



Identifying affect elements based on a conceptual model of affect: A case study on a smartphone



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ABSTRACT

The concept of affect has been considered as a requisite for the success of a product in the market. However, 'affect' is an ill-defined concept. This study developed a new conceptual model to explain the fundamental concept of affect. Based on this model, a systematic procedure of affect element identification was proposed using a literature review, a focus group interview, an internet survey and statistical analyses. Affect elements of smartphones were classified into two parts: appearance and applications. The results of this study are expected to help developers understand the nature of affect. The systematic approach proposed in the study can be applied with minor modifications to identify affect elements of other smart products.

Relevance to industry: This study proposed a conceptual model of affect and identified affect elements of smartphones. The list of affect elements will be helpful for developing and evaluating smartphones including diverse types of smart products.

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1. Introduction

Affect, also known as the perception of affective quality, indicates the perceived image/impression that users feel while using a product or service (Han et al., 2001; Han and Hong, 2003; Park et al., 2013b). Affect is an important factor that contributes to customer's purchasing behavior (Seva et al., 2007). As various user groups have newly emerged in the market, user needs when purchasing products have become increasingly diverse (Khalid, 2006). Satisfying the users' desired affect is a necessary factor in addition to simplifying product complexity and increasing their ease of use (Han et al., 2000; Sonderegger and Sauer, 2010). Considering the importance of affect has become an emerging trend in product industries; it is known to be an important element of user experience (Park et al., 2013b). The word affect (*kansei* in Japanese) was first introduced for sales promotion of the Mazda Miata, a Japanese

sports car (Nagamachi, 1995).

The goal of affect research is to determine the relationships between affect and design features of products (Han and Hong, 2003; Huang et al., 2014; Nagamachi, 1995; Nakada, 1997). Affective satisfaction, a type of user satisfaction, indicates how much users are affectively satisfied by a product or service (Cho et al., 2011; Han et al., 2004). Affect research has actively targeted various products like consumer electronics, automobile, office chairs, and mobile phones (Kim et al., 2011). The feature phone has become one of the major target domains for this research because such phones have become a necessity in daily life (Hong et al., 2008). However, it is not applicable to smartphones because the two types of phones have substantially different characteristics; i.e., smartphones support more-varied applications (apps) than do feature phones (Falaki et al., 2010). An app has its unique characteristics related to software and service (Lin and Ye, 2009). Therefore, the concept of affect obtained by examining feature phones should be extended to include the diverse characteristics of smartphones.

Emotion is very similar concept with affect and is also referred to core affect in psychology (Russell, 2003). It indicates the subjective feeling consisting of arousal and pleasure (Russell et al.,

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1989). In contrast to affect research, emotion research has more focused on theoretical constructs such as the concept or physiological mechanism of emotion (Schachter and Singer, 1962). Emotion has been widely analyzed since the late 19th century in the field of psychology. The physiological mechanism of emotion is still controversial but many researchers have concluded that emotion is related to cognition (LeDoux, 1995). In this study the theoretical understanding of emotion related to cognition was adapted to the concept of affect.

This study attempts to identify and verify the affect elements of a smartphone by considering its diverse characteristics. The smartphone was chosen as the target device because a smartphone becomes a daily necessity in our lives. In addition, affect elements through smartphones' apps can be applied to other devices' apps since many electronic products tend to use the same apps as those found on smartphones.

This study follows the procedures below. First, a conceptual model of affect was developed to understand the concept of affect. The definition and the transition theory of affect were analyzed, considering current studies related to affect and emotion. Next, affect elements contributed by smartphones' appearance and apps were identified. Previous research into effects of apps on affect is relatively rare compared to research into effects of the devices' appearance. A systematic procedure using a literature survey, a focus group interview (FGI), an internet survey and statistical analyses was proposed and affect elements of apps were identified by following the procedure. Finally, the proposed procedure for identifying the affect elements and the derived affect elements were verified using a multiple regression analysis, and affect processing diagrams for a smartphone were developed.

2. Developing a conceptual model of affect

2.1. Previous research on affect

Previous research on affect that is intensively studied can be divided into two parts: affective engineering and emotion (Park et al., 2011). In the field of affective engineering, the relationships between affect and a product design have been analyzed; this research produces results that are useful topics for product designers. Emotion research has mainly focused on identifying the concept or physiological mechanism of emotion in the field of psychology (Schachter and Singer, 1962).

2.1.1. Affective engineering and affect

Affective engineering (*Kansei engineering*) is a type of applied engineering for translating affect into product design elements (Nagamachi, 2002). It has begun to address companies' requirements that their products or service be competitive in the market. It aims to 1) identify product design features that influence users' purchase decisions, and 2) evaluate the amount of affective satisfaction that a user gets from a product or service (Nagamachi, 1995). The process drew attention when the Mazda Motor Corporation applied the concept while designing the Miata and succeeded in the American auto industry.

Nagamachi (1995) defines affect (*kansei*) as the feelings or images that users sense when they see a new product. To examine the concept of affect more clearly, Han et al. (2001) divided affect hierarchically into three components: basic sense, description of image, and evaluative feeling/attitude. Despite several attempts, affect has not been defined clearly, and the mechanism for evoking it has not yet been explained convincingly.

Along with research into the concept of affect, many researchers have tried to apply statistical techniques to identify how design features of a product influence affect. Several statistical techniques

have been applied, including regression analyses (Han et al., 2000; Hong, 2005), multiple response surface methods (Hong et al., 2008), fuzzy rule-based approaches (Park and Han, 2004; Yadav et al., 2013), rough set approaches (Zhai et al., 2009), and genetic algorithms (Han and Yang, 2004). The research trend of statistical approaches has its origin in industries' interest in identifying critical design features of a certain product; given this knowledge a company can design a product that can maximize consumers' affective satisfaction and can influence the consumer to purchase the product.

2.1.2. Emotion and affect

Emotion is defined as a neurophysiological state which is consciously accessible (Russell, 2003). Emotion research started in the late 19th century. James (1884) argued that people have feelings after a stimulus provokes bodily changes. When people meet with a carnivore like a bear, they break out in a cold sweat and then are seized with fear. Cannon (1927) contradicted James's argument, and said that physiological changes and emotion can occur at the same time, rather than consecutively. However, Schachter and Singer (1962) insisted that a conscious understanding of one's situation is more important in forming emotion than physical arousal. Furthermore, Arnold (1960) suggested that conscious appraisal has a decisive effect on emotion and that each emotion is a result of a specific appraisal process.

From all those hypotheses, two representations of emotion have emerged. The first is to classify basic emotions. These evolved naturally and all kinds of emotions are constructed by combinations of this basic form. Ekman (1972) suggested five Basic Emotions: anger, disgust, fear, happiness, sadness, and surprise and Plutchik (1980) listed eight emotions: acceptance, joy, anticipation, anger, disgust, sadness, surprise, and fear. Ortony et al. (1990) classified emotion types and suggested the global structure of emotion considering three major aspects of the world: consequences of events, actions of agents, and aspects of objects.

The second representation is to map emotions onto continuous dimensions. Each emotion can be mapped as a point in a two dimensional space that represents valence and arousal (Russell et al., 1989). Valence represents pleasantness, which is the feeling of the assessment of one's condition; arousal represents alertness, which is the feeling of mobilization. Both dimensions have bipolar characteristics that range from negative to positive.

Various studies on emotion from the psychology field have been applied in the field of marketing and industrial engineering, focusing on the emotion specifically elicited by products (Westbrook and Oliver, 1991). Emotion associated with product usage has been known as consumption emotion in the marketing field (Laros and Steenkamp, 2005; Richins, 1997; Westbrook and Oliver, 1991). Crilly et al. (2004) defined consumption emotion as affective response and stated it is the result from an appraisal process.

Both affect and emotion indicate peoples' subjective feelings, but they have different perspectives on subjective feelings. Affect is the object-oriented image/impression of product while emotion is the introspective feeling to internal or external events which are an integral blend of arousal and pleasure (Further explained in Section 2.2). In spite of the ambiguous relationship between affect and emotion, very few studies have examined the relationship between the two concepts (Khalid, 2006).

2.2. A conceptual model of affect

The term 'affect' has been defined in different ways by diverse researchers. The aim of the study is to define affect from the viewpoint of the affective engineering for integrating affect into

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