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The curious versus the overwhelmed: Factors influencing QR codes scan intention

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ABSTRACT

Quick Response (QR) codes are widely employed in promotional campaigns worldwide. Adding a QR code to an advertisement increases visual design complexity, yet there remains little research on its impact on consumers. Drawing upon relevant marketing and psychology theories, we address how curiosity, visual design complexity, and perceived fit jointly affect consumers' QR codes scan intention. We hypothesize that highly curious consumers are likely to be more attracted to visually complex advertisements, thereby demonstrating greater scan intention. However, slightly curious consumers may feel overwhelmed by visual design complexity, but are likely to be more attracted to a good perceived fit between the QR code advertisement and the brand, which overcomes the negative effects of visual design complexity, leading to greater scan intention. The experimental findings support our main predictions. We conclude by discussing theoretical and managerial implications, recognizing important limitations, and suggesting future research directions.

1. Introduction

Quick Response (QR) codes are bi-dimensional, machine-readable optical labels that were developed in 1994 for fast and accurate inventory checks (Denso, 2011). Because of their high information encoding capacity, Japanese marketers and advertisers quickly embraced QR codes in a wide range of promotional activities (Dou & Li, 2008). QR codes rapidly gained popularity in Europe in the early 2000s, and soon after in North America, with manufacturers putting them on everything from wine labels to candy bars to shampoo bottles (Okazaki, Li, & Hirose, 2012).

However, recent headlines in some trade journals claim that QR codes are already “dead” because of low consumer acceptance. For example, a comScore survey indicates that only 17% of US smartphone users scanned a QR code in 2011 (Pozin, 2012). Conversely, QR codes can be seen in many places in the marketplace, particularly in retail environments, service tickets, and many consumer products. Given this, some practitioners argue that the real measure of QR codes' success does not lie in usage by general consumers, but in usage by specific groups of consumers targeted via such codes (Morris, 2015). Consumers are more likely to scan QR codes and redeem the benefits when the incentive to scan the code is specifically targeted and made attractive to their particular needs and desires (Okazaki et al., 2012). However, the literature offers little guidance as to the variables that contribute to

consumers' QR code scan intention.

This study explores consumers' motivation to scan QR codes embedded in advertisements and the conditions that impact this motivation. After conducting a review of the relevant literature, we carry out an experimental study that examines how consumers' curiosity levels impact their intention to scan embedded QR codes. Respondents are exposed to manipulated advertisements where the QR code is embedded in either complex or simple visual imagery, and where there is either a good or poor perceived fit between the QR code advertisement and the brand.

There are both academic and managerial motivations for the selection of these variables. First, individuals with greater curiosity tend to seek more stimulating experiences (Litman & Spielberg, 2003), and prior research identifies “curiosity arousal” as a key characteristic in QR code design (Okazaki et al., 2012). Thus, the level of curiosity likely plays a role in consumers' motivation to scan QR codes, but the extent of this role is uncertain. Second, QR codes are widely criticized as lacking in aesthetic appeal, mostly due to visual design complexity (Dou & Li, 2008). Thus, it is possible that many advertisers have been reluctant to include QR codes in their ads, believing that additional visual design complexity may negatively affect both consumers' attitudes toward the ad, as well as their intention to scan QR codes.

This study advances the literature in two ways. First, despite the proliferation of QR codes in the marketplace, research on this topic has

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been both scarce and vague. This article employs the theory of curiosity to address an important, yet neglected theoretical question surrounding successful execution of QR codes in promotional campaigns. QR codes may appeal to consumers' curiosity, but due to personality differences, not all consumers are equally curious. Therefore, to what extent does curiosity impact the intention to scan QR codes? The present research aims to explore the heart of this question. Second, prior research on mobile marketing has paid little attention to the main issue associated with these codes: QR codes are commonly seen as visually dull or distasteful. This article attributes this aesthetic issue to two additional variables: visual design complexity and perceived fit. When a QR code is embedded in an advertisement, consumers may not feel like scanning the code if its presence increases the visual design complexity of the ad, or if they perceive that its use does not fit the promoted brand. This article empirically tests, in an experimental setting, the influence of three variables, namely, consumers' curiosity, visual design complexity of the advertisement, and the perceived fit between the QR code and the brand.

In what follows, we first review the theory of curiosity and introduce two important variables: visual design complexity and perceived fit. Then, we formulate several hypotheses describing how these variables impact the intention to scan QR codes. We detail the experimental method employed to test these hypotheses and report the results. Finally, we draw theoretical and managerial implications, while recognizing important limitations and suggesting future research directions.

2. Theoretical framework

2.1. Theory of curiosity

Prior research indicates that curiosity arousal is an important factor in motivating people to consume electronic content (Ho & Dempsey, 2010), purchase products through mystery promotions (Hill, Fombelle, & Sirianni, 2016), or develop memory for an advertisement (Bakalash & Riemer, 2013). The present study understands curiosity as “a desire for acquiring new knowledge and new sensory experience that motivates exploratory behavior” (Litman & Spielberger, 2003, p. 75).

Berlyne (1954) distinguishes two groups of curiosity, namely perceptual and epistemic curiosity, according to what kind of stimuli activate exploratory behavior. Perceptual curiosity is aroused by visual, auditory, or tactile stimulation, which motivates behaviors such as visual inspection in order to seek new information. Epistemic curiosity, however, is aroused by conceptual puzzles and knowledge gaps, which motivate the asking of questions or the filling of gaps by testing hypotheses. We argue that epistemic curiosity drives the motivation to scan QR codes, as consumers may envisage the code as a puzzle, and try to find out what is hidden inside the code. Perceptual curiosity evoked by visual stimulation is insufficient to drive consumers to scan QR codes. Epistemic curiosity tends to be “aroused by novel questions, complex ideas, ambiguous statements or unsolved problems, all of which may point to a ‘gap’ in one’s knowledge, and reveal a discrepancy between that which one knows and desires to know” (Litman, Hutchins, & Russon, 2005, p. 559). In this study, the discrepancy between the QR code itself and the encoded brand information reflects such a “gap.” Therefore, knowledge-acquiring behavior motivated by epistemic curiosity is imperative to prompt consumers to dispel uncertainty associated with QR codes.

Developmental psychologists (see Jirout & Klahr, 2012) traditionally view curiosity as a personality trait related to the desire for cognitive exploration of complexity, novelty, and ambiguity. Silvia (2008) conducted experiments to explore the relationship between curiosity

and complexity across types of art (poetry vs. visual art) and found that highly curious people appraised the complex poems as easier to understand, relative to slightly curious consumers. As a result, highly curious people experienced greater interest, thus confirming the findings of past research on the appraisal structure of interest.

Previous literature exploring complexity and curiosity—using complex poems as a manipulation—has shown that highly curious people find complexity easier to understand than slightly curious people (Silvia, 2005). QR codes can be seen as analogous to a complex poem. Intuitively, highly curious consumers may be more likely to perceive QR code advertisements as more interesting, thus making them more likely to scan these codes. Empirical evidence to confirm this intuition is seemingly absent in the literature. This study tests the impact of curiosity on the intention to scan QR codes in promotional ads.

2.2. Visual design complexity

The effect of visual complexity on individuals is vigorously debated. On the one hand, visual complexity is thought to overwhelm individuals, leading to a reduction in object (i.e., advertisement) involvement levels (see Rossiter & Percy, 1983). On the other hand, it is argued that this type of complexity creates the “stopping power” in an advertisement that could lead to increased involvement (Cox & Cox, 1988). Below, we first define visual complexity and then review some key arguments in this debate.

Complexity can be understood as the “multiplicity of the relationships among the parts of an entity” (Arnheim, 1966, p. 123). Visual complexity may provoke confusion if the visual diversity has no order, while too much order without visual diversity leads to boredom (Arnheim, 1966). Individuals perform novelty checks when encountering new objects, and then appraise whether they are complex, obscure, uncertain, mysterious, contradictory, unexpected, or otherwise not understood (Scherer, 2001; Silvia, 2005). Thus, consumers may ignore an advertisement that they assess as either very visually complex or lacking in visual complexity. For instance, simple pictures garner greater attention from consumers as opposed to complex ones (Rossiter & Percy, 1983). Similarly, complex brand package designs distract viewers' attention, lowering processing fluency and target attractiveness (Orth & Crouch, 2014).

However, other marketing researchers argue that visual complexity actually acts as the stopping power of advertising, since people “pay more attention to the brand and message, and people may like the challenge in accomplishing this” (Pieters, Wedel, & Batra, 2010, p. 48). For instance, evaluations of complex advertisements become more positive with multiple exposures, while those of simple advertisements do not (Cox & Cox, 1988). Similarly, visually complex ads are more effective for highly knowledgeable and cognition-seeking consumers (Putrevu, Tan, & Lord, 2004). Likewise, Geissler, Zinkhan, and Watson (2006) find that home page complexity influences consumer attention, attitudes, and purchase intention.

Given these contradictory findings, Pieters et al. (2010) propose two types of visual complexity in advertising: design complexity and feature complexity. While design complexity refers to “the structured variation in terms of specific shapes, objects, and their arrangements in the advertisement,” feature complexity refers to “the unstructured variation in the visual features of image pixels” (Pieters et al., 2010, p. 50). This study focuses on design complexity because feature complexity only addresses the basic visual features of the advertisement image. Visual design complexity has been viewed as an overall index of object-related features (quantity, irregularity, dissimilarity, and detail) and arrangement-related features (asymmetry and irregularity). This study assumes

that the visual design complexity of an advertisement automatically increases when a QR code is embedded, due to the very nature of QR codes.

2.3. Perceived fit

Perceived fit refers to “the matching between the product and the object it is associated with” (Nan & Heo, 2007, p. 65), and is defined as “any parent brand association, including category, brand concept, or brand-specific associations, [that] can connect the parent brand with an extension and serve as the basis for perceived fit” (Bridges, Keller, & Sood, 2000, p. 2). It has been widely explored in the literature, including in the fields of advertising (e.g., Dahlén, Lange, Sjödin, & Törn, 2005), branding (e.g., Moon & Sprott, 2016), event sponsorship (e.g., Olson & Thjomøe, 2011), and corporate social responsibility (e.g., Lee, Park, Rapert, & Newman, 2012).

The preference for harmony and consistency in consumers' thoughts, feelings, and behaviors is important for there to be perceived fit (Delgado, Navarro, & Sicilia, 2012; Solomon, 1996). The literature offers several consistency theories that explicate the effects of perceived fit. For example, congruity theory suggests that storage in memory and retrieval of information are influenced by previous expectations. The more a person is exposed to information that confirms their prior expectations, the more positive the resulting effects (Cornwell & Maignan, 1998; Park & Lee, 2005; Sirgy, 1982; Srull, 1981). Similarly, self-concept theory indicates that when consumers perceive a product or brand to be consistent with their self-concept there is greater motivation to purchase or use that product or brand (Park & Lee, 2005; Sirgy, 1982).

Schema theory proposes that people access information about the brand and a stimulus (e.g., person, event, object) from their memory and compare this new information with the existing brand schema (Lynch & Schuler, 1994; Misra & Beatty, 1990). A schema is a cognitive structure that represents knowledge about a stimulus (Gwinner & Eaton, 1999). Schemas are important for understanding how people efficiently process new advertising stimuli by comparing them to existing knowledge (Goodstein, 1993; McDaniel, 1999). This enables judgments about the appropriateness of a product and a stimulus (Roy & Cornwell, 2004). Brand schemas are “brand-unique abstract meanings that typically originate from a particular configuration of product features and a firm's efforts to create meanings from these arrangements,” and are central to the perceived fit between brands and their various extensions (Park, Milberg, & Lawson, 1991, p. 186).

Using schema theory, this study proposes a perceived fit between brand and advertisement design. When an ad contains a QR code, a good perceived fit between the brand and the ad increases the intention to scan that code. This prediction becomes less certain when the QR code adds to the visual design complexity of an advertisement. Furthermore, if the QR code negatively influences the perceived fit between the ad and the brand, it may also negatively affect scanning intention by distracting consumers' attention.

3. Hypotheses

Grounded in the above discussions of curiosity, visual design complexity, and perceived fit, we propose four hypotheses that drive intention to scan QR codes embedded in advertisements. Research on website complexity suggests certain detrimental effects of visual design complexity on website perception (Tuch, Bargas-Avila, Opwis, & Wilhelm, 2009). An online advertisement embedded in a very complex website is more likely to engender negative attitudes toward the advertisement, as well as the website, and decrease purchase intention (Geissler et al., 2006). Packaging research suggests that QR

codes may contribute to increased visual design complexity in product packaging, which distracts consumers' attention and can decrease purchase intention (Orth & Crouch, 2014). This is consistent with an inverted-U relationship between perceived product design complexity and product liking—individuals tend to dislike products with highly complex design (Cox & Cox, 2002). Therefore, consumers may not be attracted to, or may be distracted from, advertisements and their promotional messages if QR codes increase visual design complexity and thereby reduce intention to scan. Thus:

H1. Advertisements with a low (versus high) level of visual design complexity will increase QR code scan intention.

If there is a good perceived fit between a QR code-embedded advertisement and the brand, consumers' intention to scan the code should increase. When people are exposed to new brand information, they efficiently process marketing communications by matching visual and contextual elements from an advertisement to their prior information and expectations stored in the existing brand schema (Goodstein, 1993; McDaniel, 1999). Consumers' expectations can influence their attitudes and behavioral intentions toward the brand and marketing communications (Goodstein, 1993). Thus, when consumers perceive an advertisement with an embedded QR code as a good fit with the brand, they will likely efficiently process new information in the advertisement because it conforms to their prior expectations of that brand's schema. This results in a more favorable overall impression and should increase QR code scan intention. Thus, we hypothesize that:

H2. Advertisements with good (versus poor) perceived fit will increase QR code scan intention.

We propose that QR code scan intention varies due to variations in visual design complexity and the perceived fit between an advertisement and its brand. We predict that high visual design complexity impedes scan intention, while good perceived fit increases it, but how do these predictions change when we consider curiosity? Slightly curious consumers generally do not experience the need for exploration and new knowledge to the same extent as highly curious consumers. Slightly curious consumers are not likely to be interested in QR codes because of the advertisement's increased visual design complexity. Thus, when exposed to a QR code-embedded advertisement, slightly curious consumers' scan intention is mainly driven by the perceived fit, because they are likely to focus more on their perceptions of how this advertisement and the promoted brand are congruent with the existing schema about that brand. Therefore, slightly curious consumers intend to scan a QR code in an ad when that ad is perceived to have a good fit with the brand, overcoming the negative effects of visual design complexity. There will be an interaction effect between visual design complexity and perceived fit on QR code scan intention for slightly curious consumers. Thus, more formally:

H3. For slightly curious consumers, the positive effects of perceived fit on QR code scan intention would be more pronounced as the advertisement's visual design complexity increases.

Conversely, highly curious consumers are prone to explorative behavior due to their knowledge-acquiring desire. As these highly curious consumers crave new experiences (Silvia, 2005), they are likely to find a QR code interesting. When a QR code is embedded in an advertisement, thereby adding to its visual design complexity and resulting in an enigma that cannot be easily comprehended or explained, the code will evoke the explorative nature of such consumers. Thus, highly curious consumers are more likely to scan the code, even when perceived fit between the code and the brand is poor, because high curiosity

mitigates the impact of poor perceived fit. Therefore, there should not be an interaction effect between visual design complexity and perceived fit on QR code scan intention for highly curious consumers, as they intend to scan the code regardless of the levels of perceived fit and visual design complexity. Thus, we predict:

H4. For highly curious consumers, there will be no interaction effect between visual design complexity and perceived fit on QR code scan intention.

4. Method

4.1. Data collection and respondents

A scenario-based, between-subject 2 (high/low visual design complexity) \times 2 (good/poor perceived fit) experiment was conducted in Spain by a professional research firm using an online questionnaire. Spain was chosen as an ideal empirical site for three reasons: (1) Spanish mobile internet use accounts for 85% of total internet use (Zenith, 2016); (2) Spain is among the top five European countries with highest QR code scan volume (QRStuff.com, 2014); and (3) Spanish shoppers are regularly exposed to QR codes. For example, Spanish clothing company, Inditex (Zara, Pull & Bear, Massimo Dutti, Bershka, Stradivarius, Oysho, Zara Home, and Uterqüe), adopted in-store payments through using smartphones to scan QR code-embedded products (Boden, 2016).

We collected the response data from most populous Spanish cities,¹ using non-probabilistic quota sampling by age and gender. This resulted in a total of 663 completed and usable responses. The demographic composition of the sample, in terms of age and gender, was similar to that of the national population of Spain (see Table 1). Respondents were randomly assigned to one of the four experimental groups: high versus low visual design complexity, and good versus poor perceived fit. Curiosity was not manipulated; rather, it was measured as an inherent personality trait on a continuous scale.

4.2. Measures

All measures used in the study were adapted from prior research using 7-point Likert scales. Curiosity was measured by an epistemic curiosity scale proposed by Litman and Spielberger (2003). Visual design complexity was measured by Pieters et al.'s (2010) design complexity criteria, namely, quantity of objects (many versus a few), irregularity of objects (irregular versus regular), and dissimilarity of objects (dissimilar versus similar). Perceived fit was measured by Olson and Thjomø's (2011) scale for good or poor perceived fit. Finally, the dependent variable, QR code scan intention, was measured using scales adapted from Ajzen and Fishbein (1980).

4.3. Experimental stimuli

All scenarios used the Coca-Cola brand, which was chosen for two reasons. First, the Coca-Cola company has proactively adopted QR codes in its promotional strategies and produces advertisements with various levels of visual design complexity. Thus, using this brand would increase the level of realism. Second, we wanted to fix the product type by choosing a soft drink brand. Since our experiment was already based on three principal variables (i.e., curiosity, visual design complexity, and perceived fit), any additional product-related factors (e.g., product type, purchase involvement) would make our study excessively complex. Doing this allowed us to clearly demonstrate the effects of the

Table 1
Respondents' profiles (%).

Profiles	Visual design complexity		Perceived fit		Overall
	High	Low	Good	Poor	
Gender					
Male	26.9	24.5	28.4	23.0	51.4
Female	24.7	23.9	26.7	21.9	48.6
Total	51.6	48.4	55.1	44.9	100.0
Age					
20–29	17.3	14.6	16.5	15.4	31.9
30–39	20.2	17.4	21.5	16.1	37.6
40–49	14.1	16.4	17.1	13.4	30.5
Total	51.6	48.4	55.1	44.9	100.0
Occupation					
Office workers	9.9	5.4	7.5	7.8	15.3
Self-employed	1.8	0.5	0.9	1.4	2.3
Housewives	0.8	1.1	1.1	0.8	1.9
Students	5.7	4.4	5.1	5.0	10.1
Unemployed	7.2	5.7	7.2	5.7	12.9
Retired	0.5	0.3	0.5	0.3	0.8
Others	28.7	28.0	32.8	23.9	56.7
Total	54.6	45.4	55.1	44.9	100.0
Coca-Cola purchase frequency					
Several times a day	7.1	7.1	10.1	4.1	14.2
Everyday	15.0	12.4	17.9	9.5	27.4
1–2 times a week	22.5	17.0	20.7	18.8	39.5
Several times a month	8.1	6.2	7.4	6.9	14.3
Once a month	2.4	1.9	1.9	2.4	4.3
Never	0.0	0.3	0.0	0.3	0.3
Total	55.1	44.9	58.0	42.0	100.0
QR code usage frequency					
> 10 times	15.8	15.8	19.7	11.9	31.6
5–9 times	7.5	5.9	8.7	4.7	13.4
3–4 times	11.3	8.7	10.7	9.3	20.0
1–2 times	8.3	7.2	8.3	7.2	15.5
Never	11.7	7.8	7.7	11.8	19.5
Total	54.6	45.4	55.1	44.9	100.0

variables of interest without product confounds.

Two possible biases, one related to brand experience, and the other to QR code usage experience, may occur. We minimized the first bias by asking questions about the frequency of Coca-Cola purchase. To minimize the second bias we asked questions regarding past experience of QR code access in terms of the scanning frequency to date. Neither the Coca-Cola purchase frequency nor the QR code usage experience showed significant differences among the experimental cells (see Table 1).

The experiment used altered Coca-Cola advertisements that were taken from real Coca-Cola campaigns and paired with a standard QR code. We created four advertisements (see Appendix A) to correspond to the four experimental conditions in the study (i.e., good versus poor perceived fit and high versus low visual design complexity) in the following manner. First, among a range of real Coca-Cola advertisements in Google Image, we selected 12 with varying levels of perceived fit and visual design complexity. Second, we edited the advertisements by deleting any text or slogans and inserted QR codes. Then, using 40 students, we pretested 12 advertisements for the level of perceived fit and visual design complexity. As a result, we chose four advertisements based on the highest and lowest extremes of perceived fit and visual design complexity, i.e., (1) highest perceived fit and highest visual design complexity, (2) highest perceived fit and lowest visual design complexity, (3) lowest perceived fit and highest visual design complexity, and (4) lowest perceived fit and lowest visual design complexity. We did not include any textual message or slogan, to avoid confounding.

¹ The data were collected from Alicante, Barcelona, Bilbao, Coruña, Madrid, Málaga, Sevilla, Valencia, Valladolid, and Zaragoza. The number of respondents in each city was approximately proportionate to the population.

A scenario was created to induce a hypothetical situation. Despite its various limitations, the scenario method was a practical solution, since it was unrealistic to plan a real promotional campaign, due to financial and time constraints. The English translation of the scenario reads as follows:

Assume that you are a customer of one of the major supermarket chains, including Carrefour, Mercadona, Al Campo, Eroski, Día, or Hipercor. One day, you have found this promotional advertisement in a free newspaper. The advertisement contains a QR code discount coupon for a 2 L bottle of Coca-Cola. This QR code can be scanned by your smartphone and redeemed at any cashier of the supermarket.

We listed the largest Spanish supermarket chains to make the scenario more realistic. Furthermore, the distance between the consumer's residence and the nearest redemption location is an important factor in explaining redemption behavior (Chiou-Wei & Inman, 2008; Hwang, Chung, Kim, Lee, & Yoo, 2016). We asked the respondents to read the scenario and provide the proximity from their home to the nearest retail locations of the supermarkets, to control for any distance bias. Respondents were then asked to answer questions associated with our variables of interest, and, finally, demographic questions.

4.4. Manipulation check

We conducted a series of pretests for the manipulation of visual design complexity and perceived fit with 40 undergraduate students of a major university in Southern Spain. As a result, we chose four advertisements that best corresponded to the four experimental conditions for the study (i.e., good versus poor perceived fit and high versus low visual design complexity). There were significant differences among the advertisements in the direction and magnitude we planned, in terms of both visual design complexity and perceived fit.

After data collection and before hypotheses testing, we repeated the manipulation checks to ensure that respondents perceived the experimental stimuli in the intended directions. The difference between high and low visual design complexity was statistically significant ($t = 15.62$, $p < 0.001$), with mean values of 4.39 and 2.76 respectively. The difference between good and poor perceived fit was also statistically significant ($t = 36.01$, $p < 0.001$), with mean values of 5.70 and 3.22 respectively.

4.5. Curiosity groups

The respondents were divided into four equal quantiles from the cumulative frequency distribution based on the level of curiosity, following the procedure outlined by Gelman and Park (2009). We retained the lowest (slightly curious) and highest (highly curious) quartiles, chosen for analytical and communication simplicity. As we planned this discretization of sample, we drew samples as large as possible to offset the inevitable power reduction (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015).² We can assume that curiosity has a normal distribution according to a histogram (skewness and kurtosis) and a one-sample Kolmogorov Smirnov test ($p > 0.05$). A t -test on curiosity showed significant differences between the slightly and highly curious groups ($t(380) = 46.51$, $p < 0.001$).

5. Hypotheses testing

We ran a $2 \times 2 \times 2$ three-way ANCOVA to examine the between-subjects effects, with curiosity (slightly versus highly), visual design

Table 2
ANCOVA results.

ANCOVA	df	MS	F	η_p^2	p
Redemption distance	1	0.22	0.10	0.00	0.75
Visual design complexity	1	0.00	0.00	0.00	0.98
Perceived fit	1	126.35	59.50	0.14	< 0.001
Curiosity	1	36.74	17.30	0.05	< 0.001
Visual design complexity \times perceived fit	1	15.36	7.23	0.02	< 0.01
Visual design complexity \times curiosity	1	2.27	1.07	0.00	0.30
Perceived fit \times curiosity	1	9.48	0.00	0.00	1.00
Visual design complexity \times perceived fit \times curiosity	1	7.69	3.62	0.01	< 0.05
Error	371				

complexity (high versus low), and perceived fit (good versus poor) being independent variables and QR code scan intention being the dependent variable (see Table 2). As explained before, we included redemption distance as a covariate to control for any distance bias.³ Table 2 reports the ANCOVA results.

Although not formally hypothesized, we expect QR code scan intention to be significantly higher among the highly curious group than the slightly curious. The significant main effect of curiosity supports this prediction ($F(1,371) = 17.30$, $\eta_p^2 = 0.05$, $p < 0.001$). Table 3 shows that an overall mean of QR code scanning is greater in the highly curious group ($M = 5.79$) than in the slightly curious group ($M = 4.68$) regardless of the advertisement exposure.

H1 suggests that highly visually complex advertisements tend to impede consumers' intention to scan the embedded QR code. The ANCOVA results indicate that the main effect of visual design complexity on QR code scan intention is not significant ($F(1,371)$, $p = 0.98$), thus not supporting H1.

H2 predicts that the higher the perceived fit between the QR code-embedded advertisement and the brand, the more likely consumers will intend to scan the code. The results support this, as the main effect of perceived fit on scan intention is statistically significant ($F(1,371) = 59.50$, $\eta_p^2 = 0.14$, $p < 0.001$; see Table 2). The effect of perceived fit for the slightly curious group [$F(1,187) = 36.97$, $\eta_p^2 = 0.17$, $p < 0.001$] and for the highly curious group [$F(1,187) = 13.22$, $\eta_p^2 = 0.08$, $p < 0.001$] is in the same direction, which supports H2 (see Table 4).

Graphs for the three-way interaction illustrate the outcomes for H3 and H4 (see Fig. 1). The ANCOVA indicates that the three-way interaction is statistically significant ($F(1,371) = 3.62$, $\eta_p^2 = 0.01$, $p < 0.05$; see Table 2), albeit of modest size. H3 suggests that, for slightly curious consumers, low visual design complexity and good perceived fit will lead to greater QR code scan intention. The two-way interaction effect between visual design complexity and perceived fit is statistically significant for the slightly curious group ($F(1,187) = 13.75$, $\eta_p^2 = 0.07$, $p < 0.001$; see Table 4). When perceived fit is poor, the mean intention to scan is higher with high visual design complexity ($M = 4.68$) than with low visual design complexity ($M = 3.75$; see Table 3). When perceived fit is better, the mean intention to scan is higher with low visual design complexity ($M = 5.76$) than with high visual design complexity ($M = 5.19$), therefore supporting H3.

H4 proposes that, for highly curious consumers, the negative effect of visual design complexity on QR code scan intention would be offset by good perceived fit between a QR code-embedded advertisement and

² A discretization of a continuous variable has been used as an acceptable practice in recent publications in the *Journal of Business Research* (e.g., Karkoulian, Srour, & Sinan, 2016; Kwon, Englis, & Mann, 2016; Wolter, Brach, Cronin, & Bonn, 2016).

³ We pretested the magnitude of incentives associated with QR codes. That is, we examined if there were any significant differences in behavioral intention between the 40% and 100% discount rates. However, the results showed no statistical difference. For this reason, we discarded the inclusion of incentive as a part of our main experimental design.

Table 3
QR code scan intention by study design.

Stimuli	Slightly curious			Highly curious			Row mean		
	<i>n</i>	M	SD	<i>n</i>	M	SD	<i>n</i>	M	SD
Low visual design complexity/poor perceived fit	57	3.75	1.49	22	4.89	2.14	79	4.13	1.77
Low visual design complexity/good perceived fit	35	5.76	1.18	49	6.18	1.29	84	6.11	1.21
High visual design complexity/poor perceived fit	72	4.68	1.42	20	5.21	1.46	92	4.73	1.47
High visual design complexity/good perceived fit	28	5.19	1.18	63	5.98	1.57	91	5.79	1.48
Column mean	192	4.68	1.53	154	5.79	1.63	346	5.23	1.67

Note: *n* = cell size; M = mean; SD = standard deviation.

Table 4
ANCOVA results by level of curiosity.

Level of curiosity	Variable	<i>df</i>	MS	<i>F</i>	η_p^2	<i>p</i>
Slightly curious	Redemption distance	1	3.85	2.05	0.01	0.14
	Visual design complexity	1	0.96	0.51	0.00	0.48
	Perceived fit	1	69.43	36.97	0.17	< 0.001
	Visual design complexity × perceived fit	1	25.81	13.75	0.07	< 0.001
	Error	187				
Highly curious	Redemption distance	1	1.99	0.80	0.01	0.37
	Visual design complexity	1	0.08	0.03	0.00	0.86
	Perceived fit	1	32.94	13.22	0.08	< 0.001
	Visual design complexity × perceived fit	1	2.40	0.96	0.01	0.33
	Error	149				

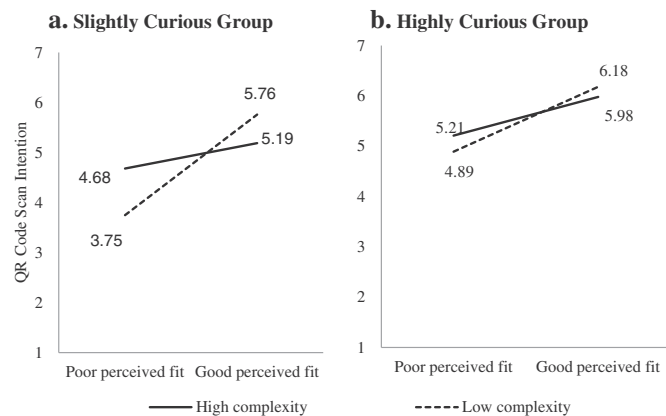


Fig. 1. Relationships between curiosity, visual design complexity, and perceived fit.

the brand, resulting a non-significant interaction effect between visual design complexity and perceived fit. For the highly curious, the mean intention to scan at poor perceived fit is 5.21 versus 4.89 for high and low visual design complexity respectively, and the same pattern is observed with good perceived fit (6.18 for low visual design complexity, compared to 5.98 for high visual design complexity; see Table 3 and Fig. 1). There is no interaction between visual design complexity and perceived fit for the highly curious group ($F(1,149) = 0.96, \eta_p^2 = 0.01, p = 0.33$; see Table 4), thus supporting H4.

6. Discussion

6.1. Theoretical implications

While widely used, QR codes are among the most understudied research topics in advertising and marketing, with only a handful of articles offering theoretical and empirical insight into QR code execution. This article addresses consumers' QR code scan intention from the perspectives of curiosity, visual design complexity, and perceived fit. Together, these provide an important contribution to the literature in the following three ways.

First, the findings seem to suggest that epistemic curiosity plays a key role in the formation of QR code scan intention. Our study confirms that exploratory behavior driven by knowledge acquisition, to reduce uncertainty, is a primary motivation for scanning a code. Thus, when hints about the encoded content are provided in an appealing but mysterious way, curious consumers are more likely to scan the code. We demonstrate that, depending on the level of curiosity, there are intertwined effects of visual design complexity and perceived fit on scan intention.

Second, to our surprise, the main effect of visual design complexity on QR code scan intention was not statistically significant. One possible interpretation is that the support from the literature is mainly based on affective or cognitive effects, and less on behavioral outcomes. Thus, the respondents exposed to high visual design complexity may have exhibited unfavorable attitudes toward the advertisement or toward the code, but this did not necessarily affect scan intention. Another interpretation is that, in our experimental design, perhaps the role of visual design complexity is limited and only manifested in conjunction with curiosity and perceived fit, as contemplated in H3 and H4. Given that our final analysis was based only on the high and low quantiles, this seems a more plausible explanation, supporting our basic theoretical thesis.

Third, consistent with schema theory, our findings indicate that perceived fit between the QR code advertisement and the brand has a significant, robust influence on scan intention, independent of curiosity. This implies that a good perceived fit might relax or soften consumers' resistance to more visually complex advertisements, thus inducing more consumers to scan the QR code. Theoretically, this finding seems to indicate that perceived fit with brand schemas is more powerful than visual design complexity.

As the level of perceived fit goes up, the negative impact of visual design complexity becomes negligible and consumers' motivation to scan the QR code increases. Conversely, when the perceived fit is poor, higher visual design complexity is an obstacle to motivating QR code scan intention. These effects are accentuated as consumers' curiosity decreases, seen by comparing the two interaction effects for the slightly curious group and the highly curious group.

As this study operationalizes curiosity as epistemic, our findings

may indicate that, even though consumers are neither cognitively oriented nor eager to explore what is hidden behind the QR code, good perceived fit could serve as a powerful catalyst to motivate consumers to scan. The findings suggest that consumers perceive a QR code as a puzzle in a symbolic sense, but curiosity alone does not seem to predict intention to scan. Slightly curious consumers can still be motivated to scan the QR code when it fits well with the brand and its promotional context. This is true even when a QR code intensifies the “messiness” or visual design complexity of the advertisement, as long as it is perceived as having good fit.

6.2. Managerial implications

Our findings provide useful and practical implications for advertisers and marketers considering implementing QR codes in promotional campaigns. The results appear counterintuitive—consumer curiosity is not the main motivator of scan intention. For highly curious consumers, visual design complexity, which is intensified with the inclusion of QR code, is not an impediment to scan intention, whatever the congruence of the QR code advertisement with the brand. In contrast, for slightly curious consumers, perceived fit becomes a catalyst in stimulating scan intention. Therefore, the main objective of QR code advertisements' market testing should be perceived fit, not visual design complexity. This may help creative designers develop and test these types of advertisements for better campaign outcomes.

The findings also indicate that slightly curious consumers ought to be the target of QR code promotions, as highly curious consumers will scan the code anyway. If advertisement designers focus on creating promotions that have a good perceived fit and catch the attention of these consumers with low to moderate curiosity levels, there is a good chance that the campaign will be successful, at least on the metric of QR code scans.

Firms could create a perceptual gap between the QR code and the promoted brand. Instead of merely attaching the QR code to the bottom of the advertisement as an afterthought, it could be integrated as a part of the design itself. For example, JetBlue successfully used a “code-inside-of-a-code” approach to promote a winter travel giveaway (Marquis, 2011). As QR codes have already been widely implemented in most boarding passes, luggage tags, and elsewhere in the airline industry, such advertisements that have integrated QR codes may increase the perceived fit more, which could result in even more code

scans.

7. Limitations, future research directions, and conclusions

This study has two important limitations. First, our research focuses on only one brand, Coca-Cola, which was done to simplify the experimental design. Future research should examine a variety of brands, categories, and other contexts to increase the generalizability of the findings. Second, we considered curiosity as a personality trait, and divided the respondents into four groups based on quantiles. However, such discretization of a continuous variable may lead to loss of power, which may be reflected in the modest partial eta squared (η_p^2) for the three-way interaction effect.

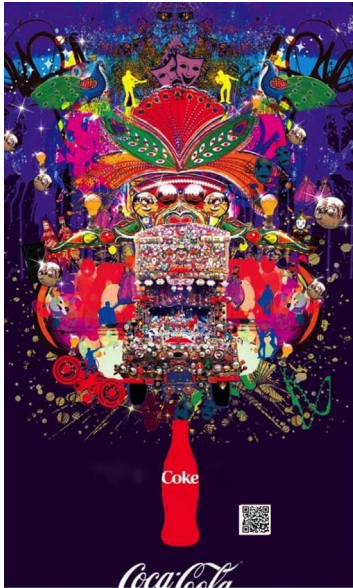
Besides overcoming these limitations, future research needs to explore actual scanning behavior in a field experiment. This study used a physical establishment as a redemption site, but many retailers now offer online channels for shopping. It would be interesting to address multi-channel coupon redemption, including both offline and online channels. Prior research on QR code provides inconsistent conclusions for information processing and visual design complexity in advertising and packaging (Orth & Crouch, 2014). An extension of our research could compare different media of QR codes to find out which printable surface might produce a maximum level of scan intention.

This study has examined the influences on QR code scan intention through a complex experiment. It found that perceived fit between the QR code advertisement and the brand is the single most important factor for all consumers when forming intentions to scan. This factor can even mitigate the dampening effects of increased visual design complexity associated with QR code in advertisements. Curiosity has a positive impact on scan intention only at high levels. We conclude with simple advice to those considering adding a QR code to an advertisement campaign or a research design: make sure the QR code fits the brand.

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Appendix A. Advertisement stimuli used in this study



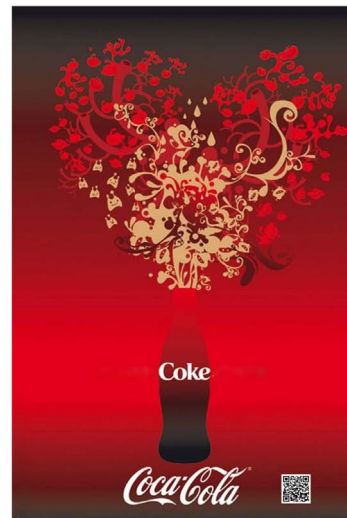
High visual design complexity with high perceived fit



High visual design complexity with low perceived fit



Low visual design complexity with high perceived fit



Low visual design complexity with low perceived fit

References

- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Arnheim, R. (1966). Order and complexity in landscape design. In R. Arnheim (Ed.), *Toward a psychology of art* (pp. 123–135). Berkeley, CA: University of California Press.
- Bakalash, T., & Riemer, H. (2013). Exploring ad-elicited emotional arousal and memory for the ad using fMRI. *Journal of Advertising*, 42(4), 275–291.
- Berlyne, D. E. (1954). A theory of human curiosity. *British Journal of Psychology*, 45(3), 180–191.
- Boden, R. (2016, July 28). *Spanish clothing retailer to roll out QR code payments*. NFC World. Retrieved from <https://www.nfcworld.com/2016/07/28/346484/spanish-clothing-retailer-to-roll-out-qr-code-payments/>, Accessed date: 14 September 2017.
- Bridges, S., Keller, K. L., & Sood, S. (2000). Communication strategies for brand extensions: Enhancing perceived fit by establishing explanatory links. *Journal of Advertising*, 29(4), 1–11.
- Chiou-Wei, S. Z., & Inman, J. J. (2008). Do shoppers like electronic coupons? A panel data analysis. *Journal of Retailing*, 84(3), 297–307.
- Cornwell, T. B., & Maignan, I. (1998). An international review of sponsorship research. *Journal of Advertising*, 27(1), 1–21.
- Cox, D., & Cox, A. D. (1988). What does familiarity breed? Complexity as a moderator of repetition effects in advertising evaluation. *Journal of Consumer Research*, 15(1), 111–116.
- Cox, D., & Cox, A. D. (2002). Beyond first impressions: The effects of repeated exposure on consumer liking of visually complex and simple product designs. *Journal of the Academy of Marketing Science*, 30(2), 119–130.
- Dahlén, M., Lange, F., Sjödin, H., & Törn, F. (2005). Effects of ad-brand incongruity. *Journal of Current Issues and Research in Advertising*, 27(2), 1–12.
- Delgado, E., Navarro, A., & Sicilia, M. (2012). Revitalising brands through communication messages: The role of brand familiarity. *European Journal of Marketing*, 46(1–2), 31–51.
- Denso (2011). *Diversified products: QR code and two-dimensional code scanners*. Retrieved from Denso Technology <https://www.denso.com/global/en/>, Accessed date: 14 September 2017.
- Dou, X., & Li, H. (2008). Creative use of QR codes in consumer communication. *International Journal of Mobile Marketing*, 3(2), 61–67.
- Geissler, G. L., Zinkhan, G. M., & Watson, R. T. (2006). The influence of home page complexity on consumer attention, attitudes, and purchase intent. *Journal of Advertising*, 35(2), 69–80.
- Gelman, A., & Park, D. K. (2009). Splitting a predictor at the upper quarter or third and the lower quarter or third. *The American Statistician*, 63(1), 1–8.
- Goodstein, R. C. (1993). Category-based applications in advertising: Motivating more extensive ad processing. *Journal of Consumer Research*, 20(1), 87–99.
- Gwinner, K. P., & Eaton, J. (1999). Building brand image through event sponsorship: The role of image transfer. *Journal of Advertising*, 28(4), 47–57.
- Hill, K. M., Fombelle, P. W., & Sirianni, N. J. (2016). Shopping under the influence of curiosity: How retailers use mystery to drive purchase motivation. *Journal of Business*

- Research*, 69(3), 1028–1034.
- Ho, J. Y., & Dempsey, M. (2010). Viral marketing: Motivations to forward online content. *Journal of Business Research*, 63(9), 1000–1006.
- Hwang, J. H., Chung, J., Kim, J. W., Lee, D., & Yoo, W. S. (2016). Antecedents to loyalty point redemption: Implications for customer equity management. *Journal of Business Research*, 69(9), 3731–3739.
- Iacobucci, D., Posavac, S. S., Kardes, F. R., Schneider, M., & Popovich, D. (2015). Toward a more nuanced understanding of the statistical properties of a median split. *Journal of Consumer Psychology*, 25(4), 652–665.
- Jirout, J., & Klahr, D. (2012). Children's scientific curiosity: In search of an operational definition of an elusive concept. *Developmental Review*, 32(2), 125–160.
- Karkoulis, S., Srour, J., & Sinan, T. (2016). A gender perspective on work-life balance, perceived stress, and locus of control. *Journal of Business Research*, 69(11), 4918–4923.
- Kwon, W. S., Englis, B., & Mann, M. (2016). Are third-party green–brown ratings believed?: The role of prior brand loyalty and environmental concern. *Journal of Business Research*, 69(2), 815–822.
- Lee, E. M., Park, S. Y., Rapert, M. I., & Newman, C. L. (2012). Does perceived consumer fit matter in corporate social responsibility issues? *Journal of Business Research*, 65(11), 1558–1564.
- Litman, J. A., Hutchins, T., & Russon, R. (2005). Epistemic curiosity, feeling-of-knowing, and exploratory behaviour. *Cognition & Emotion*, 19(4), 559–582.
- Litman, J. A., & Spielberger, C. D. (2003). Measuring epistemic curiosity and its diverse and specific components. *Journal of Personality Assessment*, 80(1), 75–86.
- Lynch, J., & Schuler, D. (1994). The match-up effect of spokesperson and product congruency: A schema theory interpretation. *Psychology & Marketing*, 11(5), 417–445.
- Marquis, R. (2011, January 31). JetBlue uses QR code. Retrieved from 2D Barcode Strategy <https://marquisonmarketing.wordpress.com/2011/01/31/jetblue-uses-qr-code/>, Accessed date: 14 September 2017.
- McDaniel, S. R. (1999). An investigation of match-up effects in sport sponsorship advertising: The implications of consumer advertising schemas. *Psychology & Marketing*, 16(2), 163–184.
- Misra, S., & Beatty, S. E. (1990). Celebrity spokesperson and brand congruence: An assessment of recall and affect. *Journal of Business Research*, 21(2), 159–173.
- Moon, H., & Sprott, D. E. (2016). Ingredient branding for a luxury brand: The role of brand and product fit. *Journal of Business Research*, 69(12), 5768–5774.
- Morris, B. (2015, May 21). Are QR codes thriving or dying? Retrieved from Business 2 Community <http://www.business2community.com/marketing/qr-codes-thriving-dying-01228016>, Accessed date: 14 September 2017.
- Nan, X., & Heo, K. (2007). Consumer responses to corporate social responsibility (CSR) initiatives: Examining the role of brand-cause fit in cause-related marketing. *Journal of Advertising*, 36(2), 63–74.
- Okazaki, S., Li, H., & Hirose, M. (2012). Benchmarking the use of QR code in mobile promotion: Three studies in Japan. *Journal of Advertising Research*, 52(1), 102–117.
- Olson, E. L., & Thjømmøe, H. M. (2011). Explaining and articulating the fit construct in sponsorship. *Journal of Advertising*, 40(1), 57–70.
- Orth, U. R., & Crouch, R. C. (2014). Is beauty in the aisles of the retailer? Package processing in visually complex contexts. *Journal of Retailing*, 90(4), 524–537.
- Park, C. W., Milberg, S., & Lawson, R. (1991). Evaluation of brand extensions: The role of product feature similarity and brand concept consistency. *Journal of Consumer Research*, 18(2), 185–193.
- Park, S. Y., & Lee, E. M. (2005). Congruence between brand personality and self-image, and the mediating roles of satisfaction and consumer-brand relationship on brand loyalty. In Y. U. Ha, & Y. Youjae (Vol. Eds.), *Asia Pacific advances in consumer research*. Vol. 6. *Asia Pacific advances in consumer research* (pp. 39–45). Duluth, MN: Association for Consumer Research.
- Pieters, R., Wedel, M., & Batra, R. (2010). The stopping power of advertising: Measures and effects of visual complexity. *Journal of Marketing*, 74(5), 48–60.
- Pozin, I. (2012, March 8). Are QR codes dead? Retrieved from Forbes <http://www.forbes.com/sites/ilyapozin/2012/03/08/are-qr-codes-dead/>, Accessed date: 14 September 2017.
- Putrevu, S., Tan, J., & Lord, K. R. (2004). Consumer responses to complex advertisements: The moderating role of need for cognition, knowledge, and gender. *Journal of Current Issues and Research in Advertising*, 26(1), 9–24.
- QRStuff.com (2014, April 2). Q1 2014: QR code trends. Retrieved from <http://blog.qrstuff.com/2014/04/02/q1-2014-qr-code-trends>, Accessed date: 14 September 2017.
- Rossiter, J. R., & Percy, L. (1983). Visual communication in advertising. In R. J. Harris (Ed.), *Information processing research in advertising* (pp. 83–125). Hillsdale, NJ: Erlbaum.
- Roy, D. P., & Cornwell, T. B. (2004). The effects of consumer knowledge on responses to event sponsorships. *Psychology & Marketing*, 21(3), 185–207.
- Scherer, K. R. (2001). Appraisal considered as a process of multi-level sequential checking. In K. R. Scherer, A. Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion: Theory, methods, research* (pp. 92–120). New York, NY: Oxford University Press.
- Silvia, P. J. (2005). What is interesting? Exploring the appraisal structure of interest. *Emotion*, 5(1), 89–102.
- Silvia, P. J. (2008). Appraisal components and emotion traits: Examining the appraisal basis of trait curiosity. *Cognition and Emotion*, 22(1), 94–113.
- Sirgy, M. J. (1982). Self-concept in consumer behavior: A critical review. *Journal of Consumer Research*, 9(3), 287–300.
- Solomon, M. (1996). *Consumer behavior*. Upper Saddle River, NJ: Prentice Hall.
- Srull, T. K. (1981). Person memory: Some tests of associative storage and retrieval models. *Journal of Experimental Psychology: Human Learning and Memory*, 7(6), 440–463.
- Tuch, A. N., Bargas-Avila, J. A., Opwis, K., & Wilhelm, F. H. (2009). Visual design complexity of websites: Effects on users' experience, physiology, performance, and memory. *International Journal of Human-Computer Studies*, 67(9), 703–715.
- Wolter, J. S., Brach, S., Cronin, J. J., & Bonn, M. (2016). Symbolic drivers of consumer-brand identification and disidentification. *Journal of Business Research*, 69(2), 785–793.
- Zenith (2016, October 27). Zenith forecasts 75% of internet use will be mobile in 2017. Retrieved from News <https://www.zenithmedia.com/mobile-forecasts-75-internet-use-will-mobile-2017/>, Accessed date: 14 September 2017.