THE DETERMINANTS OF NEWSPAPER FRONTPAGE VIEWING BEHAVIOR: An Eye Tracking Study

Deniz KILIÇ, Assist. Prof. Dr.
Anadolu University, Turkey
dkilic@anadolu.edu.tr

Sibel ONURSOY, Assist. Prof. Dr.
Anadolu University, Turkey
sonursoy@anadolu.edu.tr

Fikret ER, Assist. Prof. Dr.
Anadolu University, Turkey
fer@anadolu.edu.tr

Deniz Kılıç, was graduated from Communication Sciences Faculty. His PhD is Journalism field. He has been working as Assistant Prof. Dr. in Anadolu University.

Sibel Onursoy, was graduated from Fine Arts Faculty. Her PhD is Journalism field. He has been working as Assistant Prof. Dr. in Anadolu University.

Fikret Er, was graduated from Sciences Faculty. His PhD is related with Statistical Shape Analysis. He has been working as Assistant Prof. Dr. in Anadolu University.

Abstract
Eye movement studies have long been used to investigate the reader’s reading behavior. Several studies have examined eye movements of individuals as they perform natural tasks. Most of them have focused on the way humans observe pictures. Many of these types of studies have been very useful in the development of theories of visual perception and recognition. Eye-tracking methodology provides precise insight into how the individual reader perceives newspaper spreads. The study is based on eye-tracking analysis to empirically examine so-called entry points and reading paths. Study tries to answer questions like: Does page designer determine reading path for reader? Reading paths give explanatory information to understand reader’s reading behavior and making good page design. This article investigates how the ways of page design lead readers. In this research two different template, so-called reading paths are used to determine reader’s reading behavior. First one is clockwise designed page, which has different forms of news. Second one is counterclockwise which has same news of clockwise designed page. Actually, printed newspapers are traditionally prepared these two different design types in Turkish printed media. This study argues that the lead newspapers front-page design is effective to attract reader’s attention. Ten participants attended this empirical reading performance test. Test persons were recruited among university students. The eye tracker was then calibrated to the participant’s eye movements. They were then presented with an alternation of test template. In this test, two different groups were participated. Within five participants, three of them were men, two were women attended reading performance of clockwise designed page; three men and two women within five attended reading performance of counterclockwise designed page. As a result our findings were confirmed article argument that the leaded newspapers front-page design is effective to attract reader’s attention.

* Bu çalışma Anadolu Üniversitesi Bilimsel Araştırma Projeleri Komisyonunca kabul edilen 060118 nolu proje kapsamında desteklenmiştir.
1. EXPERIMENTAL EYE TRACK STUDIES

Studies conducted on reading activity primarily focuses on how reading activity takes place. While every reader has different reading behavior, some factors might influence reading activity. Driven by habitual behavioral patterns that are peculiar to themselves, all readers generally focus on different sections and pages of newspapers. However, there is not conclusive evidence regarding the way readers read, which pages and sections or columns they choose in a newspaper, what they read and what they skip, and whether newspaper design has a role on reading path. Readers might follow different ways of reading under the influence of each textual or visual material on newspaper pages. Eye-tracking studies are performed in order to discover reading habits, which readers have developed distinctively. Designers, on the other hand, prepare their pages in magazines, newspapers, web pages and publications like these on certain assumptions. In fact, the studies performed for observing eye movements have come across with significant information about determining and manipulating reader behavior and readers' interaction with visual and textual materials.

Eye-tracking studies have been conducted in many fields. While the studies conducted in the army focused on human factors, eye-tracking studies were also used in cognitive studies on perception in psychology and in bioengineering for solving communication problems of people with disabilities (Bolt, 1984). Non-instrumental studies in psychology carried out on eye movements date back to long ago. On the other hand, in 1989 Küpper performed one of the first studies in the pertinent literature by videotaping eye movements and making it possible to watch them through simultaneous slow motion screening. In that study, eye movements were videotaped and digital data was obtained based on these video recordings. Findings from the study gave us some information about the proper positioning of pictures on a page and revealed that images are viewed more than texts and shorter texts are preferred to longer ones. The study particularly examined the effect of reading order on pages, and the influence of position, pictures and headlines. However, it is difficult to make conclusive interpretations about the results since the data is not suitable for making generalizations.

In 1990, Widman and Polansky conducted a study on advertisement reading behavior of 129 readers of the Stockholm newspaper Dagens Nyheter (see Holmqvist & Wartenberg 2005). The researchers determined that bigger ads are noticed before smaller ones and are more likely to be remembered. Their study also points out that different positioning and different advertisement subjects have an effect on the readability of ads.

With their study on 90 readers in the USA, Garcia and Stark determined that readers do not really read but rather scan a page in a newspaper. When giving the first definition of entry point, these two researchers define it as the point at which readers stop scanning on a page and start reading. In their study, they try to determine the attractiveness of color by providing readers with manipulated editions with respect to color. Reading activity in that study is regarded as “from-left-to-right behavior” and it is also considered “read in depth” when more than one half of a text is read. The researchers further recommend that designers should prepare material that will make readers stop scanning and start reading. Garcia and Stark suggest about newspaper design that the material or visual component to be given to readers should be apt for scanning and at the same time it should have readers stop scanning and start
reading. In the study, pictures, graphics and front-page promotion boxes are defined as the entry points into reading. The researchers suggest that readers usually enter the page through the dominant photo and then move to a prominent headline or another dominant photo (Garcia & Stark 1991: 67).

Hansen studied 12 readers of the Copenhagen newspaper Det Fri Aktuelt and found that pictures are seen first, then icons and graphics followed by headlines and text. Hansen determined that length of articles, their placement and genre (news, features, debate, sport etc) play a role in readers’ priorities. Hansen’s study revealed that news, features and debate programs are almost fully read whereas a smaller portion of sports articles are read. In this respect, Hansen’s study does not confirm the Garcia and Stark study finding that “color objects attract attention more than grayscale objects do” (Hansen 1994).

Josephsson (1996) studied the colour against grayscale effect for photos in 4 manipulated newspaper pages. In the study, 32 subjects were allowed to look at these pages for 10 seconds per page. The study determined that that the position of the photo on the page is more important than the color or grayscale factor. Josephsson also reported that the subjects looked at the top of pages earlier than at the bottom and the color did not matter for them (Josephsson 1996: 3)

In 2001, Lundqvist and Holmqvist tested 14 readers of Dagens Nyheter in a follow-up study to Widman and Polansky. However they focused entirely on the size effect on attention, attitude, and memory of ads. They determined that size, memory and continuance are variables, which strongly correlate (Halsanova et al. 2006: 74)

The findings from Holmqvist and Wartenberg’s eye-tracking studies indicate that newspaper readers do not read following any order. According to them, they just scan the area looking for an entry point. When they find an interesting entry point, they quit scanning and start reading. Scanning and reading continuously follow each other. The most common entry points are pictures and headlines, particularly quoted ones or those in boxes. The effect of color, on the other hand, is controversial as any powerful influence could not be identified with respect to color (Wartenberg and Holmqvist 2005).

In 2006, Holsanova, Holmqvist and Rahm conducted an experimental study in order to determine entry point and reading path. The researchers tried to answer the questions of in what order, for how long and how carefully the items on the newspaper spread were attended to. Firstly, the time sequence in which different areas attract attention is calculated in order to determine reading priorities. Secondly, the amount of time spent on different areas is calculated in order to determine which areas have been read most. Finally, the depth of attention is calculated in order to determine how carefully those areas have been read. The results indicate that readers prefer new information and information, which they consider, appropriate for their expectations. Readers prefer the most general information at the top and the most specific information at the bottom of the page. Readers look for the most important information in the centre of the semiotic space and less important information on the periphery. All pictures, headlines, sub-headlines, picture captions, billboards, tickers, recurring vignettes, thematic markers or markers indicating to which section the pages belong are the most common entry points into the page. Readers follow elements connected to each other by framing devices such as lines and arrows. Finally, readers scan the semiotic space before taking a closer look at certain units (Halsanova, Rahm and Holmqvist, 2006: 84-87)
In this study, reader behavior was analyzed on two different designing patterns applied on front pages. These two designing styles are prevalent on the front pages of Turkish newspapers. The current study compares the differences in reading path with respect to the two designing styles. The aim of the study is to examine whether reading path is determined by page design. Also, spread through which readers enter the page is determined.

2. READING PATH AND ENTRY POINT IN PAGE DESIGN

Newspaper readers comprise the most conservative audience in the world and they do not notice what their newspapers look like until a change has been made. When there is a difference in the design, they feel nervous because of losing their comfort of familiarity. In parallel with rapid progress in technology, today’s newspaper designs are beginning to have modern appearance and design features. Most newspapers today are designed in a modular format, in which stories are packaged in rectangular modules and stacked together to form a page size module. Although newspaper pages in the past came in a variety of sizes, the two most common formats today are broadsheet (74.9 cm x 59.7 cm paper size) and tabloid (597 mm x 375 mm). While there is no eye-tracking study conducted particularly on newspaper size, a vast majority of the studies seem to have been carried on newspaper in broadsheet format. The first experimental studies on entry points were performed by Garcia and Stark (1991). Defining entry point as where the reading activity starts, the researchers suggest that news content, positioning, size and color played a key role in the emergence of reading path (Garcia and Stark define reading path as reader’s route) in reader behavior. They also state that common entry points are a dominant visual component like pictures or graphics or a prominent headline. Mentioning two principles with respect to reading path, the researchers point out that there should first of all be a hierarchy within the page and then a natural order based on this hierarchy should be created (Garcia and Stark 1991: 26).

Organic structure of the human eye presents a tracking ability and continuity. Also, the fact that the human eye possesses visual memory renders it unique with respect to perception. While recurring visual components often create a sense of continuity in readers, they sometimes become factors, which get readers involved in a subject and keep their involvement in the subject. The eye has an ability to flow from left to right in the reading direction and a tendency to move from top to down. The human eye follows a perceptual pattern from dense to scarce, dark to light, simple to complicated, big to small, and from active and powerful color to faded and pastel colors. This arrangement makes it possible for the designer to create a visual path/direction and build perception (Uçar 2004: 155).

In an eye-tracking study, Josephson Sheere, one of the researchers highlighting the importance of design, investigated the psychological effect of the ballot paper’s design used in 2000 US presidential election on voters. Findings from that study point out that presidential candidate Al Gore mathematics may have lost 13,000 voters in Palm Beach County Florida because the ballot designed in the form “butterfly” was confusing (Lester 2006: 54).

3. METHODOLOGY

The studies carried out continuously with eye-tracking instruments over the last fifty years have been aimed at reaching three different types of information. Findings gathered about fixation duration, fixation frequency, and fixation sequence altered many assumptions known
about designing before. Many researchers agree that data obtained through eye tracking are the most valid measurements in acquiring visual knowledge. Particularly fundamental visual and semiotic information was gathered in the relevant by means of the data from eye-tracking studies. It was also revealed by these findings that forming, gathering and understanding codes play a key role in understanding cognitive behavior of individuals and therefore in forming images (Smith, Moriarty, Barbatis, and Kenney, 2005: 64).

This research is based on an empirical study of entry point to page and reading path. An answer for the following principal question is sought: “Can the designer determine a reading path for the reader or where is looked at by the reader first and most?” Identifying the reading path could be significant for preparing designs, which have the reader read the page, and for learning reader behavior. This study investigates the reading paths, which manipulate the reader’s reading behavior by means of design.

Two separate page prototypes were designed for the current study. Each prototype included news samples on 15 different subjects. 11 of these 15 news samples were presented with photos and each of them covered subjects such as politics, sports, environment, technology, finance/economy, foreign affairs, paparazzi news, health, police/courts and so on. Samples of the news and photos were chosen among the news in appropriate formats for this project. The prototypes were designed in real newspaper page sizes (57cm x 82 cm paper size-broadsheet) by using QuarkXpress and Photoshop programs. The prototypes were prepared in the exact sizes of national newspapers and in the designing styles, which are generally implemented in these newspapers. Furthermore, they were prepared in black and white since color factor was excluded from the scope of this study. The newspaper spreads were designed with the same news samples in a way that would make it possible to manipulate either reading clockwise or reading counterclockwise. The clockwise reading spread prototype was designed in a style aimed at manipulating the reader into starting reading from the upper left, moving to the upper right and then to the bottom right, which led into reading from left to right. On the other hand, the counterclockwise reading spread prototype was designed in a style aimed at manipulating the reader into starting reading from the upper left, moving to the bottom left and then to the bottom right. These two different layouts are styles often used in popular newspapers in Turkey traditionally. Conducted into front pages of newspapers, this study suggests that design follows an active method in attracting readers’ attention and their reading behavior. This study was carried out on an audience of 10 subjects. Five people were asked to perform clockwise reading while the other five were asked to perform counterclockwise reading. (Picture 1.)

The news samples in the prototypes were either positioned in a box or separated from each other with a thin line so that they followed a certain order. Special attention was paid to news hierarchy; font sizes of headlines got smaller from the top to the bottom. The biggest photo and headline was the news located in the optic center of the spread in both of the designs. Like the font sizes of the headlines, the photos accompanying news got smaller from the top to the bottom.

After a separate calibration for each subject individual with eye-tracking equipment according to their operating principles, recordings started. Then, recordings were transferred into computer software. During this process, a second calibration adjustment was performed on the computer screen for each subject recording. For this calibration, the calibration spread, prepared in the size of a newspaper spread, was placed on reading desk and the calibration for study universe was adjusted through the six points on the spread to detect where a reader was
looking. After this first calibration recorded eye movements of the eye-tracking equipment during reading activity, it was used in the calibration to be adjusted in the computer to determine the limitations the eye remains while performing reading. Eye calibration adjusted for each subject was the most crucial phase of this study against losing data. In our study, each subject performed reading for different durations of time, but only the first one-minute of the total reading duration was evaluated. Considering the limitations of the equipment, before starting reading, the test subjects were asked to behave in the way they normally read a newspaper in their daily lives and they were warned not to read less or more because of the study. In an environment appropriate for research, the subjects had a look at the newspaper prototypes they were given and their reading behavior was recorded by means of mobile eye equipment.

Picture 1. There are two different prototype pages in this study. First prototype (left side) is designed for clockwise reading. Second prototype (right side) is designed for counterclockwise reading.

4. FINDINGS AND INTERPRETATION

The data from the research revealed that the prototype spreads designed for clockwise reading and counterclockwise reading yielded different reading behavior. The pages prepared were apt for identifying reading path and for manipulating the reader into different a different route. Especially the page expected to manipulate the reader into clockwise reading, due to the from-left-to-right course of normal reading, led the reader into a certain reading path. However, the page expected to manipulate the reader into counterclockwise reading could not form a certain reading path and the reader concentrated more on the news sample positioned in the optic center. (Picture 1.)

The page, which was supposed to manipulate the reader into clockwise reading, served this aim; moreover, it got the reader to scan more news samples. Also, the focus points in both of the
pages were the headline news accompanied by a big photo because both news samples were placed in the optic centers. On the other hand, the news samples placed above the logo were read more on the page designed for clockwise reading. The headline news sample on the page prepared for clockwise reading starts on the left side of the page. Therefore, it does not interrupt reading the news samples starting from the upper right and moving to the bottom. Nevertheless, the headline news sample on the page, which was expected to manipulate the reader into counterclockwise reading, started through the end of the logo, not at the beginning. Therefore, the headline news started through the right side of the page and, contrary to the headline news given on the page, which was designed for clockwise reading, it blocked the news samples, which were placed above the logo and assumed to yield reading from the top to the bottom. Thus, readers were interested in the news samples in boxes on the left as both the news samples above the logo and the headline news sample were placed on the right side of the page.

![Graphic 1](image)

**Graphic 1.** Left graphic shows female and male clockwise reader. Right graphic shows female and male counterclockwise reader. (Black color used for male, red color used for female)

Gender was a significant variable in this study. By having both male and female subjects perform more scanning, the page designed to manipulate readers into clockwise reading ensured that more news samples were seen. The male subjects jumped at further points and performed more scanning, whereas the female subjects focused on fewer samples of news but performed deeper reading. In deep reading, the female subjects concentrated more on optic center. (Graphic 1.)

The entry point to the page was the headline news sample with a big photo. However, since normal course of reading takes place from left to right, the first news sample above the logo could also be the entry point into the page. The headline news was read for the longest time. Similarly, the photo of the headline news was the one viewed most. (Graphic 2.)

In this study, does the design of the page affect peoples reading habits are investigated? This is a very challenging question at least in terms of statistics. In this study, for the beginning there are 2 blacks and white newspaper pages with different design but the same news. Clearly there is a comparison to make but usual statistical hypothesis testing is not enough. Starting with the data itself, everything in this study is special.
The main statistical problem is to make a good organization of the data. The computer output from the reader is updated every 4 milliseconds. Computer locates the position of the eye over a page in every 4 milliseconds. If you collect data 4 minutes imagine how many data points you might have in your data set. Important thing is to somehow organize the data in order to show the reading habits of the readers.

**Graphic 2.** Left graphics show that both women and men read more deeply in the direction of designed clockwise page.

The first step is to clear up the data, since the reader cannot hold his/her attention for a long time the eye might move out of the page limits. So here is a missing value. We clear them up using an excel macro. Next step is to transform 4 milliseconds data into one-second data. In order to do that there are two approaches, either one can take the first observation of a given second. So if you collect data for 60 seconds now you have a 60 points or observations, but there is a problem with this approach. The problem in this case is in any given second (or at the beginning of the second) reader might arrive that location randomly. Maybe just before moving
to that point reader was focused on somewhere else in the page and jump to this point randomly for say 8 milliseconds and then jumped back to the original location in the page. In order to eliminate, or try to eliminate, this problem the data is transformed so that, if you have 60 observations these observations are actually 2 dimensional center of the points of any given second. This approach smoothes the effect of random movements of eye from point A to point B for a very short time.

After the cleaning and organization of the data scatter diagrams of the eye locations are drawn by gender. Clearly some differences are visible on this scatter diagrams. Next the newspaper page is divided in to equal areas, which we call as quadrants. This will show us if a reader is uniform through the page. If there are equal number of objects in each quadrant a uniform spread is pronounced. But in our study the points are not uniformly distributed over the page but squeezed in to some locations. The difference in between the male and females is more pronounced in this case. Also it is very clear that different page designs effect the distribution of the points on page. Next the distances between consecutive points of a reader are calculated. Again different page styles affect the distances and there is a considerable difference between the sexes. Even nearest neighbor distribution function is shown for these distances and also from these it is clear that there are differences. A two dimensional surface graph of the data is also supplied in order to a person to see how a reader is focused on a page. Clearly a right-sided design changes a person focus area to a elliptical form from a circular form which is the case in left hand design. (Graphic 3.)

The last part of the study is related with directions. for the data set a direction is calculated from point a to point b in respect to x axis (or east is 0 degree). Again from the circular histograms it is clear that different page design produces different reading habit. The last picture is to show you what kind of a data we are dealing with; in these graphs you see a data set with arrows. So now you may try to see how eye moved thorough
5. CONCLUSION

Carried out with eye-tracking equipment to determine reading path, this study revealed that design of a newspaper has a manipulative effect upon reading behavior. The first prototype newspaper spread, designed for manipulating into clockwise reading, affected the path to be followed by the reader from left to right and from the top to the bottom in accordance with the hierarchical arrangement because this designing style facilitates reading at the same time as it does not include any components to interrupt reading. Big photos and headlines in big font sizes attracted attention in both prototypes. On the pages designed with the aim of manipulating reading direction, reading in depth occurred more in optic center due to news sizes and hierarchic positioning.

Entry into the page is often performed by headline news and headline news photo. However, the habit of reading from left to right and from the top to the bottom increases initial effect of the top left news.

There are differences in reading behavior with respect to gender in both prototypes. In the prototype defined as clockwise page, the female and male test subjects looked at more news and therefore more news samples were seen in this style of design but deep reading occurred less compared with the other style. In the prototype defined as counterclockwise page, the female subjects focused on the headline and performed more reading in depth.

In this study, color was not used in the designs so that color factor would not affect reading behavior. Color factor could be evaluated in future researches. Because the first one minute durations of the research data were evaluated in this study, reading durations based on designing styles were not evaluated in this study.

In conclusion, the designing style performed for manipulating into clockwise reading play a role in readers’ access to more news. Size and positioning of news on the page affect reading behavior. In other words, a more efficient communication is more likely to emerge when habits of reading from left to right and from the top to the bottom are combined. On the other hand, effective designs should be evaluated with reader behavior.

Reading behavior studies conducted with eye-tracking are limited with the audience within the scope of the study, but this limitation makes it possible to reach clearer and decisive results. Carrying out more empirical studies of this type will certainly contribute to elimination of communicative problems.

REFERENCES


