


The icon matters: how design instability affects download intention of mobile apps under prevention and promotion motivations

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Abstract Over the past 5 years, with the popularization of smart phones, the mobile app market has developed rapidly. Understanding the factors that can influence consumers' download intentions has become crucial to researchers, mobile app developers and publishers. Regulatory focuses, which can be classified into promotion focus and prevention focus, influence consumer behavior. This research discusses how design instability affects consumers' intention to download mobile apps using descriptions manipulated by different regulatory focuses. The results of two studies demonstrated that consumers with more promotion focus (prevention focus) would have higher download intention for apps with unstable (stable) icons. Other elements, such as the salience of stability, the boundary condition, and consumer involvement, are also discussed in this research. Our findings not only provide app publishers with deep insights into consumers' decision-making in app selection but also contribute to the literature on app icon visual design and the regulatory focus theory.

Keywords Design instability · App icon · Download intention · Regulatory focus

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1 Introduction

With the development of information technology, smartphones have dramatically changed our lives. Smartphones are not only cellular phones but also advanced pocket computers capable of handling a variety of tasks through the use of various mobile apps [26]. A mobile app is commonly referred to as a software designed to be used on mobile devices, such as smartphones, tablet computers and gaming consoles [26, 41]. There are now more than 3 million apps available on Google's Play Store, according to statistics provided by AppBrain [1]. App Annie [2] has reported that in 2016, more than 90 billion apps were downloaded from the iOS App Store and Google's Play Store and the total time spent on apps worldwide increased to nearly 900 billion hours. In addition, revenue earned by app publishers across the two major app stores is more than \$35 billion [2]. However, the distribution of app downloads is not even, which means that a relatively large percentage of downloads is accounted for by a relatively small percentage of apps [6, 32, 46]. Thus, understanding the reason why some apps in the app store can attract consumers' attention is significant for app publishers. This research focuses on the role of two common cues in app stores—app icon and product description—because of their important influence on promoting app downloads. Furthermore, unlike the consumer reviews, rating, and place order shown in app stores, the icon and description of an app are two elements that the app publisher has the power to control and change.

A product's visual design is a significant element influencing customers' decision-making [12]. Previous literature on product visual design focused on the effects of logo design, package design, and other exterior designs [9, 30, 38]. Among these visual design elements, the logo is a unique visual element that can represent brand identity, differ from other products, and influence consumers' choice [33]. However, unlike a traditional product, mobile apps do not have package design and other exterior design in the conventional sense of the term. The icon that is the concrete and essential representation of an app performs a role similar to that of a logo in visual design [41]. However, the literature on the influence of app design elements on consumers' perceptual judgments is limited.

Sixty-five percent of US iOS App Store downloads are derived from searches [2]. Consumers who download apps through searches usually have specific targets (e.g., name of the app, key words). In other words, consumers who comprise the remaining thirty-five percent of US iOS App Store downloads may just “be looking around” and downloading apps by judging the information shown by app publishers in app stores. In many cases, however, the name of the app did not indicate its function (e.g., Instagram, Tumblr, and Snapseed) [26]. Thus, the description of an app's function is another crucial tool used by consumers to understand and make their decision. Higgins [20] argued that consumers' purchase decisions are guided by self-regulation systems. According to the regulatory focus theory, consumers' regulatory focus can be classified into two types: promotion focus, which focuses on describing advancement, achievement, and goal pursuit; and prevention focus, which focuses on describing protection, safety, and risk prevention [11, 20]. In addition, consumers' regulatory focus can be manipulated temporarily by situational

demands [20], including the use of different descriptions of apps. For example, an app aims to provide services for travel, such as ticket booking and hotel reservation. The description “Use this app and get the best deals!” would activate consumers’ promotion focus, whereas the description “Use this app and avoid getting ripped off!” would activate prevention focus [28].

This research examines how the instability of an app icon influences consumers’ download intentions through different regulatory focuses manipulated by different app descriptions and whether other elements, such as the salience of stability, the boundary condition, and consumer involvement, can also affect the final download intention. The results of two studies demonstrated that consumers with more promotion focus (prevention focus), which was manipulated by rephrasing the app description, would have a higher download intention for apps with unstable (stable) icons. Other elements, such as the salience of stability, the boundary condition, and consumer involvement, are also discussed in this research.

2 Theoretical background

2.1 Symbolic associations of visual design

The previous literature on design, marketing and psychology suggested that visual design elements (e.g., shape, color, typeface) play a significant role in consumers’ reactions to products not only because of their technical properties but also because of the symbolic associations they embody [4, 13, 14, 19]. The result of these symbolic associations is that consumers endow an object element with abstract meanings which it may or may not objectively contain [22, 45]. For example, based on an assumption that circular (angular) shapes activate softness (hardness) associations, Jiang et al. [22] found that products with a circular (angular) logo lead to perceptions of greater product comfortableness (durability) than products with angular (circular) logo. Similarly, Hagtvedt [18] found that the logo of a firm with incomplete typefaces were perceived to be less trustworthy but more innovative. In addition, they argued that the strength of the association depended on consumers’ regulatory focus. The association of untrustworthiness (innovativeness) is stronger among participants with prevention focused (promotion focused) or firms with prevention focused (promotion focused) goals, such as security companies (entertainment companies) [14, 18].

In the context of mobile apps, similar to how logos identify firms, app icons that are small images with graphical notations of symbolizing computer actions usually represent an app’s functions and identities [15, 16]. Unlike the logos of products and companies, the icons of apps occupy a salient, even a major, portion of the representation and attention attraction in app stores [41]. For example, the first impression (homepage) of the IOS App Store contains numerous app icons, as shown in Fig. 1. Attractive icons elicit the curiosity of consumers, which increases their interest and leads them to further explore function [21]. A few studies discuss the influence of app icons on consumers’ behavior. Based on these studies, Shu and Lin [37] found that the icon attributes that are significant design elements

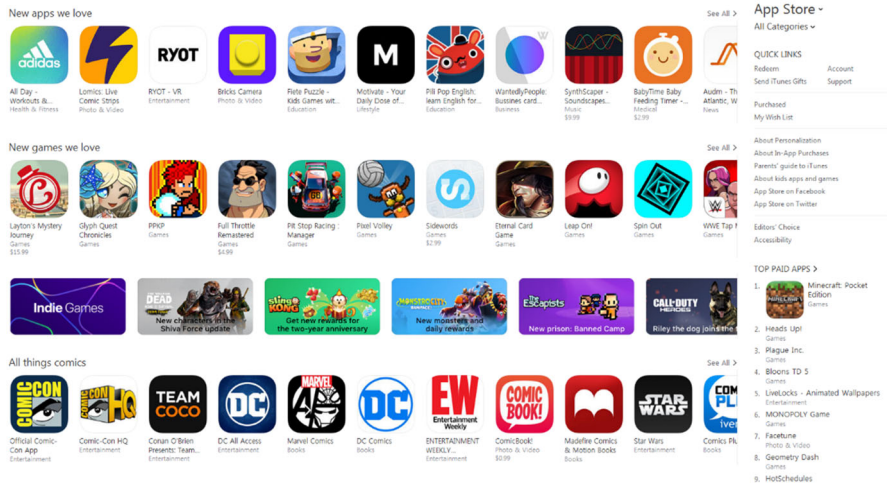


Fig. 1 Homepage of IOS App Store

considered by app users (e.g., activity, balance, complexity, depth, and organic value) are helpful to explain the functionalities of apps. Burgers et al. [6] found that app icons with visual metaphors are more persuasive than app icons without visual metaphors. Thus, understanding the influence of an app icon's visual design on consumers' behavior would benefit both app developers and app publishers.

Taken altogether, several prior studies focus on design elements' influence on consumers' perceptual judgments in traditional product fields. Although the app icons are more salient, more changeable and play more important roles in app stores than the logos of traditional products in stores, the research that discusses the influence of an app icon's design elements on consumers' perceptual judgments is limited. This research primarily discussed the influence of app icon stability on consumers' download intention with different app descriptions.

2.2 Design stability and inference

In physics, stability is defined as a function that includes both the width of an object's base and the position of the center of its mass [10]. In visual design, Pavlova et al. [31] argued that design elements with a vertex (vs. edge) below an axis, unequal (vs. equal) area allocated to left and right sides, or more area distributed to the top (vs. bottom) are commonly regarded as unstable. Previous literature has discussed the influence of design stability on consumers' response. For example, Larson et al. [25] found that shapes with downward-pointing features (vs. upward-pointing features) (e.g., V) led to individuals' negative feelings. Pavlova et al. [31] argued that visual design with unstable design would elicit the feeling of fear and suffering.

There seems to be an association between design instability and the unsafe condition. Samuel and Kerzel's [35] research provided evidence of this association.

Their results showed that people would significantly overestimate the objects' instability when judging whether the object would fall over. Rahinel and Nelson [34] further examine this association. They found that a logo's instability, not the product itself, led consumers to infer "The environment is unsafe" when the product was resistant to this reference. For example, if the logo of a fire extinguisher is unstable, consumers would infer that the environment was unsafe instead of inferring that the fire extinguisher was unsafe. Thus, we propose that the stability of an app icon is associated with the inference of danger and high risk.

Although we can predict that viewing unstable design elements produces an inference of a lack of safety from the prior research, the specific target to which this inference applies remains unclear. Several previous studies of brand logos proposed that the primary target of the inferences inferred from a logo was either the product or the brand to which that logo was attached [18, 22]. Nevertheless, Rahinel and Nelson's [34] research suggested that the target of logo-based inferences would be contingent. For safety-oriented products, consumers would infer that the environment is unsafe from unstable (vs. stable) brand logos. Given the somewhat conflicting points of view, this research also examines the target of "icon-based" inference. Because of the significant role of app icons in both representing the app and explaining its function, we propose that the target of icon-based inferences is the app itself, such as the app's function and content. For example, consumers may perceive the investment provided by an app to be riskier when the app's icon is unstable (vs. stable).

2.3 Regulatory focus theory and risk propensity

Consumer motivations are conceptualized by regulatory focus theory, which classifies consumers' motivational orientations into ideals and oughts [20]. Ideals stand for consumers' wishes and aspirations, while oughts indicate consumers' duties and responsibilities. According to regulatory focus theory [20, 28, 40], ideals and oughts imply that consumers' purchase decisions are guided by different self-regulation systems. Promotion focus, which is related to ideals, is more concerned with opportunities, the pursuit of desires, the maximization of achievement and positive outcomes [11]. This propensity to pursue positive outcomes leads to a strong preference for eager strategies that focus on gaining "hits" and avoiding "misses" (e.g., practice a long time to be a good basketball player). In contrast, prevention focus, which is related to oughts, is more concerned with safety, the pursuit of security, and the minimization of errors and negative outcomes [11]. This propensity to avoid negative outcomes leads to a strong preference for vigilant strategies that focus on achieving "correct rejections" and avoiding "false hits" (e.g., injury prevention to be a good basketball player). These two types of motives also affect consumer behavior in the mobile app market. For example, consumers who download an app for gaming are exhibiting promotion motivation because they are pursuing winning or achieving high scores, whereas consumers who download an app for insurance services are exhibiting prevention motivation, as they are seeking to avoid or reduce risk. Although both regulatory orientations seem to be opposite and operate in different ways, they coexist and one or the other may be

temporarily or chronically more accessible [20, 47]. In other words, consumers who are chronically more promotion focused can also become more prevention focused, at least temporarily, when they are activated by situational demands [20, 29]. In addition, several studies found that consumers' regulatory focus can be manipulated by framing the same product with different claims (product introduction, features, function, etc.) in terms of obtaining the ideal achievement and positive outcomes (promotion focus) or avoiding the required risk and negative outcomes (prevention focus) [28]. Thus, we propose that the description of apps in app stores temporarily activates consumers' regulatory focus in accordance with their orientations.

Attitude toward risk is a link between promotion and prevention. Usually, greater risk taking would be brought on by the activation of promotion, while greater risk aversion would be produced by the activation of prevention [47]. In addition, in most situations, options (e.g., stock investment) with more potential benefits (e.g., high investment returns) also contain more potential costs (e.g., a high possibility of losing capital), while options (e.g., bank deposit) with fewer potential benefits (e.g., low investment returns) are also those with fewer potential costs (e.g., a very small possibility of losing capital). Zhou and Pham's [47] research found that consumers with more promotion focus are likely to choose risky options with more potential benefits and more potential costs, whereas consumers with more prevention focus are likely to choose conservative alternatives with fewer potential benefits and fewer costs. As discussed above, viewing an unstable app icon leads to an inference of high risk with regard to this app. Consumers with a promotion focus are thus likely to favor this app more than those with a prevention focus, as the high risk also implies more potential benefits. In contrast, a stable app icon produces an inference of low risk with regard to this app. Consumers with a prevention focus are more likely to favor this app more than those with a promotion focus because the low risk implies fewer potential costs. Thus, we propose the following hypothesis:

H1 Consumers with more promotion focus (prevention focus), which was manipulated by rephrasing the app description, have higher download intentions for apps with unstable (stable) app icons.

Because we proposed that the app icon's stability would lead to an inference about the app's extent of risk and safety, the judgment of whether the app icon is stable or unstable is the key factor in this effect. In other words, the overall perspective on stability of the app icon affects consumers' final decision-making. However, app icons are usually combinations of different shapes with different levels of stability in real app markets. For example, if an app icon is formed by two shapes with different levels of stability (one shape is stable, the other is unstable), how do consumers evaluate the overall stability of the app icon? We propose that the salience of the shape may influence consumers' overall perspectives. A large body of evidence shows that salience contributes to the deployment of attention [7, 36, 39]. According to the literature on vision, feature contrasts that exist in different dimensions such as motion, luminance, and color can lead to salience [23, 42]. The stronger the feature contrasts in a dimension, the more attention caused by salience [3, 43]. Thus, when consumers review an app icon formed by two shapes with different levels of salience and stability, they pay more attention to

the salient shape. As a consequence, their overall perspective of the stability of this app icon depends on the stability of the salient shape. We propose the following hypothesis:

H2 The perspective of an app icon's stability can be influenced by the extent of its shapes' salience.

2.4 Boundary condition

Given that we have proposed that consumers' regulatory focus is manipulated by an app's description, a boundary condition for this effect is discussed in this research. Personal involvement is defined as "consumers perceive it to be self-related or in some way instrumental in achieving their personal goals and values" [8]. Many prior studies found that personal involvement is a crucial factor that determines consumers' motivation and attention to products [8, 17, 24, 27, 44]. High involvement leads consumers to pay more attention, exert greater mental effort, and engage in increased elaboration of product information during their attempt to comprehend [8, 44]. Thus, consumers with higher involvement attempt to find more information when they are exposed to numerous products while shopping (Mannetti et al. 2006). Consumers with low involvement ignore and reject the information provided by the products [17]. Given the discussion above, we propose the following hypothesis:

H3 The effect of interaction between app icon stability and consumers' regulatory focus occurs only when consumers are highly involved, and does not occur when consumers are not highly involved.

A theoretical model including an overview of the hypotheses and showing in which studies they are investigated is provided in Fig. 2.

3 Study 1

Study 1 explored the influence of app icon stability on consumers' download intention under different regulatory focuses. In addition, the salience of shape was discussed.

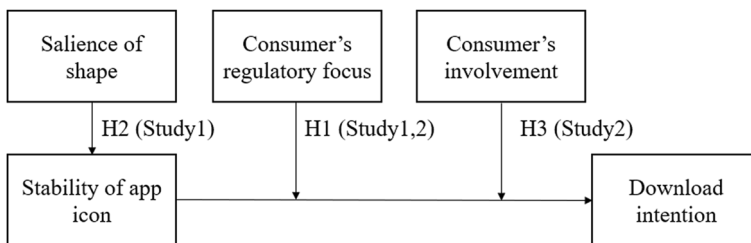


Fig. 2 Theoretical model

3.1 Method

Two hundred and forty undergraduate students (45% male; $M_{\text{age}} = 21.22$) from a large public university in Taiwan participated in this study. Participants were randomly assigned to one of 8 conditions in a 2 (stability of app icon: stable shape outside and instable shape inside vs. stable shape inside and instable shape outside) \times 2 (salience of app icon: salient square outside vs. salient triangle inside) \times 2 (regulatory focus: promotion focus vs. prevention focus) between-subject study.

3.1.1 Design stability manipulation

To manipulate the design stability, we created two app icons with two shapes for each app icon. We selected the same shapes used by Rahinel and Nelson's [34] second and third studies. In the stable shape outside and unstable shape inside condition, the icon was composed of a square oriented on its base outside with a triangle oriented to 30° below its perfect right inside. In the stable shape inside and unstable shape outside condition, the square was rotated 30° outside with a triangle oriented to sit on an edge inside. We conducted the between-subject pretest for these two app icons with 20 participants who rated the perceived stability of these two app icons on two questions (1 = not at all, 7 = very much; $\alpha = 0.71$): how stable the icon appeared to be and how likely the icon was to fall over. The results showed that there was no significant difference between the stability of these two app icons ($M_{\text{stable outside and instable inside}} = 3.80$, $M_{\text{stable inside and instable outside}} = 3.55$, $t(1, 18) = 0.68$, NS). Next, another 40 students participated in the further pretest for the four shapes in the icons (square oriented on its base, square rotated 30°, triangle oriented to sit on an edge, triangle rotated 30°) with similar questions (1 = not at all, 7 = very much; $\alpha = 0.98$). The results showed that a square oriented on its base ($M = 6.00$) has a significantly higher level of stability than a square rotated 30° [$M = 2.15$, $t(1, 18) = 15.54$, $p < 0.01$]; a triangle oriented to sit on an edge ($M = 6.10$) has a significantly higher level of stability than a triangle rotated 30° [$M = 2.10$, $t(1, 18) = 16.48$, $p < 0.01$]. Thus, the results of two pretests showed that the stability of stable shapes (square oriented on its base and triangle oriented to sit on an edge) were perceived to be more stable than unstable shapes (square rotated 30° and triangle rotated 30°), but there was no difference in stability for the two app icons that combined the four shapes above.

3.1.2 Design salience manipulation

To manipulate the salience of the app icons, we used the color red to make the shape salient. For the salient shape outside condition, the shape outside was red, whereas the inside shape was red in the salient shape inside condition. The final four app icons are provided in “[Appendix 1](#)”.

3.1.3 Regulatory of focus manipulation

Consistent with Mogilner et al. [28], we manipulated participants' regulatory focus through a regulatory framing of the descriptions of the app, which described the function of the app as either avoiding the negative outcomes (prevention) or achieving the positive outcomes (promotion). All the participants were asked to read and imagine a scenario in which "You are looking for an app about slimming and maintaining health. You see an app named "Fitness" with an app icon and description as follows". Participants in the promotion focus condition read the following description of an app: "Use Fitness, you can remain fit and healthy!", "Use Fitness, you can get professional advice for slimming!", and "Use Fitness, you can make yourself prettier!". In contrast, participants in the prevention focus condition read the description: "Use Fitness, you can avoid obesity!", "Use Fitness, you can prevent health damage when you slim!", and "Use Fitness, you won't become the 'fatty' in the eyes of others!".

3.1.4 Measures

After reading the app's icon and description, participants were asked to rate their download intention through two questions: "How much would you like to download this app?", and "Would you like to try this app?" (1 = not at all, 7 = very much, $\alpha = 0.81$). In addition, we asked "Is it a triangle that you see first?", "How much does the description make you think about obtaining something positive (promotion)?" and "How much does the description make you think about avoiding something negative (prevention)?" (1 = not at all, 7 = very much) as a manipulation check on design salience and regulatory focus.

3.2 Results and discussion

The results of the manipulation check on salience showed that participants in the salient shape inside condition ($M = 5.66$, $SD = 0.90$) perceived that the triangle was more salient than did the participants in the salient shape outside condition [$M = 2.28$, $SD = 0.88$, $t(1, 238) = 29.31$, $p < 0.01$]. In addition, the results of the manipulation check on regulatory focus showed that participants in the promotion focus condition ($M = 5.70$, $SD = 0.81$) showed that the descriptions made them think more about gaining positive outcomes than did the participants in the prevention focus condition [$M = 2.38$, $SD = 0.77$, $t(1, 238) = 32.63$, $p < 0.01$]. Participants in the promotion focus condition ($M = 2.37$, $SD = 0.77$) revealed that the descriptions made them think less about avoiding negative outcome than did those participants in the prevention focus condition [$M = 5.45$, $SD = 0.89$, $t(1, 238) = 28.81$, $p < 0.01$].

We conducted a $2 \times 2 \times 2$ three-way analysis of variance (ANOVA), with participants' download intention as the dependent variable. The results revealed a significant three-way interaction between the app icon's stability, the salience of the app icon, and regulatory focus [$F(1, 232) = 46.64$, $p < 0.01$, $\eta^2 = 0.17$]. The results of the planned contrast showed that when the square outside was salient and stable,

participants with a promotion focus ($M = 3.50$, $SD = 0.86$) had lower download intentions than participants with a prevention focus [$M = 4.15$, $SD = 0.86$, $F(1, 232) = 8.38$, $p < 0.01$]. When the square outside was salient but unstable, participants with a promotion focus ($M = 4.35$, $SD = 0.85$) had higher download intentions than participants with a prevention focus [$M = 3.40$, $SD = 0.91$, $F(1, 232) = 17.90$, $p < 0.01$, Fig. 3]. Furthermore, when the triangle inside was salient and stable, participants with a promotion focus ($M = 3.57$, $SD = 0.72$) had lower download intentions than participants with a prevention focus [$M = 4.05$, $SD = 0.89$, $F(1, 232) = 19.18$, $p < 0.01$]. When the triangle inside was salient but unstable, participants with a promotion focus ($M = 4.30$, $SD = 0.86$) had higher download intentions than participants with a prevention focus [$M = 3.32$, $SD = 0.98$, $F(1, 231) = 4.63$, $p < 0.05$, Fig. 4].

The results of study 1 provided evidence for H1 and H2. Participants with a promotion focus (prevention focus) had higher download intentions for the app with the unstable (stable) icon. It also showed that consumers' perspective on the app icon's stability was based on the salient shape. For example, the icon composed of the stable square outside and an unstable but salient triangle inside was more likely to be regarded as an unstable icon. In contrast, the icon composed of a stable and

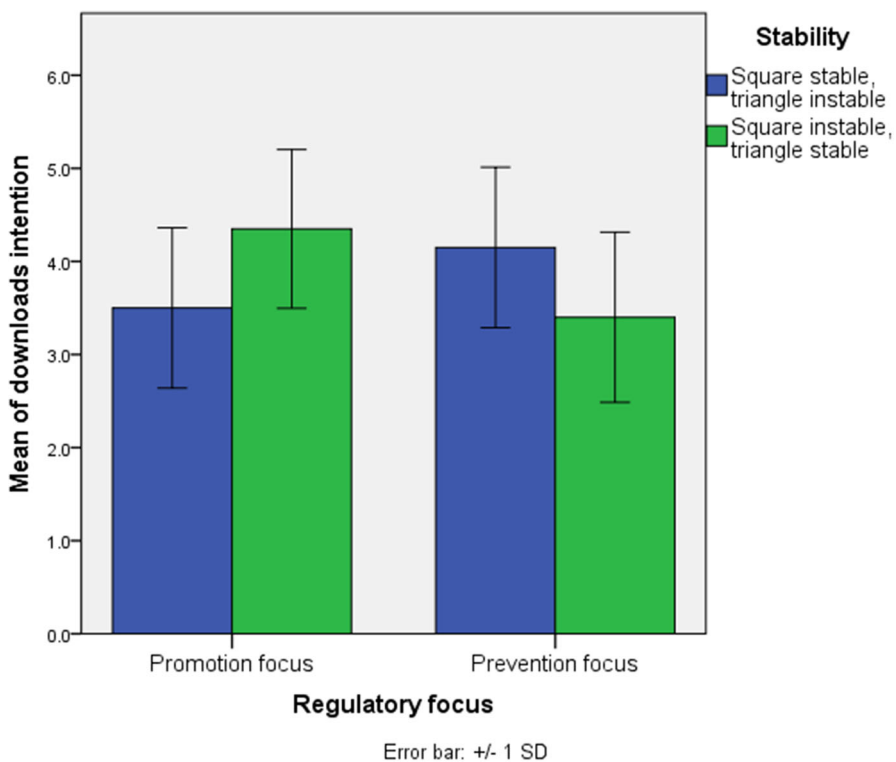


Fig. 3 When the square outside was salient and triangle inside was no salient, the interaction between regulatory focus and stability on downloads intention

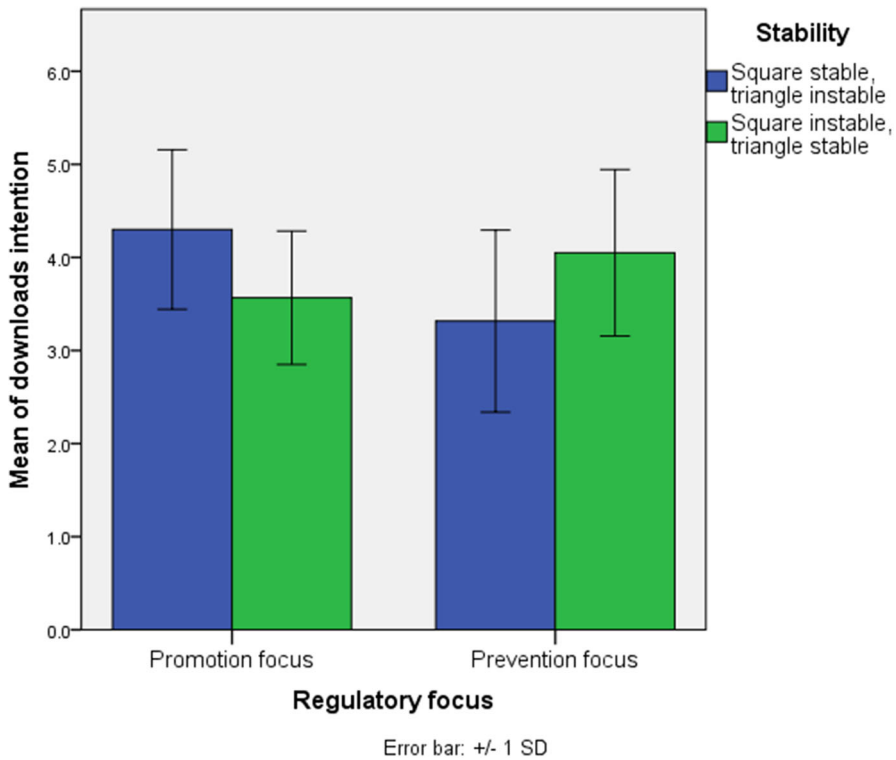


Fig. 4 When the square outside was not salient but triangle inside was salient, the interaction between regulatory focus and stability on downloads intention

salient square outside and an unstable triangle inside would more likely to be considered an icon with a higher level of stability.

4 Study 2

Study 2 aims to examine the role of personal involvement as a boundary condition for this effect.

4.1 Method

Two hundred and forty undergraduate students (48% male; $M_{\text{age}} = 22$) from a large public university in Taiwan participated in this study. Participants were randomly assigned to one of 8 conditions in a 2 (stability of app icon: stable vs. unstable) \times 2 (regulatory focus: promotion focus vs. prevention focus) \times 2 (personal involvement: high involvement vs. low involvement) between-subject study.

4.1.1 Design stability manipulation

We manipulated the stability of the app icon by using the same triangles used in study 1. For the app with the stable icon condition, we used a triangle oriented to sit on an edge as the app icon, whereas a triangle oriented to 30° below its perfect right was used for the app with the unstable icon condition. The final two app icons are provided in “[Appendix 2](#)”.

4.1.2 Regulatory of focus manipulation

Just as in study 1, we used different app descriptions to manipulate participants’ regulatory focus. All participants were asked to read and imagine a scenario in which, “You are looking for an app providing tourism service. Now, you see an app named ‘Find it’, with the app icon and description shown as follows”. Participants in the promotion focus condition read the description of the app: “Use Find it, you can find hotels all over the world!”, “Use Find it, you can gain the best deal!”, and “Use Find it, you can have a memorable vacation!”. In contrast, participants in the prevention focus condition read the description: “Use Find it, you will not get stuck at home!”, “Use Find it, you would not get ripped off!”, and “Use Find it, you don’t need to worry about your privacy!”.

4.1.3 Measures

After reading the app’s icon and description, participants were asked to rate their download intention using the same two questions ($\alpha = 0.77$) as study 1. In addition, the same questions on regulatory focus manipulation check were asked. Furthermore, we used three questions to measure participants’ involvement, consistent with research from Braverman [5] and Zaichkowsky [44]. Participants were asked to answer questions (1 = not at all, 7 = very much, $\alpha = 0.93$): “How much attention do you pay to tourism?”, “How important is tourism to you?” and “Does tourism mean a lot to you?”

4.2 Results and discussion

The results of the manipulation check on regulatory focus showed that the participants in the promotion focus condition ($M = 5.21$, $SD = 0.93$) revealed that the descriptions made them think more about gaining positive outcome than did the participants in the prevention focus condition [$M = 2.68$, $SD = 0.88$, $t(1, 238) = 21.01$, $p < 0.01$]. Participants in the promotion focus condition ($M = 2.78$, $SD = 0.85$) showed that the descriptions made them think less about avoiding negative outcome than did the participants in the prevention focus condition [$M = 5.14$, $SD = 0.91$, $t(1, 238) = 20.76$, $p < 0.01$].

The results of participants’ involvement in tourism showed that $M_{\text{involvement}} = 3.76$, $SD = 1.44$. Thus, consistent with Braverman [5], we used this to define “high-” and “low-” involvement participants, resulting in 128 participants in the

low-involvement condition ($M = 2.55$) and 112 participants in the high-involvement condition ($M = 5.12$).

We conducted a $2 \times 2 \times 2$ three-way ANOVA with participants' download intention as the dependent variable. The results revealed a significant three-way interaction between stability of the app icon, regulatory focus, and personal involvement [$F(1, 232) = 32.58, p < 0.01, \eta^2 = 0.10$], and a two-way interaction between stability of the app icon and regulatory focus [$F(1, 232) = 36.98, p < 0.01, \eta^2 = 0.11$]. The results of the planned contrast showed that for participants with high involvement, there was a significant interaction between the app icon's stability and regulatory focus [$F(1, 232) = 65.15, p < 0.01$, Fig. 5], whereas for participants with low involvement, there was no significant difference between the app icon's stability and regulatory focus [$F(1, 232) < 1$, NS]. For participants in the high involvement and promotion focus condition, participants had a higher download intention for the app with the unstable icon ($M = 4.23, SD = 0.83$) than for the app with the stable icon [$M = 3.06, SD = 0.77, F(1, 232) = 31.89, p < 0.01$].

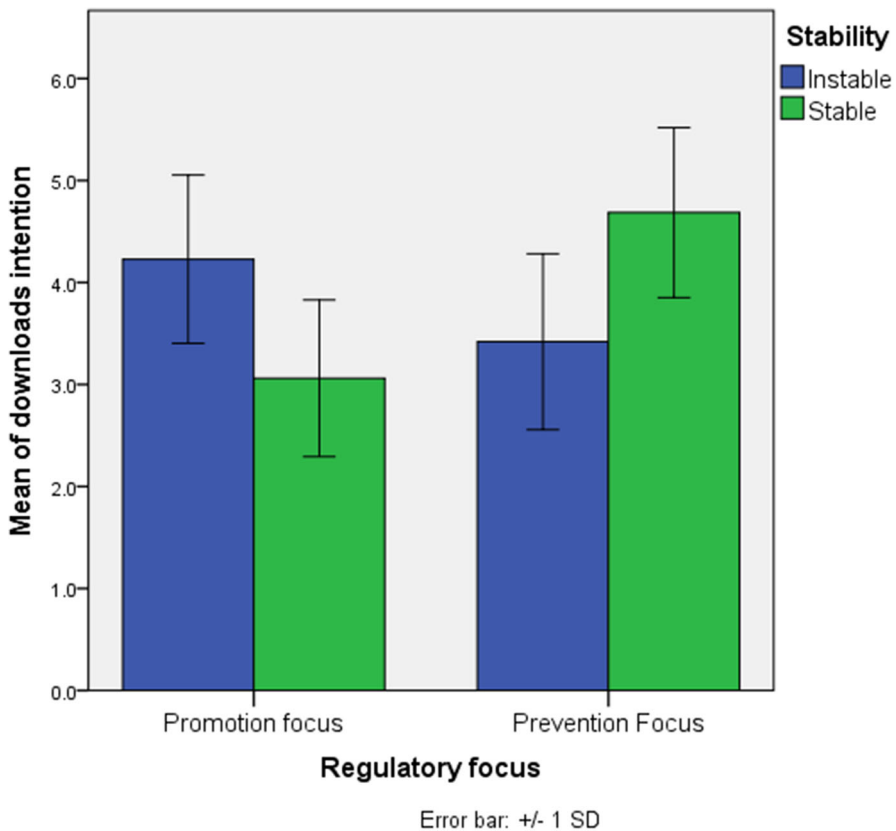


Fig. 5 When the involvement was high, the interaction between regulatory focus and stability on downloads intention

For participants in the high involvement and prevention focus condition, participants had higher download intention for the app with the stable icon ($M = 4.69$, $SD = 0.83$) than for the app with the unstable icon [$M = 3.42$, $SD = 0.86$, $F(1, 232) = 33.28$, $p < 0.01$].

The results of study 2 provided evidence for H3 and further support our earlier hypothesis. It also demonstrated the interaction between consumers' regulatory focus and the stability of an app icon on consumers' download intentions. Furthermore, the results of study 2 discussed the boundary condition of personal involvement for this effect. This effect occurred only when consumers' involvement was high.

5 General discussion

With the popularization of smart phones, the development of mobile apps has been rapid. You can find numerous apps with various functions in app stores. For example, you can play different types of musical instruments, such as piano, violin, and even saxophone with your smart phone by using the apps. The apps provide convenience for consumers and generate substantial income for app publishers. Thus, attracting more consumers and increasing download intention are app publishers' primary concerns. In this research, we mainly discuss two crucial elements of apps shown in app stores: the icon and the description. The results of two studies demonstrate that consumers with a promotion focus (prevention focus) have higher download intention for apps with unstable (stable) icons. In addition, consumers' perspectives of app icon stability depend on the salience of shapes, which means that the stability of the salient shape in the icon will influence the overall perspective of icon stability. Furthermore, consumers' involvement is the boundary condition to this effect. The effect occurs only for consumers with high involvement.

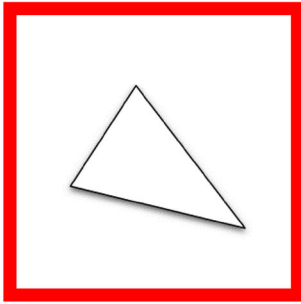
This research contributes to the literature in several ways. First, the previous research on design elements primarily focuses on the logo design and aesthetic field [4, 13, 14, 22]. Although the app icons are more salient, more changeable, and account for a larger portion of app stores than logos of traditional products in stores, research that discusses the influence of an app icon's design elements on consumers' perceptual judgments remains limited [37, 41]. This research enriches the literature on app icon design and symbolic associations by examining consumers' inferences from the stability of app icons. Furthermore, because of the conflicts of the specific target of inference from design elements, this research provides evidence that the target of icon-based inference is the app itself, including its function and content. Moreover, as another important component of apps in app stores, the research on app descriptions is limited. The research contributes to the regulatory focus theory by combining the regulatory focus theory with the app description. Prior research discussing the connections between a regulatory focus and design elements are rare [18]. This research establishes an innovative association between the icon design element (stability) and consumers' regulatory focus on app download intention. This research also provides primary evidence that consumers' perspective on icon

stability is influenced by salient shapes in the icons, which deepens our understanding of the process of consumers' judgment of visual elements.

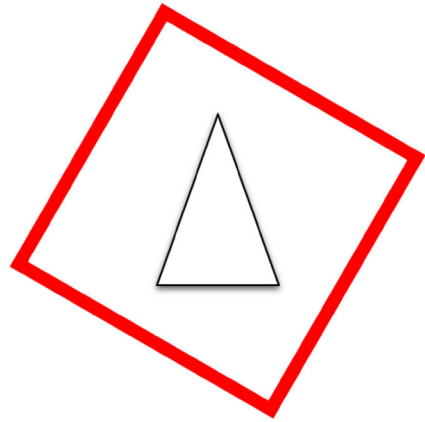
The managerial impacts of this research are notable. The present research provides app publishers with deep insights into consumers' decision-making in app selection. As both app icons and app descriptions are easily manipulated by app publishers, app publishers can differentiate collocations of icons and descriptions to help them increase downloads. For example, an app that aims to help people remember their online passwords using a stable icon and descriptions that could lead consumers to a prevention focus increases consumers' download intentions.

The present research also has several limitations for future research. First, the app icons are usually not as simple as those used in our studies. Although in study 1 we examined how the stability of the salient shape in an app icon reflected the icon's overall stability, it is still unclear what the effect may be if there are two shapes with similar salience but different stability. For example, if a control condition icon is introduced with a silent shape both inside and outside, no matter whether the stable shape is inside and the unstable shape outside or the unstable shape is inside and the stable shape outside, there may be no significant difference in consumers' overall perspective of the app icon's stability, as both stable and unstable shapes are salient. In addition, the stability of complex icons is difficult to judge, which can be a limitation of the application of this effect. Furthermore, in our study of shape selection, we found that participants perceived some symmetric shapes (e.g., circles) as stable shapes, which is different from the prior research on stability [10, 31]. Thus, whether symmetric icons or only shapes such as circles have a similar effect to that of stable icons requires further study. Moreover, the influence of other design elements, such as color, contrast ratio, brightness, and saturation, could also be considered in future research, as could personality. For example, neuroticism, which is likely related to prevention focus, may influence consumer behavior significantly.

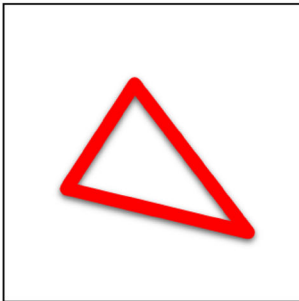
Appendix 1: App icons used in Study 1



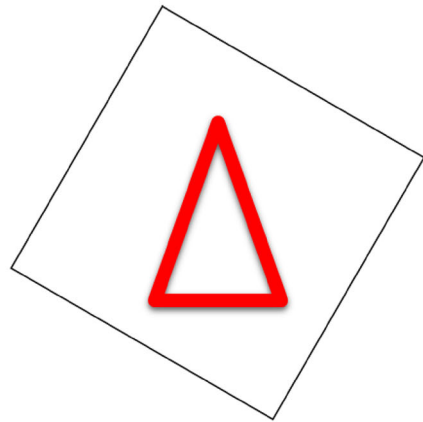
Outside: stable, salient
Inside: unstable, not salient



Outside: unstable, salient
Inside: stable, not salient

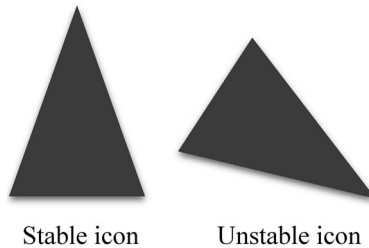


Outside: stable, not salient
Inside: unstable, salient



Outside: unstable, not salient
Inside: stable, salient

Appendix 2: App icons used in Study 2



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