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Abstract

We propose a conceptual model for the context of mobile applications (apps) that explains the relationship between perceived visual aesthetics, perceived visual attractiveness, and intention to download. The model predicts that the aesthetics characteristics influence users' perceived app attractiveness and users' intention to download the app. It further predicts an interaction effect, where users' personality types moderate the effect of aesthetics characteristics on perceived app attractiveness. In other words: differences in aesthetics characteristics explain differences in perceived app attractiveness. However, this effect varies for different types of user personality. We explain the model's grounding in theory, describe the design of a laboratory experiment for empirically testing the model, and explain our manipulations of the aesthetics characteristics along its *classic* and *expressive* dimensions. Besides presenting our conceptual model and describing out planned experimental design, this study encourages researchers to further investigate how aesthetics characteristics affect intention formation depending on user personality types.

Keywords: aesthetics, attractiveness, mobile apps, personality.

1 Introduction

Mobile phones have come from being a handheld device to being an extension of ourselves. We increasingly use mobile phones for activities that we traditionally used our personal computers for. This is possible because of the constantly growing number of mobile applications (apps). Apps have seen more than 50 billion downloads (Apple 2013), and are used for daily utilitarian tasks (e.g. scheduling appointments or checking emails) and hedonic tasks (e.g. shopping or gaming). With growing numbers of apps being available for similar activities, it has become more difficult for app designers to prevail against the competition. Apps for similar activities oftentimes converge on a similar set of functionalities, which leaves little room for competitive differentiation. App designers need to find other ways to positively differentiate their app from the competition.

Based on extant theory we argue that information systems (IS) design characteristics can be such a positive differentiator. Specifically, we bring forward better aligning interface design characteristics with users characteristics positively affect psychological evaluation and download intention.

Despite of the extensive number of benefits that mobile apps can create, the switching cost for users is very low. Switching cost is known as the ability to download a substitute app if the user does not like the particular app. Past research has shown that an average session with an app lasts for less than a minute (Kray and Rohs 2007; Satyanarayanan 2005). In scenarios where users browse app stores, the only consideration beyond assessing the app's functionalities is the considering its design characteristics. Further in this study we are looking at the more Type 2 processing of design which is the more unconscious processing (Norman 2002). Even before users can cognitively process information like price, number of ratings or detailed reviews a more affective channel can help users make an "initial impression" of the app.

Research has shown that except for top ranked apps, low ranked apps have been driven by companies for profit and usual metrics like number of downloads and ratings are unreliable metric for the quality of the app (Kuehnhausen and Frost 2013) (Khalid et al. 2015). If the initial attraction of an app is high, the user will download the app. We use free apps for our studies to consider the impact of cost on download intention. Also free apps have maximum number of downloads. For paid apps user's already have a highly intrinsic motivation for download. Attractiveness will also give app developers an idea of the initial exposure of their app. Hence, attractiveness is an important measure and a predictor for how likely the user is to download an app. One way of developing an attractive app is through visual aesthetics parameters like cleanliness, balance, creativity etc. Studies have shown visual aesthetics to be key when it comes to better designed interfaces (Cyr et al. 2006; Robins and Holmes 2008). Studies have also found linkages between visual aesthetics and higher order user judgments like quality perceptions (Bhandari et al. 2015).

Visual aesthetics is a combination of multiple design elements like clarity, cleanliness, symmetry, creativity, special effects, color, hue intensity and shapes (Guyer 2008; Lindgaard and Dudek 2011). It is hard to find a single agree upon definition of aesthetics but the most widely used framework in information systems research is the perceived visual aesthetics forwarded by Lavie and Tractinsky (Lavie and Tractinsky 2004). According to this study visual aesthetics can be categorized into two components namely expressive and classical. Expressive aesthetic refers to an interface that is clean, clear and symmetrically designed; in contrast classical aesthetic refers to interface that has creativity and special effects. Previous studies have shown that both expressive and classical aesthetics can create some form of affection within an individual to the product (Bhandari et al. 2015).

Despite having the understanding that visual aesthetics does affect the attractiveness of an app, developers have limited the attractiveness to only the functionalities of an app. This perspective has been proven to be ineffective when it comes to first time adoption of mobile apps.

Visual aesthetics may be important. However, each individual, with reference to his or her personality's traits, perceives it distinctively. Personality traits are characteristics of an individual that influ-

ences his/her cognition, motivation and behavior under different circumstances (Ryckman 2004). Studies have shown that different users respond differently to products (in this case due to their personality differences (Butt and Phillips 2008). Expressive aesthetic is induced based of the creativity of an individual that is defined as shared imagination (Dewulf and Baillie 1999). Therefore, it is difficult for designers to design mobile app that is visual aesthetically such that it takes individual's personality traits into consideration so that users will be express themselves and being allured to download it (McDonagh et. al. 2002).

Overall in this study we look at mobile application attractiveness and how personality types of users impact these decisions. This is an important question to answer since in human computer interaction and usability studies the focus has been on efficiency perspective for rational decisions. We manipulate design parameters in mobile application interfaces and expose them in random order to participants. Measurement of personality types and attractiveness are done by using subjective measures. We design mobile app interfaces which users get exposed to achieve effective visual complexity manipulations.

Our study addresses the following two research questions:

RQ1:   What is the impact of aesthetics characteristics on perceived attractiveness and intention to download?

RQ2:   How does personality impact the effect of aesthetics characteristics on perceived attractiveness?

The rest of the paper is structured as follows. Section 2 discusses the related works in visual aesthetic and personality types. In section 3, we propose a conceptual model and its hypotheses. We discuss the methodology in Section 4, and explain how we manipulate our independent variable *aesthetics characteristics*. We conclude with potential theoretical and practical implications in Section 5.

2   Related Works

2.1 Visual Aesthetics

Visual aesthetics has recently received lot of attention (Lavie and Tractinsky 2004; Lindgaard 2007;Van der Heijden 2004). The multidisciplinary approach (architecture, engineering, design etc.) to aesthetics has given rise to various perspectives. The most common and mentioned practically in every study is the relationship between aesthetics and beauty (Kant 2000). Other perspectives have linked it as a "response to a product" (Hassenzahl 2004), "visual appeal" (Lindgaard and Dudek 2003) and "beauty in appearance" (Lavie and Tractinsky 2004). To develop a precise understanding of beauty in appearance, we adopted the classical and expressive aesthetic model forwarded by Lavie and Tractinsky. This model has been used in information systems research to understand aesthetic impact on various user judgments. Form initial impressions to higher order cognitive judgments like quality perceptions. This model breaks down various design attributes into two dimensions and makes it less ambiguous for further exploration in the context of mobile applications.

While other attributes like color, hue, intensity etc. are also important we chose this model for its adaptability and clean manipulations. Classical aesthetic dimension pertains to aesthetic notions that presided from visual clarity dimension (clean, clear and symmetrical). This notion emphasizes orderly and clear design. Expressive aesthetic dimension is represented by the more subjective design

attributes like creative, original, sophisticated etc. Even though both dimensions of aesthetics originated from the same pool of aesthetic judgments they are clearly distinguishable from each other. Factors like color, saturation, hues, intensity has been studied intensively and its effect on user decision has been explored. These dimensions can be manipulated to achieve interfaces with specific aesthetic orientation.

Classical aesthetic attributes can be manipulated using balance and clarity. Balance refers to the position of the text and images along the axis. For instance, low balanced interfaces are designed so that the text and images are purposely not balanced along the axis. Mirroring is also avoided to increase the effort required to process the design. Clarity refers to the grouping and contrast of the design elements. Grouping implies that elements of design are arranged and grouped according to their functionality. Contrast provides clear distinction between sections on the design. This means higher fluency in processing as information is readily accessed and processed with lesser effort.

Expressive aesthetic can be manipulated using creativity and special efforts. Creativity is achieved by adding features that are specific to the design. These can be usage of icons, menu layouts which are distinctive and unusual. Use of animation to display the content is a way to add special effects to a design. Visual elements that add a three dimensional look can be manipulated using gradient effect, shadow add depth to the design and make it more expressive. Table 1 summarizes the visual aesthetic attributes that can be manipulated.

Visual Aesthetic Attributes	Classical Aesthetic		Visual Aesthetic Attributes	Expressive Aesthetic	
	High	Low		High	Low
Balance	Y	N	Creativity	Y	N
Clarity	Y	N	Special Effects	Y	N

Table 1.   Visual Aesthetic Attributes Manipulations for High/Low Classic and Expressive Aesthetics

2.2 Personality Type

Research has looked at individual differences form a long time. These differences impact range of parameters, from our choices to complicated decisions like whom we interact with (Benyon 1993). Personality types are one of the ways of capturing these individual differences. It can be defined in terms of the variation in preferences and cognitive skill. So along with the cognitive processing there are also intrinsically varied preferences that are much harder to measure (Benyon 1993).

Previous studies on personality psychology have explained that personality has an influence on individual's behaviour (Paunonen and Ashton 2001). Personality has also been found to have a strong influence on various user perceptions. From how satisfied you are with a service to whether you would re-use it; your inherent personality type can be an important driver for these decisions (Judge et al. 2001).

In this regard, Goldberg was one of the first researchers who used the dictionary to assess the total appearances of personality-descriptive terms as well as to apprehend the degree to which the terms share the aspects of their meaning. One of the category of personality profile in Goldberg's big five model is the extrovert/introvert behavioural dimension of an individual (Goldberg 1993). This dimension is of particular interest in this study because of its association with design. Studies have shown that using personality types to self-adapt interface has been effective. This kind of self-adaptation of design interfaces is more useful as it is much harder to change personality types.

An extrovert individual is someone who is outgoing /energetic while an introvert is an individual who is reserved. Personalities can influence an individual's preference of design. With adherence to Jung's cognitive theory, an extrovert and an introvert have different distinctive perception and judgment for creativity (Wilde 1999). For instance, an extrovert tends to place a greater emphasis on external environment to integrate various things from the environment into new entities. On the other hand, an introvert would have preference for hard-to-describe images (Kim et. al. 2008). For instance, Crozier (1999) has empirically found out that an extrovert will prefer brighter colors while an introvert will prefer darker colors. As far as the relationship between design attributes and user judgments are concerned personality can impact this relationship with introverts gravitating towards certain design preferences and extrovert users towards others.
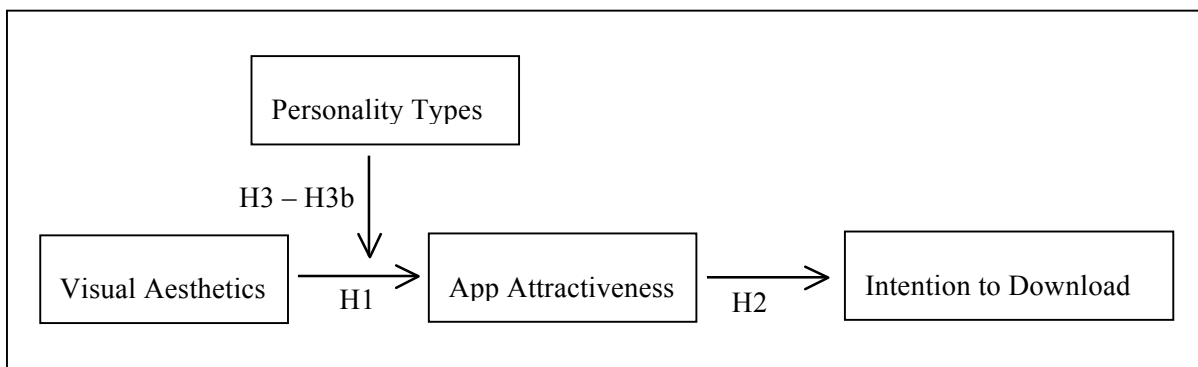
3   Hypotheses Development

Figure 1.   Proposed Conceptual Model

3.1   Visual Aesthetics and Attractiveness

According to the processing fluency theory, lesser resources, higher speed and higher accuracy are parameters for a user to process components of a design fluently (Schwarz and Clore 1996). This is also known as perceptual fluency. Perceptual fluency is important in visual aesthetics because the design (each screen on the mobile device) is being perceived as a whole screen instead of the individual components. Also classical and expressive aesthetics can be broken down into sub components like balance and creativity. However, it is the complete "unit" of design that is processed. For instance, when a user perceives that the app interface is beautiful, the user takes the image, the colors and the arrangement of the elements into consideration. Perceptual fluency can be improved if the elements on the app interface follow a more coherent and flowing design. Research has shown that users will be attracted to a more balanced and clear design which is a high classic aesthetics (Schwarz 2004; Schwarz and Clore 1996). This can also be explained from an information processing perspective: when we have more balanced design, the information entering our brain is more balanced and thus fewer resources are needed to process design as a whole. Clarity enhances the ease of linking the various elements of the design together and increase the positive attitude towards the app. Similarly creativity increases the positive evaluation of the design. Therefore we hypothesize:

H1: A highly aesthetically designed mobile application will lead to greater attractiveness as compared to a lowly aesthetically designed application.

A user faced with a highly aesthetically designed mobile app will have higher attractiveness towards the design. Once a user is being attracted to the design of mobile app, they have a higher chance of developing an intention to download. Visual aesthetics and attractiveness has been linked with user

decisions like quality perceptions, intention to use etc. (Bhandari et al. 2015). Therefore we hypothesize:

H2: A highly attractive mobile application will lead to greater intention to download as compared to a less attractive mobile application

3.2 Visual Aesthetics and Personality Types

Extroversion has been well explored in literature. It's connection with design attributes have also been found (Green and Jordan 2003). The reason behind is that just like real life preferences for interaction between human beings, we prefer designs that are consistent with our personalities. For example, extroversion personality trait is associated with more open, outgoing human beings and has been linked to certain design attributes. In literature, extroversion is measured using a scale from an outgoing manner to an introvert manner (Costa 1990). Studies have found extroverted users to have higher preferences for bold shapes, unique designs and high color saturation. Introverted users on the other hand prefer regular shapes like circle and thin lines. Thus we hypothesize:

H3: The relationship between visual aesthetics and attractiveness is contingent on personality type.

Classical aesthetics deal with regular and clean layouts however expressive aesthetics deal with unique design and special features. Extroverted personalities will be more attracted by expressive aesthetics. The reverse is true for introvert users as they will get attracted by more balance and cleaner interfaces with minimum distractions in forms of creative inputs or special effects. Thus we hypothesize:

H3a: Extroverted personality has higher attractiveness for expressive aesthetics

H3b: Introverted personality has higher attractiveness for classical aesthetics

4 Proposed Methodology

The experiment will be conducted in a laboratory within university setting where participants are first briefly explained about the experiment protocol. Custom interfaces are then uploaded on a mobile device where users will be viewing the stimuli. In this study, we look only at free apps because price is not one of the competing factors in this model. This enables that we can stay close to real life scenario where users use their mobile phones to visit app stores for certain apps.

We believe that personality types can be mapped on aesthetic preferences. This is because we gravitate towards a cleaner design or a more visually complex design based on our inherent preferences towards design. This mapping can give clear directions of which personality type prefers which kind of design parameters. In this study we create four app interfaces that are manipulated based on Table 1. The interface is high/low classic or high/low expressive aesthetics Table 2 shows mapping of personality types and the aesthetically manipulated interfaces.

Personality Type	Classical Aesthetic	Expressive Aesthetic
Extroversion	High/Low	High/Low
Introversion	High/Low	High/Low

Table 2:   Mapping of Personality Types and Aesthetically Manipulated Interfaces

We first collect data regarding our personality attributes using survey measures Gosling's version of Goldberg's personality test (Gosling et. al 2003). This is done so as to avoid long survey measures which result in users not accurately recording their responses. This version of the personality test has

been found to be efficient and has the desired validity and reliability (Correa et al. 2010; Rammstedt and John 2007). We then have the manipulated stimuli in form of mobile app interfaces. Each interface is shown to one user. Randomization within and between participants is done for interfaces.

We operationalized visual attribute design which comprises of factors balance, clarity, creativity and special effects. Our dependent variable attractiveness, intention to download and moderator personality types are from existing scales which have been adapted to suit the mobile app context. This experiment design fits well with the requirements of our study since we are trying to uncover the black box of personal choices in mobile apps.

We control age, gender, education as part of our demographic control measures. Beyond that how long users have been using smartphones, usage parameters like frequency and duration of mobile app usage is also recorded. This is done to control for technology exposure. With increasing exposure of interfaces the impact of visual aesthetics can start to wither away (Sauer and Sonderegger 2009).

5 Conclusion

In this study we manipulate visual aesthetics like balance, clarity, creativity and special effects to achieve custom interfaces. Participants are exposed to these interfaces in addition to which they answer a brief survey pre and post experiment for personality type and attractiveness indicators. When finished the study can provide custom mappings between personality types like extroversion and introversion and impact on aesthetic preferences towards mobile app interface design. It will also strengthen the impact of visual aesthetics on mobile app judgments like intention to download.

5.1   Theoretical Implications

This study has several theoretical contributions. First of all it explains the mechanism of visual aesthetics on intention to download din mobile applications. This is important to explore as we are from the generation known as digital natives. We are moving to mobile platform for most of our needs and it is important to know what the antecedents are that drive mobile adoption. While direct linkages between design and these judgments have been established, this study explores an additional path via attractiveness. Within the realms of attractiveness, the perspective is on type 2 or visceral level processing where users based on their first impression make decision to download the app. This study also explains how personality types like extroverts and introverts map to certain aesthetic sub-dimension like classic and expressive.

5.2   Practical Implications

This study is useful for developers since they have reference which provides clear mappings of what personality types go well with which kind of interface design. Knowing the audience well is the first step towards mobile app success. If the interface can be tailored to the target demographics, it will have better chances of being downloaded. Developers can also follow these guidelines to prevent their own personalities to influence the design and take it as general design criteria. For example if they are targeting younger audience they might want to look at ways to capture their attention by including creative inputs like bigger images and brighter colors. For a more introvert audience clean, clear and easy navigation can be the driving design considerations.

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