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Tracking stimulated emotions: Potentials of facial expressions to evaluate the performance of a tourism promotion message on the Internet

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Key words

Emotions; Facial expressions; Satisfaction; Tourism promotion; Sensory marketing

Summary

With the development of tourism promotion campaigns based on new artificial intelligence techniques, it is important to know how to identify a visual that provokes a positive emotion from a visual that provokes a negative emotion in order to adapt the visual to the defined promotion campaign. These emotions can be perceived through the facial expressions of the tourist. In the field of tourism, several researches support the link between the positive emotion of a tourist and his degree of satisfaction in his experience. We propose in our study to confirm the potential of using facial expressions to reliably evaluate the performance of a promotional visual. From a managerial point of view, the interest of the study is that experts in the tourism sector use facial expressions before launching their promotional campaign and verify the relevance of the chosen visuals.

Introduction

The brain has one main function: the search for the happiness hormone (Kringelbach, 2010). This is also what the tourist is looking for: a good experience or at least the experience that will bring him happiness, whether he is an adventurer, a homebody or a thrill seeker. The ability of a tourist to project himself in one tourism project rather than another is now mainly based on the visuals proposed by tourism organizations (Verma, 2022). Whether it is on social networks or on the websites of tourist destinations, sight is the sense most used by the tourist, whether it is in his research phase or even to form his first impressions. Many emotions can result from what the consumer looks at and perceives. PETERS and de Klerk-Warmerdam (1996) explain that pleasant and intense sensations have a significant impact on the memorization of the advertisement and the effectiveness of the message. The more joyful or exciting a visual is, the more likely the tourist is to be positively influenced in his decisions. What we feel leads to what we buy (Achar, 2016). Thus, incorporating appropriate emotional stimuli into marketing communications or decision-making contexts can influence the end consumer's decision making (Germann Molz, 2022). Facial expressions can objectify a consumer's emotional state. Used to measure the impact of a tourism campaign or to evaluate the value of visuals on a tourism organization's website, they allow us to detect the emotions felt by the consumer when faced with these visuals.

Considering that the relevance of a tourism promotion message can be evaluated according to its potential to generate specific emotions, we propose to measure the emotional state of the consumer through his facial expressions. Facial expressions can then be considered as a tool to measure the impact of a tourism campaign. To do so, we used simple visual stimuli whose objective was to elicit emotions in the participants and we collected and analyzed facial expressions in order to evaluate the effective value of the emotions felt in front of these stimuli and to verify if the targeted (and stimulated) emotion was the same as the emotion felt.

After a brief presentation of the theoretical framework, we describe the research method and the expected results. From a managerial point of view, the contributions allow us to consider facial expressions as a tool to measure the impact of tourist displays, reducing the time related to the choice of promotional visuals. On the other hand, the study proposes to deepen the studies on customer satisfaction measurement tools by proposing facial expressions as a new measurement index.

Theoretical framework

Satisfaction and emotions

The emotion felt triggers different behaviors in the tourist

of anger, but occur more quickly when it is a positive emotion such as joy. Consumers adapt to what they perceive.

Current methods of measuring the emotional state of the consumer

Classical measures of emotions

Declarative methods are the most used methods in marketing to measure the verbal component of an emotion (Derbaix and Poncin, 2005). These are the so-called verbal measures of emotions. The consumer expresses what he/she is aware of thanks to a list of adjectives or scores found in works such as the Differential Emotion Scale (Izard, 1977) or the Emotion Profile Index (Plutchik, 1980). Another method of measuring emotions is based on a dimensional approach found in Mehrabian and Russel's Pleasure, Arousal and Dominance (P.A.D) model, which provides a complete and validated measure. This dimensional approach would be the most effective approach to measure the verbal component of an emotion. This type of approach is regularly used to evaluate a persuasion campaign.

Limitations to classical emotion measurement methods

From a methodological point of view, these measurement methods are based on the consumer's ability to be aware of their feeling and on their ability to translate the feeling into words. These methods involve the manifestation of several cognitive processes. On the one hand, the consumer must recognize his emotions (introspection capacity) and then remember what the consumer has felt (memory retrieval process). On the other hand, the consumer must understand the words proposed by the researcher and rationalize his response according to his need to belong. These processes disrupt the consumer's statements about their feelings. To address these biases, researchers may consider an alternative method of measuring nonverbal emotions. In this research, Lang (1980) proposes the S.A.M. (Self-Assessment Manikin) scale. The S.A.M. scale is a scale of objectification of emotions, very much used in marketing research. It consists of checking the visual with which the consumer identifies the most among a set of visuals representing an emotional state.

Physiological and physiological measurement tools

Scientific advances allow us to overcome certain biases in traditional measurements by using different measurement tools. This is notably what the introduction of neuroscience in the marketing field has allowed, exploiting physiological and physiognomic measurement tools (Droulers and Rouillet, 2007). Examples include the study of pupillary response (Cai, 2022 or Lawrence, 2011), studies using brain imaging (Meyerding, 2020), or studies using an Electroencephalogram or EEG (Maliha, 2023). Within this framework, facial electromyography or EMG is a measure that is based on muscle activation of the facial components of emotion. Facial muscles are used to produce facial expressions that can serve as an objectification of emotion. Van Bommel (2020) states that "the face is an indicator of the thoughts" of the consumer. The EMG allows studies to be carried out within the framework of F.E.A (Facial Expression Analysis). Ekman, Levenson and Friesen (1983) show that a facial expression is generally accompanied by other changes in the consumer. For example, they measured skin temperature by guiding study participants to make certain facial expressions. They found that participants exhibited physiological changes when they made these expressions. For example, anger causes an increase in extremity (finger) temperature. Hence, harnessing facial expressions is becoming an increasingly used method in research. Work includes modernizing the methodology proposed by Ekman (Koelstra, 2012).

In view of the growing use of artificial intelligence in research and the need to find a comprehensive and reliable method of quantifying emotions, we will consider in this research whether, in the context

of an evaluation of a tourism promotion, we can demonstrate the potential of facial expressions as a tool to assess the relevance of a web campaign.

Methodology

Protocol and sample

The study was conducted on 20 participants who viewed a set of photos and videos. The participants were all filmed during viewing after completing a consent form, signifying their permission for their videos to be used in the research. During exposure to these videos, there was no audio to place them in a more reliable situation and not bias them by the auditory emotional impact (Fritz, 2009). The images were chosen to be able to trigger negative or positive emotions.

The images are vectors of emotional stimuli. This is what happens in the cinema for example, the propensity of immersion of the individual will allow a better capacity of stimulation of the visuals. Here the images were selected according to their proportion to stimulate an emotional state in the individual. To select these images we relied on research involving cultural emotional stimuli (Zhu, 2015). The impact of culture is important in triggering emotions. This connection between the two is why individuals may react differently. Images were linked to emotions because they represented cultural stimulation (Lim, 2016).

As schematized in Figure 2, the sequence of the study is constructed as follows:

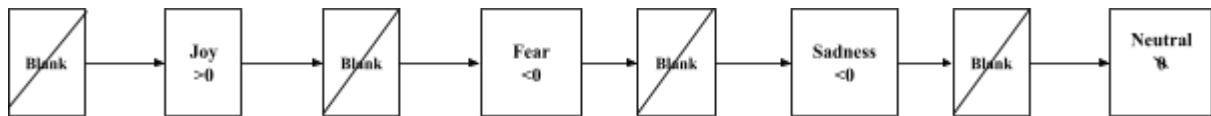


Figure 2. Sequence of visuals proposed to participants

The blanks composing the sequence last between 2 and 3 seconds. The duration of these blanks was determined in accordance with the literature, which indicates that a facial expression lasts between 0.25 and 0.5 seconds (Ekman, 2002).

The questionnaire allows for the evaluation of the participants' emotional feelings on a scale of 1 to 5. For example, in the question "I felt joy during the video clip", the participant indicates 1 if he/she "Strongly disagrees" and 5 if he/she "Strongly agrees". This question varied depending on the emotion that was being assessed.

The measurements

The measurements of the intensity and the emotional valence of the participants during the experimentation are based on the declarations collected by a questionnaire and on the observation of the facial expressions, which were treated thanks to the Noldus software. The data collected are therefore varied: both declarative and observational measures.

The data collected in the questionnaire will be called "Declared Emotions" (DE). The participant gave an emotional score between 1 and 5. For the observational measures, they were collected with the Noldus software. We will call them "Observed Emotions" (OE). The observed measures, the results, were in the form of an emotional variable. The variable indicated the rate of presence of an emotional facial expression.

The analyses

The calculation of the emotional maximums was obtained in two ways. On the one hand, for the declared maximums, we divided the initial declarations by 10. On the other hand, for the observed maximums, we divided by 10 the maximum observed by the facial recognition tool. The interest was to obtain a common scale for both types of measures (declarative and observational), with 1 as the minimum value and 10 as the maximum value.

Results

The emotions felt are congruent with the nature of the stimulus

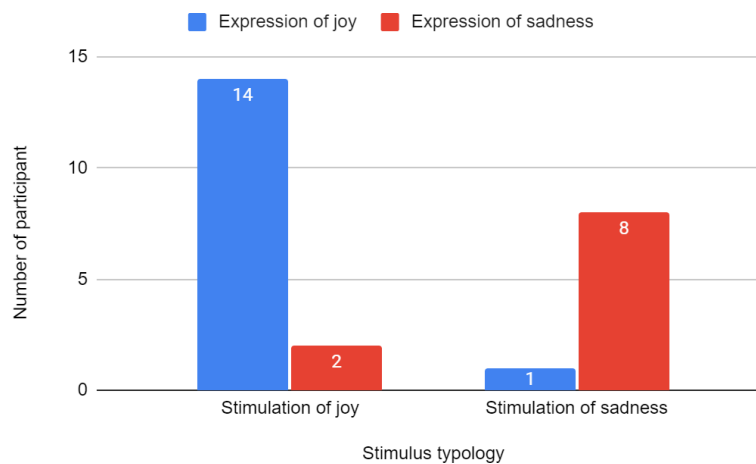


Figure 3. Dominant observed emotions (OE) during visual stimulation (happy versus sad)

Figure 3 shows the type of observed facial expression that is dominant during stimulus exposure. By dominant, we consider the facial expression that is most present during stimulus exposure in either situation. The relative importance of each histogram and the numbers shown therefore correspond to the number of participants who predominantly expressed each type of emotion between the three expressions of joy, sadness and neutrality.

The results show a good congruence between the nature of the proposed stimulus and the types of facial expressions observed. Thus, the joy emotion is the dominant emotion during the positive stimulation: under joy-inducing stimulus, the joy facial expression is the most observed in the sample (14/20 individuals, 70%). And sadness is the dominant emotion during negative stimulation: under a sadness-inducing stimulus, the facial expression of sadness is the most observed in the sample (8/20 individuals, 40%). Although the emotion is less observed in the sadness situation, in both situations there is a coherence between the nature of the emotion that one wishes to induce and the nature of the emotion actually observed.

These first results confirm that it is indeed possible to stimulate a targeted emotion. To stimulate a typology of emotion, it is preferable to refer to cultural triggers in order to target the most individuals. However, even if we note a congruence of the level of emotion perceived according to the emotion stimulated, we note that stimulating an emotion does not induce the absence of the opposite emotion. Thus, when joy is stimulated, some individuals express sadness (2/20, 10%). Conversely, when sadness was stimulated, the possibility of an expression of joy was observed (1/20, 5%).

Maximum score for expression of emotions

Stimulated emotion	Declarative Measures (DE)	Observational Measures (OE)	Normalized variance between DE and OE
Joy	6,7	8,3	0,24 (24%)
Sadness	5	5,9	0,18 (18%)
Variation between joy and sadness	1,7	2,4	

Table 1. Comparison of declared (DE) and observed (OE) emotional maxima and analysis of differentials.

Table 1 first presents the difference in emotion between verbally expressed emotion and physically expressed emotion as a function of the nature of the stimulus (joy or sadness).

First, the results of our study suggest that the joy stimulus is a better emotional trigger than the sadness stimulus. Both in verbally expressed emotion (DE) and in physically expressed emotion (OE), joy is more present than sadness. In detail, in declared emotion (DE), we observe a maximum of 6.7/10 for joy against 5/10 for sadness. There is therefore a gap between the declared expression (DE) of joy and sadness of 1.7. The emotion of joy is 34% more expressed than the emotion of sadness. As a result, there is a difference between the observed expression (OE) of joy and sadness of 2.4. The emotion of joy is 40.6% more expressed than the emotion of sadness.

Secondly, the results related to the ratio between verbally expressed emotion and physically expressed emotion show each time that there is an inferiority of emotion expression if the emotion is measured verbally compared to an observed measure through facial expressions. Indeed, the differential between verbally expressed emotion (DE) and physically expressed emotion (OE) with respect to the reference of verbal expression (DE) is always positive in favor of the facial expression mode. In both stimulation configurations (joy *versus* sadness), the observed expression scores higher. For joy stimulation, the differential is about 24%. For the sadness stimulation, the differential is about 18%. Although there is a difference in this differential (24% and 18%), this difference is relatively small. In summary, we conclude that the observation of emotions and facial expressions are an accurate indicator of the participant's emotional state. Facial expressions thus allow us to correctly approximate the emotional feeling of the individual as expressed in terms of valence (type of emotion) although they somewhat overestimate the intensity of the emotions compared to what is declared. These results show that facial expressions are indeed an indicator of feeling that the researcher or professional can consider as a collection of opinions.

Discussion and implications

The purpose of this research was to consider facial expressions as a tool for evaluating the relevance of a visual in a digital medium.

Through the first demonstration, we first showed that the emotion of joy is more easily stimulated and more stimulating than the emotion of sadness. Then, this demonstration allows us to affirm that there is indeed a congruence between the value of the stimulus and the emotion felt, whether it is joy or

sadness. However, the first demonstration shows that the stimulation of a particular emotion does not induce the absence of the presence of an opposite emotion. Through the second demonstration, we concluded that joy was a better emotional trigger than sadness. On the other hand, the ratio between declared emotions (DE) and observed emotions (OE) allows us to see that OE obtains higher scores than DE. Thus, the facial expressions allow getting closer to the felt emotion.

In terms of managerial contribution, the demonstrations show firstly that it is better to insist on positive stimulation rather than negative. Thus, it would be better to turn some speeches about sustainable tourism towards a positive message rather than a negative one, as with speeches aiming to attract a feeling of guilt in the consumer. Secondly, the study's managerial contributions show that facial expressions can be used to measure an audience's interest in a presented visual. Thus, it is possible to consider the collection and analysis of facial expressions to detect blocking points during a web navigation.

Conclusion

The results were obtained using two types of data, from declarative and observational measures. These results were based on the participants' feelings towards a sequence of visuals (stimulating and non-stimulating).

From a methodological point of view, the study shows that it is necessary to cut out the stimulating visual sequences by means of white visuals. Moreover, these visuals, which will be called "visual breaks" in this study, must be long enough and recognizable. The interest is twofold. On the one hand, the data are retrieved in video form and are easier to analyze by the tool because the researcher is able to delimit the moments of stimulation from the moments of non-stimulation per second. On the other hand, at the beginning of the sequence, these "visual cuts" will serve as measures and references for the different emotions.

Our study has identified a major limitation, which concerns the presence of facial expressions during certain parts of our sequence when they were not stimulated. Faced with this first limitation, it would be interesting to add several reference values in the studies on facial expressions and to verify if it is not an effect of mood, character or facial morphology.

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