is based on a study of several websites where they reached the conclusion that at 30 participants the correlation was 0.85 which is enough to make stable heat maps. (Nielsen & Pernice, 2009:2). However, there are other studies that have shown a different result. E.g. Van Diepen reached the conclusion that n=17 was enough to get valid heat maps in a web study. (2009)
The sample size also depend on if the study is a within-subject design or a between-subject design. A between-subject design requires a larger sample size for every condition being compared. (Bojko & Adamczyk, 2010; Nielsen & Pernice, 2009:2)

It is also important to over recruit to ensure that at least the wanted amount of data will be analysable. Tobii recommends at least 5% over recruitment. (Tobii, 2011)

**Aggravating factors**

When recruiting participants it is important to know about what factors that aggravates the eye tracking and try to avoid them since they might generate unanalysable data. These factors are:

- Bifocal glasses
- Large amounts of mascara
- Coloured lenses

One eyed and cross eyed people can cause difficulties, however, if correct setups are used in the software it should not be a problem. A very small amount of people cannot be eye tracked for unknown reasons. (Tobii, 2011)
The Bokus study

This chapter will present the Bokus-study - a study that was practically conducted to further investigate the navigation behaviour’s impact on the visual attention to internal ads on an e-commerce website. The methodology used in the experiment is based on theories described in the previous chapters.

Goal

The goal of the Bokus-study was primarily to further investigate how the consumers’ task affect their visual attention to internal advertising on an e-commerce website. A secondary goal was additionally to evaluate the methodology that specifically was developed for investigating these specific variables in an e-commerce environment.

Bokus.se

The website that got chosen for the study was Bokus.se - an e-commerce website that sells books online. It has a classical layout for e-commerce websites, with left menu, top menu, search field on top of the page, featured products in the middle content area of the main page and advertising in a right column as well as some banners in the content area. (See figure 3, pp. 7) These were almost exclusively internal advertising that had a classical display ad-design with text and pictures promoting books sold on the website. During the whole study the website was static and unchanging.

Measurements

The study was carefully designed with realistic tasks and the data was analysed after the experiment was completed. The advertising on the website were marked as areas of interests(AOI’s) and the noticeability and interest to these AOI’s were measured with four different metrics and compared between ads and tasks.

Participants

Within-subjects design

The study had a within-subjects design, which means that one single group of participants was investigated while performing the different types of tasks. To compensate for possible order effects the tasks were assigned to the participants in random order by a Latin square.

Sample selection

The target group used for the study was Media Technology students at Royal Institute of Technology in Stockholm.

Sample size

Due to limited time and resources and an additional limitation in the possible duration to keep bokus.se static, the sample size used was n=12, which is a relatively small sample size for a quantitative eye tracking study. However, even though the sample size was not enough to provide statistically valid data, it is still large enough to give as strong indication on how the visual attention is affected by the consumer’s task when using this specific methodology. It will reveal differences in results compared to previous studies using other methodologies, as well as reveal weaknesses in the current methodology.
Environment
The study took place in a lab environment since it gave better control over factors that could affect the eye tracker (light etc) or the subjects (distractions). The study would gain ecological validity if it was conducted in a more realistic place, such as the subjects’ home, but would also lose internal validity since it would add more uncontrollable variables. (Duchowski, 2007) However, in this study the lab was a well-known meeting room at the subjects’ university, which is not a completely unrealistic place for the subjects to order a book of any kind.

Tasks
The cover study of the research was a usability study. The reason for this was to not affect the result of the eye tracking study by giving the subjects hints about the real goal of the experiment since it could make them bias and more aware of the advertising.
To make the subjects act as natural as possible the tasks were realistic, personally formulated and simple. The subjects were also told to act as natural as possible and ask questions if there were any uncertainties. The tasks were scripted and displayed on the screen to ensure that the instructions were consistent throughout the whole study.

Task types
Since the goal of the experiment was to investigate how the tasks affect the viewing behaviour, the participants were given several tasks that were based on realistic situations and typical behaviour on e-commerce sites. These were:

- **Browsing (task A)**
  The subjects got to choose a book of their own choice.
  Formulation: *You have decided that you should read more. Find a book that you think would be interesting and readable*

- **Directed browsing (task B)**
  The subjects got directions on what kind of book to browse for:
  Formulation: *You are going for a holiday in the sun and want to buy an exiting detective story to read on the beach.*

- **Goal directed search (task C)**
  The subjects were told to find a specific book title and got some additional information about the book:
  Formulation: *You have heard of a new detective story-author that got you interested. You do not remember his/her name but the title of the book was “De Korrupta”*

The order of the tasks were mixed by a Latin square to avoid order effects.

Limitations
The subjects were not allowed to use the search field on the website. The reason for this was that if they searched the study would not generate a visual search behaviour possible to compare to the result from the remaining tasks since the search result pages on Bokus.se did not contain any ads.
Complementing Questions

Follow-up questions
After each task the participants were asked to orally answer a question of how the task went and why they picked their book. This worked as a complement to the eye tracking data and provided information about why the subjects allocated their visual attention in a specific way during the tasks.

Questionnaire
When the eye tracking part of the study was completed, the participants got to answer a short questionnaire (included in the study software in Tobii Studio) where they were asked to recall (unaided) the advertising seen on the page. Some demographic questions and questions about their previous experience of Internet and e-commerce websites were also included in the questionnaire.

Analysis

AOI’s+Statistics
The main tools for analysis will be statistics generated from the AOI’s. The metrics measured are:

Noticeability
- **Percentage** of participants who fixated on the advertising
- **Time before the first fixation** on the advertising

Interest
- **Number of fixations** on the advertising
- **Total visit duration** on the advertising

Heat maps & gaze plots
As visualisations heat maps and gaze plots for each task were created and compared. These worked as complement to the statistics and provided a clearer overview. It also gave a picture of if there were typical ways to look at the website, and if it differed between the different tasks.

Hypotheses
The following hypotheses are based on theories and findings presented in the background chapters:

**H1:** When performing a goal-directed search the subject will ignore the banners to a larger extent than in the two browsing tasks.

**H2:** When browsing (undirected) the advertising will get more attention than in the other two task types

**H3:** More targeted advertising (ads on category page and book pages) will not get more attention than the ads on the main page.

**H4a:** Horizontal advertising (banners) AOI’s that are located in the content area will get more attention than vertical advertising (skyscraper) AOI’s.

**H4b:** The upper horizontal ad (banner) will receive attention fast and from most participants.

**H5:** Since the advertising is internal, thus contextual and informative, it will not be perceived as intrusive.
Results

In this an informative chapter where results of the Bokus-study will be presented. These will be divided into sections about noticeability and interest with the subcategories: general findings, main page and book pages. The results mainly consist of statistics, but also some heat maps and gaze plots. The results are analysed and discussed further in the next chapter.

Noticeability

As mentioned in the methodology section (pp. 18) noticeability is the measurement of how visible the ad is to the consumer and to what extent it gets noticed. This is measured by:

- **Percentage fixating** on the ad
- **Time before first fixation**

General Findings

The general findings describe how noticeable the ads were across the whole study measuring the participants' attention during all three tasks. These findings therefore show the general noticeability of the ads without categorizing them according to the nature of the tasks.

*Figure 7*

The main page on Bokus.se with the AOI's marked. The upper middle banner is placed in the content are, above the main content. The lower middle banner is placed in the content area under the fold. On the right side a skyscrapers and the recommendation "Veckans recenssion" are found. On the left side the external ad Coop Med Mera is placed.

The general findings in summary:
• 92% of the participants (11/12) fixated on the upper middle banner placed in the content area at some point during the study. This banner was fixated on within the first second by most of the participants that fixated on it.
• 67% fixated on the lower middle banner further down in the content area (“under the fold”).
• 50% fixated on the sky scraper on the right side of the webpage.
• 33% fixated on the Coop Med Mera-ad in the lower part of the left menu.
• 33% fixated on “Veckans Recenssion” below the advertising on the right.

During tasks
Tasks:
A = browsing task
B = directed browsing
C = goal directed search

Main Page
Percentage fixating
As expected a high percentage of the participants fixated on the advertising on the main page when they performed the browsing task (A). However, an equal amount of participants fixated on all the ads except from the lower middle banner when performing the goal directed search task (C). (Even more on the Coop Med Mera-ad.)

The percentage fixating on the advertising on the main page when performing the directed browsing task (B) were substantially lower compared to the other tasks. However, an important aspect when analysing this result is the time spent on the page. When performing task B the participants left the main page after in average approximately 11s, in A after 28s and C after 16s.

Since the participants left the main page relatively fast when performing task B, noticeability of ads on the category page: “Deckare” which 67% of the participants went to, were also measured.
This page did not have an upper middle ad and the lower middle banner was placed even lower than the corresponding banner on the main page. Despite this, 75% of the participants who visited this page during task B fixated on it. That was a higher percentage than the percentage of participants fixating on the lower middle banner on the main page during all the three tasks (66.67%). 0% fixated on the ad when performing task C. However, only 33% of the participants made it to this category page during the task and the wanted book was placed right above the lower middle banner and also above “Veckans Recenssion”.

**Chart 2.** Percentage fixating on main content and ads on the category page “Detective stories” (Deckare).

**Time to first fixation (TTFF)**

When it comes to the TTFF on the ads there were many differences found in the collected data. To get a comprehension on how the TTFF relates to rest of the content on the website, the TTFF on the upper and lower content of the page have also been added to this chart.

**Chart 3.** Time to first fixation (TTFF) on main content and ads on the main page.

The results show that the upper middle banner was fixated on early during all the tasks, most times even before the page content located right below it. When it comes to the other ads they all got
relatively long TTFF. If the numbers are put in relationship to the average time spent on the page for all the participants this becomes clearer. \((A = 28s, B = 11s \text{ and } C = 16s)\) It is most visible for the \textit{Coop Med Mera}-ad during the goal directed search task(C). The average TTFF was 35.06 s, which is more than double the average time spent on the page for all participants during task C. This was the most extreme example, however, if looking closer at the chart it becomes clear that in task C the TTFF for most of the ads are longer than the average time spent on the page for all the participants (including the ones that did not fixate on the ads). In other words, the participants who fixated on the ads generally stayed on the page for a longer amount of time than the ones who did not fixate on them. This was also the case for the directed browsing task(B) that only had 11s as the average visit time. However, in the browsing task(A) this phenomenon only occurred for the right skyscraper, the rest of the ads(which also had long time to first fixation) were not longer than, the average time spent on the page.

In this specific study the differences in TTFF are not statistically valid since they are based on a low percentage of the participants and the deviation is large. However, it is notable that, both in task A and B, the TTFF is relatively long for all the ads except from the upper middle banner.

**Heat map**

The noticeability findings might be better understood when visualized. The heat maps below shows that the gaze patterns were similar when performing task A and C, but different when performing task B. It is clear that the upper middle banner got attention and that even though the other ads capture some attention, it is less than for that ad or other elements of the page. These heat maps also explains the “gaps” in TTFF for the ads. Most participants started out fixating on the upper part of the content area, where the upper middle banner was located. Other elements that attracted attention were the left menu and the top list. However, since these are not interesting for this study the have not been chosen as areas of interests(AOI’s).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure8.png}
\caption{Heat maps showing the navigation behaviour on the main page during task A, C and B. Green represents fixations and yellow and red indicates more and/or longer fixations. The patterns are similar between task A and C, but different for task B.}
\end{figure}
Book pages

When the subjects during the browsing task(A) and the directed browsing task(B) got to pick a book of their own choice, 11 out of the 12 participants, entered one or several book pages. The book pages displayed a picture of the book cover, information about the book, book description, possible user reviews and three different kinds of internal ads, in form of recommendations, to encourage additional sales. Below the description one book was “matched” with the current book (upper recommendation) and right below that more books by the author were displayed (lower recommendation). In the right column, books are listed under the topic “People who bought this book also bought…” (right recommendation). The book pages were not identical to one another since they all displayed different books and thereby different ads/recommendations. However, the layout of the book page and the ads on it were consistent between all the pages.

Percentage fixating

The most noticed ad was the upper recommendation. For the two other recommendations the result was inconsistent between the two tasks. When performing the browsing task(A) more participants fixated on the right recommendation than the lower ad. In the directed browsing(B) the situation was reversed.

Figure 9

The internal ads on the book pages are targeted recommendations based on the current book. The upper recommendation matches the book with another book and shows their total price. The lower recommendation displays other books from the same author and the right recommendations shows what buyers of the current book also have bought.
Time to first fixation

The right recommendation was generally fixated on earlier than the upper recommendation. The upper recommendation was then fixated on before lower recommendation. Between the two different task types the results indicates that during the directed browsing task (B) the participants focused on the recommendations earlier compared to the browsing task (A). It should be noted that the results when it comes to TTFF are very inconsistent between the individual participants. The most extreme example is the TTFF on the upper recommendation that during the browsing task (A) that got the average TTFF=14s. The individual TTFFs ranged from 0s to 54s, and most of the subjects individual TTFF were far away from the average TTFF. This means that for this study no valid “typical behaviour” when it comes to fixating on the recommendations were found.

![Chart 4. Percentage fixating on ads/recommendations on book pages.](image)

![Chart 5. TTFF on ads/recommendations on book pages.](image)
Interest
Once a subject have fixated on an ad, the subject’s interest of the ad can be measured with following eye tracking metrics:

• Number of fixations on the ads
• Total visit duration on the ads

Main Page
Total Visit Duration(TVD)
To get a better comprehension of the relationship between the TVD and the rest of the content on the website, the TVD for the upper- and lower content area have been added also in the charts. As seen in the chart the average TVD is below 1s for all the ads, regardless of which task performed. The large contrast between TVD on the main content and on the ads can partly be explained by the size of the areas of interest. However, the difference is significant enough to show that there is a considerable difference in the amount of interest paid to the content compared to the ads.

The amount of interest paid to ads also varied between the tasks. When browsing(A) more time are spent fixating on ads compared to the other two task types. Furthermore, more time is spent on the ads located in the content area than on the ads on both sides of the content. During the directed browsing task(B) TVD is either significantly low or no ads are visited at all. When performing the goal directed search task(C) the TVDs are generally shorter than when performing the browsing task(A).

Visit Count(VC)
Another measurement of how interesting a certain area is to the subjects, is measured by how many times a participant visits that specific area. As seen in the chart, the content area especially the upper content gets significantly more visits than the advertisements. Most ads only get one visit. However, the middle banners, especially the upper one, actually gets more. Most participants return to the ad at some point during the browsing task(A), and several also
during the other two tasks. During the directed browsing task(C) the participants visited the right ads more times than in the other tasks.

![Chart 7. Visit count(VC) on main content and ads on the main page.](chart7)

**Book Pages**

**Total Visit Duration**

The average TVD on the book pages were similar to the total time spent on ads/recommendations on the main page: below 0.5s for all the ads. However, more time is spent on the upper recommendations than on the right recommendations.

Between the tasks some modest differences can be found. During the directed browsing task(B) the participants fixated more on the upper recommendations compared to during the browsing task(A). However, the right recommendations got slightly longer fixations when the subjects performed task A.

The lower recommendation got a low percentage of participants fixating on it, however, when it comes to TVD it got the longest durations. The recommendations that got the longest TTFF also the longest TVD. In other words, even if the lower recommendation got the fewest amount of participants fixating on it and additionally after the longest amount of time, the visits it got lasted for longer than for the other recommendations.
Visit Count
The number of visits to the areas of interests goes in line with the number of visits the ads on the main page got. Most participants only visited them one time, but some returned one or several more times. The areas that got longer TVD also got more visits compared to the other areas of interest.

Chart 8. Total visit duration (TVD) on ads/recommendations on bookpages

Recall
25% of the participants recalled the *Coop Med Mera*-ad. One participant recalled the ad below the content on the book pages. The rest of the participants could not recall that saw any ads or they saw that they existed but did not bother to pay attention to them. Some participants fit in two of the answers.

Basically 33% (4 participants) recalled some kind of ad (according to the definition in this study). Three participants saw the Coop Med Mera-ad and only one participant recalled one of the internal Bokus-ads.

![Chart 10. Recall of ads/recommendations/offers during the study.](image)

### Other Observations

#### Menus
The left menu was well used by most participants, even though they could have used the top menu for the same purpose. Subcategories within the book categories were extensively used to filter the websites assortment. The top lists were also frequently visited and used for finding books.

#### Goal directed participants
The subjects got very goal directed since they wanted to perform well and succeed. This became very clear in this study, especially after the cases where the participants failed the task (task C). After the failure, most of them did not take their time to browse (even though they got the instruction) instead they focused on finding a book as fast as possible.

#### The search limitation
After task C was performed almost every participant mentioned that it felt unnatural not to be able to use the search field and that in a real situation they would search immediately. When they got the follow up question how they would do if the only partly knew the title or author but not remembered the correct name, the answer was that they would find the answer on the Internet, probably via Google Search and after the find the correct answer, they might return to the page again and search.

#### Task formulation
The tasks were formulated in a way to give the participants a context and a goal related to real life tasks. However, the extra sentence might have confused some of the participants and made them interpret the tasks in different ways than intended. The most obvious example of this was during the directed browsing task (B) where the task was: You are going for a holiday in the sun and want to buy an exiting detective story to read on the beach. Several participants interpreted this task that they should buy a paperback book even though the task did not said anything about it. One of the participants even forgot that she was going to buy an “exciting detective story” and went straight to the section for paperback romantic novels.
A reason for the large amount of participants failing when performing task C was probably also due to the unclear task formulation. The task was to find a specific detective story from a “new author”. The intention of the task formulation was that the subjects would look for the book in the section for either “Debutants” or “Detective Stories”. However, most of them looked for the title in the section for “New books” where it could not be found, not even under the subcategory for detective stories. This was of course very frustrating for the subjects and fatal for the results of the study. In retrospect, the formulation error is obvious. However, when preparing the study it made sense and during the pilot studies, on two different persons, the misinterpretation did not occur. This finding shows that pilot studies are important and a correctly conducted pilot study could help to avoid e.g. unnecessary formulation errors, which in other case would affect the outcome of the main study.

**Ad definition**

It was difficult to formulate the definition of ads so that the subjects would get the same understanding as the author and also as each other. This was noted on the recall question, and might have been a factor in the high recall of one of the only external ad (Coop Med Mera) on the website.

**Order effects**

When subdividing the results into the task order-groups, the three groups that got the three different tasks in the same order, it is clear that the order of the tasks affected the result when performing task B and C. When performing task A the results were more alike between the order of the tasks. However, during the other tasks the result is distinguishably different between the groups who performed B or C as their first task and the ones who had already performed one or two task before. As seen in the gaze plots below - during their very first task (A, B or C) the participants familiarize with the website and look around a bit. When already acquainted with the website after performing a task/tasks the participants move on and perform the task at hand much faster.

**Task A**

![Gaze plots for Task A](image)

*Figure 10*

When performing task A the gaze plots are fairly similar – regardless of if it was the 1st, 2nd or 3rd task.
Figure 11
The gaze plot for the participants having task B as their first task differs from the ones who performed it as their 2nd or third task.

Figure 12
The participants performing task C as their first task looked around on the whole website while all of the participant, except from one stayed above the fold for the whole task.
Analysis & Discussion

In this chapter the results and the methodology of the Bokus-study will be evaluated and analysed. The results will be compared to theories presented in the Background and the challenges of conducting these kinds of studies will be discussed further.

Evaluation of the results

Attention during tasks

The findings from the study did not entirely live up to the expectations formulated in the hypotheses. The most unexpected difference from the expectations was that the results from the main page when performing task A and C were surprisingly alike, while the noticeability of the ads on the main page gave low results during the directed browsing task(B). This result can thereby not prove the hypotheses:

H1: When performing a goal-directed search the subject will ignore the banners to a larger extent than in the two browsing tasks.

H2: When browsing(undirected) the advertising will get more attention than in the other two task types

The previous findings that shows that browsing behaviour would result in more attention to ads( e.g. Kuisma et al., 2010; Pagendarm & Schaumburg, 2001; Owens et al., 2011) could at first sight thereby not be confirmed in this study. However, when analysing the results further it becomes clear that due to inadequate task design, the subjects’ actual navigation behaviour created from the tasks did not reflect the intended navigation behaviour when designing the tasks. This was unfortunately the case for all the three tasks and will be further discussed in the next section when evaluating the methodology. To get an understanding of the complexity that the analysis around hypotheses H1 and H2 involves, the deficient design of task B have to be presented already in this section. The reason for this is that out of the three tasks of the Bokus-study, task B possibly turned out to be the most goal directed task during its first part, which thereby gives the results of the study a different meaning.

The task instruction for the directed browsing task(B) said that the subjects should find “an exciting detective story”. “Detective stories” is a common category that in an online book store it can be expected to be found in some kind of category menu. After performing at least one task, the subjects knew/-or expected a category menu to exist and also its location. (It could also have been based on previous experiences) This made it easy for them to quickly direct their attention to the part of the main page where they could find a way to the requested target. Since the subjects knew the way to the target, task B actually became a much more goal directed task than intended, at least until the point when they found the right category. This can be deduced by the theory of Pagendarm and Schaumburg mentioned in the background (pp.14), arguing that a goal directed task occurs when the consumer can use top-down mechanisms to direct the attention to areas on the website where the information- or clues about where the information are expected to be found.(2001) This is possibly what occurred when the subjects immediately directed their attention to the left part of the website where they expected to find the category menu. Since the information given to the subjects in the task instruction for task B allowed them to use stored top-down mechanisms that presumably were more obvious than for task C – the navigation could have been more goal directed in the first part task B than in task C.

Browsing was earlier in this study defined as search strategy that the consumer uses when s/he has a less precise view of what information that might be available. The strategy then works as a screening process for identifying possible candidates for goal directed search, when the goal directed search strategies are inadequate (Janiszewski, 1998), or when the consumer lacks enough information to be able to define the goal. (Rowely, 2000). In the Bokus-study during task B, once the subject had entered the right sub-category page(“Detective stories”), all books...
were potential targets. The subject did not have any precise information about the book and could therefore no longer use stored top-down mechanisms to navigate and find a target - which then resulted in browsing as the searching strategy.

The intention when formulating task B was to create a task that was more goal directed than task A and less goal directed than task C. However, in retrospect it is obvious that it instead became a mix of a goal directed search task (probably more goal directed than task C) and a browsing task. This goes in line with Rowely’s theory that the search strategy might change over time during one task. (2000)

Since the first part of task B unintentionally became the most goal directed search task – it is possible to argue that the results from the Bokus-study actually could confirm H1 *(When performing a goal-directed search the subject will ignore the banners to a larger extent than in the two browsing tasks)*. Once the category page is entered, task B becomes a browsing task. This explains the higher noticeability to ads on that page during task B, which is on a level with the high noticeability to ads on the main page when performing task A. The findings from the Bokus-study would thereby be consistent with previous findings that shows that browsing behaviour would result in more attention to ads (e.g. Kuisma et al., 2010; Pagendarm & Schaumburg, 2001; Owens et al., 2011) However, since these findings were more accidental than planned the results are not extensive enough to provide strong evidence for H1. To fully confirm the hypothesis, the methodology should be iterated and the tasks more carefully designed and formulated.

**Design, size & placement**

The noticeability was highest for the horizontal banners located in the content area and even though the interest was generally low for all the ads, it was slightly higher for these ads as well. The hypothesis H4 is thereby confirmed. **H4a:** *The horizontal advertising (banners) AOI’s that are located in the content area will get more attention than vertical advertising (skyscraper) AOI’s*. These findings are consistent with the previous findings proving that an object’s closeness to the object of focus increases its ability to compete. (Laarni, 2002; Kuisima et al., 2010) Previous studies that have shown that banners get less attention than sky scarps have studied banners located above the main content at the very top of the page (e.g. Fig 4, p.10). (Burns & Lutz, 2006) The findings of such studies are thereby not disproved in this study.

Out of the two horizontal banners placed in the content area the upper one had significantly higher noticeability than the lower one. This confirms hypothesis **H4b:** *The upper horizontal ad/banner will receive attention fast and from most participants.*

**Content of advertising**

The advertising on the category pages did not get higher noticeability nor interest compared to the advertising on the main page. On the book pages the attention was more evenly distributed on the ads. However, both noticeability and interest were lower compared to the ads on the main page. This proves hypothesis **H3:** *More targeted advertising (ads on category page and book pages) will not get more attention than the ads on the main page.*

In the post questionnaire the subjects answered that they did not perceive the advertising as intrusive. This confirms hypothesis **H5:** *Since the advertising is internal, thus contextual and informative, it will not be perceived as intrusive.*

**The mystery of the Coop Med Mera-ad**

The relatively high recall of the *Coop Med Mera-*ad was unexpected. The ad was fixated on by 33% of the participants and 25% recalled it. However, an interesting finding was that among the participants that, according to the eye tracking data, fixated on the ad - only one recalled seeing it. The remaining two participants that recalled seeing the ad did not have any fixations registered on it. This confirms the theories that humans can “look without seeing” (Krugman, 1977) and that the brain can perceive objects with the peripheral vision without directly fixating on it with the eyes, (Kuisima et al., 2010) especially if the object is familiar (Bojko & Adamczyk, 2010), (which the Coop-brand was to all the participants who recalled it in the
study). Furthermore, this shows that attention is more than just what we see and how long we are watching it and that memory does not necessarily have to be connected directly to visual attention. The need of post questionnaires/interviews where recall of ads is an important question to complement the eye tracking study is thereby confirmed.

**Evaluation of methodology**

**Defining browsing behaviour**

A large difference in the methodology used in this study compared to previous studies is the definition of browsing and how the tasks were designed thereafter. The several studies that reached similar results have all used a more aimless form of browsing where the participants were asked to look at a certain web page according to their own interest. This was compared to very specific tasks including printed questions that should be answered. (E.g. Calisir & Karaali, 2007; Schaumburg & Pagendarm, 2001)

As mentioned earlier in the report, browsing and searching are two ends of a spectrum. The above-mentioned studies used a more expanded spectrum where the browsing is more aimless and the search was even more goal directed compared to the tasks in the Bokus-study. The reason why the spectrum was more narrow in the Bokus-study grows from an ambition to investigate a realistic behaviour for the specific website. On an e-commerce website it is not realistic just to aimlessly browse, since consumers usually have some kind of goal when entering a website. (Nielsen & Pernice, 2009) When just “familiarizing” with a page an unnatural behaviour is created and the subject will move from being a consumer to being a spectator. S/he will therefore not act on the banner blindness in the same way as s/he would in reality. From this point of view, if the methodology from previous studies would have been used in the Bokus-study it might have given stronger but also more unrealistic results. It is, however, important to add that for websites other than e-commerce sites, e.g. online-magazines, the natural state of people visiting that page might be less goal-directed and more spectator alike.

**Creating a browsing behaviour**

The objective with the task formulations of the previous studies was to let the subjects create their own goals and by not giving them any precise tasks not impose external goals. One could argue that this would create a more natural behaviour than if the subject would be given an open browsing-task(such as in the Bokus-study) since the subject would get to decide themselves.

This is probably true, if the subject also got to choose which website to explore. If the subject is placed on a specific page without a goal, the visit can become meaningless for the subject since s/he might not have any interest in being on that specific web page. If asking them to explore the page after the own interest anyways, the subject might act more like a spectator than a consumer on the website, which would generate data that is not relevant for a study researching the behaviour of consumers of that website. The solution to instead give the subject a defined, but yet open, task(like in the Bokus-study) is demonstrably not perfect, but it would create a browsing behaviour that is closer to the way that consumers behave on that specific website. This especially applies to studies on e-commerce websites, while goalless tasks could be more realistic on e.g. web newspapers and magazines. Nielsen observed the dilemma of the subjects’ goals on specific websites and tried to solve it by creating a new methodology where the subjects should be able the leave the website if not interested and move on to another one. (Nielsen & Pernice, 2009) This is a very time consuming method providing data that is hard to analyse since it most definitely will include eye tracking data from several websites. As mentioned before, there are a lot of factors affecting the attention to ads on websites(goal, website type, size, design, placement, informativeness etc.) Comparing data between different websites would therefore not provide any actionable results since it is not possible to determine which factor/s that result in more or less attention. Additionally, when performing these kinds of studies there is usually one or several specific websites that are interesting for the client. Researching several websites in addition to them would be unnecessarily costly.
Giving the subject some kind of task, as done in the Bokus-study, is as mentioned not perfect since it also will affect the realism of the browsing behaviour, even though it is an open task. The reason for this is firstly that the subject was given an aim: to find a book to buy. Rowley called this purposive browsing, which is still browsing, however, less open than general browsing. (Rowley, 2000) This type of browsing can be found on the browsing part of the spectrum, although not as close to the end as general browsing. The spectrum being researched is thereby not as wide as in the previous studies. Secondly, when giving the subjects a goal while they know that they are being watched they want to perform well and succeed in the task. This will possibly make them more goal directed than they would be in real life. (Nielsen & Pernice, 2009) The browsing behaviour in such a study will possible be more rushed and less exploratory than it would be in reality. Several of the participants in the Bokus-study mentioned in the post questionnaire that they did not remember seeing any ads since they were so focused on completing the task, even when browsing. This is, except from another evidence of banner blindness, an indication that the participants experienced the browsing task as a goal that needed to be completed.

As mentioned in the background section, a browsing task indicates that the user has an imprecise view of the information or objects that might be available and is not sure whether their requirements can be met, or sometimes not even how they might be met. (Rowley, 2000) In the browsing task(A) used in the Bokus-study the subjects were told to buy a book. They were thereby told that in this study their requirements could be met and also how they could be met. In other words, by giving the subjects a browsing-task with a concrete goal, a realistic browsing behaviour was not created.

It is clearly a challenge to create a realistic browsing behaviour since the behaviour is affected by many factors. Based on the literature study and the observations from the Bokus-study, two theories about how to create a more realistic browsing behaviour have been developed for this thesis.

1. The best way to create a realistic browsing behaviour without using extremely costly methods is to give the subject a very open task that goes in line with the usual use of the website. However, it is important that the task does not have a definite goal and that the subject feels as little pressure as possible. The task should not have a time limit that the subject is aware of. This to avoid the feeling of time pressure or that they have to “kill” an unnecessary amount of time on the website. The subject should therefore be able to finish whenever he or she wants to, or be interrupted by the moderator after a certain amount of time (relatively long and unknown to the subject.)

2. Another contradicting theory that can be drawn from the literature study as well as form the failure of creating a browsing behaviour during the Bokus-study is that even though the browsing tasks used in the previous studies are not based on realistic tasks, they might generate more realistic results. The reason for this is found the subject’s inability to use a relaxed browsing behaviour during a study. If a natural browsing behaviour cannot be created and instead it becomes too goal directed when studied, a browsing behaviour found further out the spectrum might compensate this and the two opposite effects will cancel each other out. This theory is of course very philosophical and there are no valid evidence to support it in this study. However, it is still a possibility that should be further investigated before rejected.

**Defining and creating a goal directed search behaviour**

Previous studies have created a goal directed search behaviour by giving the subjects tasks including finding specific information to answer scripted questions (e.g. Owens, et al., 2011; Hsieh & Chen, 2011) or by giving them certain requirements that a product should fulfil, e.g. finding the smallest available backpack etc. (Shresta & Lenz, 2007) The goal directed behaviour was similarly created in the Bokus-study by giving the subjects the task to find a book with a specific book title. They also got some additional information about the book and the restriction that they were not allowed to use the search box. When evaluating the results from the Bokus-
study it is clear that the goal directed task felt unnatural to several of the participants. This was primarily due to the search field-limitation. This generated a behaviour that was not natural for the participants, and thereby not reflecting reality. The reason for this limitation was that if the subjects had used the search box, the study would not have generated a visual search behaviour that was possible to compare to the results from the remaining tasks. However, if generating unrealistic results, that is not useful either.

The unexpected goal directed search behaviour that occurred during task B was therefore more realistic than the behaviour evoked from task C. Without any further limitations the participants used their top-down mechanisms that were based on memory and previous experiences to direct their attention to the left menu – an element where they expected to find a way to the wanted target.

Another factor that might have affected the navigation behaviour during task C was that the participants possibly became more confident that the target existed somewhere on the website. In reality they would perhaps have left the site if the information was hard to find, but since the task was included in a study they might have looked around longer. This theory by Nielsen and Pernice(2009) can partly explain why the noticeability was unexpectedly high for task C in the Bokus-study. The participants could have seen the task as a “quest” to find the hidden product and looked around more on the page than they would have done in a realistic situation.

The challenges of creating natural goal directed search behaviour on e-commerce sites are different in comparison to creating a natural browsing behaviour. The largest challenge is to design and formulate a task that is realistic to the website, creates a visual navigation behaviour without limiting the subject from using behaviour or search strategies that falls most natural to them. A task including requirements rather than names or titles creates a goal directed scanning behaviour without opening the possibility or desire to use the search field. These tasks are realistic on websites that are selling products with clear standard specifications and measurements, e.g. backpacks, digital cameras, running shoes, dishwashers, food etc. However, this type of task is harder to formulate on a website like Bokus.se that contains a large amount of products even in the subcategories. Requirements are also hard to define on a subjective product category such as books. The same goes for music, movies etc. When creating a goal directed task on an e-commerce page selling subjective products it will most of the time include name, title or a characteristic term (e.g. “cup cakes”, “Paris”, “World War II” etc.), which encourages usage of searching functions. To invent a task unnatural to the consumers just to come around this will give weak and possible unusable data. It is therefore important to before the study research and evaluate what kind of goal directed navigation behaviour that commonly occurs on the website in question. If it is found that when entering the website with a specific goal in mind the consumer will generally use the search field, this should be allowed also in the study. If the data later shows that nobody paid attention to the ads during these tasks, this is still an actionable result. Follow-up actions could be to place ads that matches the search query high in on the search result page (like on Google SERPs), invest more in recommendation ads for additional sales on specific product pages (book pages in the case of Bokus) or to simply focus on the browsing consumers when designing ads.

**Studying internal advertising**

As mentioned in the background - internal advertising is usually focused on marketing specific products and offers rather than the brand itself, and consumers are generally more acquainted with specific brands than their selection of products. Since it is easier for a person to register and recall familiar objects (Bojko & Adameczyk, 2010) it is therefore probable that recall of external ads is higher compared to recall of internal ads. The Bokus-study focused on internal advertising and it is therefore not unexpected that the recall of ads on the website was extremely low. If the subjects even remember that ads existed on the web page, they were generally unable to recall the appearance and content of them. The exception was the *Coop Med Mera*-ad that 25% of the participants recalled. This despite the fact that out of all ads on the website the *Coop Med Mera*-ad got the lowest result in both noticeability and interest. Since the *Coop Med Mera*-ad was the only external ad, marketing a brand rather than a product, this goes in line with the above-mentioned theory.
Order effects

The influence of order effects on the Bokus-study were clear and consistent with previous theories arguing that in a study, the finished tasks will affect the subjects’ visual attention during the following tasks. This was seen in the Bokus-study when the participants after performing one task, performed the following tasks faster and without looking around as much. The Bokus-study only studied the behaviour on a single website. However, it also possible that the visual behaviour will be affected by previous tasks on other similar websites since the subjects might expect elements to be found where they were located on the previous sites. When conducting an eye tracking study it is important to have this in mind and design the study thereafter.

If studying several tasks, these should be presented in mixed order to distribute the possible order effects evenly. Alternatively use a between-subjects study design where each group only get one task(except from the warm-up task).
Conclusion

In this chapter the findings of the thesis are summarised and directed to answer the initial problem formulation.

In this thesis several subject areas, such as online advertising, consumer behaviour and eye tracking methodology, have been introduced and connected to answer the sub-objectives of the thesis. These answers have been discussed and analysed in the aim to answer the main problem formulation:

What impact does the consumer’s navigation behaviour on an e-commerce website have on their visual attention to internal advertising on that website?

After reviewing previous studies and literature on the subject and conducting the Bokus-study it stands clear that a consumer’s task on a website has a meaningful impact on the visual behaviour on a web site. The task determines what navigation behaviour or search strategy to apply to reach the wanted target, which is decided by top-down mechanisms that are based on the consumer’s previous experiences as well as the current goals. These mechanisms enable him/her to direct the visual attention to areas of the website where the wanted information is expected to be found. If the target is less precise and/or the consumer’s stored goal directed search strategies are inadequate s/he will have to browse, i.e. screen through the website to identify possible candidates for goal directed search. Since the consumer cannot rely on any stored search strategies, browsing becomes more dependent on human perception and the surrounding visual environment. When objects of potential interest are recognised the consumer can choose to defer to a more goal directed search. Since every object, anywhere on the website is a potential candidate for further inspection, the consumer also gets more reactive to peripheral stimuli. Since the consumer uses different search strategies depending on if they are browsing or searching - the navigation behaviour is largely affected by the consumer’s type of task. However, the visual search strategies also depend on the structure of the visual scene as well as the stored top down mechanisms of each individual consumer. This means that the visual behaviour will additionally be affected by the web site (type, design, purpose etc.) and the previous experiences of each individual consumer.

When the consumer is browsing s/he is more responsive to peripheral stimuli and the salience of objects (bottom-up), while s/he is more focused when performing a goal directed search and uses top-down mechanisms to navigate around on the website. The navigation behaviour thereby affects the consumers’ visual attention.

Since the task substantially affect a consumer’s visual behaviour and allocation of visual attention on a web site it is important to take that into account when designing and conducting an eye tracking study. Realistic and actionable results demand natural and realistic tasks. The tasks should therefore be carefully designed and based on tasks that are actually performed by the actual target group on the specific website. Since the behaviour might depend a lot on the task type, it is a good idea to include both browsing and goal directed search tasks in the study. This if both task types are realistic for the website being studied.

A realistic and natural browsing behaviour has shown to be very hard to create in a study environment. It has in previous studies been created by letting the subjects navigate on the website under “free-viewing”-conditions. However, free-viewing is in most cases not a realistic online behaviour, especially not in an e-commerce environment. A free-viewing task would instead probably transform a consumer to a spectator. Most consumers have some kind of goal, even when browsing and even though loosely specified. This complex behaviour is challenging to create in a study environment, since the subjects tend to become very goal directed and satisficing when assigned a task while they know they are being observed and/or measured in some way. The browsing-tasks therefore become more goal-directed in a study environment than they would be in a natural environment. This is a problem that have to be investigated further before a solution is found, but for the time being it is important to acknowledge that the problem exists and that the result in an eye tracking study will be affected by it.
Additional factors that can affect the result of an eye tracking study are task formulation and the order of tasks. It is therefore important to carefully formulate task instructions and try them out in pilot studies before the actual study. Also to mix the order of the tasks to avoid order effects, alternatively only conduct one task per participant in the study.

As stated above, it is clear that the task affects how the consumers allocate their visual attention on a website. However, when it comes visual attention to advertising on the website the answer is more complex. Browsing largely relies on human perception and would theoretically mean that attention would be directed to large and salient objects on a website since these are attributes that attracts human perception. However, banner blindness has resulted in that consumers react negatively on salient objects and generally use their peripheral vision to avoid elements that looks like ads instead of being attracted to them.

The visual navigation behaviour that the consumer applies when performing a goal directed search task is much more focused compared to when browsing. Stored top-down mechanisms are used to direct the visual attention to elements on the website where the wanted information/target is expected to be found – which implies that all other elements are ignored and thereby the advertising. When browsing, more elements are potentially interesting for the consumer and the screening behaviour that s/he applies might result in more fixations on the advertising. Especially if it the advertising is placed among or close to the main content of the website. I.e., the visual attention to advertising is affected by the navigation behaviour of the consumer.

When it comes to internal advertising the visual attention to it is affected by the same banner blindness as for external advertising, even though it might be more relevant for the consumer. The reason for this is that internal- and external advertising usually have similar design and placement. If the design of the advertising instead is consistent with the content of the website it is possible that it will get more attention, and perhaps not even be perceived as advertising. This only goes for internal advertising, since the consumer might feel deceived and react negatively if being transferred to a third party site when clicking on something s/he thought was a part of the current website.

When it comes to memorizing the advertising on the other hand, external advertising have an advantage over internal ads. The reason for this is that external ads generally promote brands which in many cases are familiar to the consumers that have chosen to enter the website on which they are displayed. Internal advertising on the other hand usually promotes products and offers. These are generally not as established among the consumers and are therefore harder to register and in retrospect recall. However, memory is not necessarily a good indicator of neither visual attention nor advertising impact, since it is possible to unconsciously store visual representations of objects in the visual memory without explicitly remember seeing them.

When conducting studies researching attention to advertising it is therefore important to combine eye tracking studies that captures the unconscious visual behaviour and attention of the consumer with impact studies that captures the consumers conscious memories and opinions.

**Future Research**

As mentioned in the conclusion – the methodology developed and evaluated in this thesis needs to be further iterated to work as a guideline for future research. The main reason for this is that creating a natural browsing behaviour was challenging and the participants thereby became more goal-directed than they would be in a realistic situation. It can therefore be investigated how the study environment affect the visual behaviour, how to create a browsing behaviour that generates results that reflects reality or how to interpret the results to understand the real behaviour.

Furthermore, it can also be investigated how the methodology applies to external advertising as well as on other type of websites, e.g. online magazines, social networks, service website, etc.
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