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Refining Design Prediction Through the Principles of Typicality and Novelty

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Refining Design Prediction Through the Principles of Typicality and Novelty

A thesis submitted to the Graduate School of the University of Cincinnati in partial fulfillment of the requirements for the degree of Master of Design in the School of Design of the College of Design, Architecture, Art, and Planning

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Abstract

Despite their expertise in the visual domain, designers face heavy scrutiny from other disciplines based on the intuitive nature with which decisions are often made in design. While more businesses seek competitive advantages through visual appeal, designers still face an uphill battle when debating the merits of these contributions against more easily measured attributes like material cost or ergonomics. However, psychological research has identified a number of principles that explain some relatively universal preferences in the visual domain. This thesis explores the interaction of two principles—typicality and novelty— for improving product designers' predictions of consumer preference based on visual appeal. Preliminary studies were conducted to support existing knowledge on how these principles affect product preferences, culminating in the creation of a framework to facilitate analysis of visual attributes informing a concept selection activity. Although the principles provoked critical thinking about a product's visual appeal, designers accurately predicted the preferences of laypeople prior to the framework's intervention. The framework exhibited more influence as decisions appeared to increase in difficulty, but it did not necessarily improve prediction. Accurate initial predictions were most likely a result of priming designers to consider the audience and context, suggesting the importance of participant preparation preceding a design evaluation. Through the use of empirically supported principles like typicality and novelty, designers can bring added credibility to their discipline and reinforce the core competency of creating visual appeal.
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1.0 Introduction

1.1 Defending Visual Appeal: A Problem with Intuition

Predicting the preferences of users is one of the most important competencies for a business to develop. Without this ability, new products miss the mark and businesses lose significant investments in time and money bringing the wrong product to market. While a range of factors may influence preferences, initial impression plays an important role in overall preference and makes this opening part of the user experience an important one to consider. First impressions may occur in a variety of ways, but consumers often notice the product’s visual qualities first (Olshavsky & Spreng, 1996). In short, the ability to predict user preferences can be strongly tied to the ability to predict visual appeal.

Understanding and producing visual appeal are core competencies for designers. How do designers predict visual appeal? Research has shown that professionals perceive novel, innovative designs differently than consumers do (Gourville, 2006). Perhaps because of this difference, a common research method asks consumers to give feedback on a range of concepts (often “mild to wild”). Despite the popularity of this method, many researchers understand that people generally lack the ability to explain their preferences accurately, especially preferences that are visual or aesthetic in nature. To select the product concepts for this method, decisions are made based on professional intuition and experience. A creative director or project team simply picks the concepts they think will have the strongest visual appeal, assuming all other requirements of the project have been met equally. Because of this intuitive approach combined with consumers’ inability to explain their preferences, businesses lack the ability to truly understand why consumers prefer certain visual arrangements over others. This creates two key issues for these businesses.
First, it hinders the development of strategies for visual appeal that can be applied efficiently across multiple initiatives. Second, it restricts the ability to defend a concept’s visual appeal when compared to more easily quantifiable goals like cost, ergonomics, or shelf space. Despite the importance of visual appeal to businesses, lack of credible support for this area undermines design’s value and often leads to compromised versions of a product.

It is established that predicting preference is important to businesses and strongly linked to visual appeal. Given the challenges defending visual appeal decisions rooted in intuition, an opportunity exists to build stronger rationale for design decisions in the visual domain. Designers can begin this process by building up their knowledge of existing psychological research that provides empirical support for motivations that lead to visual appeal.

1.2 Empirical Support for Visual Appeal

Despite their sense of accuracy regarding aesthetic judgments, many designers struggle to provide the objective, rational support for their decisions that would allow them to be more influential in multi-disciplinary business teams. Seminal works on perception including those from Ramachandran and Hirstein (1999) and Reber, Schwarz, and Winkielman (2004) and Hekkert (2006) provide explanations and empirical support for many visual preferences for which designers often have an intuitive sense. These principles include (but are not limited to) problem solving, perceptual grouping, contrast extraction, metaphor, symmetry, isolation of a single cue, optimal match, unity in variety, peak shift, and maximum effect for minimum means.
Although most visual appeal studies focus on art, a number have been found to apply to manufactured products as well. Research on the typicality principle suggests a strong relevance to design because many of its foundational experiments were conducted using everyday objects including furniture (Whitfield & Slatter, 1983), interior designs (Pedersen, 1986), houses (Purcell, 1992), consumer products (Veryzer & Hutchinson, 1998), consumer products (Hekkert, Snelders & van Wieringen, 2003), and watches (Halberstadt & Rhodes, 2000, 2003).

Typicality, also known as the preference-for-prototypes theory (Whitfield, 1979)¹, is the tendency to prefer objects that are strong examples of their category. For instance, a sparrow is a stronger example of the category “bird” than an ostrich is. Psychologists argue that people prefer typical objects because they are more fluently processed (Reber, Schwarz & Winkielman, 2004) and because they lead to familiar, safe decisions (Bornstein, 1989). Atypical products that cannot be easily categorized can be underappreciated, which may result from a lack of “thought confidence” in one's evaluations (Goode, Dahl, and Moreau, 2013). Typicality in products can be influenced not only by a product’s objective, physical properties, but also by one’s level of familiarity and exposure to it (Hekkert, 2006). Finally, Lidwell (2010) notes that while typicality and familiarity generally correlate, they are in fact distinct. Familiarity is based on past exposure, while typicality refers to how recognizable an object is as its type.

While the typicality principle is well supported, the attraction to new things is also apparent in our world. One cannot study typicality without considering the impact of its complement and counterpart: novelty. This is the tendency to be attracted to things that are new or

¹ The definition of “prototype” as used in psychology is an conflicting one for the field of design, which associates the term strongly with physical and/or testable models.
unfamiliar. Visual newness is often the first evaluation consumers make when assessing a product (Radford & Bloch, 2011). To observe the best example of the preference for novelty in action, one needs to look no further than the nearest toddler, grabbing everything within his reach and putting it in his mouth. Psychologists believe that we like novel things when they provide an opportunity to learn and adapt to our environment (Bornstein, 1989).

Berlyne theorizes that the source of pleasure derived from novelty comes from processing an initially unsettling experience and successfully transitioning it into a more familiar or understandable state (Bianchi, 2002). With this in mind, extreme amounts of novelty may be difficult to overcome, and so it has been found that there is a limit to the amount of novelty generally preferred (Loewy, 1951). Like typicality, the preference for novelty is dynamic and can be influenced by risk, time, experience, knowledge, environment (Bianchi, 2002), and an inherent need for uniqueness (Simonson & Nowlis, 2000).

Our preference for novelty contributes to the ethical challenges for designers. Many industries rely on novelty to sell their “latest and greatest” model or to exaggerate differences between variations that would be otherwise superfluous. This can contribute large amounts of waste to our environment and promote unhealthy attitudes about consumerism. While designers aren’t solely responsible for maintaining sustainable business practices, their work is at the heart of product development where irresponsible choices often originate. The goal of this paper is not to assess the ethical standards by which designers should apply these principles. Novelty can be used meaningfully with many positive intentions, namely to ensure that consumers can easily identify a new product as having an improved usage experience in any number of ways. Hopefully, designers can focus on finding the most meaningful opportunities to apply the knowledge gained through this research.
1.3 Typicality, Novelty, and MAYA: When Two Become One

When considering the advantages of both typicality and novelty principles simultaneously, they can provide an interesting challenge for design. Implementing a fully typical design may help someone categorize and interpret a product, but it might not fulfill goals around standing out from competitors or emphasizing a new benefit. Novelty can be used to capture one’s attention, but it also comes with the risk of confusing or irritating its audience if there are few perceived benefits. Pitting these two principles against each other can seem like a compromised approach that will result in halfhearted concepts that are neither classically appealing nor strikingly new.

However, research suggests that the two principles can work together productively. Hekkert, Snelders & van Wieringen (2003) studied the typicality and novelty of a broad variety of objects, including tea kettles, telephones, sanders, and mid-sized sedans. Their study found that while the positive effects of typicality and novelty appear to suppress each other, they are not exactly negatively correlated. Upon closer analysis, researchers state that typicality and novelty are “jointly and equally effective in explaining aesthetic preference.” In other words, previous research supports the notion that typicality and novelty are unique processes and suggests that designers can make the most of both benefits independently and simultaneously.

Ideal designs may seek an optimal balance of the two principles, coined “Most Advanced Yet Acceptable” (MAYA), by famed designer Raymond Loewy in 1951. In his own words, Loewy describes typicality and novelty along a single dimension featuring a “shock-zone” that designers should approach but not enter. “It is a sort of tug of war between attraction to the
new and fear of the unfamiliar.” Because of Loewy’s prominent role in the development of industrial design in the United States, MAYA may have strong influence over industrial design students and recent graduates, whether it be through direct or indirect exposure.

Loewy’s MAYA is a theory based solely on the designer’s reflections on past successes and failures. As such, there are two key discrepancies between the explanation of MAYA and the psychological theories that underpin the principles of typicality and novelty. First, MAYA describes typicality and novelty as opposite ends of a single axis, wrongly implying that changes to a design impact typicality and novelty equally. While the two principles are nearly negatively correlated, this is at odds with Hekkert et al.’s findings that these are two independent variables. Second, Loewy idealizes the novel state and devalues the typical state. Loewy frames the value of MAYA around optimizing novelty: “The consumer is influenced in his choice of styling by two opposing factors: (a) attraction to the new and (b) resistance to the unfamiliar.” Loewy, perhaps speaking for many industrial designers, is announcing the importance of an orientation towards designing for novelty: “Our desire is
naturally to give the buying public the most advanced product that research can develop
and technology can produce.” Novelty bias has been found to be prevalent in experts
(Hekkert, Snelders & van Wieringen, 2003), designers notwithstanding. Due to Loewy's
influence, the understanding of how typicality and novelty interact may be skewed in a way
that is detrimental to their application.

While Loewy’s philosophy centered on style, many products don't rely heavily on aesthetics
to be successful. This may imply that novelty is only important for products motivated by
fashion, but fortunately novel form and visuals can be applied to a broad range of products
for a variety of benefits. Novel controls can help communicate the presence of new
functionality that would otherwise be invisible (e.g. electronic devices). Novel shapes can
communicate semantic value to help a consumer interact differently with a new orientation
or configuration (e.g. surgical devices held in a new ways). Novelty can even stimulate new
emotional responses that are intended to provide benefit of wellbeing (e.g. an infant's
mobile). Needless to say, novelty can provide a broad range of benefits and is not limited to
matters of style.

Given the differences between the MAYA "tug of war" model and the independent
psychological theories of typicality and novelty, a number of questions arise. First, do
designers consider the typicality and novelty principles when making decisions? And if so,
do they consider typicality and novelty as opposites, as Loewy describes? The following
section (2.1) will explore these questions through a series of interviews with designers.
Second, will the most preferred designs be moderately typical and novel? Can a combination
of highly typical and highly novel successfully exist? Preliminary study 1 (section 2.2) will
address these questions through a survey. Finally, how might contextual factors influence
preferences for typicality and novelty? Preliminary study 2 (section 2.3) addresses these questions through a second round of surveys. These preliminary studies inform the development of a framework that educates designers on these principles, along with subsequent tests to measure its effectiveness in a concept selection activity (section 3.0).

2.0 Preliminary Research

2.1 Do designers consider typicality and novelty when making decisions?

While designers often rely on their intuition to predict user preferences, this intuition evolves over the course of their experience to naturally incorporate concepts that have been taught to them through formal education or observation. For example, an experienced designer may elegantly incorporate the principles of Gestalt psychology into his/her work, yet be unable to articulate a single principle when asked about them. How do designers incorporate the principles of typicality and novelty into their evaluations, among all of the other knowledge they have developed? By understanding these questions, we can develop approaches to help enhance designers’ methods for evaluating concepts.

2.1.1 Methodology

To understand whether typicality and novelty manifest in designers’ judgments, a group of 7 designers (4 male, 3 female) with varying backgrounds (4 industrial designers, 2 graphic designers, 1 interior designer) were asked to pick their preferred designs from a range of typical and novel stimuli. A series of 6 slides each featured 3-4 images from a single category (chandelier, speaker, impressionist paintings, cheese plate, butterfly, umbrella). One image was a highly typical example of the category, one image was a highly novel example, and at least one was moderately typical and novel (or MAYA). Observation of a broad range of category examples was used to identify stimuli most likely to be associated
with typicality and novelty, along with a pilot test with a graduate student in design as further confirmation. Categories selected were relatively unfamiliar and unbranded to avoid possible preferences based on familiarity with any certain stimulus. The image order and slide order were randomized, along with a distractor slide (guitars of different colors) to avoid potential response biases from participants who might otherwise become aware of the study goals.

Participants were asked to pick their preferred image on each slide, working quickly and relying on their first impression. After going through all of the slides, participants reviewed the images a second time and described the rationale for their choices. Key descriptors and comments were noted throughout the interviews and coded in order to identify repeating themes and patterns. Finally, participants were asked to visualize how they made their decisions and how they might teach others how to think about the products in the same way.

2.1.2 Results

Some participants preferred stimuli that were moderately typical and moderately novel (MAYA), but this was far from a universal result. Despite any obvious patterns, participants used typicality and novelty to describe their decisions regardless of which stimulus they selected. Terminology around typicality or novelty was particularly fluent when participants described why a design was not preferred ("this is too weird," “It’s ‘not’ a chandelier"). When explaining their preferences, designers used a variety of terms that were aesthetic ("balanced") or symbolic ("human"). This included terms relating to typicality and novelty but was certainly not limited to it. Participants cited a number of factors influencing their decisions, including personal taste, category norms, image contrast,
outline shape, and level of risk. This list would likely continue to expand with a larger study. Synonyms for typicality and novelty were identified as having positive, neutral, or negative valences. Synonyms for typicality included classic, comfortable, normal, conventional, common, and boring. Synonyms for novelty were new, unique, different, unexpected, and weird.

Many participants articulated typicality and novelty as opposite ends of a single dimension, similar to Loewy's description. Some of them visualized this relationship during the final phase of the research.

2.1.3 Analysis

Participant responses were made on the basis of the range of stimulus provided, so respondent themes relating to typicality and novelty are not proof of their importance in and of themselves. However, the observed tendency to use typicality and novelty to describe unappealing designs in particular may indicate the use of these principles as an important element in the deselection process. Rather than identifying the best design among a large group, first eliminating one or two obviously unattractive designs (possibly too typical or too novel) simplifies the decision-making process. Shoppers in retail environments are known to use this method when searching for specific product brand or flavor, and it likely was the way participants made their evaluations in this study. Rajaram and Travers (2005) describe the deselection process in further detail.

There are three potential reasons to explain why designers wrongly view typicality and novelty as opposites. First, their education may have taught them to construct a mental model with a single dimension as MAYA does. Second, designers may estimate the negative
correlation between typicality and novelty as exact, since they’re rapidly considering a multitude of factors and are required to take some mental shortcuts to make quick decisions. Finally, one must consider that a conversational, nonacademic, meaning of the two terms, as well as their synonyms, positions them as opposites.²

2.1.4 Conclusion

User preferences are highly multi-dimensional. Designers use a lot of terminology and attempt to consider many elements simultaneously when making decisions. Context will always influence a design’s ability to be preferred, and typicality and novelty are but two factors that could influence preference. It will remain important when studying these principles to keep other potential influences in mind. A carpenter with a hammer tends to see everything as a nail.

The range of valence for typicality and novelty suggests a potential issue: if designers don’t commonly ascribe the qualities of both typicality and novelty to a positive orientation, they may not have a strong inclination to use these principles to predict user preferences. This also poses communication challenges during the discussions that lead up to concept selection, where a comment on a design’s typicality could be easily misinterpreted as positive or negative. This study shows that designers have many verbal tools to help them describe positive and negative impressions, but typicality and novelty do not feature prominently in this set. According to Hekkert et al. (2003), designs could potentially leverage both principles to create a strong preference. Because designers think about typicality and novelty as opposites ends of a spectrum (MAYA), they may miss an opportunity to identify good designs that leverage both principles simultaneously.

² Thesaurus.com does not list typical and novel as antonyms, further support the two terms are not opposites.
Based on these findings, two opportunities exist for further exploration. First, designers should be better educated on these principles to pull them more consistently into dialogues on design. Second, it may be beneficial to renovate designers’ perspectives on typicality and novelty to reflect on them independently.

2.2 Preliminary Study 1: Typicality, Novelty, and Preference in Product Form

Two pilot studies were conducted to explore the relationship between preference, typicality, and novelty. These studies were conducted with two goals in mind. The first was to efficiently gain first hand experience studying and testing these principles. The second goal was to expand upon existing findings by using stimulus and methods that were more comparable to real-life contexts.

Studies on typicality and novelty may benefit from stimuli that better represent real-life product experiences. Veryzer and Hutchinson (1998) operationalized novelty in a series of telephones by making the silhouettes unusually concave. In a similar manner, Blijlevens, Carbon, Mugge, and Schoormans (2012) presented toasters that were progressively more rounded. Both approaches resulted in some stimuli that were unattractive, physically uncomfortable, or not manufacturable. While the rigorous control applied to the creation of these stimuli should be noted, the incremental nature of these options creates an artificially narrow selection of products. In real life scenarios, people often experience more varied and complex differences.

Additionally, on tools and other products where functionality is important, it is likely that the interaction between aesthetic differences and functional ones can influence user
perception. Hekkert et al. (2003) compared power sanders that varied significantly in terms of features (sandpaper shape/size). Power sanders, as the name suggests, are commonly evaluated primarily based on their power, and size is a common heuristic for strength (bigger = more powerful). Since the size of the sanders was not controlled across stimuli, participants may have automatically and inadvertently rated the products based on the primary category benefit of power despite the requested rating of “ugly/beautiful.” With a more realistic and controlled stimulus set, in which all designs are relatively appealing, we may be able to gain better insights about how typicality and novelty interact with overall preference.

![Image of power sanders](image)

Figure 2: Examples of stimuli from previous research show opportunity for more design sensitivity.

The presentation format of stimuli could also provide more accurate insights if it can be designed to simulate real life scenarios. In Hekkert et al.’s experiment, participants rated each stimulus on 3 successive attributes (typicality, novelty, preference). This method may have led to exposure effects in which a positive score for one attribute (e.g. ugly/beautiful) could inadvertently improve the subsequent scores of other attributes (e.g. uniqueness). Furthermore, Hekkert utilized the specific rating scale of ugly/beautiful to understand
aesthetic preference rather than a more general preference, which is the aim of this research. These methods made conscious some judgments that are typically made on a subconscious level, potentially yielding different results. Finally, the concepts in this study were presented individually rather than in groups. Because consumers rapidly make decisions based on exposure to multiple products simultaneously, a research approach that mirrors this experience could provide insightful information.

The types of products studied also require consideration, because product categories are judged differently and may require unique methods or yield different results. Three main considerations of level of newness, level of functionality, and level of expertise are given to these studies for additional focus. First, new product development efforts can be classified into two types of newness: incremental or disruptive (or evolutionary/revolutionary). Incremental designs are the focus of this research because they represent the majority of design efforts being conducted today. Second, a low level of functionality limits the possibility of perceptual complications due to a key functional feature (e.g. the varying sizes of power sanders). Third, products tested should require minimal expertise and be easily understood by most people. This will allow for broad participation in the studies and minimize complications in which different levels of expertise among participants create different standards for typicality and novelty. While products with high levels of newness, functionality, or expertise requirements are all worthy of future study, this research will focus on incrementally improved and universally understood products. These limitations may imply the research relegates itself to concerns of style, but novelty (as well as typicality) can be applied in a variety of ways to visually communicate new functionality, semantics, emotional response, and other factors.
This study attempts to replicate the results of the past research on typicality, novelty, and preference using different methods that simulates realistic contexts that consumers usually experience when evaluating products. In this first study, it is hypothesized that designs that are highly typical and highly novel will also have the highest preferences, because these designs will maximize the two independent principles of preference.

2.2.1 Methodology

To conduct the study, 36 college freshman (18 male, 18 female. Average age=19) in the University of Cincinnati’s School of Design participated in a survey. Because expertise has been found to increase preferences for novelty (Hekkert, Snelders & van Wieringen, 2003), freshmen were selected because they have not yet fully developed this expertise. Three surveys with identical stimulus were presented. Each page featured 6 grayscale images (approximately 3” square) of products in one category in a similar, canonical view. This approach reflects shopping experiences in which consumers are faced with multiple products either in store or online. Three products were selected to offer a range of experience types on two contextual dimensions that may be influential: aesthetic function and level of product engagement. Aesthetic function is the extent to which attractiveness defines the product’s overall perceived value. In some categories, the products’ primary role is to be aesthetically beautiful (e.g. impressionist paintings), while in others the role of beauty is trivial (e.g. step ladders). Product engagement is defined as the amount of direct interaction a user has with the product. The products selected were vases (high/low), wine bottles (high/high), and coffee mugs (low/high). Images of vases were of existing products sourced from the internet, while wine bottles and coffee mugs were created in Adobe Illustrator for the purposes of maintaining consistent proportions, contrast, and overall level of realism across designs. Each of the three surveys asked participants to rank only
one attribute: typicality (defined as “category example”), novelty (defined as “uniqueness”), or preference. This approach ensured that multiple exposures didn’t influence results, as may have been the case in previous studies. The surveys used a 7-point rating scale similar to previous studies on typicality. Participants were asked to respond quickly and intuitively, relying on their first impression.

Figure 3: Example of survey instrument used in both preliminary studies.

2.2.2 Results

Results for these items showed that typicality and novelty are negatively correlated but neither was consistently related to preference. Of the five products with the highest preference scores, two were highly typical, two were highly novel, and one was moderately typical and novel. Products with a low preference did not show a consistent connection to typicality or novelty. Of the 18 products surveyed, none were considered both highly novel and highly typical. Similarly, low novelty and low typicality examples did not occur. While these results are inconclusive in regards to the hypothesis, a number of other insights were gained.
2.2.3 Analysis

While neither typicality nor novelty was an obvious indicator of preference, some interesting observations can be made when looking at them together. The highest preference products have more similar results between their typicality and novelty ratings, while the lowest preference products have more extreme differences between ratings. In other words, designs that are highly preferred made fewer tradeoffs between typicality and novelty, compared to low preference designs. Two possible conclusions can explain this difference. First, it may be true that products that are moderately typical and moderately novel (MAYA) will have strong preferences. Second, it may be true that rare designs that are both highly typical and highly novel will have strong preferences. It appears that the best preference scores will come from designs which incorporate elements of novelty that do not detract from the product’s typicality, which is in line with the findings of Hekkert, Snelders, and van Wieringen (2003). By carefully choosing how to incorporate novelty, a designer may be able to achieve the rare position of a highly typical and highly novel product, utilizing both principles to generate initial preferences.

Figure 4: High preference designs appear to make fewer tradeoffs between typicality and novelty.
It seems that typicality and novelty will always appear to push and pull against one another. The extent to which they do that is where the opportunity space for a designer exists. If the benefits inferred by novelty outweigh the perceived drawbacks due to a reduction in typicality, then the design will most likely be preferred (Goode, Dahl, Moreau, 2013). This gives designers two potential strategies. On one hand, a designer might focus on applying novel features or aesthetics in areas that aren't strong factors in the product's typicality, and this would most likely result in an incremental or evolutionary design. On the other hand, a designer could replace the most typical elements with meaningful novelty that reframes the category paradigm or redefines the prototype. This would likely result in a revolutionary, disruptive innovation. There are benefits and drawbacks to either strategy, depending on a variety of factors, including the business goals, the category context, and the intended audience.

A number of other observations resulted from this study. Products featuring texture created interesting preference results, but texture introduces an ambiguous distinction from form that will be considered out of scope for the rest of this research. Symmetry, another factor influencing preference (Ramachandran & Hirstein, 1999), may have influenced some results of wine bottles and should be considered carefully on products where symmetry is highly typical. Aesthetic changes can inherently influence perceived functionality, which can change preference and therefore should also be carefully controlled in future stimulus. Different categories appear to place different values on typicality and novelty. For example, vases accessorize a home and stand in as art pieces, suggesting that the category permits high amounts of novelty. By comparison, waste baskets are similar in size and shape to vases but aren't perceived as having many aesthetic qualities. These contextual differences will be explored in a follow-up study.


2.3 Preliminary Study 2: Typicality and Novelty Moderated by Aesthetic Function,

Frequency of Use

From the literature review, it is clear that contextual factors can be influential in determining whether the preferred products in a category tend to favor high typicality or high novelty. Among these factors, two key questions arise. First, how does the frequency of use with a product affect its need to be typical? A user might prefer highly typical products when they require frequent interaction because the importance of usability, propelled by a typical appearance, would increase as the frequency of use increases. For example, a chef may seek out knives and other kitchen tools with highly typical attributes because she seeks to maximize her efficiency making hundreds of plates of food each night. Typical attributes prompt her to believe the products will fulfill her need for speed. By comparison, a novel knife design may have her questioning its applications or its quality, which she cannot afford to risk in the high speed, high frequency culinary world. On the other hand, it could be argued that frequently used products could tolerate less typicality because users will more quickly learn how to use them. The hard-working chef will rapidly understand a novel knife’s advantages and disadvantages after a just a few minutes of chopping. Needless to say, the interaction between frequency of use and typicality needs to be explored.

Second, does a category featuring a high aesthetic function lead to preferred designs with higher novelty? According to Hekkert, Snelders, and van Wieringen (2003), aesthetic function relates to objects that are created with the primary intention of inducing an aesthetic experience. If one of a category’s fundamental norms is to evoke beauty, then audiences may engage with category examples on a more conscious level and allow for novelty to play a lead role in their decision. Selecting a beautiful vase to complement a
flower arrangement is much more important than selecting a beautiful coffee mug to contain one's morning energy boost (industrial designers and coffee fanatics notwithstanding).

These questions lead to two hypotheses. First, because typical products tend to be preferred in a low-engagement context, products with a higher frequency of use will be preferred in highly typical states at first impression. Second, products within categories that feature a high aesthetic function will be preferred in highly novel states at first impression.

2.3.1 Methodology
The methodology for this study was similar to the first preliminary study. Sixty students from the University of Cincinnati (21 male, 36 female, 3 did not answer. Average age = 20) participated in a short survey. Most were freshman in the School of Design, while a small number were Master of Design (5) and MBA (4) students. Three surveys with identical stimuli were presented; each page featured six grayscale images of products from a single category, each approximately 3” square. To ensure that multiple exposures didn’t influence evaluations, the total sample was divided into three groups of 20. One group was asked to rate the products only in terms of typicality (defined as “category example”), while a second group was asked to evaluate the products in terms of novelty (defined as “uniqueness”), and a third was asked to rate the products based on a general preference. Additionally, half of the surveys were presented in reverse to average out any order effects. The surveys used a 7-point rating scale based on previous studies around typicality. Participants were asked to respond quickly and intuitively, relying on their first impression.
To explore hypotheses around aesthetic function and frequency of use, stimuli were selected based on their ability to represent multiple categories with minimal visual changes. Watches and clocks (for frequency of use), desk lights and pendant lights (for frequency of use), and wastebaskets and vases (for aesthetic function) were selected. A page of wine glasses was used as a distractor slide to disrupt the pattern of stimulus and reduce the possibility of participants noticing repetitive, identical stimulus pairs. All images were sourced from the internet, with minor changes to remove logos and other details that might influence the results.

2.3.2 Results

Pairs of stimuli that were visually similar were rated differently in terms of typicality and novelty when the category conditions changed. For example, a typical vase with a floral motif was perceived as dramatically more novel and less typical when the same form was presented to the viewer as a wastebasket. Despite these shifts in the perception, there were no notable changes in terms of preference. Both hypotheses may be false, but it is more likely that the effects of aesthetic function and frequency of use were too subtle to observe through this approach.

On a more general level, the results matched the first study, further confirming the near negative correlation between typicality and novelty. Additionally, these results showed that typicality is likely a better indicator of preference than novelty in low engagement situations: 10 out of the 13 products with the highest preference were on average more typical, while 8 out of the 10 products with the lowest preference were more novel. It appears to be very difficult (but probably not impossible) for a design to be both typical and novel based on an assessment of the product's overall impression.
2.3.3 Analysis

Existing research suggests that aesthetic function and frequency of use will influence the relationship between typicality, novelty, and preference. Refining the methods and stimuli of these pilot studies could potentially reflect these results. Upon reflection, stimuli used in this study exist in only slightly different contexts (desk light and pendant light), which could explain the modest shifts in preference. Increasing the sample size or testing a broader range of products could also aid in creating stronger results in the future.

Another way to interpret these results is to correlate the similar preference scores with the similar aesthetic properties. It may be that universal aesthetic properties (e.g. balance, harmony, contrast) are valued more strongly than the category labels that dictate how typical or novel a design is. This is an opportunity for further research beyond the scope of this thesis.
If most decisions are made in a low-engagement context (Zaltman, 2003), and typicality is a good indicator of preference in these contexts, there could be meaningful implications for designers to shift their efforts towards understanding typicality. Spending more time understanding what elements within a category create typical designs could be a valuable process step in generating preferred designs.

This research and previous studies show that typicality and novelty are not exactly negatively correlated. Because of this asymmetry, an opportunity for further research may be to analyze case studies and explore strategies for novelty that do not detract from the typicality of the category. In other words, preferable designs should seek to increase their novelty without reducing typicality (Hekkert, Snelders & van Wieringen, 2003).

2.3.4 Conclusion of Preliminary Studies

These studies have generally supported past research findings on typicality and novelty and their context for generating preference. However, the primary aim of this thesis is to show that knowledge about these principles can help designers predict user preference. With that in mind, the next step is to explore these principles in action when evaluating design concepts.

Existing research shows how typicality and novelty can help to explain consumer preferences based on visual appeal, but this knowledge may offer little benefit to designers unless it can be applied proactively during the selection and subsequent refinement of new concepts. What remains to be studied is if these principles can help designers better predict broad consumer preference during concept selection phases of the new product
development process. Because many new products are evolutionary in nature and feature some reference to their predecessors, it is likely that designers informed of the effects of typicality and novelty can improve their decisions.

As the primary aim of this thesis, it can be hypothesized that educating designers on the principles of typicality and novelty will improve their ability to predict consumer preference for product form at first impression.

3.0 A Framework for Analyzing Typicality and Novelty

3.1 Development and Testing of the Framework

The framework consists of three elements: background information, definition of the principles, and an analysis of a product and its category. In the background section, the basis for general visual preferences is established with support from the field of cognitive science. Low-engagement processing and heuristics are described, informing participants that the majority of decisions are made quickly and subconsciously. In the second section, the principles of typicality and novelty are defined and examples are provided. Third, the framework applies these principles by walking designers through a concept selection exercise. Designers identify the attributes influencing typicality and outline strategies for novelty for a specific category. They then map out concepts and competitive products along dimensions of typicality and novelty to reveal underlying patterns and evoke critical thinking about their work. Finally, contextual considerations provide a rationale for why some designs might warrant a target position on the map. No specific recommendations are given on which concepts to pursue or how to improve them. Rather, designers are encouraged to make their own observations from the analysis, selecting and refining designs based on their individual project goals and objectives.
Preliminary studies (sections 1.3, 2.1) revealed some key issues that need to be clarified to participants when defining typicality and novelty. While interviews indicated that the two principles are a part of designers’ general decision-making process, the mental model for them may be incorrectly conceived. Designers may unintentionally view MAYA as a compromise between typicality and novelty, as if the two principles are opposite ends of a single spectrum. Additionally, they may overestimate the value of novelty based on their expertise. Providing a clear definition of the relationship between typicality and novelty will be a critical point in understanding if the intervention has an effect on participants.

The types of observations made regarding the typical or novel aspects of a design require further definition. Crilly, Moultrie, and Clarkson (2004) define three types of cognitive response to products: aesthetic impression, semantic interpretation, and symbolic association. These response types adequately cover a broad range of observable or inferred patterns that might indicate typicality in a category. Typical features may be defined by color or material (aesthetic), by the presence of certain functional features (semantic), or by their ability to represent certain aspirations (symbolic). For example, a typical smart phone is likely black and rectangular, makes certain affordances through a touch interface, and can symbolize intelligence or status. At the same time, the three types of cognitive responses can be used to describe opportunities for novelty that break from aesthetic, semantic, and/or symbolic typicalities. A novel smart phone may come in a bold, bright color, feature a camera with remarkable performance, and symbolize curiosity or romance. Through analysis it becomes easy to recognize how these three responses begin to interact with each other, ideally working together to produce a cohesive overall experience.
With novelty, it is additionally important to identify why the novelty should be preferred over what is typical. Often novelty finds it’s way into products to visualize meaningful differentiation, with the potential benefits of the novelty ideally outweighing the risk of exploring an unknown. Remembering that the pleasure derived from novelty comes as a result of learning something new, the effects of novelty will likely be limited if their reason for existence is just simply to “stand out.” In the third section of the framework, a fill-in-the-blank statement has been created to ensure that novelty is instrumental in delivering on something the consumer would find valuable. Three prompts are given to participants to help them identify meaningful approaches to creating novelty. First, what is the purpose or objective of the novelty? Second, which type of novelty (aesthetic, semantic, symbolic) would best fulfill this objective? Third, what specific element of the design should be used to visually communicate the objective? Using these three prompts, participants can ideate and develop many potential novelty strategies to be explored through ideation.

Once typicality patterns and novelty strategies have been identified, participants map out competitive products and original concepts along dimensions of typicality and novelty. The intention of this step is to have them think critically about the category, where their concepts fit within it, and any gaps or clusters that currently exist. A checklist of contextual factors helps designers understand why a highly typical or highly novel approach may be an appropriate target, although this isn’t always the case. The list includes: engagement-level, level of risk, aesthetic function, category homogeneity, and the user’s level of expertise. Because the category context can play a strong role in what is preferred, there are no fixed “good” or “bad” positions for concepts on the map. Finally, designers are encouraged to refine concepts of their choosing, ideally exploring ways to increase the effects of one dimension without detracting from the other.
3.1.1 Methodology

Surveys were administered to design students (n=39, 64% male 36% female, mean age=22) before and after an intervention to test the framework's ability to improve designers’ predictions of a general audience’s preferences. As a benchmark, the same survey questions were administered to a broad group of laypeople (n=83) with limited expertise and interest in design.

Stimuli were created in four categories (wastebaskets, wine bottles, pendant lights, and clocks) to provide a range of products with different contextual needs like aesthetic function and frequency of use. Choosing universally identifiable products ensured that all participants in the study would easily understand the products being tested, minimizing the risk of confusion. For each product, three variations of the product form (highly typical, moderately typical and novel, highly novel) were created based on the unique category attributes that operationalized typicality and novelty observed in the preliminary studies. For example, in wine bottles, symmetry was observed to strongly impact typicality, while in clocks, it was the presence/absence of hour markings and hands that appeared to influence this perception most. Each stimulus was rendered realistically in grayscale using Adobe Illustrator. The basic proportions, colors, contrast levels, and key features were held approximately constant to focus the survey responses on changes in typicality and novelty.

Many products are intended for broad audiences, and it was important for participants to evaluate stimuli through this lens as opposed to their personal taste. In order to put participants in this mindset, the pretest survey presented participants with the following scenario: “Imagine that you manage a major retailer that offers a variety of products. In
order to have a successful business, it is your responsibility to choose the products that people will like the most.” The survey was comprised of 16 forced preference, multiple choice questions. Each set of three products was presented in all possible pairings, creating three questions per category (highly typical design vs. moderate design, moderate design vs. highly novel design, highly typical design vs. highly novel design). All three variations were also presented as a triad in which participants selected the one that they thought would be most preferred. All 16 questions were distributed across four pages in Survey Monkey, with only one product category per page, presented in a random order. Participants were asked to conclude each page by stating how confident they were in their responses, using an 8-point scale.

Figure 6: Sample of stimuli. Four products were design in typical, moderate, and novel versions.

Following this pretest, an intervention occurred in which participants were exposed to the framework (described in detail in section 3.1). Of the 39 participants, 26 were presented this work as a part of a third-year design studio class, receiving a 30-minute explanation of the principles followed by 60-minute working session to apply the principles to their projects, which were centered around furniture, lighting, or biomimicry. 11 students
scheduled individual meetings to receive the intervention, otherwise presented in a similar format. 2 participants worked professionally and conducted the intervention on their own using provided documents.

Following the intervention, participants were invited to participate in a series of follow up questions. This survey was nearly identical to the pretest, featuring the same product stimuli presented in pairs and triads in a random order. Confidence scores were also provided after each page. A series of final questions requested feedback on the intervention's perceived usefulness and ease of use, as well as the participants existing knowledge of typicality and novelty.

As a benchmark for comparison with the designers' predictions, a similar survey was also administered to a group of laypeople. Rather than provide the scenario about the product manager at a major retailer, this version of the survey asked participants to simply pick the products they preferred, relying on their first impression. The same stimuli were presented in the same, randomized order across four pages. Confidence questions were omitted. At the end of the survey, participants were asked to rate their expertise and interest in art/design on a 5-point scale. After removing those with high scores (4 or 5 out of 5) in either question, 83 responses (54% male, 46% female, mean age=25.5) remained and served as a sample of a general preference for the products presented.

### 3.1.2 Results

Designers accurately predicted the preferences of the general audience the majority of the time in the pretest, maintaining their decisions in the post test as well (10 out of 16 questions). Only 1 prediction better matched those of the general audience after the
intervention. In this case, the designers’ choice for a more typical, less novel lighting design moved into significance in the post test.

![Image of bar chart showing preference percentages](image)

**Figure 7:** Participants accurately predicted general preferences in both pretest and posttest.

Four predictions declined in the posttest after the intervention. Two of these questions compared highly typical and moderately typical/novel designs of lighting and wine. In the posttest, more participants chose the moderate design despite the general preference for the more typical design. A prediction of typical and moderate wastebasket designs also weakened after the intervention. This result appears once in a comparison of two stimuli, and a second time in a comparison of three stimuli, in which participants likely deselected the highly novel wastebasket design from comparison. Designers’ prediction of the most typical wastebasket increased significantly from pretest to posttest, but this was in opposition to the general preference.

In terms of the general preference, the more typical designs were preferred over more novel options the majority of the time (11 out of 16). A more novel design was preferred
just two times, while the remaining results were not clear or not significant. This result reinforces past research that suggests more typical designs are preferred, particularly in low-engagement situations.

Overall, the intervention received good feedback from participants. While the vast majority of participants (90%) reported knowing “little” or “some” about the principles prior to the study, 85% reported that the intervention was “successful” to “very successful” at helping them think about users’ preferences. Most (88%) reported that the tool was “successful” to “very successful” in providing a rationale for their design decisions and that it was “somewhat relevant” to “very relevant” for their future projects. 76% reported that the intervention was “very easy” or “easy” to understand. Despite the intervention’s inability to change designers’ predictions in this study, the content appears to be an appealing and inspiring topic for designers.

Although the hypothesis appears to be false, it is likely that adjustments to the methodology would yield more positive results. This will be addressed further in the following section.

3.1.3 Analysis

Three potential reasons explain the primary trend in which designers made accurate initial predictions, with no change in the posttest predictions. First, it is possible that designers already possessed the knowledge for making these decisions through expertise developed over the course of their education. Running the same test with a group of seasoned professionals could reveal any differences as a result of expertise. Because the potential for novelty bias grows with expertise, it could be important to know if and how decisions change over time as designers gain more experience.
Second, it is likely that designers acted as laypeople due to the study design. Because the study subtly primed participants to think about products to be sold for a general audience, designers possibly made judgments using the same heuristic processing as non-designers, rather than accessing specific knowledge as a result of training in design. Analysis of the sample of laypeople with design expertise and interest revealed a strong shift in preference for novelty. Since these people may be a representation of “designers” (formally trained or not), this suggests that the priming influenced the results since it was the key difference between the two studies. Because the products tested required little expertise, no specialized knowledge may have been required to make judgments, and designers had little challenge using their intuition to make choices confidently. Further research on a broader range of product types could reveal if designers do require specialized knowledge to make good predictions in certain categories more than others. This would be interesting, as it would have implications for how best to evaluate product design through different forms of priming, consumer research, and expert assessments.

Third, the preferences of laypeople may be more similar to those of designers than was expected. It is possible that designers made judgments based primarily on their personal preferences, and the difference between their expert judgments and those of laypeople is much smaller than expected. While designers have a reputation for having very different preferences compared to an average person, this may be changing as consumers gain more and more exposure to design through the media. Future research relating to how consumer perception of design has changed over time could potentially reveal new ways to make decisions that will benefit a sophisticated new set of consumers.
In cases where the intervention appeared to have an influence, it is still to be determined which piece of information may have been the most impactful. Was one principle the primary factor driving decisions or were they used in combination? Due to the multi-variable nature of the information presented to designers, it is possible that typicality, novelty, or the contextual factors may have individually contributed different levels of influence. Future studies could isolate these variables along with follow up interviews to provide insights on the most influential elements of the intervention.

Where significant shifts occurred between pretest and posttest (4 out of 16), knowledge of the intervention may have played a role. Because there is no clear trend or pattern among these results for lighting, wastebaskets, and wine bottles, the contextual factors were probably the most persuasive. Considering the contextual factors explained in the intervention, “aesthetic function” best explains this result. Wastebaskets have a low aesthetic function while lighting is relatively high, and shifts in predictions from pretest to posttest trend in the direction of typical and novel respectively. Wine bottles also have a high aesthetic preference, which explains the increase in preference for a more novel design. However, wine is also an aesthetically homogenous category, which is why the asymmetrical design may have been perceived as too unusual and was universally rejected. During the posttest, designers may have evoked their fresh knowledge of aesthetic function to drive their decisions in different directions. Future research could isolate the variable of aesthetic function and explore its potential to help designers improve their evaluations of concepts.

Regardless of which factors dominated the decision making process, a key finding from this study is that the intervention’s influence varies based on the difficulty of the decision being
made. Four legs of the research featured the largest shifts in predictions among designers from pretest to posttest. These same four legs also had the weakest strength of preference in the posttest. In other words, responses to these four questions were the least unanimous. This pattern can also be observed in the pretest to a lesser extent. Because the strongest shifts in prediction correlate to the weakest strengths of preference, it can be inferred that the intervention becomes more influential as the difficulty of the decision increases. This key observation is in alignment with common intuition about evaluation. Some stimulus pairs were quickly and easily evaluated, requiring little to no conscious consideration. When the decision becomes more difficult, designers are forced to think more critically and may evoke elements of their training, including the framework presented in this study. The intervention's influence did not correlate to more accurate predictions in preference, which will be discussed in more detail in the conclusion of this section.

The general preference in this study for more typical designs reinforces and supports the principle of typicality in low engagement contexts. Of particular interest is the observation that designers (as experts) appear to be just as likely to rely on this heuristic as laypeople. While priming may have been a factor, these results are interesting nonetheless because it speaks to the strength of the heuristic. Despite all of the countless hours designers spend developing their creativity and ability to think beyond the norm, they ultimately still prefer products that feel familiar when the conditions are correct. This finding along with related research could be used to help resistant audiences accept the principle of typicality and low engagement processing as important considerations when developing new products and ideas.

3.1.4 Conclusion
Going into this study, it was assumed that designers might show an initial preference for novelty given the nature of their work focused on innovation and creativity. The alignment of designers’ predictions with laypeople and the consistency with which they preferred typical designs provides an interesting basis for further research on how designers make decisions and accurate predictions. Many processes, approaches, and tools exist to help designers evaluate products, but this work is one of the first to specifically address visual appeal analysis through typicality and novelty, and it should serve as a platform for future refinements. Despite the positive feedback received on the intervention in this study, this approach did not result in improvements in predictions of general preference. However, the ability of the intervention to elicit a rationale for decisions is inherently valuable. By providing a framework that generates ideas about why a person might like something, designers are empowered to test their ideas and develop repeatable knowledge that could credibly reinforced their intuition. Testing and showing support for design principles will improves designers’ value and influence within a business organization.

One final observation made after the study is the role of the designers in creation of the stimuli. Because participants didn’t build the stimuli themselves, they weren’t emotionally invested in the products surveyed. This is meaningfully different from how concepts are created and selected in design studios. Designers often fall in love with certain ideas for reasons that are not related to their audience's preferences, like the amount of effort that went into a concept. Businesses are also increasing the practices of co-creation and co-design because they are beginning to understand how shared ownership among stakeholders increases motivation for a project’s success. Future research should consider the implications of creation and how it influences decision-making.
4.0 Final Conclusion

The aim of this research was to understand how the principles of typicality and novelty might improve the decision-making abilities of designers. After a series of preliminary studies demonstrating the relationship between typicality, novelty, preference and a number of contextual influences, an intervention was created to educate designers on how these ideas can be applied to a product’s visual form. In the main study, the intervention provided rationale for decisions but did not improve designers’ ability to predict the preference of a general audience.

4.1 Limitations

The experiments in this research were limited to products with low levels of visual newness, functionality, and required expertise to enable involvement from a broad number of participants. Future studies could explore how these other types of products may be judged according to their typical or novel appearances. The intervention presented a bottom up approach to understanding the relationship between typicality and novelty, creating challenges in predicting which piece of information may have influenced the posttest results. Future studies may isolate different aspects of the intervention to understand their level of influence. Overall, this research provides a promising platform for continued research to understand how visual forms are evaluated.

4.2 Suggested Takeaways

A series of final recommendations can be taken from this research on typicality and novelty. Through these principles, designers should be more informed on two critical motivations for how people select products. Designers can make more informed judgments by considering the low engagement context in which people make many of their evaluations.
These principles can be utilized to enhance products' visual form, to refine design and brand strategies, to improve the rationale with which designers make their evaluations, and to foster collaboration with multiple disciplines in a business.

1. Visually appealing design should aspire to both high typicality and high novelty.
2. Reframe typicality as a positive opportunity for design.
3. Typicality is relative and dynamic. It must be projected into the future.
4. Novelty is most effective when it is meaningful.
5. Typicality and Novelty benefit multiple points of the design process.
6. Explore applications for both mass and niche targets.
7. Principles should inform designers, not eliminate them.
8. Apply specialized knowledge relative to the needs of the category.
9. Collaborate with scientists and develop uncompromising new methods.
10. Explore priming methods that improve prediction of visual appeal.

### 4.2.1 Visually appealing design should aspire to both high typicality and high novelty.

Many designers instinctively focus on one of the two principles studied in this report. One subculture of design focuses primarily on a philosophy related to typicality—emphasizing ease of use, alignment to mental models, human factors, or universal design. Another subculture focuses on novelty—pushing aesthetic boundaries, changing paradigms, challenging the status quo, or disrupting the market. Designers of all types should not focus on just typicality or novelty, but on achieving some combination of both simultaneously.

Despite this paper's inability to create designs that were highly typical and highly novel, this paradox remains a valuable way of thinking about good design. Future research exploring different methods could uncover product forms where typicality and novelty are both quite strong. Given the world's tendency to evolve and designers' ability to surprise, it would seem risky to assume that a product could never be perceived as both typical and novel.

### 4.2.2 Reframe typicality as a positive opportunity for design.
Despite existing evidence on the preference for typicality, designers tend to see this principle as a drawback rather than an asset. Indicated by the product design industry’s lexical focus on novelty (new product development, innovation, think outside the box), typicality can be received negatively at times. Designers can feel frustrated when they are unable to change certain elements of a product even though these constraints often have positive effects. Many times, constraints will reinforce typicality and therefore give the principle a bad reputation. Whether it is the color palette, the product proportion, or a stock part constrained to its typical state, designers should assess these elements in terms of how they might contribute to the product’s visual appeal, anchoring it’s membership in the category and making it more efficient to process. Designers can also use an evaluation of typicality to challenge certain constraints that are not important to the product’s typicality, where something more novel would be beneficial in the visual communication of a project objective.

4.2.3 **Typicality is relative and dynamic. It must be projected into the future.**

Designers should carefully consider how typicality is best defined to meet their project objectives because different definitions will lead to different results. Typicality can be viewed broadly as a general category (toothpaste) or narrowly as a specific subcategory (premium whitening toothpaste). Typicality can also be viewed with a category lens (computers) or a brand lens (Apple computers). Brands often seek to develop advantageous features that are typical (“ownable”) to itself but novel the category. It is also important to consider that what is initially novel influences the concept of what is typical and may eventually become a new norm. Furthermore, product concepts that are typical relative to today’s market may not be typical in 3 years when they are released to the public.
Depending how dynamic the category is, designers may need to create future projections of typicality to ensure they are not designing things based on today, or worse, the past.

### 4.2.4 Novelty is most effective when it is meaningful.

Novelty will be most effective when it is effectively applied to an element that is meaningful to the audience. In other words, small changes to the design merely for the sake of grabbing attention may be worth less and less in the eyes of today’s savvy consumer. This may explain the results of the final test in this study, in which the shape of the wine bottle, the precise time of day, or the curvature of a waste basket simply aren’t instrumental in making their respective products significantly more appealing. By contrast, a Dyson vacuum’s clear canister is a feature that is both important to users (containing the dirt) and clearly indicative of a benefit (seeing how effective the vacuum is). For better or worse, the stimuli presented in this study are a fair representation of the types of novelty often seen in many retail situations—minor adjustments to the product shape or to the way semantic information is presented. Where designers still carry the reputation as being superficial stylists, approaching novelty more systematically could broaden perspectives about what the design discipline can offer. Future studies might explore the relationship between the visual newness of a feature and the meaningfulness of that feature. Research by Mugge and Dahl (2013) could offer good basis for studies in this direction. If a design does not contain anything meaningful to provide a platform for novel visual elements, the best approach may be to refine the overall elegance of the aesthetic execution. This in itself is a form of novelty because it may convey a heightened level of craftsmanship, Apple or Audi serving as recent strong examples. Finally, because novelty inherently captures attention both positively and negatively, it has the potential to annoy or frustrate a user if it doesn’t deliver the meaningful benefits that are implied by the visual design. For all of the shortcomings
associated with a misuse of novelty, designers should take measures to better consider which elements are the best candidates for novelty and in what way they should be expressed visually.

4.2.5 Typicality and Novelty benefit multiple points of the design process.

This study focused on idea evaluation and did not address applications of these principles to improve idea generation, but existing tools suggest they can stretch into other parts of the design process. Systematic Innovation Tools (SIT) (Boyd & Goldenberg, 2013) emphasizes the need to break our natural inclination for “fixedness” in order to develop new ideas. Fixedness is a form of the familiarity heuristic, closely related to typicality, stating that people orient their expectations for product based on how they have experienced them in the past. Many of the SIT tools begin with a component list similar to the typicality analysis presented in the intervention portion of this thesis (see section 3.1), suggesting that the breakdown of a product into smaller elements could be a promising activity for both generation and evaluation activities. As use of these principles expands, it will be important to reflect on how knowledge of them might change the way designers think about their work. Would the emergence of these typicality and novelty principles constrain designers to help them develop more approachable, meaningful visual concepts, or would they put up unnecessary limits on new aesthetic or semantic expressions?

4.2.6 Explore applications for both mass and niche targets.

Because this research utilized incrementally new designs in categories with low functionality, this research may have implicitly emphasized a visual design “for the masses.” While this research could insinuate that typicality and novelty principles are intended for the “mainstream consumer,” the use of these principles should be just as valuable to
designers seeking to find the fringes through disruptive product concepts. The tools in this study encourage the designer to think critically about how to communicate value through novelty, regardless of the target market. Even the most radical new forms will often require a degree of typicality to make them understandable, and the suggestions in this research may successfully limit designers from creating bizarre, unusable ideas. Furthermore, this research accounts for differences in expertise and category needs that may require design strategies with a focus on highly novel form. The approaches in this paper should just as effectively support the creation of MoMA-style “high design” as they should “design for the masses.”

4.2.7 Principles should inform designers, not eliminate them.

Efforts to understand visual form from an empirical point of view are not an attempt to replace designers’ expertise with standardized processes. While some businesses do seek out the comforts of statistical data to make design decisions, studies like this one will ideally work to counteract a dependence on data by better demonstrating the underlying principles designers use to come to successful conclusions about product form. By educating designers on these principles, they can explain and justify otherwise intuitive decisions to instill a broader sense of confidence in their recommendations.

While designers may feel empowered by knowledge of typicality and novelty (or psychology in general), the results of this report suggest that this knowledge alone may not help a designer be more successful in making choices for a general audience. Applying these principles flexibly could be a crucial factor in whether or not they are beneficial. A designer who seeks to overanalyze his ideas so that they satisfy every known heuristic may limit his potential by creating too many boundaries. Constraints are a well-known key to creativity,
but too many constraints would be at odds with how a designer usually excels. We must develop productive methods for applying typicality, novelty, and similar principles to enable the evaluation of innovative ideas rather than hinder them.

### 4.2.8 Apply specialized knowledge relative to the needs of the category.

The results of this study suggest the possibility that designers may not have much specialized knowledge for predicting consumer preference. This is currently limited to the research context of products with relatively low function where minimal expertise is required and a small number of options are given. Perhaps the evaluations of product designers provide only nominal benefits in categories where the products are simple and universally understood, because most people are able to effectively judge them using a common set of heuristics (e.g. residential furniture, silverware). If this is the case, one might recommend that product designers focus on opportunities that do benefit significantly from specialized knowledge, like categories with higher risk (e.g. mountain climbing, blowtorches), higher needs for expressiveness (footwear) or situations where many options are presented (consumer packaged goods).

On the other hand, a great quantity of products exists under the conditions of low function and low expertise, and designers will undoubtedly be recruited to work on these products. If no expertise is required to predict their preference, why should designers engage with such opportunities? Designers seem to have a special ability for envisioning innovative (novel) product ideas which can help under appreciated categories reinvent themselves, many of which fall into the classification of low function, low expertise. Brands like Dyson, and Method have influenced entire categories through novel interpretations of products with highly established conventions. As is the case with these brands, new products
shouldn't just look new for the sake of grabbing a consumer's attention. They should visually communicate benefits that outweigh the risk of trying something unfamiliar. Designers can also contribute to low function/low expertise categories by maintaining the appropriate level of typicality overall to aid in the adoption of disruptive new features within products. Without a designer, it may be difficult to make products that people find typically appealing, yet are new enough to change an industry for the better.

4.2.9 **Collaborate with scientists and develop uncompromising new methods.**

Designers and psychologists alike are interested in understanding what motivates people to make certain choices, to behave in certain ways, and to form certain beliefs. These two disciplines can benefit very much from each other's strengths and contrasting approaches, and in order to work together they must develop new methods that are mutually beneficial. Psychologists, as well as related scientific fields, can bring a rigorous approach to their studies, but this attitude can lead to unusual stimuli or impractical experiments that make the findings exceedingly difficult to apply to real life situations. Designers, on the other hand, embrace intuition and uncertainty and seldom utilize methods necessary for obtaining reliable, broadly applicable knowledge. While many designers know how to create successful products, their approach makes it difficult for them to identify the significant concepts or theories they've contributed to their discipline at large. This is not to say that all designers are merely intuitive artist-types. Certainly, many adhere to meticulous, rational approaches, especially when it comes to human factors or ethnographic studies. However, in the study of visual form and the focus of this research, designers currently rely too much on their intuition to visualize key objectives into tangible artifacts.
By coming together, designers can integrate their holistic point of view with the rigorous standards of scientists to develop great new methods that yield knowledge for multiple fields. However, if either discipline compromises their values, the collaboration may be marginalized. Both fields should uphold their unique way of thinking through problems and seek out win-win approaches to understanding visual responses to product form.

4.2.10 Explore priming methods that improve prediction of visual appeal.

The simplest insight from this study may be to ask designers to think like an average person when evaluating design. Designers, as well as their peers in engineering or marketing, often view products through a specific lens, taking a professional (or even political) view that upholds to a set of common beliefs for their discipline. In doing so, designers may alter their recommendations to advance ideas about the importance of design (e.g. push the envelope, uphold brand equity) rather than trying to identify the products people will like the most.

By contrast, a designer’s unbiased, non-professional preferences may be a good proxy for the preferences of a broader audience because they are both based on the same general set of heuristics. As was shown through the priming of designers in this research, properly preparing designers to evaluate work through the lens of their audience could be a simple yet valuable way to improve their ability to predict visual appeal and overall preference.
References


Appendix

Conceptual visualization of Raymond Loewy’s “Most Advanced Yet Acceptable” principle.

Discussion Guide for initial interviews (n=8)

Objectives: Understand how the typicality/novelty principles fit into the thinking of designers. Understand if typicality/novelty is a factor in making decisions about good design.

Method: Use an approach that isn’t leading, let people develop their own terminology. Use distractor questions.

I’d like to talk with you about design. Specifically, I’d like to know a little bit about how you think about aesthetics. When I say aesthetics, I mean the basic elements that can make one design beautiful and another ugly. Things like metaphor, storytelling, brand, and emotion are great for design, but I’m not interested in those things for this conversation.

Warm up question (5 min.)
Tell me about a design that you thought was beautiful from the very first moment you saw it.

Part I: Understand Designer’s Mental Model (30 min.)
I’m going to show you a series of products, and I’d like you to imagine you’re working for this business. It’s your job to pick the design that will grab people’s attention and attract them the most. Imagine all the products are concepts for a project – they all have the same features, would fulfill the same user needs, same price, etc. First, we’ll go through each set of images and I’d like you to point at the one you like the most. I’d like you to focus on your first impression, so work quickly and go with what feels right. Then, we will go through them again and talk some more.

Which design do you think is the most attractive? Why did you pick this design? What makes this design the most successful of the group (probe on response)?

Part II: Understand how a designer communicates that mental model (30 min.)
Now, I’d like you to imagine you’re the leader of a design team, and you need to teach other people how to make decisions about design in the same way that you just did. Draw a picture, create a diagram, write a set of principles, whatever you think makes the most sense. For this part, you can focus on the types of design you’re the most familiar with. Remember, this isn’t about the *entire definition of good design, it’s just about the first impression and what someone finds attractive initially.

Instrument for initial round of interviews

Butterfly

Based on your first impression, circle the image that you find the most attractive.

![Butterfly Images]

Umbrella

Based on your first impression, circle the image that you find the most attractive.

![Umbrella Images]
**Wireless Speaker**

Based on your first impression, circle the image that you find the most attractive.

![Images of Wireless Speakers L, G, V](image1)

**Cheese Plate**

Based on your first impression, circle the image that you find the most attractive.

![Images of Cheese Plates Y, M, E](image2)
Flower Art

Based on your first impression, circle the image that you find the most attractive.

P  W  F

Guitars

Based on your first impression, circle the image that you find the most attractive.

P  W  F
Visualization of thought process from interview with graphic designer.

Unique?
No, why continue?  Yes, continue.

Functional?
No, stop.  Yes, continue.

Too Contemporary?
No, continue.  Yes, stop.

Easily Recognizable?
No, stop.  Yes, continue.
Instrument for Preliminary Study 1

Initials:  
Age:  
Gender:  
Major:  

Please read these instructions before beginning:

- On each page, you will see six products in the same category.
- Evaluate each product in terms of your personal preference. A value of "1" is a low preference, and a value of "7" is a high preference.
- It is okay for multiple products on the same page to receive the same value.
- Try to work quickly and intuitively, going with your first impression.
- There are no right or wrong answers; this is not a test of your skills as a designer. Please just give your honest opinion.
Instrument for Preliminary Study 2
Initials:
Age:
Gender:
Major or Profession:

Please read these instructions before beginning:

- Evaluate each product in terms of your personal preference.
- A value of “1” is a low preference, and a value of “7” is a high preference.
- It is okay for multiple products on the same page to receive the same score.
- Use your first impression and try to work intuitively and quickly.
- There are no right or wrong answers, this is not a test. Please just give your honest opinion.
Vase

Wall Clock
Visualized results of Preliminary Study 1 & 2

Typicality and Novelty are nearly negatively-correlated.

Neither typicality nor novelty is required for high preference.

High preference designs were generally more typical.

Low preference designs were generally more novel.
Some products (watch, clock) trend towards typicality. High aesthetic function (vase, lighting) permits more novelty.

Preferred designs make fewer tradeoffs between typicality and novelty.

Higher preferences feature smaller differences between T and N. Lower preferences often feature greater differences and extremes in T or N.
Five contextual factors inform preferences.

- **Engagement**: Low ↔ High
- **Level Risk**: High ↔ Low
- **Aesthetic Function**: Low ↔ High
- **Category Homogeneity**: High ↔ Low
- **Level of Expertise**: Low ↔ High

**Stimuli for Final Study**

![Images of various objects labeled as Highly Typical, Moderately Typical & Novel, and Highly Novel]
Instrument for Final Study

<table>
<thead>
<tr>
<th>Product Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imagine that you manage a major retailer that offers a variety of products. In order to have a successful business, it is your responsibility to choose the products that people will like the most.</td>
</tr>
<tr>
<td>You will see a variety of different products. For the sake of this survey, imagine that all the products from one category are the same price, same size, same general specs. The only difference to consider is the appearance of the products.</td>
</tr>
</tbody>
</table>
Aesthetics Research Introduction

To help us with our research we are conducting a survey. This survey should only take 10-15 minutes. Please answer the questions honestly and carefully.

**The results of this survey are anonymous and will not be shared with anyone.**

**This is to help us to understand how our products are perceived and to help improve our products.**

**Your feedback will be used to help us understand how our products are perceived and to help improve our products.**

**Thank you for taking the time to complete this survey.**

1. Who are you?
   - Name:
   - [ ] Male
   - [ ] Female

2. Age:
   - [ ] Under 18
   - [ ] 18-24
   - [ ] 25-34
   - [ ] 35-44
   - [ ] 45-54
   - [ ] 55-64
   - [ ] Over 65

3. What is the project you'll be allocating labor to this study?

4. What is your education level?
   - [ ] High School
   - [ ] Some College
   - [ ] Bachelor's
   - [ ] Master's
   - [ ] Doctorate

Product Preferences

Imagine that your company is a major retailer that offers a variety of products. In order to have a successful business, it is your responsibility to choose the products that people will buy in the end.

You will see a variety of different products. For the sake of this survey, imagine that all the products from one company are the same price, same size, same general shape. The only difference is visible in the appearance of the products.

Wine Bottles

- Which wine bottle do you think will be most successful?
  - [ ] A
  - [ ] B

Clocks

- Which clock do you think will be most successful?
  - [ ] R
  - [ ] S
16. Which clock do you think will be most successful?

17. Which wine bottle do you think will be most successful?
9. Which light do you think will be most successful?

- R
- S

10. How confident do you feel regarding your decisions on this page?

- Not at all confident
- Somewhat confident
- Very confident

Product Preferences

Imagine that you manage a major retailer that offers a variety of products. In order to have a successful business, it is important to understand which products are most likely to sell well.
**19. Which light do you think will be most successful?**

- O
- O

**20. How confident do you feel regarding your decisions on this page?**

- Very Confident
- Confident
- Somewhat Confident
- Not Confident

**Product Preferences**

Imagine that you manage a retail store that offers a variety of products. In order to have a successful business, it is important to choose products that will be popular among customers. For the purpose of this exercise, imagine that all the products from each category are the same price, size, style, and general appeal. The only difference is in their appearance.

**Wine Bottles**

- D
- E

**21. Which wine bottle do you think will be most successful?**

- O
- O

**Trash Baskets**

- D
- E

**22. Which trash basket do you think will be most successful?**

- O
- O
**Posttest Followup Questions**

**32. How much did you know about "typical and novel" prior to using this tool?**

<table>
<thead>
<tr>
<th>None</th>
<th>Little</th>
<th>Some</th>
<th>A Lot</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**33. How easy was it to understand the tool's content?**

<table>
<thead>
<tr>
<th>Very Difficult</th>
<th>Difficult</th>
<th>Neutral</th>
<th>Easy</th>
<th>Very Easy</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**34. How successful was the tool at helping you think about your users' preferences?**

<table>
<thead>
<tr>
<th>Not successful</th>
<th>Somewhat successful</th>
<th>Successful</th>
<th>Very successful</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**35. How successful was the tool at providing a rationale for your design decisions?**

<table>
<thead>
<tr>
<th>Not successful</th>
<th>Somewhat successful</th>
<th>Successful</th>
<th>Very successful</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**36. In general, how relevant will this tool be to your projects in the future?**

<table>
<thead>
<tr>
<th>Irrelevant</th>
<th>A little relevant</th>
<th>Somewhat relevant</th>
<th>Very relevant</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Thank You!

I truly appreciate your help with this study and I hope to be able to share some positive results with everyone involved in this process.

37. If you are willing to have a 30 minute conversation about this project, please write your email below:

[Email Address]
“People are very open-minded about new things – so long as they are exactly like the old ones.”
—Charles F. Kettering

Three Parts:
- The Premise
- Two Principles
- How to Use Them

We can make almost 10,000 decisions every day. How?

95% of decisions take place in the subconscious mind.

Subconscious shortcuts drive decisions, even when we think we’re being rational.
Two Principles:

Designers should use heuristics to trigger as many “approach” cues as possible.

We like typical experiences because they are easy to understand and use.

People tend to prefer things that are typical. People also prefer things that are novel.

We like typical experiences because they are easy to understand and use.
We like novel experiences because they teach us new ways to interact with our world.

Typical & Novel might seem like opposites, but they’re distinctly different.

And the best designs aren’t always in the “middle” of the map.

Context influences how typical or novel a product should be.

Good design can often feel both typical and novel.
Typical & Novel Concept Selection Tool

PHASE 1

Prepare

BACKGROUND:
This analysis provides one way to facilitate a concept selection phase. It will not give you an answer; it will guide your thinking about how to proceed.

PURPOSE:
All concepts should be based off of a design brief with goals and objectives clearly defined. This study focuses on the product's appearance. Any differences in cost, functionality, performance, or other technical specs should be considered ONLY if they influence how the product is perceived.

TO BEGIN THE ANALYSIS, YOU WILL NEED:
5-10 Category Examples
5-10 Concept Sketches or Renderings
Pen and paper
Space to work
Camera for documentation
PHASE 1
Observe Typical Properties

WHY YOU'RE DOING THIS:
Define the category's typical qualities, because people often prefer typical designs.

WHAT YOU'LL NEED:
Images of 5-10 competitive products, pencil, notebook, paper, scissors to work.

TIME:
15 minutes

PROCESS:
Spread out images of 5-10 competitive products. These should represent the most popular and well-known examples of the category.

Look for patterns of common qualities. These can be semantic components like handles or buttons, or they can be aesthetic qualities like shape or proportion. They can even be metaphors or symbols common across the category.

List as many typical qualities that you can identify. Like any brainstorm, do not censor yourself at this point.

It is not necessary for 100% of the examples to share a quality for it to be typical.

You may want to write post-it notes so you can rearrange these in later phases.

COMPONENTS (SEMANTICS):
- Top opening
  (approx. 4")
- Place to grip
- Stable base of some kind

AESTHETICS:
- Cylindrical
- Ceramic
- Glossy
- Curves
- Tall proportion
  approx. 1:3
- Solid color
- Symmetrical

SYMBOLIC:
- Inspiration
  from nature
- Human form

PHASE 2
Define Strong Typical Cues

WHY YOU'RE DOING THIS:
Focus your strategy on using the strongest cues for typicality.

WHAT YOU'LL NEED:
List of typical qualities from Phase 1.

TIME:
15 minutes

PROCESS:
Determine which qualities are most needed to create a typical version of the product.

Divide your list into three groups: strong cues, medium cues, and weak cues. Focus on only the strong cues.

STRONG CUES:
- Top opening
  (approx. 4")
- Solid color
- Cylindrical
- Symmetrical
- Curves

MEDIUM CUES:
- Stable base
- Place to grip
- Inspiration
  from nature

WEAK CUES:
- Tall proportion
  approx. 1:3
- Ceramic
- Glossy
- Human form
Develop Novelty Strategies

**Phase 5**

**Process:**
Based on project objectives, develop novelty strategies, stating them as such:

- This element [element should be novel in this way] is for the purpose of [purpose].

**Remember:** Novelty can detract from typology.

**1. Anticipate Transformations (Aesthetic):**
- Before the design is more formally articulated, balanced, harmonious, etc.

**2. Semantic:**
- Determine the attributes that define how a user perceives the product's function or its context of use.

**3. Syntactic:**
- Define what the product communicates as an object, how people will perceive it.

- Note: These steps should be interrelated and inclusive each other.

---

Map Concepts & Competition

**Phase 4**

**Process:**
Place each concept on the map according to how typical and novel it is, based on your observations from earlier in the process.

Optional step:
Include the competitive prototypes depicted similarly on the map and observe how new ideas fit in with the current category.

Most products will fall along the diagonal line connecting highly typical and highly novel.

**Remember:** This is a visual evaluation. Any differences in costs, functionality, or other technical aspects should be considered if they influence how the product is perceived.
**MAKE DECISIONS**

**WHY YOU’RE DOING THIS:** Identify strategies for integrating gaps in individual concepts.

**WHAT YOU’RE DOING:** Map and consider from Phase 2.

**TIME:** 10-45 minutes

**PROCESS:**
- Make decisions about which concepts to move forward to a more final design.
- Develop strategies for refinement.

**Propose methods for how to increase either typical or novel elements depending on the context or category.**

- Context affects preference, including levels of:
  - Engagement (mindless behavior is more typical)
  - Risk (if very risky, typical is better)
  - Aesthetic function (category demands novelty)
  - Category homogeneity (novelty is more potent)
  - Expertise (experts may seek novelty)

The best designs are an optimal combination of typical and novel elements, but they need not appear in any one part of the map.
Final Study Results

![Diagram 1]

- Pre Test: 28%
- Language Preference: 18.1%
- Post Test: 21%

![Diagram 2]

- Pre Test: 72%
- Language Preference: 81.9%
- Post Test: 79%

![Diagram 3]

- Pre Test: 10%
- Language Preference: 26.5%
- Post Test: 13%

![Diagram 4]

- Pre Test: 90%
- Language Preference: 73.5%
- Post Test: 67%
Analysis of Design Enthusiasts

Laypeople vs. “Design Enthusiasts”
Reveals influence of priming

Design enthusiasts (n=26), initially screened out of benchmark test, reveal a shift towards novelty as priming changes to personal preference.

Analysis of significant shifts in preference

As decisions get more difficult, the intervention becomes more influential.

Four questions created significant shifts. Same questions feature the least decisive results in posttest.