Social Influence and Emotional State While Shopping

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Abstract. New technologies are opening novel ways to help people in their decision-making while shopping. From crowd-generated customer reviews to geo-based recommendations, the information to make the decision could come from different social circles with varied degrees of expertise and knowledge. Such differences affect how much influence the information has on the shopping decisions. In this work, we aim to identify how social influence when it is mediated by modern and ubiquitous communication (such as that provided by smartphones) can affect people's shopping experience and especially their emotions while shopping. Our results showed that large amount of information affects emotional state in costumers, which can be measured in their physiological response. Based on our results, we conclude that integrating smartphone technologies with biometric sensors can create new models of customer experience based on the emotional effects of social influence while shopping.

1 Introduction

The shopping experience at brick and mortar businesses is changing with the introduction of ubiquitous systems and technologies, which allow customers to query social networks and search engines whenever they are unsure with a purchase decision. This social question asking phenomenon, as described by Morris [1] in his survey of 2010, shows that about half of the people ask their friends from social networks their opinion about a product, restaurant, place, technology, or events, and around a third part had done it in several occasions. Since not all responses are weighted equally, social closeness is an important factor to take into consideration. The closer the social tie, the more influential the answer will be [2]. This is more visible when the costumer is asked to give an opinion: they usually refer to comments from friends, family, and colleagues rather than mass media reports or expert opinions [3]. Most of the time social influence in a decision only comes from closer ties, partly because the answers in social networks tend to be sparse [4]. That is the reason that recently e-commerce websites use a recommendation systems were users leave comments and rate the products, this reduces the search complexity, and improve decision quality [5].

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However, during a social question asking process, it is necessary to use additional mental resources to access, use and interpret information in order to make satisfying decisions [6,7]. Based on the theory that only a limited amount of information can be processed by a person [8], extra or unnecessary quantities of information can lead to mental fatigue and stress [9]. As to save time and avoid a heavy reasoning process, customers tend to rely on emotion and external opinions to help in their decision [10]. Hence, shopping decision-making is a process usually loaded with emotional biases, and highly sensitive to external influence [2,5,11,12]. To provide a good experience to the customers, retailers need to take special attention in minimizing cognitive load while keeping in mind that excessive information may be detrimental to the customers overall mood [13].

New developments in wearable technologies provide a great opportunity to help people in their decision-making during a regular shopping experience. Previous works have been capable of leveraging the use of biometric-signals sensors, such as Galvanic Skin Response (GSR), Hear Rate (HR), Skin Temperature (SKT), in order to establish a relationship between a user physical state and the emotions that he or she experiences [10,14]. For example, variation in GSR has been found to be related to the intensity (arousal) of specific emotions [15]. GSR has been widely used for emotion assessment, stress identification and cognitive load [16,17]. Solovey et al. [18] created a methodology to evaluate cognitive load on drivers, correlating the cognitive load with the GSR. This same variation, with the information provided by heart rate, can be used to identify when a person encounters a new challenge [19]. Moreover, feeling confident about a purchase can make a person to feel more relaxed. As a result of this relaxation, the skin temperature rises, as well as the heart rate, due to the parasympathetic activity of the nervous system [20]. This bodily response has been classified as an indicator of relaxation level along with a lower heart rate [21].

In this work, we argue that social influence modifies a person's mood, specifically in the context of shopping. Mood has been shown to have important effects on consumer behavior and decision-making processes [22], while also modifying the way a customer judge their shopping experience [13]. Therefore, our main hypothesis can be stated as follows: in retail context and under social influence, the emotions that a customer experiences are related to his/her shopping decision and shopping experience. That is to say that physiological variables such as GSR, HR or SKT are capable of capturing events where a purchase decision improves the shopping experience. Under this hypothesis we designed an experiment were participants could select a product from different categories, having support from different sources of information through the use of a smartphone with WhatsApp Messenger. A smart watch recorded all the biometric signals necessary for later analysis.

1.1 Limitations

The main limitation of this work is related to the use for this study of a smart band wrist wearable by commercial name Basis Peak(TM), which counts with GSR, HR, SKT sensors, and which takes a measurement every minute. We could not find any way around this. In contrast, the GSR wearable used by Hernandez [23] can take up to 60 measurements per minute.

2 Method

Experiments were done in the months of June and July 2015. At the end of each test, participants received a $5 cash-card for taking part in the study. We chose to use WhatsApp Messenger in order to have natural feedback from participants, since all participants had experience with this type of messenger and could use their own smartphone.

2.1 Participants Demographics

In this study, 34 participants (17 women) were recruited from a pool of undergraduate students, ranging in age from 18 to 27 years ($\mu = 21.24, \sigma = 2.23$). All of them were highly experienced with mobile messaging apps, rating themselves as highly proficient. Thirteen participants (38.23 %) reported having 10 to 20 different messenger conversations in an average week. Participants were familiar with the group functionality of the mobile messaging app, with ten belonging to 3 to 5 groups, twelve being part of 5 to 10 different groups, seven to 10 to 20, and four with 20 or more groups. Using a multiple option questionnaire, we could see that our participants usually go to retail shops to buy clothing (88 %), footwear (76 %), fragrances (62 %) and technology (59 %). Only 9 % of them buy wine in a departmental store. The majority of participant reported asking their friends or family for help with purchasing decisions, with 27 of them frequently appealing to their closest ones suggestions, 2 having done only once or twice, and 5 never having it done before.

2.2 Procedure

Once a participant was selected to do the experiment, he or she was randomly assigned to either the experimental or the control group. Then, a member of the team would ask the participant to put a Basis Peak(TM) smart band on and while the reading started, a member of the team explained the procedure to the participant and asked to sign the consent form, allowing to be videotaped and allowing us to use the data for academic proposes. In the case of the control group, immediately after the previous steps, the participants went to a mock-up department store. On the case of the experimental group, we ask them first to start a group on his/her phone with friends and family who could help them to take a decision and then add a contact named "participant-lumia" that was link to a 500 Nokia Lumia smartphone. This smartphone was then given to the participant with the contacts of six different experts (a man and a woman from each of the three product categories), and a group named "crowdsource" with several contacts added that the participant did not know before.

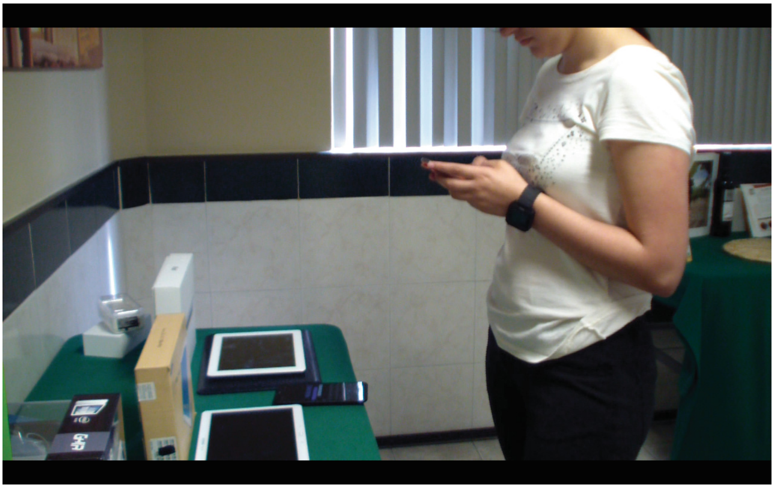

Fig. 1. Participant selecting products and asking to her friends via smartphone (chat)

Mock-Up Department Store. The mock-up department store designed for the experiment was a classroom adapted for this purpose. We disposed tables for each of the categories, one for Gourmet Food (wines), other for Technology (tablets), and two for Health and Beauty items (perfumes, one for men and other for women). The brands of all the products are detailed in the Table 1. To help the participants to play the role of a customer in a department store, decoration was placed on each table. On one of the walls, we projected video ads from a department store's YouTube channel, and posters lent us by the department store's management, were placed on above all product tables. To help on the later analysis, we put a camcorder to record all the room to see most of the reactions of the participants. On Fig. 1 we can see pictures of a participant asking on the phone.

Once the participant enters the mock-up store, he or she had a few seconds to familiarize with it while one of the researchers gave a brief introduction to the products that had to be chosen. The order of the tables was randomly counter-balanced and once the participant arrived to a table, a staff member presented the three options that had to be selected. In the control group, after the

Table 1. Options available for each category

Category	Options
Gourmet Food (wine)	Montesierra, Sangre de Toro, Rioja Cuné
Technology (tablets)	iPad, Samsung Galaxy 3, Ghia i7
Men's H &B (fragrances)	Benetton Sport, Cold, Perry Ellis America
Women's H &B (perfumes)	Nature, Forever Dreams, Tommy Girl

participant selected a product, they had to answer why he or she chose that option and if he had to ask someone about the products, whom he or she would choose. On the experimental group, the participant was introduced to the respective experts of the product category, and then they had to decide which one to ask about the products (the man or the woman). Finally, they had to message the crowdsource group and his/her friends and family. No additional instructions were given, each participant was free to contact each source as he or she liked (text, picture or audio). Once the decision was made or 10 min passed on the table, the participants continue to the next table and so on until the three decisions were made. At the end of the experiment, the participants of both groups had to answer an inventory to assess their emotions during the experiment called Positive and Negative Affect Schedule (PANAS) [23].

2.3 Information Sources

Participant's interactions were limited to text media messages using WhatsApp messenger, so, making phone calls or using SMS were not allowed during the test. Participants in the experimental setting had access to three distinct information resources:

Social Groups. Each participant created a group of friends and family using the mobile application. It was due at the beginning of each experiment in case they want to ask for a recommendation during the purchasing decision.

Product's Experts. For each product category (in our case, Health & Beauty, Gourmet Food and Technology), participants had to choose one expert to contact using WhatsApp, and ask for some product's reviews in order to take their decision. A total of six personas of different genders were created, with different name, age, occupation, face picture, motivations, goals and frustration, each one simulating a different expert in each the product categories. Using a Wizard of Oz method, we instructed a member of staff to converse with the participant answering from a pre-defined set of answers. All answers were the same regardless of the gender of the expert, thus, all participants received the same information from the experts.

***Crowdsource* Group.** Friends and family of the staff members were invited to help during the experiment. They were added to a WhatsApp's group called "Crowdsource", with a total of 15 members (8 men and 7 women). We did not give any explicit instruction as to how to respond the participants inquires, however we did provide the group with the names and brands on display beforehand. All members information (e.g., their names) was anonymized on the phone the participants were using.

2.4 Processing Biometrics Signals

The activity-tracking wristband Basis Peak(TM) is set to capture the following body signals: HR, SKT, and GSR. A measurement is taken every minute, and stored in the clock's internal memory until it is synced with a mobile device and cloud server. We downloaded the records from the Basis Peak cloud server, and split the data by participant. In order to make a fair comparison between signals and statistics approach was used. For each measurement we obtained mean, variance, median, minimum and maximum. We also obtained these descriptive statistics for the first 5 and the last 5 min of the experiment, and for the signal without considering neither the first 5 nor the final 5 min. This resulted in a dataset consisting of 34 participant's signals by 73 descriptive statistics. These statistics were centered and scaled by taking the mean and dividing by one standard deviation. To have a better understanding on the signals and to give a stress evaluation, we calculate it with a formula that uses heart rate, skin temperature and galvanic skin response to give a stress level value, and a filter proposed to automatically detected stress [24]. We correlate this information with the PANAS results.

3 Results

When comparing the self-reported metrics between groups using a Fisher's exact test, we were unable to find any significant difference at the $p = 0.05$ level. However, there was a slight tendency, on the $p = 0.1$ level, for participants on the experimental setting to feel slightly more nervous ($p = 0.10$).

Furthermore, not only stress related emotions were seen in our results. Other negative emotions, like irritability and anger values on the PANAS were reported by the experimental group. We confirmed the latter, with biometric data collected in our experiment; the variance of the ST was lower on the control group ($t(14.179) = -2.3459;\ p < 0.05$), and as explained by Ekman [10], this could be due to the higher emotional charge on the experimental group, caused by anger (higher ST) or by stress (lower ST).

To calculate the participants' stress, the values of HT, ST and GSR were normalized and fed through a filtering algorithm. This algorithm highlighted that the participants from the experimental group had more stressful events, with most of them lasting longer, than their control counterparts do. A significant difference on the mean stress level was found between the groups ($t(6 : 0856) = 17 : 725;\ p < 0.01$).

The experimental group participants reported more negative emotions like stress, and according to the classification filter [24], 11 out of 16 presented stress episodes as shown in the Fig. 2, whereas in the control group (Fig. 3), only 4 users presented stress.

Our results point towards a relation between the external input, the shopping task and the self-reported emotions felt during the experiment. We then focused our efforts to find if such relations reflect on the participant's biometrics.

The HR is the main biometric variable that gave us a clear differentiation between groups. While the experimental group had the higher max value, the mean was higher in the control group; this could be due the great variation between subjects, while the values in the control group where more uniform,

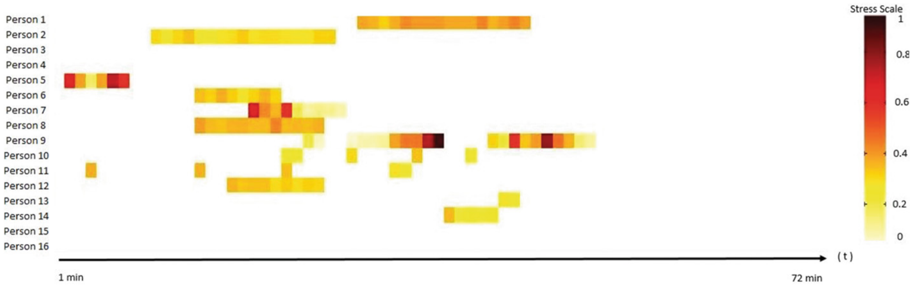

Fig. 2. Experimental group

Fig. 3. Control group

in the experimental group, had more changes because not all the subjects had the same levels of stress. Based on the results from the correlations test on the results of the formulas applied to calculate stress level, we confirmed that the atypical data, like a stress episode, have to be analyzed separately. As Khazan [25] explains, in biofeedback therapy this type of data is used to characterize emotional states. Based on this, we considered appropriated to calculate the stress level after a filter detects the stress on the person. Finding a significant difference when it was used.

4 Conclusion

Social influence is an important factor to assess while evaluating the shopping experience at stores because this it is likely to emerge with the presence of smartphones, which facilitate interaction with friends and networks while evaluating products. Recent studies show that more than 89 % of smartphone owners use their phone in the store [26]. This could lead to a better experience, but not in all cases as shown in this work. We found that when too much information is given to the participant, he tends to experience more negative emotions as seen in the PANAS results. Capturing such emotions can now be done easier and in real time with new wearable technology that could give us even less subjective results; HR, GSR and ST have been proved to be good metrics to measure negative emotions like stress, and give a better insight of post-test instruments such as the PANAS. The use of wearable devices like the smart-watch Basis Peak(TM) could be an important addition to the studies that evaluate shopping experience in the context of understanding the requirements of technologies for shopping with smartphone interaction.

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