

Emotions, Possession and Willingness to Pay: The Case of iPhone

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Abstract: Emotions are an important factor underlying most human behaviour. The role of emotions is explained by neuroeconomics that is a synthesis of neuropsychology and economics. In this study we test the role of emotions in an exploratory setting, namely the adoption of the iPhone in Denmark. To test the role of emotions a research model was developed that includes emotions as independent variables and the intention to buy an iPhone as dependent variable. The hypotheses derived from the research model are tested by regression analysis. The analysis shows that positive emotions explain 35 % ($R^2 .348$) of the variance in people's intention to buy iPhone. Hence, the conclusion suggested in the paper is that emotions should be addressed in research and in the design of mobile artefacts.

1. Introduction

Emotions, such as love, hate, desire, and dislike, are subconscious and have a fundamental impact on human behaviour. However, research into ICT seldom addresses emotions as a factor influencing people when adopting ICT. Instead, very much of the current ICT research implies that human beings behave according to a rational model. This rational view is evident in mainstream models and theories such as Diffusion of Innovations or Technology Acceptance Model. Consequently, underlying mechanisms that shape our attitudes and beliefs are missed or not addressed, such as our intuitive feelings towards an object. Studies into neuroeconomics have shown the impact of emotions on behaviour and beliefs. It is necessary to investigate the role of emotions in the adoption and diffusion of ICT applications. We explore the role of emotions in people's intention to buy the iPhone.

1.1 Literature Review: Neuroeconomics

Neuroeconomics is an emerging field that seeks to develop our understanding of human behaviour and in particular the role of emotions and emotional response [1]. The field integrates findings from neuropsychology into social sciences [2]. One of the core findings is that emotional response is an important and underlying mechanism of most human behaviour [1]. The role of emotions has been identified through experiments with people and animals involving neurological techniques (Hansen and Riis Christensen 2007). The role of emotions in human behaviour may be explained by the functioning of the brain, which is addressed next.

According to contemporary neurological and neuropsychological research [1, 3], the brain consists of three basic parts: neo cortex, old cortex, and pre-reptilian part. The neo cortex is the outer part of the brain and the largest. It has several specialized areas for seeing, calculating, reasoning etc and it is here our cognitive processes to a large extent are believed to take place. The old cortex functions as the control system of the brain and is located in the central part of the brain and manages communication between the neo cortex and pre-reptilian brain. The pre-reptilian part is the inner and central part of the brain

located in the lower part of the brain and it interacts with the old and neo cortex, where information is processed. It controls basic and elementary processes through three elements. The first is the thalamus where most sensory stimulation passes, such as smells, tastes, touches, looks and hearing. The second element is the amygdale which controls our basic responses, such as glandular behaviour (e.g. increase in heart rate) and autonomous responses (e.g. to duck when an object is thrown at you). The third element is the hippocampus, where elementary information is stored, and when interacting with the amygdale it controls emotional responses. The processes controlled by the pre-reptilian part are referred to as emotional responses. They occur before any cognitive process is activated. Every stimulus, from external or internal sources, passes through the thalamus, where an unconscious evaluation of the stimuli occurs. Depending on the stimuli, previous experiences, and the person in question we respond in different ways.

Hansen [4, p. 1432] illustrates brain functionality: “If, for example, an individual in the middle of the road observes a car approaching with fast speed, the perception channelled through the thalamus may, through the amygdale, generate an increased heart rate (autonomous response), sweating in the hands (glandular response) and freezing or running away. All these may occur before any activity in the cortex takes place. Only later, when information has been transmitted here, can the precise nature of the danger be identified and labelled, and possibly, this may influence the further direction of the response.”

Hence, there are several types of brain processes, some are conscious and some are unconscious, activated by affective or cognitive processes. Camerer et al. [2] summarizes different types of brain processes into a two dimensional matrix describing different neural functioning. They distinguish between controlled and automatic processes on one dimension and cognitive and affective processes on the other dimension. Controlled processes are deliberate and sequential when encountering stimuli. In most cases people have a good introspective account of controlled processes. For example, a software developer can recall the development process, such as what problems existed and how they were solved. Automatic processes are parallel and occurs unconscious and are effortless. Parallelism is central. It is the brain’s multitasking ability and extremely fast. For example, a person is able to manage numerous of stimulus at the same time, such as seeing, listening, talking, touching, smelling, and tasting. But people have limited introspective account for these processes and are unable to recall why they did something in a certain way.

The other dimension deals with cognitive and affective processes. Affective processes are closely related to motivation and feelings. All affective processes are valence, i.e. they are either positive or negative. They are also labelled as go/no-go questions that elicit behaviour – do or do not. There are two types of affective processes: biological, such as hunger, sex, drug addiction, and social, such as desire to have or to be included. Cognitive processes are brain processes that do not have valance. They answer true and false questions. Hence, cognitive processes cannot lead to action by themselves, only if affective processes are involved. The different brain processes do not exist in a pure form or exist in isolation. According to Camerer et al. [2] all behaviour has to involve affective processes.

In this section we have briefly outlined some of the key ideas of neuroeconomics. The underlying foundation is the new understanding of how the brain functions and the role of emotions and emotional response that underlie all human behaviour. In addition four key brain processes, including controlled, automatic, cognitive and affective, are briefly described. To summarize and integrate the ideas we present the Emotion Cognition Behaviour (ECB) model that relates emotions to behaviour, see figure 1. All behaviour is elicited by some external or internal stimuli. The stimuli are first automatically processed in the pre-reptilian brain leading to either a positive or negative emotion (affective brain processes), which leads to an emotional response. The emotional response may elicit a behavioural response or a cognitive process (controlled or automatic) that may lead to

certain behaviour. In the following section we present a research model that incorporates affective (emotions) and cognitive controlled (intention to buy) processes.

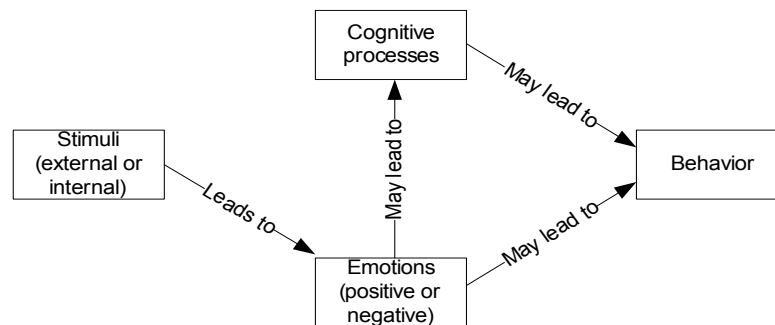


Figure 1: Emotion Cognition and Behaviour Model

1.2 Research Model

Stimuli can be defined as being something that causes a physical response in an organism and stimuli can be either external or internal. External stimuli are stimuli that people sense in their external environment. These can for example be visual stimuli such as images or text. Internal stimuli are peoples' own thoughts on a given product or concept. The external stimulus in this investigation is the questionnaire presented to the respondents. The questionnaire contained a short descriptive text of the iPhones features, a photo of the iPhone, and questions related to our research question. The internal stimuli are the thoughts and possible preferences that people may have formed as a consequence of the continual exposure of the device in different media since its presentation at Macworld Expo in January 2007 and during the process of filling out the questionnaire. This leads to the following hypotheses:

H1a: Stimuli, external or internal, are related to negative emotions.

H1b: Stimuli, external or internal, are related to positive emotions.

The emotions elicited by the stimuli leads to emotional responses (behaviour and/or cognitive process. Behaviour (affective and automatic brain processes) elicited directly from emotions is not measured, since it is not relevant for our study. Cognitive processes (thinking about the iPhone and in fact answering the questionnaire) is a response to emotions leading to the following hypothesis:

H2a: Emotions, positive or negative, elicit emotional response (cognitive processes).

Positive emotions are found to have a great impact on people's choice of consumer products and brand (Hansen and Riis Christensen 2007). Therefore, we hypothesize that positive emotions is a predictor of people's intention to buy iPhone:

H2b: Emotions, positive, is positively related to people's intention to buy an iPhone.

2. Objectives

The overall research question is: Can emotions explain the failure or success of information technology? We explore this in the context of the adoption of iPhone in Denmark the purpose is to increase our understanding of how emotions affect people's intention to buy the iPhone. This paper contributes to our understanding of emotions as an underlying mechanism in the adoption and diffusion of mobile services and technology. We acknowledge that emotions and rational behaviour cannot be separated but must be investigated collectively, and believe that it is necessary to rethink the use of existing models to include emotions in order to be able to provide a broader picture of adoption and diffusion of mobile services and technology.

3. Methodology

Given the research question of the paper, to identify the role of emotions in human behaviour, the study conducted is mainly exploratory. One of challenges was to find a behavioural situation, where emotions are likely to be of importance to predict the intention of behaviour. We finally decided to explore our research question in the context of people's intention to acquire the iPhone in Denmark. The reason for this choice was mainly due to the fact that the iPhone was not sold in the Danish market at the time of the data collection. However, it is available through individual parallel import mainly from the UK and the USA. For instance in the beginning of April 2008 there were more than 8.000 iPhone's used in the Danish mobile networks [5]. The iPhone has attracted a lot of attention from customers and competitors, some people find the iPhone so attractive that they go to foreign countries in order to acquire it, and crack it in order to make it work in their home countries. This seemed to be a unique situation for investigating the role of emotions and the intention to acquire a new mobile phone.

3.1 Instrument Development

Affective processes, such as emotions, are difficult to measure directly. But, it is possible to infer the underlying emotions by inquiring about feelings [4, 8]. In psychology there are several instruments available to measure feelings. For example, Ortony and Turner [9] provide a review of different instruments. These measurements are based on verbal expressions and include different feeling words, such as hate, love, joy, distress etc. The instrument used in this study is based on scales from previous empirical studies [6, 7].

The development of the instrument involved three phases: The first phase relates to the development of measurements (feeling words) that measure "emotions". These feeling words came from an initial list of 53 positive and negative feeling words from marketing literature [6] and information systems literature [10, 11]. The initial list was presented and discussed in two workshops with 30 master students. Through these workshops we were able to reduce the number of feeling words to 32.

To test the reliability of the 32 items we developed a questionnaire addressing the impact of "emotions" on potential consumer's "willingness to pay" for an iPhone. The respondents were asked to evaluate the applicability of each of the 32 feeling word to describe their emotions towards the iPhone and its feature. The questionnaire was tested by 39 Ph D students. From the test we selected the five most applicable positive feeling words and the two most applicable negative feeling words. The words were: "excitement", "smart", "doubt", "expectations", "like", "interest", and "uncertainty".

The third phase involved the development of measurements that relates to controlled cognitive processes. The dependent variable or studied behaviour is people's "intention to buy" an iPhone. This was measured by one item "Do you intend to acquire an iPhone". The intention to buy was measured by "positive emotions". The scales were measured using a five-point scale ranging from strongly disagrees to strongly agree.

4. Result

4.1 Population and Sample

Approximately one thousand students enrolled at undergraduate and graduate level at the IT University and the DØK studies (managerial economics and IT) at the Copenhagen Business School were invited to participate in the study. In table 1, we summarise the demographic data of the respondents. Usable responses consist of 158 students including 103 male (66%) and 54 female (34%). The survey was anonymous, and students were asked to respond to all items and in the way consistent with their perceptions and emotions

in regard to the iPhone. Respondents were between age 21 and age 57. 103 of the respondents were between 20 and 30 years old which accounts for approximately 65% of the sample. 33 respondents were between 30 and 35 years (21%), 12 were between 35 and 40 years (8%) and 8 respondents were between 40 and 57 years old (5%).

Table 1: Demographic Information of Survey Respondents

Male 103 (66%)		Female 54 (34%)	
Age 21 – 30 103 (65%)	Age 30 - 35 33 (21%)	Age 35 – 40 33 (21%)	Age 40 - 57 12 (8%)

Table 2, show the respondents experience of Apple products; 82 respondents (52%) stated that they have no or very little experience with MAC computers, 55 (35%) have no or little experience with iTunes and 49 (31%) have no or little experience with iPods. 45 (28%) state that they have much experience with MAC computers, 81 (51%) have much experience with iTunes and 84 (53%) have much experience with iPods.

Table 2: Respondents' Previous Experience with Apple Products

	No or little experience	Much experience
MAC computers	82 = 52%	45 - 28%
iTunes	55 = 35%	81 - 51%
iPods	49 = 31%	84 - 53%

The respondents all have a mobile phone; 72 (45%) have a Nokia phone, 53 (34%) have a Sony Ericsson phone, 6 (4%) have an iPhone and 27 (17%) own a phone of a different brand, such as Samsung, LG, HTC or HP Ipaq. 31 (20%) of these phones are Smartphone's and 127 (80%) of the phones are other phones.

4.2 Analysis

The factor analysis contains three factors (Positive emotions, Negative emotions, and Cognitive processes) explaining 77% of the overall variance. The analysis based on principal component extraction and varimax rotation produced a good factor structure. Kaiser-Meyer-Olkin Measure of Sampling Adequacy gave a result of ,853. The communalities varied between ,571 (Excitement) to ,933 (Cognitive process) indicating that the factors represents the variables well. Nevertheless, the main result of the factor analysis relates to hypothesis 1a, 1b that stimuli elicit to positive and negative emotions, which can be measured by feeling words. This is consistent with studies from marketing [6]. The factor analysis also provides support for the hypothesis 2a that emotions elicit cognitive processes. Another way to illustrate that cognitive processes have been elicited by the stimuli (the survey and its questions) is that 158 persons have participated and spent on average 5 minutes and 47 seconds on the survey.

The second part of our result presentation addresses hypothesis H2b that is based on a linear regression analysis. The dependent variable is intention to buy and the independent are the factor "positive emotions" from the factor analysis. Negative emotion was excluded, since it is not expected to predict intention to buy and the factor cognitive process is an antecedent of cognitive brain processes and not intention to buy. Based on the underlying items of the four factors an index was created for each factor. The indexes were used as independent variables in the regression analysis.

The regression analyses provide acceptable support to the regression models. The squared R reached ,348 and F 80.68 for Positive emotions, thus explaining 35 % of the variance in people's intention to buy iPhone. The results of the study show that cognitive neuroscience is a viable science that can inform information system as suggested. It provides some new insights and illustrates the role of the constructs emotions and emotional response that may force of the revise and rethink some of our models and theories.

5. Business Benefits

Previous research within other fields has shown that positive emotions have a great impact on people's choice of consumer products and brand [6]. Our study supports this theory and the main benefit of the study is the provision of evidence that positive emotions predict people's intention to buy an iPhone. Benefits of the Emotion Cognition Behavior-model for the various stakeholders are listed below:

- Mobile phone users could experience benefits if businesses use the constructs of the ECB-model and design mobile phones that seek to accommodate the users' emotions towards design and functionality.
- The business community should therefore ensure the incorporation of mobile users' emotions when developing mobile devices. Mobile users have emotions towards the design of the phone and the functionalities supported by the phone. These emotions elicit an emotional response in the form of cognitive processes and these may lead to a certain behavior, such as the acquisition of a particular mobile device. The business community may then benefit even more from their marketing of information and communication technologies that already seems to be approaching peoples' emotions.
- The IS research community could benefit from integrating the discoveries in cognitive neuroscience into IS theories about how the diffusion and adoption of IT supports human processes and should therefore also incorporate emotions in the development of theories and business models. The inclusion of emotions seems to have influence on and predict whether a mobile device, and possibly also information and communication technologies in general, is adopted and thus whether it becomes a failure or success.

The investigation of the failure or success of information and communication technologies as well as the adoption process of technologies feed back to the business community that may use this knowledge in the further development of technologies and marketing, which will in the end benefit the end-users.

6. Conclusions

This paper has introduced neuroeconomics to the IS community and presented the results of a study that investigates the role of emotions, emotional response and behavior. The purpose was to contribute to the overall question whether emotions can explain the failure or success of information technology. We explored this in the context of iPhone adoption in Denmark and investigated whether emotions influence peoples' intention to buy the iPhone.

After introducing Neuroeconomics, we developed an instrument through three phases to measure feelings and ended up with seven, five positive and two negative, feeling words that may explain the intention to buy an iPhone. 158 respondents participated in the study. Through factor analysis we found that three factors (positive emotions, negative emotions and cognitive processes) explain 77% of the overall variance. We consequently deduce that external and/or internal stimuli are related to positive and negative emotions. Furthermore, the factor analysis shows that positive and/or negative emotions elicit emotional response (cognitive processes). This was further supported by respondents spending on average of 5

minutes and 47 seconds completing the survey. A regression analysis provides evidence that positive emotions are positively related to peoples' intention to buy an iPhone.

Our study therefore shows that cognitive neuroscience is a viable science that can contribute further to information systems research and that constructs such as emotions and emotional response may be incorporated into existing models of diffusion and adoption.

6.1 *Future Research*

There are numerous opportunities to explore the ECB model and emotions in future information systems research and thereby improve our understanding of different factors influencing the diffusion and adoption of information technology and the design information systems.

The presented research contains certain limitations. These include the technology being studied in a voluntary and not a mandatory context, the role of emotions in regard to the technology is investigated before an adoption can occur at an individual level and the technology itself, which is quite simple as opposed to large complex information systems. These circumstances create an opportunity for IS researcher's to explore the role of emotions in the following settings:

- From voluntary to mandatory context: Our study was conducted in a voluntary context; people's individual intention to buy an iPhone, and therefore the result, referring to the specific feeling words and the impact of positive emotions on intention, cannot necessarily be applied to a mandatory use context. Hence, it could enhance the explanatory power of emotion to study the role of emotions in a mandatory setting. For instance, the role of emotions in sales peoples intention to use CRM system or software developer's intention to comply with procedures in information system development methods. To expand emotions from a voluntary to a mandatory setting requires the inclusion of different feeling words than the seven used in this study, see table 2.
- From before to after diffusion and adoption: The iPhone has not been released in Denmark when this study was conducted and only 4% of respondents own an iPhone, which furthermore demonstrates that diffusion and adoption of the technology has not yet taken place. The current adopters may be categorized as innovators so when the iPhone is released in Denmark it could be of interest to investigate the role of emotions as we go further into the diffusion curve of innovation and the behavior of the iPhone adopters become individual experienced reactions [7].
- From simple to more complex technologies: The intention to buy the iPhone is a simple behavior or at least the decision to buy one does not require a complex decision making process. It would be interesting to study the role of emotions in situations involving adoption decisions of more complex technologies such ERP system. Another situation related to the development of information systems would be the case of software developers solving complex problems, e.g. the design of a new operating system.
- From individual to group or organizational setting: Most existing research within cognitive neuroscience, neuroeconomics, and neuromarketing has been done at the individual level. There are very few attempts to move this research to a group or organizational setting [2]. Thus, there is an opportunity for exploring and exploiting the use of feeling words in both group and organizational settings. For example, are there common emotions towards an object within a workgroup or do common emotions reveal something about the underlying values of an organization. Emotions on technologies introduced in a group or an organizational setting may very well be different from technologies chosen to be used by the individual. The dynamics of a group or an organization are different as well as the benefits of using the technology. It could be relevant to study how emotions influence the implementation of an information system in a change management context. What is the role of employees'

emotions when they respond with resistance against the change? And is this common feeling reinforced in the group as opposed the feeling at the individual level?

These different research settings may help explain the success and failure of information systems and show that positive emotions and cognitive processes towards an information system influence people's intention to make good use of the system and behave as intended and thus make the use of the system a success. Correspondingly negative emotions and cognitive processes towards an information system influence people's resistance against the use of the system and thus cause it to fail.

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