# Instruments Used for Marketing Experiments

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**Abstract**
What can normally be observed on the market, it is often considered the premises of developing marketing as a science, but what is seen, is it always true? It remains to be investigated. It is possible to study what is really happening without any intervention, but in order to obtain different and significant results, there can be manipulated certain independent variables for analyzing their influence, by measuring the effect on dependent variables reflected in consumer behavior. Marketing experiments have proven to be highly effective in identifying relevant results over time, representing a method of research into the different phenomena encountered on the market for various products and services. In fact, marketing experiment method measures the cause and effect relationship. This paper proposes to contribute to the development of the specialized literature by presenting the tools used for a marketing experiment. It has been used as a method of investigation, analysis of the secondary databases. Against the backdrop of technology development, an inventory of new tools used in applying such a research method is needed to highlight scientific researches as a modern and current tool in marketing research.

**Keywords**: marketing experiment, instruments, eye tracking, facial analysis.

**JEL classification**: C93, M31.

## 1. Introduction

Marketing experiment is a method of researching a cause-effect relationship among variables (Freedman el al, 2007). Marketing experiments have proven to be highly effective in identifying relevant results over time into the different phenomena encountered on the market for various products and services.
The specific elements of a marketing experiment are: independent variables, dependent variables, participants and treatment condition. By their help, the researcher attempts to discover the cause–effect relationship between two or more variables by manipulation of the independent variable over the dependent one. If differences are registered on the dependent variable, the researcher concludes there is a cause–effect relationship.
The present paper proposes to contribute to the development of the specialized literature by presenting the tools used in marketing experiments. It has been paid attention and realized a main chronology of marketing experiments studies, and observing the subject and instruments trending.

## 2. Starting from classic to modern marketing experiments

The first marketing experiment dates from 1931, when Farnsworth and Misumi investigated the effect of reputation and recognition on artwork's quality (Khan, 2011).
Festinger (1953) receives recognition for using the systematic manipulation checks to an experiment involving abstract concepts, in order to obtain better results.

Campbell and Fiske (1959) developed measurement instruments to capture unobservable constructs by manipulation and blended checks to establish construct validity. The manipulation and blended checks provide systematic way to affirm that measurement instruments capture unobservable constructs (Khan, 2011).
Later, Cardozo (1965), studied about effort and expectation of both product and shopping experience by using a catalog.
Also, in 1967, Robert Holloway, built an experiment based on consumer decision which involved four dissonant producing factors: inducements, anticipated dissonance, information and cognitive overlap (Holloway, 1967).

Perdue and Summers (1986) suggest ways to design marketing experiments that limit the chance of non-valid inferences and experiments that generalize. They discussed about the 'timing, construction, and analysis of manipulation and confounding checks in marketing experiments and provide approaches to assessing the construct validity of experimental manipulations'.
In the last 25 years in the marketing research literature, the number of scientific papers reporting findings from field experiments has increased because of using Internet tools. However, it has also registered an increase in field experiments in physical stores and other non-Internet tools. Many of these papers focus on pricing and advertising topics, but several papers that used field experiments attend model-free validation of optimization model's subject (Simester, 2017).
For example, Lodish et al. (1995) investigated long-term ads effect by using 55 field experiments. The researchers compared the extra sales in the test year with the extra sales in the next two years. The results relate that, extra sales on second and third year, registered almost the same sales as those in the test year (first year), although only half of the brands analyzed had a long-term effect. The conclusions were that, on average, an investment in advertising can pay back for two times as much as people thought, based on a one-year evaluation. Lodish et al. (1995) found that a long-term effect does not occur when there is no short-term response to the advertising; a second possible explanation for no long-term effect is that sales effects are often cancelled out by competitive advertising. One feature of the experimental test of hypotheses is that sometimes predicted findings represent a stronger result than one that is observed, but not predicted (East and Ang, 2017).
In 2008, another experiment was developed (Teerling and Pieterson, 2010) in order to empirically investigate the effectiveness of communication as a tool to lead citizens to the electronic channels they chose to conduct an experiment. In the experiment, they compared a service delivery process in which citizens are steered via communication to the electronic channel (the experimental group), with a condition in which they are not specifically led towards the website (the control group). The researchers designed the experiment in cooperation with the national Dutch government agency responsible for pensions and child allowances. The experiment focuses on the first time a citizen submits a claim for child benefit. Dutch child allowance is paid per child, per quarter, and this system is automated in such a way that after the child benefit has been awarded for the first child, parents automatically receive the child venue for each subsequent child that is born. They used as example before, a field experiment (Teerling and Pieterson, 2010).
Recently, experiment studies have taken a new face, combining basic procedures with modern techniques and instruments used, in order to get faster and accurate data.

An experiment based on neuromarketing method was conducted in order to determine if brain event related potentials, provoked by seeing photos with some destinations, can be used to evaluate the tourist destination's efficacy of marketing insights from movies. Brain reactions

tried to identify if marketing stimuli of tourist destination marketing, manipulated the consumers perception, otherwise difficult to measure. The participants were split in two groups and, have been shown pictures from the cities of Bruges and Kyoto. Before viewing the pictures, one group saw a part from the movie *In Bruges*, which positively describes Bruges' main tourist attractions. The other group saw a movie excerpt that did not feature Bruges. The emotional responses were captured in the Bruges pictures, for the Bruges group only; In Kyoto case was not found between-group differences regarding event related potentials. This marketing experiment has used as a tool for data collection, EEG-based neuromarketing, which is a valuable tool for estimating the effectiveness of tourist destination marketing, where it can be found that popular films can positively influence the affective destination image (Bastiaansen et al., 2018).

## 3. Instruments used for marketing experiments

With the development of technology and the constant changes of consumer behavior, the methods used in marketing research also have had to adapt to present. Further more, the present paper describes about new tools used in marketing experiments designed to facilitate the consumer behavior' studies for various products and services such as eye tracking, or facial analysis.

### 3.1. Eye Tracking

Eye tracking is the process of measuring the movement of eyes. An eye tracking device is used to measure the position and movement of eyes and is applied for researching in psychology, marketing, and human-computer interaction. (Kotani et al., 2017).

Eye tracking is the process of identifying the place where a person searches and how, generating a particular interest in user experience at the beginning of the 21st century, when technology has become more accessible. Eye tracking is now commonly used to evaluate and improve designs (from websites to packaging) at different stages of the development cycle. Eye tracking is a technique of reading research. Researchers at the end of the 1800s realized that people's eyes did not move so easily through text, as always. This observation has led scientists to develop a technology to measure eye movements in order to get a better understanding of how people read (Duchowinski, 2007).

The earliest eye tracker appeared in the 1900s. These eye tracking tools were invasive because they were based on electrodes mounted on the skin around the eyes, or uncomfortable contact lenses that participants of different studies were supposed to wear them. Non-intrusive eye tracking techniques developed shortly thereafter. These involved the recording of light that was reflected on the eye, or direct eye filming. The advancement of eye tracking technology has since focused on reducing the constraints experienced by the specialists in interpreting the results, on the participants of research, while increasing the precision of these devices and, by implication, facilitating the analysis of the data. At the same time, eye tracking has focused on the researchers' understanding about the relationship between different aspects of eye movements and human cognitive processes (Bojko, 2013).

The first eye tracking application dates from 1947 when it was investigated how pilots used the cabin instrument information to land an airplane. At that time, however, eye tracking was still mainly used by academic and medical researchers. In the early 2000s, technology became more widespread among practitioners, especially thanks to its improved accessibility and use (Fitts, Jones & Milton, 1950).

As this subchapter presented before, eye tracking is the process of determining where someone is looking. It can also measure the characteristics of the movements of the eyes and the eye itself. To perform eye tracking, a special device called eye tracker is needed (Duchowski, 2007).

Eye tracking systems are used to investigate the position of the eyes and eye models assumed as visual contact in humans.

Eye tracking is a new emerging way in human computer interfaces. With better access to devices that are capable of measuring eye movements, it becomes accessible even in common environments. However, the first problem faced by researchers when they are working with eye movements, is correct mapping of subject's view - the place where the user looks at the screen (Adiseshiah, 2017).

Pupilometer is a device that attaches to the head of a person and determines interest and attention by measuring the level of pupil eye dilatation. In theory, the pupil of a person widens more when sees an interesting picture than when it looks at a less attractive image. For example, eye tracking records on which parts of an ad moves the eye of consumer. In the beginning, companies have used eye tracking along with the in-depth interview to understand how customers interact with its customer service site (Bojko, 2013).

In technical terms, eye tracking is an "eye detector"; more precisely, a piece of hardware that records eye movements when a person looks at a computer screen, a physical object, or even the environment in general. Some eye trackers are a pair of glasses, or a special hat that can be worn by the subject. Others can be placed in front of it, such as those attached to computer monitors.

The retina is positioned in the back side of the eye and this component, is becoming very sensitive at light contact. The pupil is a small black circle that let the light to enter the retina. Cornea is another element of the eye, this time transparent. When a subject looks at a fix point, the location of the pupil center is identified, in relation to the corneal reflection. And if that subject moves his head for few moments, the eye tracker register that he looks at the same place, the relationship between the pupil's center and the corneal reflection remains the same.

The human eyes, without rotation, cover a field of vision about 180 degrees horizontally (90 degrees to the left and 90 degrees to the right) and 90 degrees to the vertical. Whenever the eyes are open, the visualized image is projected onto the retina. Cells from retina convert the image into signals, which are then transmitted to the brain. The cells responsible for high visual acuity are grouped into the center of the retina, which is called the fovea (Bojko, 2013).

Many researchers have established that, where the people look is usually associated with what is drawing their attention. This is called the eye-mind hypothesis. However, there are some skeptics, who do not believe in knowing where people look at something, cannot understand in any way. The argument is usually that a person can look at someone's face, but at the same time he / she can see a sweater color. It means that, her attention can cover the periphery vision. People prefer to straighten their eyes when they change their visual focus, focusing on what they are trying to see. However, when people do not look at something directly, one cannot say that they certainly did not see it. Eye tracking captures only foveal vision without providing information about what was observed peripherally. This is one of the limitations of eye tracking. Another argument against eye tracking might be the following: people can look at something, but not necessarily to see it. It is possible when a human can look at an object, or another without recording data about it.

Visual behavior is influenced by everything that causes them to look from bottom to top as well as the voluntary intention to look from top to bottom. The attention is influenced by stimuli and it is moved involuntarily to objects that contract in some way with their surroundings. For example, bright colors and movements, or new and unexpected things can cause the subjects to look in there. If the bottom-up factors are the only ones that influence people's attention, everyone would look around in the same way.

There are two main applications for eye tracking: as a research technique and as a recording device. As a recording device, movements at their eyeballs become control signals for an information system instead of a mouse and a keyboard People with disabilities use such

applications for helping them to communicate. Interaction is also used in entertainment (for example, gambling ) and moves to mass mobile applications (Boyko, 2013).

Each eye tracking device is accompanied by a detailed manual, and additional training is often provided by the manufacturer. Method information, on the other hand, is not as easily accessible.

The way of testing stimuli, combines perfectly with experimental models. For example, when a researcher decides to build an experiment, he has to decide whether to use between or within-subjects approach. In a between subject design, each participant is exposed to only one of the tested interfaces or products. If there are two interfaces to test, half of the participants will interact with interface A and half will interact with interface B (Bojko, 2013).

One of the reasons for using eye tracking is to obtain, both qualitative and quantitative perspective on the cognitive processes of users during formative research; a qualitative outlook can be obtained after data collection. The qualitative analysis highlights the user experience that occurs during events, such as mouse movements and clicks, physical object manipulations, and participants' comments. Eye movements help to discover the often inconsistent processes that led to these results. Furthermore, the information can be used to detect and explain usage problems. On the other hand, a quantitative perspective generated by eye tracking can be obtained; this is most useful in summative studies evaluating products or alternate interfaces (for example, different types of ads). For example, ads influence marketing decisions, such as which design version should be selected for the future product. Quantitative results are often illustrated with aggregated data representations, such as focus maps. Quantitative analysis of the eye tracking technique refers to comparisons between models or design and a reference point. The collected data are extracted from the software. Inferential statistics, such as the Chi-Square Test, the T Test and the ANOVA Test, are used to determine whether any numerical differences observed in the study can be generalized to the entire population from the sample tested. Graphs are effective instruments for delivering quantitative results in reports and presentations. Graphs give information faster and make the results more accessible and attractive, usually in the form of bar graphs.

However, eye tracking technique has a limit regarding the interpretation difficulties, but still is used to allow researchers to know exactly on what consumers react, associating brain activity with the right stimulus.

### 3.2. Facial analysis

Facial expression is a research method used to understand the displaying of human emotions. Facial expression analysis (FEA) has been extensively studied over the last decades. In daily lives, some of the facial expressions are just one of the predefined emotional states, but they are blends of a few basic expressions. Even though the concept of "mixed emotions" was proposed many years ago, most researchers have not yet dealt with the FEA.

Recognition of automatic facial expression is used to help for interpreting emotions. Face recognition software compiles hundreds and even thousands of facial expressions to recognize the consumer's expression. The algorithms used in these software programs can be extremely complex, which corresponds to the exact emotion expressed by the consumer according to the size, location and relative position of the consumer's cheeks, eyes, nose and jaw (Zhao et al., 2015).

In recent years, there has been an increasing interest in improving all aspects of human-computer interaction. As an essential means for human communication, facial expressions provide rich information about human emotions. Facial expressions are most commonly used in human-to-human daily communication, such as a smile to show greeting, frown when someone is confused, and opening mouth when a person is surprised. Researchers have tried to analyze facial expressions through an attempt to understand and classify these expressions.

However, most previous attempts describe each facial image with one of the predefined affective labels, such as six affective states of happiness, sadness, surprise, fear, anger and disgust. They assume that each facial image is linked to a single affective label that tends to be more simplified. Normally, people can express mixed emotions. For example, when someone receives an unexpected birthday gift from his best friend, he would be both happy and surprised. Few of the expressions show only one predefined affective state (for example, 100% happiness).

A particular attention has been paid to the facial expression analysis (FEA), as it plays a very important role in human interaction. There are some exciting applications such as virtual reality, videoconferencing, customer satisfaction surveys for web and broadcast services, and some intelligent environments that require an effective analysis of facial expression.

According to psychology research, the main approach to emotion modeling is the category-based method. Six basic emotions (happiness, sadness, surprise, fear, anger and disgust) are confirmed in this method and these labels become the most universal targets of the FEA (Zhao et al., 2015).

The human face is able to show a combination of emotions at the same time, called mixtures.

In conclusion, facial analysis represents a great tool used in marketing experiments that analyzes the consumer's behavior through facial expression typologies at different moments before, during and after the purchase, or other actions undertaken by the individual, and identifying its profile.

## 3. Conclusions

This paper proposes to contribute to the development of the specialized literature by presenting the tools used for a marketing experiment. It has been used as a method of investigation, analysis of the secondary databases. Against the backdrop of technology development, an inventory of new tools used in applying such a research method is needed to highlight scientific researchers as a modern and current tool in marketing research.

Furthermore, the present paper described two of the new tools used in marketing experiments designed to facilitate the consumer behavior' studies for various products and services such as eye tracking or facial analysis. Eye tracking is the process of measuring the movement of eyes. Eye tracking is an "eye detector"; more precisely, a piece of hardware that records eye movements when a person looks at a computer screen, a physical object, or even the environment in general. Facial expression is a marketing research method used to understand the displaying of human emotions.

However, eye tracking technique has a limit regarding the interpretation difficulties, but it is still used to allow researchers to know exactly on what consumers react, associating brain activity with the right stimulus.

Facial analysis represents a great tool used in marketing experiments that analyzes the consumer's behavior through facial expression typologies at different moments before, during and after the purchase, or other actions undertaken by the individual, and identifying its profile.

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