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THE VISUAL THESIS: THE EFFECTS OF INFORMATION
PRESENTATION FORMAT AND SCREEN SIZE ON
CONSUMER DECISION OUTCOMES

BY
SEREIKHUOCH ENG

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN
BUSINESS ADMINISTRATION

UNIVERSITY OF RHODE ISLAND

2018

DOCTOR OF PHILOSOPHY DISSERTATION
OF
SEREIKHUOCH ENG

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UNIVERSITY OF RHODE ISLAND
2018

ABSTRACT

Visual information had been found to be superior to textual information in terms of processing ease, and to increase consumer preference, attitude, and purchase intention. Since many digital devices are used to access information in contemporary society, this dissertation research is designed to extend the current literature on information presentation format. Existing research has established visual format's superior effects mainly in decision environments that are more hedonistic in nature (e.g., jackets, crackers) than utilitarian, without a clear measure of objective decision quality. In complex decision environments that include utilitarian choices (such as for healthcare and credit card), it is unclear whether the visual advantage persists particularly since objective decision quality is a more important outcome than attitude or behavioral intentions. This research attempts to examine the potential joint effect of information presentation format and screen size on objective as well as subjective decision outcomes.

Using visual theory, construal-level theory, and research on screen size effects, three experiments investigated the visual thesis in small and large screen conditions. The three studies explored the process and outcome variables in decision making tasks for different product categories. Study 1, using the health insurance decision context, examined whether the process and outcome variables – particularly objective choice making – fare better when the information presentation format is visual than textual and when viewed on a larger than a smaller screen. Study 2 investigated the effect of hedonic/utilitarian value of product on the process and outcome variables, as well as

its interaction effect with information presentation format and screen size. A jacket was used as the hedonic context and credit card as the utilitarian context. Finally, Study 3 investigated the effects of temporal bias (near- vs. far-distant future frame) on the process and outcome variables. Streaming media and video-on-demand subscription services were used in Study 3.

The research evidence supports the visual advantage for subjective/affective measures, but not for objective quality (Study 1 and 2). Textual information was found to positively affect objective quality (Study 1 and 2). Under the condition of temporal frame (Study 3), little visual advantage effect was found for both subjective and objective measures. In addition, the visual advantage only had positive effect for subjective measures when it was in the near-distant future frame but not the far-distant future frame. This research found minimal or mixed evidence for the effect of small screens.

The research contributes to the information processing and decision making literature, in particular by providing evidence of the superiority of textual format in objective decision quality. The managerial implications of the findings suggest that higher objective quality can be influenced by relevant information presentation format (particularly, the textual format) when the decision task is more utilitarian and when choice tasks are in distant time frame. The findings indicate a need for policy intervention to require appropriate amount of (text) information made available to consumers to make the (most possible) optimal decisions.

ACKNOWLEDGMENTS

I am enormously grateful for the guidance, support, encouragement, and patience from my committee members, College of Business faculty and staff, friends and family.

First and foremost, I would like to formally express my deepest gratitude toward my advisor and mentor, Dr. Ruby Roy Dholakia. She has been instrumental in my development and journey as a student, a researcher, and a teacher. She has touched me with her wit, wisdom, and incredible practicality. She is a true source for unlimited inspiration for high quality research and decisions, and I have hugely benefited from her guidance and mentorship. I am profoundly humbled by the amount of professional and personal investment she has placed on my development and career.

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I am particularly thankful to Dr. Nikhilesh Dholakia, with whom I started working on research projects early in my PhD years. He sparked my interest in research with public policy and global market implications.

I thank Dr. Hillary A. Leonard for having been resourceful and offering alternative viewpoints on many decisions that I have made during the years that I have known and worked with her. I am also appreciative of her enthusiasm and inspiration for my research in the area of consumer culture.

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I thank the Dean, professors and staff of the College of Business as well as the assistantship awarded to enable my completion in the program.

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This journey was made more enjoyable and colorful with the kindness, friendship, encouragement, and laughter that my friends shower upon me and my family. I also thank the friends and colleagues with whom I have the privilege to work with at URI.

I thank my parents for their love, support, sacrifices and commitment to my higher education. My sisters, for having been a role model and paved the paths ahead for me. I am tremendously grateful to my husband; thank you for being a solid rock for me and our family. We owe it to our children who graciously tolerated the time sacrificed from home and spent away from them. We are thankful for the privilege and joy of being their parents.

DEDICATION

My advisor and mentor – Dr. Ruby Roy Dholakia – who has sparked and nurtured the
creation of new knowledge

My parents – for their sacrifices and investment in my education

My husband and our children – for their unrelenting source of inspiration and energy

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CHAPTER 1

INTRODUCTION

*Information is a source of learning. But unless it is organized,
processed, and available to the right people in a format for decision making,
it is a burden, not a benefit.*

— C. William Pollard (*The Soul of the Firm*, 2000, p. 123)

1.1 Background

Abundant choices, in terms of both brands and products, characterize the contemporary marketplace. A supermarket, on average, carries roughly 40,000 items (Food Marketing Institute, 2016); a new age Walmart Supercenter carries, on average, over 142,000 items and the product list on Amazon.com is too long to keep count. Along with physical products and intangible services, the quantity of information has also exploded; the problem is no longer lack of information. New media has made information easily and widely available. Instead of being useful, however, this abundance of information frequently becomes cumbersome and frustrating to consumers (Horrigan, 2008). Due to limited cognitive capacity and time resources, available information often gets ignored and consumers frequently fail to achieve optimal choices. For example, caloric information on restaurant menus (e.g., in New York City) has shown little impact on actual behavior for healthier food choices and for curbing obesity rates (Takepart.com, 2012). When enough consumers exhibit sub-

optimal choice behaviors, market failures result as evident in recent cases of sub-prime mortgage choices (Bianco, 2008; Denning, 2011; Whalen, 2008).

One approach to helping consumers simplify their processing of available information is through computer-aided decision making tools such as recommendation agents (e.g., creditcards.com; Consumer Reports), and improved ease of processing via comparison matrix (e.g., Bankrate.com for comparing credit card offers; mutual fund comparison by Fidelity as depicted in Figure 1.1). These tools help organize the information that can reduce cognitive effort and further the cause of decision accuracy. Early research on such decision tools suggests that they positively impact evaluation and quality of choice (Diehl, Kornish and Lynch, 2003; Gonzalez and Kasper, 1997; Haubl and Trifts, 2000; Todd and Benbasat, 1999).

Figure 1.1: Comparison Matrix of an Investment Product

Fidelity

CUSTOMER SERVICE | OPEN AN ACCOUNT | REFER A FRIEND | LOG IN

Search or get a quote

Accounts & Trade

Planning & Advice

News & Research

Investment Products

Why Fidelity

Home » Mutual Funds Research » Mutual Funds Results

AAA

Mutual Fund Results

REFINE YOUR SEARCH

☐ Fidelity Funds only

☐ Fund Picks from Fidelity

☒ No Transaction Fee only

☐ Include Closed Funds

☐ Socially Responsible

☐ Include Leveraged/Inverse Funds

Fund Management Approach

☒ All

☐ Active

☐ Index

[Fewer Options](#)

FUND FAMILY

FUND TYPE

FUND FEATURES

MORNINGSTAR RATINGS

RETURNS & RANKINGS

EXPENSES

VOLATILITY

INCOME CHARACTERISTICS

Look Up Funds

by name, symbol, or family

GO

3,720 Matching NTF Only Funds

Reset Search

Bookmark Search

Overview

Risk

Management & Fees

Morningstar Rankings

Help me read this table

Data as of 06/30/2018 unless otherwise noted

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Complete

Name	Morningstar Category	YTD # (Daily)	1 Yr	3 Yr	5 Yr	10 Yr	Expense Ratio	Morningstar		
							Net†	Gross‡	Overall▼	
Matching Fidelity Funds:										
☐	Fidelity® Select Semiconductors	Technology	8.56%	30.24%	24.32%	26.08%	16.41%	0.75%	0.75%	★★★★★ 175 Rated
☐	Fidelity® Select Software	Technology	17.78%	32.62%	24.02%	21.69%	17.06%	0.73%	0.73%	★★★★★ 175 Rated
☐	Fidelity® Select	Technology	13.68%	29.83%	23.13%	21.96%	15.75%	0.75%	0.75%	★★★★★ 175 Rated

View 329 Matching Fidelity Funds

All matching Funds:

Complete

☐	Putnam Global	Technology	17.47%	34.44%	26.96%	24.76%	--	1.28%	1.32%	★★★★★ 175 Rated
☐	Victory RS Science and	Technology	22.12%	39.33%	26.33%	23.16%	15.51%	1.49%	1.49%	★★★★★ 175 Rated
☐	Virtus KAR Small-Cap	Small Growth	22.08%	41.85%	24.99%	20.59%	15.45%	1.48%	1.48%	★★★★★ 806 Rated
☐	BlackRock Technology	Technology	18.45%	39.83%	24.37%	25.24%	14.81%	1.17%	1.42%	★★★★★ 175 Rated
☐	Fidelity® Select Semiconductors	Technology	8.56%	30.24%	24.32%	26.08%	16.41%	0.75%	0.75%	★★★★★ 175 Rated
☐	Fidelity® Select Software	Technology	17.78%	32.62%	24.02%	21.69%	17.06%	0.73%	0.73%	★★★★★ 175 Rated
☐	Janus Henderson	Technology	16.17%	32.97%	23.76%	21.53%	14.89%	0.93%	0.93%	★★★★★ 175 Rated
☐	MFS® Technology	Technology	20.44%	34.02%	23.49%	21.51%	14.43%	1.24%	1.24%	★★★★★ 175 Rated

1 | 2 | 3 | ... | 186 | Next

* Closed Fund | ** Closed to New Investors | † Transaction Fee or Load

Source: Fidelity Mutual Fund Evaluator. <https://www.fidelity.com/fund-screener/evaluator.shtml#!&ntf=Y>

1.2 Information Environment

Since the late 1990s and early 2000s, there have been additional changes in the information environment. The technological capabilities of the online environment have expanded so much that information can be as easily provided in rich, interactive and visually engaging formats as well as in the traditional text format. When print medium was the dominant source of information, research on print advertisements indicated that visual-based advertisements were more effective in generating positive attitude towards the brand and more effective in communicating the advertised product attributes than text-based advertisements (Holbrook, 1985; Mitchell and Olson, 1981).

As other media have grown in popularity, such as social media, there has been further movement towards more visual-based communication (Walter, 2012), with only snippets of text if any (e.g., Facebook status update; Twitter 140-character limit; Instagram; Pinterest; and the most recent newsworthy photo-messaging application Snapchat). Research results from the new media seem to also suggest the superior effectiveness of visual formats; for example, Kim and Lennon's (2008) study of apparel product presentation in visual versus textual format in an online shopping environment shows positive effects of visual format on attitude and purchase intention.

While attitude contains components of both cognition and affect (e.g., Fishbein and Ajzen, 1975; Lutz, 1991), it captures just the psychological dimensions associated with a person's evaluative process, such as consumers' tendency to evaluate things as good-bad, harmful-beneficial, pleasant-unpleasant, and like-dislike (Ajzen, 2006; Ajzen and Fishbein, 2000). In some decision tasks (such as financial decisions and

healthcare), achieving *objective* (quality) measures in decision is much more important than *subjective* (affective state) measures. Most past studies, however, focused on the subjective outcomes of decision than objective ones. This leaves the question of how the visual advantage fares for objective measures unanswered.

Furthermore, despite the relative effectiveness of visual formats, it is not always easy to provide information in meaningful visual formats, particularly for complex products such as healthcare or financial choices. In addition, research has shown that choice quality suffers when consumers are overwhelmed – with information (e.g., Lee and Lee, 2004) or with other tasks and worries (e.g., Mani, Mullainathan, Shafir and Zhao, 2013). It is important in these cases to not only reduce the consumers’ cognitive load of information processing but also increase their decision quality. An important practical and policy question remains, therefore, regarding which information format (visual vs. textual) facilitates higher quality decisions.

1.3 Digital Devices

Provision of consumer-friendly information is complicated by the use of hand-held devices (e.g., smartphones, tablets, phablets) to access and evaluate information. The Pew Research Center (2018) reports 77% of American adults have a smartphone in 2018 (up from 35% in 2011) and near saturation levels for the 18-29 year-olds (94%) and the 30-49 year-olds (89%). Twenty percent (or one in ten) of Americans rely entirely on their smartphones for online services and do not have the traditional home broadband services for other online access alternatives (Pew Research Center, 2018). Further, about eight-in-ten Americans shop online – 79% have made an online

purchase of any type, 51% have made a purchase using a cellphone, 15% have made a purchase by following a link from social media sites, and 15% buy online on a weekly basis (Smith and Anderson, 2016). Those aged 18-29 years are most likely to make purchase using a cell phone at 77% compared to only 17% of those aged 65 years and above (Smith and Anderson, 2016).

At least 63 percent of all cell phone owners across various income groups use it for Internet access, with tablet trailing behind somewhat (Fox, 2014; Smith, 2013).

Table 1.1 provides a snapshot of the growth of device ownership and its uses.

Table 1.1: Trend of Device Ownership and Use

Device Ownership	2018	2016	2015	2013	2011
All cell ownership ¹	95%	92%	92%	91%	83%
Smartphone ownership ¹	77%	70%	68%	56%	35%
Tablet ownership ¹	53%	51%	45%	34%	8%
E- reader ownership ¹	n/a	22%	19%	24%	12%
Smartphone-only Internet users ¹	20%	12%	13%	8%	n/a
Cell owners accessing the Internet on their phones ²	n/a	n/a	n/a	63%	47%
Device Use & Online Information Access	2018	2016	2015	2013	2011
Smartphone share of US retail m-commerce sales ³	70%	65%	47%	n/a	n/a
Look up information about a health condition online	n/a	n/a	62% ⁴	45% ⁵	17% ⁶
Get news on a mobile device ⁷	85%	72%	n/a	54%	n/a

Sources:

1. Pew Research Center (2018). *Mobile Fact Sheet*. Washington, DC: Pew Research Center. February 5, 2018. Retrieved from: <http://www.pewinternet.org/fact-sheet/mobile/>
2. Duggan, M & Smith, A. (2013). *Cell Internet use 2013*. Washington, DC: Pew Research Center. Retrieved from: <http://www.pewinternet.org/Reports/2013/Cell-Internet.aspx>
3. Kressman, J. (2017). Mobile purchasing keeps ramping up in the US. *eMarketer Retail*. March 10, 2017. Retrieved from: <https://retail.emarketer.com/article/mobile-purchasing-keeps-ramping-up-us/58c328d8ebd400016cd37b6f>
4. Smith, A. & Page, D. (2015). *US smartphone use in 2015*. Washington, DC: Pew Research Center. April 2015. Retrieved from: http://assets.pewresearch.org/wp-content/uploads/sites/14/2015/03/PI_Smartphones_0401151.pdf
5. Fox, S. & Duggan, M. (2013). *Health online 2013*. Washington, DC: Pew Research Center. Retrieved from: http://www.pewinternet.org/~media/Files/Reports/PIP_HealthOnline.pdf
6. Fox, S. & Duggan, M. (2013). *Health online 2012*. Washington, DC: Pew Research Center. Retrieved from: http://www.pewinternet.org/~media/Files/Reports/2012/PIP_MobileHealth2012_FINAL.pdf
7. Lu, K. (2017). *Growth in mobile news use driven by older adults*. Washington, DC: Pew Research Center. June 12, 2017. Retrieved from: <http://www.pewresearch.org/fact-tank/2017/06/12/growth-in-mobile-news-use-driven-by-older-adults/>

While the statistics show an increasingly prevalent and important role of hand-held devices, existing studies in consumer research have not yet addressed the distinction between the traditional desktop/laptop computer and hand-held device environment for information display. Does the new smaller screen environment mean

that findings of effectiveness of certain information formats (e.g., matrix, visual, text) can be easily replicated? Imagine, for example, viewing a comparison matrix for a set of credit card offers on a desktop screen versus a smartphone screen – the size and layout of the information displayed on these different screen sizes vary (see Figure 1.2). How will it affect information processing and decision making?

Figure 1.2: Comparison Matrix of Credit Cards on a Traditional Computer Screen vs. a Smartphone Screen

Card	Intro APR	Balance Transfer	Regular APR	Annual Fee	Credit Needed
Capital One® Quicksilver® Cash Rewards	0% Intro On Purchases 9 Months	0% Intro On Balance Transfers 9 Months	14.49% - 24.49% Variable	\$0	Excellent, Good
Discover it® Cashback Match™	0% Intro On Purchases 14 Months	0% Intro On Balance Transfers 14 Months	13.49% - 24.49% Variable	\$0	Excellent/Good
Capital One® Savor™ Cash Rewards Credit Card	0% Intro On Purchases 9 Months	0% Intro On Balance Transfers 9 Months	15.99% - 24.74% Variable	\$0	Excellent, Good
Chase Freedom Unlimited®	0% Intro APR On Purchases 15 Months	0% Intro APR On Balance Transfers 15 Months			

First screen view on a desktop computer (showing results on page 1 of 5)

Card	Intro APR	Balance Transfer	Regular APR	Annual Fee	Credit Needed
Capital One® Quicksilver® Cash Rewards	0% Intro On Purchases 9 Months	0% Intro On Balance Transfers 9 Months	14.49% - 24.49% Variable	\$0	Excellent, Good
Discover it® Cashback Match™	0% Intro On Purchases 14 Months	0% Intro On Balance Transfers 14 Months	13.49% - 24.49% Variable	\$0	Excellent/Good
Capital One® Savor™ Cash Rewards Credit Card	0% Intro On Purchases 9 Months	0% Intro On Balance Transfers 9 Months	15.99% - 24.74% Variable	\$0	Excellent, Good
Chase Freedom Unlimited®	0% Intro APR On Purchases 15 Months	0% Intro APR On Balance Transfers 15 Months			

First screen view on a 5.5" screen smartphone (showing results on page 1 of 5)

Source: Bankrate.com

When accessing information on hand-held devices, consumers are constrained by the screen size, making the presentation of (textual) information unfriendly (e.g., one may have to scroll length- or width-wise). Research studies suggest that smaller screens inhibit the ability of users to navigate a site and negatively affect decision

performance (Albers and Kim, 2002; Arning, Ziefle, Stephanidis and Pieper, 2007; Churchill and Hedberg, 2008; Dillon, Richardson and McKnight, 1990; Jones, Buchanan and Thimbleby, 2003). However, when the information is provided in graphic or visual format, it appears to interact with screen size and reverse some of the negative effects of small screen sizes on performance (Arning et al., 2007; Bridgeman, Lennon and Jackenthal, 2003; Chae and Kim, 2004; Kim and Albers, 2003). It is not surprising, therefore, that visual format often dominates in small screen environment (Roam, 2009; Townsend and Kahn, 2014), and marketers such as Amazon, Zappos, and Gilt automatically present information on hand-held devices visually on the first screen of their pages (Roam, 2009; Townsend and Kahn, 2014).

The research on small screens has generally measured performance in terms of time spent on task and recall (e.g., Acton, van der Heijden and Golden, 2005; Arning et al., 2007; Bridgeman, Lennon and Jackenthal, 2003; Bruijn, Mul and Oostendorp, 1992; Chae and Kim, 2004; Kim and Albers, 2003; Reeves, Land, Kim and Tatar, 1999). For example, Kim and Albers (2003) report that information presented in tabular format can be two screens wide on hand-held computers without negative effects on usability. Kim and Albers (2001) report that subjects spend more time on web search tasks in the small screen condition than those in the larger screen condition; and this lower performance with smaller screens occurs on search pages containing greater than 225-350 word-lengths. While these measures have shed light on how screen size affects consumers and their *performance*, they do not directly address the question of decision quality.

While extant research has separately looked at the effects of visual information and screen size on consumers' task *performance*, the effects of screen size and information presentation format on consumers' decision outcomes, especially *decision quality*, remain unaddressed. Yet this question of decision quality in different screen size environments is of substantive practical as well as public policy concern, and is the focus of this research.

In addition, studies in consumer research have widely used apparel, food and electronics as product categories in their investigation (Kim and Lennon, 2008; Lurie, 2004; Mogilner, Aaker and Pennington, 2008; Townsend and Kahn, 2014; Widing and Talarzyk, 1993). While these studies have established and contributed to the knowledge of visual advantage, the question of how visual format performs in product categories less explored in consumer research (e.g., healthcare) remains to be investigated. Understanding how information presentation format affects decision quality of complex and infrequently purchased products is of imperative importance with public policy implications. Many of these products (such as health insurance and credit cards) are associated with benefits that are difficult to estimate (e.g., probabilities of needing a surgery covered in a specific plan). As a result, these products may suffer from biases in consumer decision. The effect of decision bias on visual advantage for these products is unclear.

1.4 Research Questions and Research Objective

Recognizing the critical importance of decision quality and to address the research gaps, this dissertation addresses the following research questions:

- Does visual information enhance decision quality?
- Will information presentation format interact with screen size to affect decision quality?
- Will the visual advantage persists for different product categories?
- Will consumer's bias limit the effect of visual information and screen size?

In summary, the objective of the dissertation is to examine whether the visual advantage extends to a small screen environment, and whether the visual advantage carries into process and outcome variables beyond performance related (i.e., time spent on task) and subjective (e.g., satisfaction, confidence, attitude and purchase intention) measures. The research examines whether the visual advantage persists when objective decision quality measures are also considered. In addition to examining complex products, this research also examines product categories in hedonic and utilitarian choice environments, as well as decision tasks in the near and distant future time frame. Thus the goal of this research is to contribute to a clearer understanding of the visual thesis in the new age of hand-held devices, while developing theoretical and managerial implications.

1.5 Organization of the Dissertation

The dissertation is organized into five chapters. After this introductory chapter, the next chapter (Chapter 2) presents a theoretical foundation based on a review of past literature relating to information presentation, information processing, hedonic

and utilitarian product, and display screen size. Particularly, it reviews literatures relating to processing of images and words, hedonic/utilitarian value in products, construal-level theory, and temporal bias research. Chapter 3 outlines the methodology adopted to empirically test the research hypotheses developed in Chapter 2. Chapter 4 presents the experimental studies and their findings, and the final (fifth) chapter discusses the theoretical and managerial implications of the findings and future research avenues.

CHAPTER 2

REVIEW OF LITERATURE

Over the years, the manner in which consumers make decisions regarding choice, purchase and use of products and services has been studied extensively (see for a review: Bettman, Johnson and Payne, 1991; Frederick, Loewenstein and O'Donoghue, 2002). Often, consumers are faced with difficult choices that involve many alternatives resulting from technological improvements, competition, and the availability of information (Bettman, Johnson and Payne, 1991). Merely making information available may not be enough. The manner in which people process information influences decision accuracy. Contemporary scholars have addressed the decision-making process by addressing the factors that influence consumer decision making.

2.1 Contingent Decision Making

Past research indicates that decision making is characteristically contingent on task variables, context variables, and person factors (Bettman, Johnson and Payne, 1991). Researchers have examined (1) task characteristics such as the size of the problem, time pressure, types of decisional tasks, alternative similarities, correlated attributes, comparable versus non-comparable choices, and the quality of alternatives (Bettman, Luce and Payne, 1998; Bettman and Park, 1980; Biehal and Chakravarti, 1982; Johnson and Meyer, 1984; Park and Lessig, 1981; Payne, 1976); (2) context

variables include family-based decisions, feelings of accountability, and the need to justify choices (Heath and Soll, 1996; Huber, Payne and Puto, 1982; Kunda, 1990; Simonson, 1989); and (3) characteristics of individuals such as prior knowledge, information processing abilities, and socio-demographic differences (Bettman, 1979; Bettman, Johnson and Payne, 1991; Cowan, 1988; Haugeland, 1981; Howard, 1994; Johnson and Russo, 1984). The focus of this stream of research is on performance-related process measures such as time spent, recall and comprehension, and process outcome variables such as assortment perception, affective evaluation (e.g., disappointment, regret, confidence), attitude, intention, and commitment (Formisano, Olshavsky and Tapp, 1982; Howard, 1974; Howard and Sheth, 1969; Iyengar and Lepper, 2000; Kivetz and Simonson, 2000; Townsend and Kahn, 2014).

While contingent decision making models have investigated a number of antecedents and the consequences of decision making, the variables and conditions of today's modern market have changed considerably, which indicate that research studies that incorporate current contingencies will further our understanding of contemporary consumer decision making.

2.2 Research Framework

Figure 2.1 below summarizes the research framework of this dissertation based on the contingent model. In essence, this dissertation manipulates four antecedent variables (information presentation format, screen size, product type, temporal frame) and examines their effects on process variables ('perceived time spent on task', 'subjective feeling'), and outcome variables ('subjective quality' and 'objective

quality’). Potential covariates (style of processing, involvement, numeracy, perceived task difficulty, and demographic variables) are also examined.

Figure 2.1: Research Framework

The following sections elaborate the antecedents, process and outcome variables of the research framework.

2.2.1 Antecedent Variables

Task-Related Variables

Information Presentation Format. Information presentation format has long been found to influence information processability, and information processing activities of users (e.g., Bettman and Kakkar, 1977; Bettman and Zins, 1979; Russo,

1977; Townsend and Kahn, 2014). Information presentation formats can be broadly divided into (1) visual-based format (i.e., picture, graph, video, animation, etc.), and (2) text-based format (i.e., words, textual description, scripts).

The visual format has been found on numerous occasions to have a more positive effect on processability and processing ease (i.e., more positive emotion during processing, shorter perceived time spent on task) (e.g., Childers and Houston, 1984; McKenzie and van Winkelen, 2011; Townsend and Kahn, 2014). Processability refers to the ease with which information can be comprehended and used (Bettman, Johnson and Payne, 1991, p. 57). Kim and Lennon (2008) show evidence of visual display to positively influence attitude and purchase intention in an online shopping environment. An expansive literature search did not yield any research on visual format effect on objective decision quality.

Display Screen Size plays a major role in how information is accessed and processed. Not only is traditional media such as print or TV less frequently used by today's consumers (Gursky, 2017), a desktop computer is no longer guaranteed to be the primary display device for information (Olmstead, 2017). Hand-held digital devices (i.e., smartphones or tablets) have increasingly replaced desktop and laptop computers as the primary access points for marketplace information as well as decisions (Anderson, 2015a; Cellular News, 2013; Duggan and Smith, 2013; Fox and Duggan, 2013).

Information presented on hand-held devices often faces space constraints. As a consequence, information has to be presented differently on smaller screen sizes than

on mainstream desktop or laptop computers; otherwise consumers will have to engage in more effortful processing of relevant information.

Some evidence from the web design and system support disciplines (but not consumer research) exists for the effect of display screen size on information processing. Available evidence suggests that smaller screen size inhibits information display, information processing, and performance-based measures (e.g., learning time, memorization, accuracy of recall) (Acton, van der Heijden and Golden, 2005; Albers and Kim, 2002; Bridgeman, Lennon and Jackenthal, 2003; Bruijn, Mul and Oostendorp, 1992; Maniar, Bennett, Hand and Allan, 2008). The effect of screen size on decision outcome and objective decision quality has not been studied.

Context-Related Variable

Hedonic/Utilitarian Product Type. Decision tasks vary in the hedonic/utilitarian value of the product in question (Batra and Ahtola, 1990; Mano and Oliver, 1993; Wertenbroch and Dhar, 2000). Hedonic products, by their very nature, tend to be experiential and difficult to assess pre-consumption (MacInnis and Price, 1987). Types and amount of information are likely to differ for these product types. Past research suggests that the different hedonic/utilitarian considerations form independent components of product evaluations and attitudes, and allow consumers to differentiate between products according to their relative hedonic or utilitarian value (Batra and Ahtola, 1990; Mano and Oliver, 1993).

Past research studies on the effect of hedonic and utilitarian products have generally emphasized subjective outcomes such as affective feeling states, perception

of assortment size, preference, and purchase intention (Palazon and Delgado-Ballester, 2013; Rajagopal and Burnkrant, 2009; Townsend and Kahn, 2014; Wertenbroch and Dhar, 2000).

Temporal Bias. Some decisions are made within a short period of time; others are for future decisions. Research on temporal frame shows that manipulating temporal frames (near- vs. far-distant frame) affects what information consumers consider in a decision (Grant and Tybout, 2008), the appeal of a product (Chang and Lee, 2009), perception of risks, intention and communication message effectiveness (Chandran and Menon, 2004; Tangari and Smith, 2012). Temporal frame effects have not been explored for objective decision quality.

2.2.2 Process Variables

The process variables are induced responses elicited by the choice process (Ajzen and Fishbein, 2000; Giner-Sorolla, 1999; Schwarz and Clore, 1996). Several process measures have been used in the past including time spent on task, confusion and frustration felt during the decision-making process (Olson and Widing, 2002; Widing and Talarzyk, 1993).

Time Spent on Task. Time spent on task indicates the level of attention to the decision process. It determines the amount of time and interest an individual invests in a particular stimulus or market information (Ajzen, 2001). When presented with a stimulus, a person's level of attention has been shown to exert a great influence on the amount of information that is processed and retained for future use (Ajzen, 2001; Ajzen and Fishbein, 2000). In addition, attention influences how much information is

moved from sensory memory to working memory (Ajzen, 2001, 2006; Ajzen and Fishbein, 2000).

Confusion and Frustration. Confusion and frustration experienced during decision-making process are important motivator of consumer behavior (Strebel, O'Donnell and Myers, 2004; van Steenburg, Spears and Fabrizze, 2013; Wetzer, Zelenberg and Pieters, 2007). They can influence one's satisfaction, confidence and outcome of the decision (Lee and Lee, 2004; Malhotra, 1982; Olson and Widing, 2002; Widing and Talarzyk, 1993).

Confusion represents a "hygiene" factor in consumer decision making, and its presence may cause dissatisfaction but its absence will not motivate a consumer and will not necessarily lead to satisfaction (Mitchell and Vassilios, 1999). Confusion has also been defined as conscious state of mind that has cognitive, affective and behavioral dimensions (Mitchell, Walsh and Yamin, 2005). Confused consumers are likely to experience unpleasant emotions including frustration, irritation, anxiety, or even anger (Mitchell, Walsh and Yamin, 2005).

Freud (1958) described frustration as barriers to goal attainment and internal obstacles that block satisfaction in reaching a goal. Frustration occurs when a negative outcome results when a positive outcome is desired (Roseman, 1991) because situational events are obstructive to goal attainment, delay goal attainment or require additional effort for goal attainment (Scherer, 2001). The frustrating situation, in conjunction with individual psychological characteristics, determines resulting behavior and the response pattern adopted (Freud, 1958).

2.2.3 Outcome Variables

In the literature, “quality” contains both *subjective* and *objective* components. Researchers have emphasized the difference between perceived and objective quality (e.g., Dodds and Monroe, 1984; Garvin, 1983; Holbrook and Corfman, 1985; Jacoby and Olson, 1985; Parasurman, Ziethaml and Berry, 1986). Holbrook and Corfman (1985, p. 33) made the distinction between perceived and objective quality to be “humanistic quality” that involves the “subjective response of people to objects and is therefore a highly relativistic phenomenon that differs between judges,” whereas “mechanistic quality” involves an objective aspect or feature of a thing or event. Ziethaml (1988, p. 3) postulates that ‘perceived quality’ of a product is a consumer’s judgment about its “overall excellence or superiority”. Because *subjective* quality is specifically different from *objective or actual* quality in that the former is a higher level abstraction and a “global assessment” that resembles overall attitude (Holbrook and Corfman, 1985; Olshavsky, 1985; Ziethaml, 1988), this research separates the two components.

Subjective Quality. Subjective quality variables include satisfaction, confidence, attitude, and purchase intention (Olson and Widing, 2002; Widing and Talarzyk, 1993).

Satisfaction is typically conceptualized as either an emotional or cognitive response, with more researchers classifying satisfaction as an emotional response (Giese and Cote, 2000; Westbrook and Oliver, 1991). Satisfaction is evoked by the antecedents and process involved the decision making (Phillips, Olson and Baumgartner, 1995).

According to Westbrook and Reilly (1983), satisfaction is an emotional response to the experiences provided by an object or event. Oliver (1997) defines it as pleasurable fulfillment; in other words, one feels that an object or event fulfills some need, desire, goal, and that such fulfillment is pleasurable. Thus, satisfaction can be postulated to be a confirmation or a disconfirmation of a decision outcome against a standard of pleasure versus displeasure (Oliver, 1997).

The degree of *confidence* an individual has in a chosen outcome is important because it can affect the strength of the relationship between attitudes and behavioral intentions (Howard; 1989; Howard and Sheth, 1969; O’Cass, 2004). Howard (1989, p. 40) proposed that the construct of confidence is “the buyer’s degree of certainty that his or her evaluative judgment of a brand, whether favorable or unfavorable, is correct”.

In the consumer behavior literature, the confidence construct is used in two theoretically different ways. It has been used to refer to a buyer’s overall confidence in the brand (Howard and Sheth, 1969), and a buyer’s confidence in his or her ability to judge or evaluate attribute of the brands (Bennett and Harrell, 1975). Thus, the degree of confidence could reflect either certainty or uncertainty to which judgment is correct or the best in a given situation (Day, 1970; Zajonc and Morrisette, 1960). Confidence in this dissertation refers to the extent that an individual has confidence in his or her ability to make the right choice.

Attitude is “a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object” (Fishbein and Ajzen, 1975, p. 6). Petty and Cacioppo (1981) suggest that attitudes are general evaluations of objects,

issues, or people. Attitude captures the psychological dimensions associated with a person's evaluation of object; such as consumers' tendency to evaluate things as good-bad, harmful-beneficial, pleasant-unpleasant, favorable-unfavorable, and like-dislike (Ajzen, 2006; Ajzen and Fishbein, 2000).

While attitude does not always necessarily result in actual choice or behavior, it influences such (Ajzen and Fishbein, 2000; Fishbein and Ajzen, 1975). Various research has established strong evidence that attitude predicts intentions including *purchase intentions* (e.g., see a review by Ajzen, 2001). Some research studies have shown evidence of visual display to positively influence attitude and purchase intention in an online shopping environment (e.g., Kim and Lennon, 2008); however, visual format influence on decision quality has not been established.

Objective Quality. Several authors have conceptualized decision quality. Since a decision is “a choice made from among available alternatives” (Daft, 1991, p. 180; see similar view by Payne, 1982), decision quality is a measure of the goodness of this choice – the degree of match or fit between heterogeneous consumer preferences and differentiated products (Haubl and Trifts, 2000).

Objective quality is used in the literature to describe the actual technical superiority or excellence of the object (Hjorth-Andersen, 1984; Monroe and Krishnan, 1985), with measurable and verifiable superiority on some standard or standards (Ziethaml, 1988). Existing research has used ‘dominant alternative versus nondominant alternatives’ framework as the cue for objective quality. A dominant alternative is one that is superior on at least one attribute level, without being inferior on any other attribute levels of competing alternatives in the choice set (Haubl and

Trifts, 2000; Olson and Widing, 2002). Nondominant alternatives are sub-optimal given an individual's utility function at the time of decision and the set of available alternatives (Haubl and Trifts, 2000).

Researchers have also used choice switching as another indication of objective quality. Widing and Talarzyk (1993, p. 133) argue that switching is indicative of decision error, while not switching is indicative of a more certain, reasoned, informed, and thus higher decision quality of initial choice. Therefore, choice switching is indicative of a poor choice (Haubl and Trifts, 2000; Olson and Widing, 2002).

While past studies contributed to the understanding of the decision quality construct, they have used subjective quality and objective quality interchangeably. Furthermore, in the extant research, quality of a decision is not the focus; rather affective, subjective states, and behavioral intentions are emphasized (Feiereisen, Wong and Broderick, 2013; Kim and Lennon, 2008; Townsend and Kahn, 2014).

2.2.4 Individual Difference Variables

In the following section, a concise review of additional factors that affect consumer decision and decision quality is presented. These factors serve as covariates to the effect of the antecedents on the process and outcome variables in this research.

Style of Processing. The Style of Processing Scale (SoP), developed by Childers, Houston and Heckler (1985), assesses individuals' ability and preference to process visual information. A result of individual preferences, style of processing can affect information acquisition, processing, and utilization for judgment forming (Childers, Houston and Heckler, 1985).

Involvement. One's involvement with a product category or a purchase leads to a more intensified inclination to invest cognitive resources and process information for optimum decision (Laurent and Kapferer, 1985; Zaichkowsky, 1985).

Numeracy Skills. Because this dissertation emphasizes objective quality, it needs to take into account the covariate effect of numeracy levels among respondents. Numeracy pertains to one's aptitude with probabilities, fractions, and ratios (Fagerlin et al., 2007). Adequate understanding of risks and benefits of alternatives in a choice task requires adequate numeracy skills. Numeracy is negatively related to information processing since decision tasks requiring cognitive resources become harder (Viswanathan, Rosa and Harris, 2005).

Perceived Task Difficulty. In choice tasks, the perception of level of difficulty one associates with the task at hand can affect the individual's performance and outcome of the task (Huber, 1985; Samuelson, 1991; Townsend and Kahn, 2014).

Demographic Differences. Demographic differences have been found to affect information processing, behavioral intention and judgment (Capon and Burke, 1980; Dholakia, 2012). Demographic variables such as gender, age, household income and educational levels are all potential covariates in this research.

2.3 Hypothesis Development

Effect of Information Format

Paivio's dual coding theory (Paivio, 1971, 1975, 1986) describes two independent but partially interconnected systems for encoding, storage, organization, and retrieval of stimulus information – one for visual and one for verbal. The imagery system is

specialized for processing nonverbal information stored in the form of images, that is analog representations of concrete things. On the other hand, the verbal system is specialized for dealing with linguistic units. Words and numbers are processed sequentially or in a piecemeal fashion, while an image can be processed all at once (Hart, 1997; Paivio, 1986).

Research using brain imaging techniques shows evidence that while processing of words and images shares an initial common neural network in the left fusiform and middle temporal gyri of the brain, recognition of verbal and pictorial stimuli subsequently engage modality-specific activation of the brain regions during periods of semantic processing of stimuli (Khateb, Pegna, Michel, Landis and Annoni, 2002). The left inferior parietal lobule was observed for processing of words, and the right middle occipital gyrus for processing of pictures (Khateb et al., 2002). Studies of higher level processing of memory, expectation, and attention, have examined event-related potentials (ERPs, the neural signs that reflect brain activity) and have found consistent differences between the processing of words and pictures, particularly the differences between the two forms in the brain regions activation start to depart from each other at about 150 milliseconds following stimulus presentation (Khateb et al., 2002).

Studies on image processing have generally found visual superiority in recall and recognition (e.g., Guenther, Klatzby and Putnam, 1980; Lutz and Lutz, 1977; Paivio and Csapo, 1973; Shepard, 1967; Starch, 1966), faster and more automatic processing and the connection between an image and its meaning is more direct than it is for words (e.g., Luna and Peracchio, 2003; Unnava and Burnkrant, 1991).

Furthermore, advertising research suggests that people appear to interpret visual detail in a different order than words. It is proposed that people process visual detail literally, *then* figuratively, in relation to their interests, motivations and perceptions to create a relevant personal narrative about the picture (McKenzie and van Winkelen, 2011). This establishes a “cognitive comfort zone”, without compromising the difference depicted or losing the big picture in the detail (McKenzie and van Winkelen, 2011).

Education and audiovisual scholars have gathered evidence of the relative effectiveness of tables and graphics and the ability of visual displays as complements to narrative information on a subject to positively influence task performance (e.g., Dwyer, 1971; Eggen, Kauchak and Kirk, 1978; Feliciano, Powers and Bryant, 1963; Rigney and Lutz, 1976; Vernon, 1952).

Since visual information facilitates processability and increases perceived cognitive ease, ‘perceived time spent on task’ and ‘subjective feeling’ are posited to be enhanced by visual more than textual information.

H1a: ‘Perceived time spent on task’ will be lower for visual than textual format.

H1b: ‘Subjective feeling’ will be more positive for visual than textual format.

Other research on visual/imagery juxtaposes that visual communication helps people “apprehend the essence of a concept,” (Taylor and Ladkin, 2009) and is more powerful at triggering emotion and actions (Hsee and Rottenstreich, 2004; Lee, Amir and Ariely, 2009; Lieberman, Gaunt, Gilbert and Trope, 2002). Research on the effects of visual and textual information on attitudinal responses (Holbrook, 1985;

Holbrook and Moore, 1981; Mitchell and Olson, 1981) draws evidence that visual information instigates more changes in participants' beliefs about the product, thereby creates more positive attitudes and purchase intentions than textual information (Kim and Lennon, 2008; Mitchell and Olson, 1981).

H1c: 'Subjective quality' will be higher for visual than textual format.

Visual presentation of information can give the summarizing, aggregate-level effect (Amit, Algom and Trope, 2009; Trope and Liberman, 2010). Studies of aesthetics have found evidence for automatic and even unconscious processing of images, which influences perceptions of attractiveness without explicit awareness (Arnheim, 1974). Due to the faster, more automatic, unconscious processing of visual information (Luna and Peracchio, 2003; Unnava and Burnkrant, 1991), it is predicted that objective quality of a decision suffers in visual format. Formally, the following hypothesis for objective decision quality is drawn.

H1d: Objective quality will be lower for visual than textual format.

Effect of Screen Size

There is some, but scarce, research (mainly found in the web design, decision support fields) that examines the effect of the display screen size of information. These studies establish that smaller screen size inhibits information display, information processing, and performance-based choice measures (e.g., Acton, van der Heijden and Golden, 2005; Albers and Kim, 2002; Bridgeman, Lennon and Jackenthal, 2003; Bruijn, Mul and Oostendorp, 1992; Maniar, Bennett, Hand and

Allan, 2008). This stream of research uses performance-based measures of decision including learning time for the presented information, time spent to reach a decision, memorization, retention and accuracy of recall of information, and subsequent cognitive task performance (e.g., verbal and math exercise). The main focus is on the performance-based measures, rather than on decision outcomes.

Due to the established inhibiting effect of small screen size, a larger screen size is expected to do better than smaller screen size, consistent with past research. The main effects of screen size are likely to be as follows:

H2a: ‘Perceived time spent on task’ will be lower for large than small screen.

H2b: ‘Subjective feeling’ will be more positive for large than small screen.

H2c: ‘Subjective quality’ will be higher for large than small screen.

H2d: Objective quality will be higher for large than small screen.

In addition, interaction effects are expected between screen size and information format. Specifically:

H3a: ‘Perceived time spent on task’ will be higher for textual format on small than large screen, but unaffected by screen size for visual format.

H3b: ‘Subjective feeling’ will be more positive for visual than textual format for small screen, but unaffected by format for large screen.

H3c: ‘Subjective quality’ will be higher for textual format on large than small screen, and unaffected by screen size for visual format.

H3d: Objective quality will be higher for textual than visual format on large screen, but unaffected by format for small screen.

Effect of Context(ual) Variables

1. Hedonic versus Utilitarian Product Type

Choice alternatives may also vary in the nature of their attributes. Hedonic attributes, by their very nature, tend to be experiential and difficult to assess pre-consumption (Batra and Ahtola, 1990; MacInnis and Price, 1987). While many products involve both dimensions of hedonic and utilitarian value to differing degrees (Batra and Ahtola, 1990), consumers often characterize some products as primarily hedonic and other products as primarily utilitarian (Werthenbroch and Dhar, 2000).

Scholars have broadly defined hedonic products to provide more experiential, affective, sensual and aesthetic consumption, fun, pleasure, fantasy, and excitement (e.g., designer clothes, sports cars, luxury watches) (Hirschman and Holbrook, 1982; Strahilevitz and Myers, 1998; Werthenbroch and Dhar, 2000). MacInnis and Price (1987) posit that hedonic attributes are more sensory and imagery-invoking.

Utilitarian products are defined in the literature to be more cognitively driven, primarily instrumental, functional, goal-oriented, and accomplishes a practical or functional task (e.g., microwaves, minivans, personal computers) (Hirschman and Holbrook, 1982; Strahilevitz and Myers, 1998; Werthenbroch and Dhar, 2000).

Products such as healthcare and financial products are more utilitarian in nature, while food and apparel choices are often perceived to be more hedonic (e.g., flavors of ice cream; colors of a jacket) (see Werthenbroch and Dhar, 2000).

Scholars suggest that the different hedonic/utilitarian considerations form independent components of product evaluations and attitudes, and allow consumers to

differentiate between products according to their relative hedonic or utilitarian value (Batra and Ahtola, 1990; Mano and Oliver, 1993). Types and amount of information are therefore likely to differ for these product types and influence the effectiveness of information format and display devices on decisions. It is predicted that visual information will help facilitate subjective decision outcomes in a hedonic product choice task than a utilitarian product choice task, much more than textual information will. The following hypotheses indicate the main effect of product type, as well as the interaction between information format and screen size for hedonic and utilitarian product condition.

H4a: ‘Perceived time spent on task’ will be lower for a hedonic than utilitarian product.

H4b: ‘Subjective feeling’ will be more positive for a hedonic than utilitarian product.

H4c: ‘Subjective quality’ will be higher for a hedonic than utilitarian product.

H4d: Objective quality will be higher for a utilitarian than hedonic product.

A two-way interaction is expected between information format and product type, such that:

H5a: ‘Perceived time spent on task’ will be lower for visual than textual format for a hedonic product; but higher for visual than textual format for a utilitarian product.

H5b: ‘Subjective feeling’ will be more positive for visual than textual format for a hedonic product, but more positive for textual than visual format for a utilitarian product.

H5c: ‘Subjective quality’ will be higher for visual than textual format for a hedonic product, but unaffected by format for a utilitarian product.

H5d: Objective quality will be higher for a utilitarian than hedonic product for the textual format, but unaffected by product type for the visual format.

A two-way interaction is expected between screen size and product type, such that:

H6a: ‘Perceived time spent on task’ will be lower for a hedonic than utilitarian product on large screen, but unaffected by product type for small screen.

H6b: ‘Subjective feeling’ will be more positive for large than small screen for a utilitarian product, but unaffected by screen size for a hedonic product.

H6c: ‘Subjective quality’ will be higher for large than small screen for a utilitarian product, but unaffected by screen size for a hedonic product.

H6d: Objective quality will be higher for a utilitarian than hedonic product on large screen, but unaffected by product type for small screen.

A three-way interaction effect of information format, screen size, and product type is expected. Specifically:

H7a: ‘Perceived time spent on task’ will be the lowest for hedonic product in visual format on large screen.

‘Perceived time spent on task’ for a hedonic product will be higher for textual format on small than large screen, but unaffected by screen size for visual format.

‘Perceived time spent on task’ for a utilitarian product will be higher for textual than visual format on large screen, but unaffected by format for small screen.

H7b: ‘Subjective feeling’ will be the most positive for hedonic product in visual format on large screen.

‘Subjective feeling’ for a hedonic product will be more positive for large than small screen for visual format, but unaffected by screen size for textual format.

‘Subjective feeling’ for a utilitarian product will be more positive for large than small screen for textual format, but unaffected by screen size for visual format.

H7c: ‘Subjective quality’ will be the highest for hedonic product in the visual format on large screen.

‘Subjective quality’ for a hedonic product will be higher for visual format on large than small screen, but unaffected by screen size for textual format.

‘Subjective quality’ for a utilitarian product will be lower for visual than textual format regardless of screen size, and higher for large than small screen for textual format.

H7d: Objective quality will be the highest for a utilitarian product in the textual format on large screen.

Objective quality for a hedonic product will be higher for textual than visual format on large screen, but unaffected by format for small screen.

Objective quality for a utilitarian product will be higher on large than small screen for the textual format, but unaffected by screen size for the visual format.

2. Temporal Frame

Consumers often face decisions with imposed expiration dates by which they must make a commitment or purchase decision or lose certain benefits or privileges. For example, in the current marketplace exchange for health insurance, the time window for shopping and committing to a health insurance plan is externally imposed. Similarly, for financial products such as credit cards, a new credit card offer with a guaranteed credit line is available within a limited time window. This “must act today” or “must act this month” is referred to as temporal framing.

Construal-level theory explains the influences of temporal distance on both process and outcome variables. Construal-level theory (CLT) highlights the differences in *how* people represent events in the near and far distance (Trope and Liberman, 2003; Trope and Liberman, 2010). Distance according to this theory can be social, temporal, spatial, psychological, or hypothetical. This theory posits that people have very distinct psychological associations with temporal distances. People represent events in the *distant* future at a “high-level”, decontextualized term or with

greater *abstraction*, and at a “lower-level”, contextualized term or more *concrete* for the more immediate or *near* future events (Liberman and Trope, 1998; Trope and Liberman, 2000). In the near future, people think concretely about the *feasibility* of an event (i.e., means used to achieve the end-states or goals; what constraints may be in the way), whereas in the more distant future, thoughts are more dominated by abstraction of *desirability* of the same event (i.e., why should I accomplish this goal) (Trope and Liberman, 2000). Table 2.1 summarizes the distinctions between high-level and low-level construals as documented by Trope and Liberman (2003).

Table 2.1: Distinctions between High-Level and Low-Level Construals

High-Level Construals	Low-Level Construals
Abstract	Concrete
Simple	Complex
Structured, coherent	Unstructured, incoherent
Decontextualized	Contextualized
Primary, core	Secondary, surface
Superordinate	Subordinate
Goal relevant	Goal irrelevant

Source: Adopted from Trope & Liberman (2003)

Temporal construal research informs that as an event draws nearer in time, individuals shun the abstract representation of their goals in favor of the more concrete, task-specific representation, arousing effective reactions to the situational context (Trope and Liberman, 2000, 2003). In addition, temporal proximity intensifies

individuals' sensitivity to potential barriers and possibility of negative outcomes (Liberman and Trope, 1998).

With time proximity, an alternative that may seem attractive and fit with *desirable* goal in the future loses its appeal and yields to the *feasible* goal when individuals are required to take immediate action (Zauberman and Lynch, 2005). For example, as time nears, the concerns of *desirability* ("Why should I strive to accomplish this goal?") succumbs to concerns of *feasibility* ("How can I go about accomplishing this goal?") (Vallacher and Wegner, 1989). Thus, a choice set that is presented in a near-versus far-distant frame (e.g., buy today vs. buy next month) affects one's evaluation of the alternatives in the choice set and one's decision outcomes. This implies that when tasks are presented in a near-distant future frame, individuals are more vulnerable to making decisions that may not be in their best long-term interest, and therefore low in decision quality.

Research on temporal frame also offers a number of relevant insights. Chandran and Menon (2004) investigated health hazards and found differences in the proximal (near) or distal (far) time frame. Grant and Tybout (2008) manipulated time frames of product launch and found differences in reliance on information for past launch and future launch condition. In a study of the distant future frame of energy savings, Tangari and Smith (2012) found that temporal framing of energy savings products influenced consumers' product choice, purchase intentions, attitude and perception of savings.

The following hypotheses are drawn.

H8a: Due to more concrete thinking, ‘perceived time spent on task’ will be lower in near- than far-distant frame.

H8b: The focus on feasibility will lead to more positive ‘subjective feeling’ in near- than far-distant frame.

H8c: ‘Subjective quality’ will be higher in near- than far-distant frame.

H8d: Objective quality will be higher in far- than near-distant frame.

A two-way interaction is expected between temporal frame and information format, such that:

H9a: ‘Perceived time spent on task’ will be lower in near- than far-distant frame for visual format, and lower in far- than near-distant frame for textual format.

H9b: ‘Subjective feeling’ will be more positive in near- than far-distant frame for textual format, but unaffected by temporal frame for visual format.

H9c: ‘Subjective quality’ will be higher in near- than far-distant frame for visual format, and lower in near- than far-distant frame for textual format.

H9d: Objective quality will be higher for the textual than visual format in near-distant frame, but unaffected by format in far-distant frame.

A two-way interaction is expected between temporal frame and screen size, such that:

H10a: ‘Perceived time spent on task’ will be lower for large than small screen in far-distant frame, and unaffected by screen size in near-distant frame.

H10b: ‘Subjective feeling’ will be more positive for large than small screen in near-distant frame, and unaffected by screen size in far-distant frame.

H10c: ‘Subjective quality’ will be higher for large than small screen in near-distant frame, and unaffected by screen size in far-distant frame.

H10d: Objective quality will be higher in far- than near-distant frame for large screen, but unaffected by temporal frame for small screen.

A three-way interaction is expected among temporal frame, information format and screen size. Specifically:

H11a: ‘Perceived time spent on task’ will be the lowest in near-distant frame for the visual format on large screen.

In near-distant frame, ‘perceived time spent on task’ will be lower for visual than textual format on large screen, but unaffected by format for small screen.

In the far-distant frame, ‘perceived time spent on task’ will be lower for visual than textual format on small screen, but unaffected by format for large screen.

H11b: ‘Subjective feeling’ will be the most positive in the near-distant frame for visual format on large screen.

In the near-distant frame, ‘subjective feeling’ will be more positive for visual than textual format on large screen, but unaffected by format on small screen.

In the far-distant frame, ‘subjective feeling’ will be more positive for textual format regardless of screen size, and more positive on large than small screen for visual format.

H11c: ‘Subjective quality’ will be the highest in near-distant frame for the visual format on large screen.

In the near-distant frame, ‘subjective quality’ will be higher for visual format on large than small screen, and lower for textual format regardless of screen size.

In the far-distant frame, ‘subjective quality’ will be higher for textual format on large than small screen, but unaffected by screen size for visual format.

H11d: Objective quality will be the highest in the far-distant frame for the textual format on large screen.

In the near-distant frame, objective quality will be higher for textual than visual format on small screen, but unaffected by format for large screen.

In the far-distant frame, objective quality will be higher on large than small screen for the textual format, but unaffected by screen size for the visual format.

Having outlined the framework and hypotheses for this dissertation, the next chapter outlines the methodology used to empirically test all the stated hypotheses.

CHAPTER 3

METHODOLOGY

The methodology of this research involves using controlled experiments that randomly assign participants to conditions which will vary by the antecedent variables presented in the research framework. Multiple experiments were conducted to test the hypotheses developed and presented in the previous chapter. Figure 3.1 provides an overall study plan for the research (see Appendix A for a detailed summary of the research study plan).

In order to test the hypotheses, two pretests were first conducted to test the stimuli and experimental manipulations. The three experiments and their findings are described in Chapter 4. Chapter 3 describes the variables and their operationalization first, followed by the pretests of this dissertation. Chapter 3 is organized into two sections:

3.1 Variables and Their Operationalization

3.2 Pretests

Figure 3.1: Summary of Research Study Plan

3.1 Variables and Their Operationalization

Antecedent variables.

Information presentation format – a manipulated experimental variable, the stimuli are presented in either a visual or textual format. The visual format contains cartoon illustration imagery cues, while the textual format consists of only texts. The use of cartoon illustrations allow greater assurance of information equivalency between the two formats, and that any difference observed is not driven by additional information that might be intuited from realistic visual depictions (Townsend and Kahn, 2014).

Screen size – a measured variable through an embedded survey feature on Qualtrics platform that tracks device type used by participants in the study. It was also self-reported by participants via two multiple-choice questions that achieved acceptable statistically significant correlation (Pearson's r ranging .78 – .88 across all studies). The two questions used in the studies are reported in Appendix F.

According to Best (2015), the average screen size of most smartphones is between 5 and 5.6 inches, and the latest iPhone X measures at 5.8 inches. As such, in this research, screen sizes of less than 6 inches were coded as 'small screen' and those of more than 6 inches were coded as 'large screen'.

Hedonic/utilitarian product type – a manipulated experimental variable. Two products were selected according to the literature on hedonic/utilitarian values of products (Batra and Ahtola, 1990; Crowley, Spangenberg and Hughes, 1992; Strahilevitz and Myers, 1998; Voss, Spangenberg, and Grohmann, 2003; Wertenbroch

and Dhar, 2000). The stimuli varied for the studies; Study 1 examined health insurance, while Study 2 featured a credit card and a jacket as stimuli.

Temporal frame – a manipulated experimental variable. As the literature and research on temporal distance has found (Frederick, Loewenstein and O'Donoghue, 2002; Liberman, Sagristano and Trope, 2002; Trope and Liberman, 2003), people represent events in the near- and far-distant differently. One popular operationalization for the temporal frame is via scenario framing wherein subjects are asked to imagine a specific task/event to happen at/within a certain time frame (Liberman, Sagristano and Trope, 2002; Trope and Liberman, 2003). For example, in an article by Trope and Liberman (1998), they examined construal-level theory of temporal distance by manipulating it as tomorrow versus next year, and examined the level of abstractness with which subjects thought about the same behavior in two different time frames.

For this dissertation, the temporal frame used is 'one week from today' to represent the near-distant event, and 'one month from today' to represent the far-distant event.

Manipulation checks.

Perception of the stimulus visualness in terms of its visual content versus textual content was measured using a rating question ('*Please indicate whether you feel the way information was presented to you, contains more text/word or more picture/graphic*' on a 7-point scale from '*1 = More text/word*' to '*7 = More picture/graphic*').

As existing studies do not report how visual manipulation was checked, this single-item measure was created to check the manipulation. Single-item measures have been demonstrated to have equally high predictive validity as multi-item scales (Bergkvist and Rossiter, 2007, 2009).

Perceived hedonic versus perceived utilitarian value of the product used in the studies were adopted from the Voss, Spangenberg and Grohmann's (2003) scale containing 10 evaluative semantic differentials on a 7-point scale, five of which measure the hedonic value and the other five measure the utilitarian value. The full scale items are reported in Appendix F and the scale reliability for all experimental studies is reported in Table G1 in Appendix G. The reliability score is .73 for hedonic scale and .85 for utilitarian scale; both are above acceptable value (Field, 2013).

Perceived temporal distance was measured with a created two-item scale. It measured participants' perception of the near-distant condition as being *nearer* to the present than the far-distant condition. These measures follow the protocol used by previous research (Liberman, Sagristano, and Trope, 2002; Trope and Liberman, 2003). The two questions are highly correlated (Pearson's $r = .99, p < .01$) and correlation is reported in Table G1 in Appendix G.

Dependent variables.

Subjective measures. Because subjective measures are self-reports, they are straightforward to measure using Likert-scale responses. Subjective measures in this dissertation include process variables ('perceived time spent on task', confusion and frustration felt while making a choice), and outcome variables (satisfaction,

confidence, attitude and purchase intention). These are similar to existing research (e.g., Lee and Lee, 2004; Olson and Widing, 2002; Townsend and Kahn, 2014).

Perceived time spent on task was participants' self-reported perception of time taken to make a choice. One item was used to generate their self-report ('*Based on the [product] you just chose, how much did the way information was presented affect your choice making time?*' 1 = *It took much less time than I expected*; 7 = *It took much more time than I expected*).

An objective time spent on task was also recorded through an embedded time stamp feature of the Qualtrics platform (see example in Exhibit B3 in Appendix B). While objective time spent was available, this dissertation focuses on the subjective (i.e., perceived) time spent, and all subsequent analyses and discussions focus on this subjective (or perceived) time spent measure.

Subjective feeling. 'Subjective feeling' is measured by frustration and confusion felt during choice making (using a 7-point Likert scale). Higher score indicates more positive 'subjective feeling'. The items are reported in Appendix F. The two-items correlations across studies are significant (Study 1 Pearson's $r = .615$, $p = .000$; Study 2 Pearson's $r = .764$, $p = .000$; Study 3 Pearson's $r = .741$, $p = .000$), and reported in Tables G2-G4 in Appendix G.

Subjective quality. 'Subjective quality' is measured by four manifest variables (satisfaction, confidence, attitude, and purchase intention) using a 7-point Likert scale. Higher score indicates more positive 'subjective quality'. The four items are described in Appendix F. The manifest variables are related components (Howard 1974; Howard and Sheth, 1969; Solomon, 2013), and appropriate factor analyses were

conducted on these items for each study using the principal component factor analysis with Varimax rotation. All descriptive statistics for the four manifest variables indicate skewness and kurtosis values that are acceptable for normal distribution assumption (ranging close to zero; Field, 2013). The results from the factor analyses indicate that the four items adequately loaded onto one factor. Tables G2-G4 in Appendix G report the factor loadings and reliability analyses across all three studies; high reliability is indicated with Cronbach's $\alpha > .80$ (Study 1 $\alpha = .817$; Study 2 $\alpha = .885$; Study 3 $\alpha = .922$), and deemed to be statistically robust (Field, 2013). In addition, Tables G2-G4 also report Pearson's correlations between 'subjective feeling' and 'subjective quality' which indicate only a weak-moderate negative relationship between the two (Pearson's $r < -.5$; Field, 2013).

Objective measures of decision quality. For an objective standard, research on decision quality has used the following two major operationalizations to measure objective quality. The first measure is the proportion of choice made on dominant versus nondominant alternatives. A dominant alternative is defined as one that is superior on at least one attribute level, without being inferior on any other attribute levels for alternatives in the choice set (Haubl and Trifts, 2000; Olson and Widing, 2002). A consumer's choice of nondominant alternatives is considered to be sub-optimal (Haubl and Trifts, 2000).

A second objective measure of decision quality looks at the proportion of respondents who, when given a chance, switch from their initial choice (Haubl and Trifts, 2000; Olson and Widing, 2002; Widing and Talarzyk, 1993). Choice switching is indicative of decision error (Haubl and Trifts, 2000; Widing and Talarzyk, 1993).

Objective decision quality in this research is thus a two-part measure: first measure uses a Z-test of the proportion of dominant choice vs. nondominant choice made by participants, and second a Z-test of the proportion of choice switching.

Contextual variables. Five contextual variables were measured that are covariates in this research, and are operationalized as follows.

1. *The Style of Processing Scale* (adapted from Childers, Houston and Heckler, 1985) containing 10 items (4-point Likert scale) were used to assess participants' ability and preference to process visual information. As shown in Table G5 in Appendix G, this measure has moderate to high Cronbach's alpha scores across the studies, suggesting acceptable reliable internal consistency (Study 1 $\alpha = .606$; Study 2 $\alpha = .802$; Study 3 has a relatively lower Cronbach's alpha of .441).

2. *Involvement.* Different degree of involvement with objects leads to different responses to the said objects (Laurent and Kapferer, 1985; Zaichkowsky, 1985). An involvement scale created by Mittal (1989) is adopted because it measures involvement with choice tasks, which is relevant to this dissertation. The scale items are presented in Appendix F, and Table G5 in Appendix G reports consistently high Cronbach's alphas across studies (Study 1 $\alpha = .825$; Study 2 $\alpha = .772$; Study 3 $\alpha = .792$).

3. *Numeracy.* There are generally two scales used in extant research to measure numeracy skills – objective numeracy and subjective numeracy (Fagerline et al., 2007). The objective numeracy scale includes questions that assess people's overall ability to perform mathematical tasks. Tasks include risk magnitudes using

percentages and proportions, converting percentages to proportions, proportions to percentages, as well as probabilities to proportions. Critiques have posited that when administering objective numeracy tests online, it is possible that participants may use calculators or ask for others' help, which can threaten the validity of the research (Fagerline et al., 2007).

Therefore, for the purpose of this dissertation, a subjective numeracy scale was adopted. Subjective numeracy is defined as “aptitude with probabilities, fractions, and ratios” (Fagerlin et al., 2007, p. 672). The Subjective Numeracy Scale (SNS) contains 8 items that measure one's aptitude for numbers, percentages, probabilities, fractions and ratios. The scale items are reported in Appendix F. Table G5 in Appendix G reports adequately high Cronbach's alpha scores across all experimental studies, indicating reliable internal consistency (Study 1 $\alpha = .833$; Study 2 $\alpha = .806$; Study 3 $\alpha = .801$).

4. Perceived task difficulty. Perception of task difficulty can influence task performance and outcome (Townsend and Kahn, 2014; Samuelson, 1991). A rating question on the perceived task of the experiment (using 7-point Likert scale) was used to measure participants' perception of task difficulty. The rating question is adopted from Townsend and Kahn (2014) and is reported in Appendix F.

5. Demographic information. In addition to the above covariates, basic demographic information such as gender, age, education level, and household income were also collected.

3.2 Pretests

Before implementing the experimental designs, two pretests were conducted to ensure that the research instruments and manipulations were effective. Each of these pretests is described below.

Pretest 1: Visual vs. textual stimuli and questionnaire pretest.

Purpose. The primary goal for this pretest is to test the visual and textual designs of the stimuli. The secondary goal is to test for comprehension of the questions in the instruments.

Stimuli. Credit card options were used as the stimuli having attributes of annual fee, APR/interest rate, and rewards (consistent with the marketplace; e.g., creditcards.com). The stimulus designs follow the protocol explicated by Townsend and Kahn (2014) such that the visual stimuli used cartoon illustrations. Figure 3.2 contains the stimuli used in this pretest.

Figure 3.2: Pretest 1 Credit Card Stimuli (Visual vs. Textual Format)

	Credit Card 1	Credit Card 2	Credit Card 3	Credit Card 4	Credit Card 5
Annual Fee
APR/ Interest Rate
Rewards

	Credit Card 1	Credit Card 2	Credit Card 3	Credit Card 4	Credit Card 5
Annual Fee	\$0	\$0	\$0	\$0	\$12
APR/ Interest Rate	15.99%	16.99%	20.99%	23.99%	23.99%
Rewards	3% Cash back	3% Cash back	None	\$1 = 1 Point	1% Cash back

Design and Procedure. The design was a repeated measure wherein participants were exposed to a pair of visual and textual stimuli about a set of credit card options. They were asked to (1) rate which of the stimuli was more visual (contained more picture/graphic), (2) pick a stimulus format (visual vs. textual) they want to receive information about the credit card options, (3) indicate reasons for their stimulus choice, and (4) indicate whether they were ready/able to choose among the options given in the choice set.

Participants. Two-hundred-fifty-nine undergraduate students (41% female; average age 20 years ranging from 19 to 35) at a large northeastern university participated in the online survey in exchange of extra course credit.

Results. To test whether the visual stimulus was perceived to be more visual than the textual stimulus, a paired-samples *t*-test was conducted on the pretest dataset. On average, participants rated the visual stimulus to be more visual ($M = 7.69$, $SD = 2.594$, $SE = .163$) than the textual stimulus ($M = 2.65$, $SD = 2.079$, $SE = .131$), and this

difference is significant ($t_{(251)} = 19.187, p = .000 < .05$), with Cohen's $d = 2.16$ inferring that the difference between the two means is larger than two standard deviations, and is a large-sized effect (Field, 2013).

When asked which format they would prefer to view information about the credit card offers, the majority of participants (81.4%) chose the textual format. Among those who chose the textual format to view the information, 58% indicated they were ready/able to make a choice among the available options (compared to 49% for those who chose the visual format; the differences are not significantly different, $Z = .986, p = .322$).

Of all the participants, 56.2% indicated that they were able/ready to make a choice (43.8% indicated that they were not able/ready to make a choice). Participants who indicated that they were not able/ready to make a choice, were asked to provide reasons through an open-ended question. Three themes emerged from this pretest's open-ended responses to not being able/ready to make a choice: (1) participants expressed the need to consult another source; (2) participants felt they did not have enough knowledge about the topic; and (3) they felt that the cartoons used in the stimuli make the information appear less credible. Based on the third reason, the experimental stimuli were modified in Pretest 2; instead of using cartoons that contained facial expressions (e.g., smiling), neutral cartoon-illustrated objects were used.

Pretest 2: Stimulus pretest, task variables, credibility, informativeness, familiarity, importance, and diagnosticity of attributes.

Purpose. Learning from the results of Pretest 1, the goals for Pretest 2 were fourfold: (1) to replicate the manipulation test of the visual vs. textual stimuli; (2) to test the manipulations of the hedonic/utilitarian value of product and perceived task difficulty of choice tasks; (3) to test the credibility and informativeness of the information in the scenario; and finally (4) to test the diagnosticity of the levels of each attribute.

Stimuli. Pretest 2 used credit cards and jacket as the stimuli. The attributes selected for the pretest stimuli followed the convention in the actual marketplace (e.g., macys.com; creditcards.com). For jacket, the attributes used were price, shipping cost, and expected delivery period. For credit card, the attributes include annual fee, annual percentage rate (APR), and rewards on the card. Similar to Pretest 1, the designs of the stimuli followed the protocol explicated by Townsend and Kahn (2014), and used cartoon-illustrated objects. Figures 3.3 and 3.4 contain the stimuli used in Pretest 2.

Figure 3.3: Pretest 2 Credit Card Stimuli (Visual vs. Textual Format)

Credit Card A Annual Fee	APR/Interest Rate	Rewards
Credit Card B Annual Fee	APR/Interest Rate	Rewards
Credit Card C Annual Fee	APR/Interest Rate	Rewards
Credit Card D Annual Fee	APR/Interest Rate	Rewards
Credit Card E Annual Fee	APR/Interest Rate	Rewards

Credit Card A \$0 Annual Fee	13.49% APR/Interest Rate	1% cash back Rewards
Credit Card B \$95 Annual Fee	23.99% APR/Interest Rate	5% cash back Rewards
Credit Card C \$30 Annual Fee	18.49% APR/Interest Rate	3% cash back Rewards
Credit Card D \$0 Annual Fee	13.49% APR/Interest Rate	5% cash back Rewards
Credit Card E \$50 Annual Fee	16.99% APR/Interest Rate	0% cash back Rewards

Figure 3.4: Pretest 2 Jacket Stimuli (Visual vs. Textual Format)

Jacket A \$99 Price \$4.95 Shipping Cost 5 Days Expected Delivery	Jacket A \$99 Price \$4.95 Shipping Cost 5 Days Expected Delivery
Jacket B \$129 Price \$7.99 Shipping Cost 2 Days Expected Delivery	Jacket B \$129 Price \$7.99 Shipping Cost 2 Days Expected Delivery
Jacket C \$99 Price \$5.99 Shipping Cost 7 Days Expected Delivery	Jacket C \$99 Price \$5.99 Shipping Cost 7 Days Expected Delivery
Jacket D \$84 Price \$4.95 Shipping Cost 2 Days Expected Delivery	Jacket D \$84 Price \$4.95 Shipping Cost 2 Days Expected Delivery
Jacket E \$109 Price \$9.99 Shipping Cost 3 Days Expected Delivery	Jacket E \$109 Price \$9.99 Shipping Cost 3 Days Expected Delivery

Design and Procedure. In order to achieve the goals of this pretest, a 2 (information format: visual vs. textual) x 2 (product type: hedonic vs. utilitarian) between-subject design was adopted. The participants were randomly assigned to different choice task conditions (jacket vs. credit card), and either received a visual or textual information for the assigned task condition.

Upon exposure to the stimulus, participants were asked to rate the credibility and informativeness of the scenario and stimulus, the diagnosticity for the levels of the attributes in the stimulus, the visualness of the stimulus (whether the information presented contains more text/word or more image/graphic), perceived task difficulty, and perceived hedonic value of the product in the choice task.

Participants. One-hundred-forty-two undergraduate upper-classmen (50.4% female) from a large northeastern university participated in an online survey in exchange for extra course credit.

Results. To test for the group differences in the rating for the visualness of the stimuli, an independent t -test was performed on the data. The visual stimulus ($M = 6.778$, $SD = 1.766$, $SE = .214$) was significantly higher in imagery/graphic ($t_{(118)} = 5.201$, $p = .000 < .05$) than the textual stimulus ($M = 4.304$, $SD = 2.583$, $SE = .313$).

The group differences for visualness rating were also significant when analyzed within product type. For Jacket group, the visual stimulus ($M = 6.19$, $SD = 1.747$, $SE = .304$) was significantly higher in imagery/graphic content ($t_{(61)} = 2.864$, $p = .006 < .05$) than the textual stimulus ($M = 4.66$, $SD = 2.642$, $SE = .440$). Similarly for Credit Card group, the visual stimulus ($M = 6.36$, $SD = 1.805$, $SE = .305$) was significantly higher in imagery/graphic content ($t_{(58)} = 4.403$, $p = .000 < .05$) than the textual stimulus ($M = 4.00$, $SD = 2.522$, $SE = .439$).

The hedonic value for jacket ($M = 5.24$, $SD = .737$, $SE = .088$) was significantly higher ($t_{(137)} = 4.980$, $p = .000 < .05$) than for credit card ($M = 4.57$, $SD = .857$, $SE = .103$).

Table 3.1 summarizes the successful manipulations in Pretest 2.

Table 3.1: Summary of Manipulation Results from Pretest 2

Manipulations	Mean Scores		Significance Value
Information format (visual vs. text)	Visual = 6.27 SD = 1.766	Textual = 4.30 SD = 2.583	$t_{(118)} = 5.210$ $p = .000$
Information format (jacket stimulus)	Visual = 6.19 SD = 1.747	Textual = 4.66 SD = 2.642	$t_{(61)} = 2.864$ $p = .006$
Information format (credit card stimulus)	Visual = 6.36 SD = 1.805	Textual = 4.00 SD = 2.522	$t_{(58)} = 4.403$ $p = .000$
Perceived hedonic value (jacket vs. credit card)	Jacket = 5.24 SD = .737	Credit Card = 4.57 SD = .857	$t_{(137)} = 4.980$ $p = .000$

To ensure that the experimental stimuli and information were effective and credible, measures of information credibility, informativeness, attribute familiarity and importance, as well as attribute diagnosticity were collected. Credibility of information was measured with 3 items (7-point Likert scale), informativeness with 2 items (7-point Likert scale), attribute familiarity with 1 item each (7-point Likert scale) and attribute importance with point allocation (100-point allocation scale), and diagnosticity of the levels of each attribute was measured with 3 items (7-point Likert scale). Appendix F contains the items used for these measures.

To achieve acceptable scores for assurance of credibility, informativeness, familiarity, importance and diagnosticity of the attributes, the grand mean for each of these scales must capture more than the central value of their respective scales (e.g., must be greater than 3.5 for a 7-point scale; greater than 50 for a 100-point allocation scale) (Gourville, 1998). Both Jacket and Credit Card groups all have mean values

above 4.0 (see Tables 3.2, 3.3 and 3.4), which indicate that the information provided in the experimental stimuli is credible, sufficient, and effective.

Table 3.2: Summary of Credibility and Informativeness Scores from Pretest 2

Scale (individual items are reported in the Appendix)	Jacket Group (N = 71)	Credit Card Group (N = 71)
Credibility of information (3 items)	$\bar{X} = 4.54$ SD = 1.433	$\bar{X} = 4.47$ SD = 1.146
Informativeness (2 items)	$\bar{X} = 5.23$ SD = 1.325	$\bar{X} = 5.32$ SD = 1.160

Table 3.3: Summary of Jacket Attribute Scores from Pretest 2

Scale (individual items are reported in the Appendix)	Jacket Group (N = 71)		
	Price	Shipping Cost	Delivery Period
Attribute Familiarity (1 item)	$\bar{X} = 5.83$ SD = 1.090	$\bar{X} = 5.76$ SD = 1.080	$\bar{X} = 5.59$ SD = 1.210
Attribute Importance (1 item; out of 100)	$\bar{X} = 67.34$ SD = 18.890	$\bar{X} = 18.89$ SD = 10.170	$\bar{X} = 13.77$ SD = 11.840
Diagnosticity (3 items)	$\bar{X} = 4.96$ SD = 1.356	$\bar{X} = 4.96$ SD = 1.426	$\bar{X} = 4.88$ SD = 1.366

Table 3.4: Summary of Credit Card Attribute Scores from Pretest 2

Scale (individual items are reported in the Appendix)	Credit Card Group (N = 71)		
	Annual Fees	APR/Interest Rates	Cash Back Rewards
Attribute Familiarity (1 item)	$\bar{X} = 5.09$ SD = 1.640	$\bar{X} = 4.99$ SD = 1.450	$\bar{X} = 5.01$ SD = 1.560
Attribute Importance (1 item; out of 100)	$\bar{X} = 33.92$ SD = 13.610	$\bar{X} = 43.45$ SD = 17.810	$\bar{X} = 23.47$ SD = 13.140
Diagnosticity (3 items)	$\bar{X} = 4.75$ SD = 1.313	$\bar{X} = 4.97$ SD = 1.396	$\bar{X} = 4.793$ SD = 1.233

The results from the two pretests established successful manipulation checks and stimuli for use in the main studies. In the next chapter, the methodology of each experimental study and results from the hypothesis tests are reported.

CHAPTER 4

EXPERIMENTAL STUDY DESIGNS AND FINDINGS

With the pretests establishing the reliability and relevance of stimulus properties, 3 experimental studies were designed and implemented to systematically test the hypotheses. The experimental studies were performed using an online instrument via the Qualtrics platform. Study 1 tests hypotheses H1-H3 regarding the effects of information format and screen size on various dependent variables; Study 2 extends the previous study and tests product type related hypotheses (H4-H7); and finally, Study 3 tests the temporal frame hypotheses (H8-H11). In this chapter, the specific methodology and findings for each of the studies are described. The dependent variables are similar across all studies, and the results are organized by the dependent variables tested in each study.

Study 1: Effects of Information Format and Screen Size

Purpose. Study 1 tests H1-H3, which examines hypotheses regarding the effects of visual stimulus, screen size and their interactions. The objectives of this study are twofold: (1) to explicate the process underlying the visual effect and (2) to assess effect on objective decision quality in addition to the existing effects on subjective decision quality.

Stimuli. Individual health insurance is used as the stimulus in this study. Health insurance decisions are infrequent and suited to an experiment on objective quality. It

also provides a way to understand the visual advantage in a task environment that extends beyond existing research which had focused on products where subjective outcomes are more common (e.g., apparel, food).

The stimuli were designed using Affordable Care Act marketplace exchange options as a guide (e.g., healthyhode.ri.gov). The choice set was constructed with 7 alternatives varying at 4 attribute levels. The attributes chosen are deductible, out-of-pocket maximum, primary/specialist co-pay and annual premium costs. Exhibit C1 in Appendix C describes the study's stimuli. The stimuli were designed for cross-platform display (i.e., the resolution and pixels were compatible for both small and large screens). Exhibit C2 in Appendix C presents screenshots of the stimuli on both screen conditions.

Experimental Design and Procedure. The experiment employs a 2 (information format: visual vs. textual) x 2 (screen size: small vs. large) between-subject design. To achieve external validity, participants were recruited through Amazon Mechanical Turk with guaranteed monetary incentive for completion. M-Turk workers only qualify to participate if they use a certain device (i.e., a smartphone for the small screen condition vs. a laptop or desktop computer for the large screen condition) to complete the online instrument via Qualtrics platform. The Qualtrics metainformation survey feature on device type was embedded (invisible to participants) in the survey instrument to track and control the type of device from which participants accessed and completed the instrument. In addition, participants self-reported their device and screen size with a two-question measure on device screen size.

Participants were randomly assigned to one of the four experimental conditions. They were then asked to imagine they were shopping for the experimental individual health insurance plan. The scenario indicated that the presented alternatives were narrowed down by the participants themselves. They were next asked to view the choice set presented in random order and make a preference (see Figure 4.1 for the study scenario). After the selection of their preferred choice, they answered questions containing measures of the dependent variables. Participants were then given an opportunity to switch their choice, and those who opted to switch were asked to indicate their new choice. In addition to manipulation check question, they were asked to complete the involvement, numeracy and Style of Processing scales, perceived task difficulty, and demographic information.

Figure 4.1: Study 1 Scenario (Health insurance)

Imagine you are shopping for an individual health insurance plan, and have narrowed your choices down to the following options, which **differ ONLY on the following dimensions: Deductible, Out-of-Pocket Maximum, Copay, and Annual Premium.**

As a guide, these dimensions are defined as:

- Deductible: The amount you pay for covered healthcare services before your insurance plan starts to pay. For example, with a \$2,000 deductible, you pay the first \$2,000 of covered services yourself.
- Out-of-Pocket Maximum: The most you have to pay for covered services in a plan year. After you hit this amount on deductibles and copays, your health plan will pay 100% of the costs of covered benefits for the rest of the plan year.
- Copay: A flat fee (for example, \$20) that you pay for a healthcare service each time you use the service, before you hit your out-of-pocket maximum.
- Annual Premium: The amount of premium (i.e., cost of coverage) you pay per plan year.

Please choose **ONE** plan which **YOU PREFER MOST**.

Participants. Three-hundred-sixty-seven independent unique M-Turk workers (46% female, average age 33 ranging from 21 to 71) completed the online instrument.

Manipulation check. Stimulus manipulation was successful. An independent-samples *t*-test was conducted on the dataset. Participants rated the visual stimulus to be more visual ($M = 5.01$, $SD = 1.327$, $SE = .098$) than the textual stimulus ($M = 2.66$, $SD = 1.826$, $SE = .135$), and the difference is significant ($t_{(365)} = 14.060$, $p = .000 < .05$).

Hypothesis tests.

1. Process outcomes for health insurance choices

Perceived Time Spent on Task. To test for the effects of information format and screen size on ‘perceived time spent on task’, a 2x2 ANCOVA using the *F*-test was conducted with information format and screen size as the independent variables, while controlling for the effect of the covariates (style of processing, involvement, numeracy, perceived task difficulty, gender, age, education, and household income).

Hypothesis H1a states that ‘perceived time spent on task’ is lower in visual than textual format. A univariate *F*-test reveals a significant mean difference ($F_{(1,353)} = 14.196$, $p = .000$, partial $\eta^2 = .039$); those in the visual format perceived to have spent less time ($M = 2.493$, $SE = .092$) than those in the textual format ($M = 2.987$, $SE = .093$). This supports H1a.

H2a states that ‘perceived time spent on task’ is higher for small than large screen. The univariate *F*-test analysis reveals a significant main effect of screen size ($F_{(1,353)} = 27.730$, $p = .000$, partial $\eta^2 = .073$); those in the small screen perceived to have spent

more time ($M = 3.087$, $SE = .093$) than those in the large screen ($M = 2.393$, $SE = .093$). This supports H2a.

H3a articulates an interaction effect between information format and screen size for ‘perceived time spent on task’. The univariate F -test analysis reveals a significant interaction effect ($F_{(1,353)} = 35.019$, $p = .000$, partial $\eta^2 = .090$). ‘Perceived time spent on task’ was higher for textual and small screen condition ($M = 3.725$, $SE = .133$) than textual and large screen condition ($M = 2.248$, $SE = .131$); and roughly the same for both visual and small screen condition ($M = 2.449$, $SE = .130$) and visual and large screen condition ($M = 2.537$, $SE = .132$). The significant interaction effect supports H3a. Figure 4.2 depicts the interaction graphically.

Figure 4.2: Two-way Interaction Effect of Information Format and Screen Size on ‘Perceived Time Spent on Task’ (Study 1: Health Insurance)

Subjective Feeling. H1b states that ‘subjective feeling’ is more positive in visual than textual format. The F -test pairwise comparison reveals a significant main effect of information format on ‘subjective feeling’ ($F_{(1,353)} = 5.655, p = .018$, partial $\eta^2 = .016$). The mean value in the visual format ($M = 2.989, SE = .104$) is higher (i.e., more positive) than in the textual format ($M = 2.636, SE = .105$). These results support H1b.

H2b states that ‘subjective feeling’ is more positive for large than small screen. The F statistic ($F_{(1,353)} = 2.442, p = .119$, partial $\eta^2 = .007$) is not significant. H2b is not supported.

H3b states that an interaction between information format and screen size occurs for ‘subjective feeling’. The F statistic reveals a significant interaction effect of information format and screen size on ‘subjective feeling’ ($F_{(1,353)} = 7.949, p = .005$, partial $\eta^2 = .022$). The mean value of ‘subjective feeling’ was higher (i.e., more positive) for those in visual and small screen condition ($M = 3.316, SE = .147$) than those in textual and small screen condition ($M = 2.542, SE = .151$); but those in visual and large screen condition ($M = 2.661, SE = .149$) was lower (i.e., less positive) than those in textual and large screen condition ($M = 2.731, SE = .148$). The significant interaction effect supports H3b. Figure 4.3 presents a graphical depiction of this interaction.

Figure 4.3: Two-way Interaction Effect of Information Format and Screen Size on ‘Subjective Feeling’ (Study 1: Health Insurance)

2. Decision outcomes of health insurance choices

Subjective Quality. H1c states that ‘subjective quality’ is higher for visual than textual format. Using an F -test, the pairwise comparison of information format reveals a non-significant main effect on ‘subjective quality’ ($F_{(1,353)} = 1.588, p = .208$, partial $\eta^2 = .004$). H1c is thus not supported.

H2c states that ‘subjective quality’ is higher for large than small screen. The F -test reveals a non-significant main effect of screen size ($F_{(1,353)} = 2.013, p = .157$, partial $\eta^2 = .006$). H2c is not supported.

H3c states that an interaction effect of information format and screen size is expected for ‘subjective quality’. The analysis reveals a significant interaction effect ($F_{(1,353)} = 4.440, p = .036$, partial $\eta^2 = .012$). The mean value was higher for those in

visual and small screen condition ($M = 5.118$, $SE = .126$) than those in textual and small screen condition ($M = 5.007$, $SE = .130$); those in visual and large screen condition ($M = 5.028$, $SE = .128$) was lower than those in textual and large screen condition ($M = 5.460$, $SE = .127$). These results support H3c. Figure 4.4 depicts the two-way interaction effect in graphical form.

Figure 4.4: Two-way Interaction Effect of Information Format and Screen Size on ‘Subjective Quality’ (Study 1: Health Insurance)

Objective Quality. As discussed in Chapter 3, to test for the objective quality hypothesis, tests were performed on the two measures of objective quality – ‘proportion of dominant choice’ and ‘choice switching’. To test for the significant difference between groups for these two measures, Z-test statistics were conducted on the proportions.

Objective Choice. Following from H1d, objective choice is expected to be higher in textual than visual format. A Z test reveals that significantly more participants chose the dominant choice (Plan D) in the textual format (99; 27.0%) than in the visual format (78; 21.3%). The Z test is significant ($Z = -2.244, p = .012$), supporting H1d.

Similarly, following from H2d, objective choice is expected to be higher for large than small screen. Participants in the large screen condition (89; 24.3%) were just as likely to choose the objective choice (Plan D) as those in the small screen condition (88; 24.0%). The Z test on these observations were not significant ($Z = 0.154, p = .440$); H2d is not supported.

Following from H3d, objective choice is expected to be higher for textual than visual format in large screen, and indifferent in small screen. In the small screen, participants in the visual format (41; 23.2%) were as likely to choose the dominant choice as those in the textual format (47; 25.7%); Z test is not significant ($Z = -1.026, p = .151$). In the large screen, significantly more participants chose the dominant choice (Plan D) in the textual format (52; 28.4%) than in the visual format (37; 20.1%). The Z test is significant ($Z = -2.146, p = .015$); H3d is supported.

Choice Switching. Following from H1d, choice switching is more likely in visual than textual format. A Z test performed on the proportions of choice switching behavior reveals that greater switching took place in the visual condition (107; 29.2%) than in the textual condition (73; 19.9%). The Z test is once again significant ($Z = 3.499, p = .000$), supporting H1d.

Following from H2d, choice switching is expected to be more likely for the small screen condition than the large screen condition. Contrary to the hypothesis, participants in the small screen condition (80; 21.8%) were less likely to switch than those in the large screen condition (100; 27.2%); the Z test is significant ($Z = 2.139, p = .016$). H2d is not supported.

Following from H3d, choice switching is expected to be higher for visual than textual format in large screen, and modest in small screen. In the small screen, participants in the visual format (50; 27.2%) were more likely to switch than those in the textual format (30; 16.4%); Z test is significant ($Z = 2.845, p = .002$). In the large screen, participants in the visual format (57; 31.0%) were more likely to switch than those in the textual format (43; 23.5%). The Z test is significant ($Z = 2.160, p = .015$). H3d is supported.

Summary of Study 1. Table 4.1 summarizes the findings in Study 1.

Study 1 findings provide some support for the hypotheses of visual advantage, particularly for ‘perceived time spent on task’, and ‘subjective feeling’; main effect was not found for ‘subjective quality’. The screen size main effect was only found for ‘perceive time spent on task’. The interaction effects of information format and screen size were observed for all dependent variables.

Consistent with the hypotheses, the visual condition did not fare as well as the textual condition in facilitating objective quality of choice, in both measures of objective quality. The objective choice was higher in textual than visual condition, while choice switching was higher in visual than textual condition. Screen size effect,

however, was not found for objective choice; choice switching was found to be significantly higher in large screen than small screen contrary to the hypothesis.

Table 4.1: Summary of Findings from Study 1

Independent Variables	Dependent Variables	Hypothesis	Support
Information Format	Perceived Time Spent	H1 a	✓
	Subjective Feeling	H1 b	✓
	Subjective Quality	H1 c	X
	Objective Quality	H1 d	✓
Screen Size	Perceived Time Spent	H2a	✓
	Subjective Feeling	H2b	X
	Subjective Quality	H2c	X
	Objective Quality	H2d	X
Information Format * Screen Size	Perceived Time Spent	H3a	✓
	Subjective Feeling	H3b	✓
	Subjective Quality	H3c	✓
	Objective Quality	H3d	✓

Because of the mixed results of the visual advantage on the subjective measures, one may argue that there may be something else at play in these results, and they may not be entirely attributed to the visual effect. As indicated in the design of Study 1, the health insurance product was intentionally selected as the experimental stimulus in an endeavor to emphasize objective decision quality. To investigate the possibilities of product category effect, Study 2 was designed with a hedonic as well as a utilitarian product in a 2x2x2 experimental design.

Study 2: Hedonic vs. Utilitarian Product Choice

Purpose. The primary goal of Study 2 is to specifically test for effect differences in hedonic vs. utilitarian products. In addition to testing for H1-H3, Study 2 tests H4-H7 related to hedonic and utilitarian product differences.

Stimuli. The two products chosen are jacket and credit card. A jacket is perceived to be more hedonic while a credit card is a utilitarian product (Batra and Ahtola, 1990; MacInnis and Price, 1987; Strahilevitz and Myers, 1998; Wertenbroch and Dhar, 2000). In addition, these two products often lend themselves to one type of information format than the other; for instance consumers are more used to seeing health insurance or financial products presented in text form whereas products such as apparel or food are often depicted with some degree of pictorial/graphic form (Townsend and Kahn, 2014). The use of the two products in this dissertation allows us to directly assess whether the visual advantage extends beyond the usual food/apparel (hedonic) categories.

For each of the product choice tasks, the problem size was kept constant. Each choice set contains 7 alternatives that vary at 4 attribute levels. The size of the problem (number of alternatives by number of attributes) assures that both tasks are comparable in complexity (see for example, Jacoby, Speller and Berning, 1974; Townsend and Kahn, 2014).

Appendix D contains the stimuli used in this study.

Design and Procedure. The design for this study is 2 (information format: visual vs. textual) x 2 (screen size: large vs. small) x 2 (product choice task: hedonic vs. utilitarian) full factorial design. M-Turk workers were recruited for the study with

guaranteed monetary incentive, and controlled for their use of device type as in Study 1.

Similar to Study 1, participants read information about **credit cards** (utilitarian condition) or **jackets** (hedonic condition), and then were asked to make a choice among the alternatives. Figure 4.5 presents the scenario in this study. Dependent variables, manipulation checks, and covariates are similar to those in Study 1. An additional manipulation check measures perceived hedonic value of the two choice task conditions.

Figure 4.5: Study 2 Scenario (Credit Card Example)

Imagine you are shopping for a credit card, and have narrowed your choices down to the following options, which **differ ONLY on the following dimensions: Annual Fee, APR, Sign Up Bonus, and Cash Back.**

As a guide, these dimensions are defined as:

- Annual Fee: A yearly fee charged to your credit card account for the use of a credit card.
- APR: The annual percentage rate is the interest rate applied to any outstanding balance that is not settled by each month's due date, and is charged to your credit card account.
- Sign Up Bonus: A bonus amount credited into your credit card account once when you sign up for the credit card.
- Cash Back: The incentive scheme of cash back on purchases for your use of the credit card.

Please choose **ONE** credit card which **YOU PREFER MOST.**

Participants. Four-hundred-forty-nine M-Turk workers (44% female, average age of 29, ranging from 18 to 67) completed the instrument in exchange for guaranteed monetary compensation. Of the total 449 participants, 217 were randomly

assigned to the utilitarian condition (credit card; 43.5% female, average age of 32 ranging from 19 to 65), and 232 were in the hedonic condition (jacket, 45% female, average age of 30.5 ranging from 18 to 67).

Manipulation check. The utilitarian and hedonic manipulations were successful. The credit card group ($M = 5.19$, $SD = 1.359$, $SE = .092$) scored higher on utilitarian scale than jacket group ($M = 4.74$, $SD = 1.589$, $SE = .104$); the difference is significant ($t_{(447)} = 3.202$, $p = .001$). Also, the jacket group ($M = 4.87$, $SD = .986$, $SE = .065$) scored higher on hedonic scale than credit card group ($M = 4.67$, $SD = 1.136$, $SE = .077$); once again the difference is significant ($t_{(447)} = -2.056$, $p = .040$).

Hypothesis tests.

In order to test the hypotheses, statistical procedures and analyses were performed on the data, while controlling for the covariates similar to Study 1. Results are reported by the process and outcome variables.

1. Process outcomes of hedonic vs. utilitarian choice tasks

Perceived Time Spent on Task. H1a states that ‘perceived time spent’ is lower in visual than textual format. The F -test reveals a non-significant main effect of information format ($F_{(1,327)} = 1.731$, $p = .189$, partial $\eta^2 = .005$). H1a is not supported.

H2a states that ‘perceived time spent on task’ is lower for large than small screen. The F -test reveals a non-significant main effect of screen size ($F_{(1,327)} = 0.004$, $p = .949$, partial $\eta^2 = .000$). H2a is not supported.

H3a states that an interaction effect between information format and screen size occurs for ‘perceived time spent on task’. The F -test reveals a non-significant interaction effect ($F_{(1,327)} = .000$, $p = .989$, partial $\eta^2 = .000$). H3a is not supported.

H4a states that ‘perceived time spent on task’ is lower in hedonic than utilitarian choices. The analysis reveals a significant main effect of product type ($F_{(1,327)} = 3.763, p = .053, \text{partial } \eta^2 = .011$). However, contrary to the hypothesis prediction, ‘perceived time spent on task’ was higher for the hedonic (jacket) condition ($M = 3.338, SE = .106$) than the utilitarian (credit card) condition ($M = 3.034, SE = .113$). H4a is thus not supported.

H5a states that a two-way interaction effect of information format and product type occurs for ‘perceived time spent on task’. The analysis reveals a non-significant interaction effect of information format and product type on ‘perceived time spent on task’ ($F_{(1,327)} = .386, p = .535, \text{partial } \eta^2 = .001$). H5a is not supported.

H6a states that a two-way interaction effect of screen size and product type is expected for ‘perceived time spent on task’. The analysis reveals a non-significant interaction effect ($F_{(1,327)} = 0.801, p = .371, \text{partial } \eta^2 = .002$). H6a is not supported.

H7a states that a three-way interaction effect of information format, screen size and product type occurs for ‘perceived time spent on task’. The ANCOVA analysis reveals a non-significant three-way interaction effect among the independent variables ($F_{(1,327)} = 0.015, p = .902, \text{partial } \eta^2 = .000$). H7a is not supported.

Subjective Feeling. H1b states that ‘subjective feeling’ is more positive in the visual format than textual format. The test reveals a non-significant main effect ($F_{(1,327)} = 2.508, p = .114, \text{partial } \eta^2 = .008$). H1b is not supported.

H2b states that ‘subjective feeling’ is more positive in large than small screen. The analysis reveals a significant main effect ($F_{(1,327)} = 16.045, p = .000, \text{partial } \eta^2 =$

.047). ‘Subjective feeling’ in the large screen ($M = 3.160$, $SE = .114$) was more positive than the small screen ($M = 2.503$, $SE = .116$). H2b is supported.

H3b states that there is a two-way interaction effect between information format and screen size on ‘subjective feeling’. The analysis reveals a non-significant interaction effect ($F_{(1,327)} = 0.005$, $p = .945$, partial $\eta^2 = .000$). H3b is not supported.

H4b states that ‘subjective feeling’ is more positive for hedonic than utilitarian choice task. The analysis reveals a significant main effect ($F_{(1,327)} = 7.437$, $p = .007$, partial $\eta^2 = .022$). The hedonic condition ($M = 3.060$, $SE = .113$) had more positive ‘subjective feeling’ than the utilitarian condition ($M = 2.603$, $SE = .120$). H4b is supported.

H5b states that a two-way interaction of information format and product type is expected for ‘subjective feeling’. The analysis reveals a non-significant two-way interaction between information format and product type ($F_{(1,327)} = 0.063$, $p = .802$, partial $\eta^2 = .000$). H5b is not supported.

H6b states that a two-way interaction effect between screen size and product type occurs for ‘subjective feeling’. The analysis reveals a non-significant interaction effect ($F_{(1,327)} = 0.071$, $p = .790$, partial $\eta^2 = .000$). H6b is not supported.

H7b states that a three-way interaction among information format, screen size, and product type will occur for ‘subjective feeling’. The analysis reveals a significant three-way interaction ($F_{(1,327)} = 6.463$, $p = .011$, partial $\eta^2 = .019$). H7b is supported.

In the hedonic condition, those in the visual format and large screen condition ($M = 3.459$, $SE = .227$) had significantly more positive ‘subjective feeling’ than those in the visual format and small screen ($M = 2.355$, $SE = .226$); those in the textual format

and large screen ($M = 3.540$, $SE = .217$) had modestly more positive ‘subjective feeling’ than those in the textual format and small screen ($M = 3.063$, $SE = .227$). Contrary to prediction, textual format on large screen has the most positive ‘subjective feeling’.

In the utilitarian condition, those in the visual format and large screen ($M = 2.586$, $SE = .242$) had modestly more positive ‘subjective feeling’ than those in visual format and small screen ($M = 2.399$, $SE = .233$); those in the textual format and large screen ($M = 3.233$, $SE = .237$) had significantly more positive ‘subjective feeling’ than those in the textual format and small screen ($M = 2.194$, $SE = .246$).

Figure 4.6 depicts this three-way interaction graphically.

Figure 4.6: Three-way Interaction Effect of Information Format, Screen Size and Product Type on ‘Subjective Feeling’ (Study 2)

2. Decision outcomes of hedonic vs. utilitarian choice tasks

Subjective Quality. H1c states that ‘subjective quality’ is higher for visual than textual format. The analysis reveals a non-significant main effect ($F_{(1,327)} = 2.861, p = .092$, partial $\eta^2 = .009$). H1c is not supported.

H2c articulates that ‘subjective quality’ is higher in large than small screen. The analysis reveals a significant main effect ($F_{(1,327)} = 5.539, p = .019$, partial $\eta^2 = .017$). Contrary to prediction, participants in the small screen condition ($M = 6.006, SE = .065$) had greater ‘subjective quality’ than those in the large screen condition ($M = 5.790, SE = .064$). H2c is not supported.

H3c states that a two-way interaction effect between information format and screen size occurs for ‘subjective quality’. The analysis reveals a non-significant interaction effect ($F_{(1,327)} = 0.422, p = .516$, partial $\eta^2 = .001$). H3c is not supported.

H4c states that ‘subjective quality’ is higher for hedonic than utilitarian product. The analysis reveals a non-significant main effect ($F_{(1,327)} = 0.027, p = .869$, partial $\eta^2 = .000$). H4c is not supported.

H5c states there is a two-way interaction effect between information format and product type on ‘subjective quality’. The analysis reveals a non-significant two-way interaction effect ($F_{(1,387)} = 0.411, p = .522$, partial $\eta^2 = .001$). H5c is not supported.

H6c states that a two-way interaction effect between screen size and product type occurs for ‘subjective quality’. The analysis reveals a non-significant interaction effect ($F_{(1,387)} = 0.098, p = .754$, partial $\eta^2 = .000$). H6c is not supported.

H7c states that there is a three-way interaction among information format, screen size, and product type on ‘subjective quality’. The analysis reveals a non-significant

three-way interaction effect ($F_{(1,387)} = 2.359, p = .126$, partial $\eta^2 = .007$). This provides no support for H7c.

Objective Quality. Similar to Study 1, statistical tests were performed on the two measures of objective quality.

Objective Choice. Following from H1d, the dominant choice is more likely to be chosen in textual than visual format. The cross-tab statistics reveal a significant result ($Z = -4.540, p = 0$) wherein the visual format (85; 21.9%) had lower observed dominant choice than the textual format (129; 33.2%). This supports H1d.

Following from H2d, participants are more likely to choose the dominant choice in the large screen than small screen condition. Contrary to prediction, the small screen condition (117, 30.1%) had higher proportion of objective choice chosen than the large screen condition (97, 24.9%). The Z test on these observations is significant ($Z = 4.476, p = 0$). H2d is not supported.

Following from H3d, objective choice is expected to be higher for textual than visual format in large screen, and indifferent in small screen. In the small screen, participants in the visual format (65; 33.3%) were more likely to choose the dominant choice than those in the textual format (52; 26.8%); Z test is significant ($Z = 1.783, p = .037$). In the large screen, participants in visual format (44; 22.6%) were less likely to choose the dominant choice than those in the textual format (53; 27.3%); Z test is not significant ($Z = -1.108, p = .133$). H3d is not supported.

According to H4d, the utilitarian condition will see more of dominant choice chosen than the hedonic condition. A higher number of participants chose the dominant (most optimal) option in the credit card condition (117; 30.1%) than in the

jacket condition (97; 24.9%). The Z test is significant ($Z = 2.881, p = .002$). H4d is supported.

From H5d, objective choice is expected to be higher for a utilitarian than hedonic product for the textual format, but unaffected by product type for the visual format. In the textual format, participants in the utilitarian condition (68; 35.1%) were more likely to choose the dominant choice than those in the hedonic condition (61; 31.4%); Z test is significant ($Z = 1.875, p = .030$). In the visual format, participants in utilitarian condition (49; 25.1%) were more likely to choose the dominant choice than those in the hedonic condition (36; 18.5%). Z test is significant ($Z = 2.319, p = .010$); H5d is partially supported.

From H6d, objective choice is expected to be higher for a utilitarian than hedonic product on large screen, but unaffected by product type for small screen. For large screen, participants in the utilitarian condition (54; 25.0%) were more likely to choose the dominant choice than those in the hedonic condition (43; 19.9%); Z test is significant ($Z = 1.997, p = .022$). For small screen, participants in utilitarian condition (63; 36.4%) were more likely to choose the dominant choice than those in the hedonic condition (54; 31.2%); Z test is significant ($Z = 2.233, p = .012$). H6d is partially supported.

From H7d, objective choice for a hedonic product is expected to be higher for textual than visual format on large screen, but unaffected by format for small screen; and for a utilitarian product to be higher on large than small screen for the textual format, but unaffected by screen size for the visual format. For the hedonic and large screen condition, participants in the textual format (38; 34.9%) were more likely to

choose the dominant choice than those in the visual format (5; 4.7%); Z test is significant ($Z = -6.263, p = 0$). For the hedonic and small screen condition, participants in the textual format (23; 27.1%) were less likely to choose the dominant choice than those in the visual format (31; 35.2%); Z test is not significant ($Z = 1.463, p = .072$).

For the utilitarian and textual condition, participants in the large screen (28; 25.7%) were less likely to choose the dominant choice than those in the small screen (40; 47.1%); Z test is significant ($Z = 4.721, p = 0$). For the utilitarian and visual condition, participants in the large screen (26; 24.3%) were about as likely to choose the dominant choice as those in the small screen (23; 26.1%); Z test is not significant ($Z = 0.459, p = .322$). H7d is not supported.

Choice Switching. Following from H1d, choice switching is expected to be higher in visual than textual format. The results reveal that participants were more likely to switch in the visual format (81; 20.8%) than the textual format (64; 16.5%), and the difference in the observations is significant ($Z = 1.743, p = .041$). H1d is further supported.

Following from H2d, choice switching is expected to be higher in small than large screen. Contrary to prediction, the large screen (115; 29.6%) had higher proportion of switching behavior than the small screen (30; 7.7%), and the Z test is significant ($Z = -7.276, p = 0$). H2d is not supported.

Following from H3d, choice switching is expected to be higher for visual than textual format in large screen, and indifferent in small screen. In the small screen,

participants in the visual format (15; 7.7%) were as likely to switch as those in the textual format (15; 7.7%); Z test is not significant ($Z = -.104, p = .460$). In the large screen, participants in the visual format (66; 33.8%) were more likely to switch than those in the textual format (49; 25.3%). The Z test is significant ($Z = 2.463, p = .006$). H3d is supported.

Following from H4d, the hedonic condition is expected to have higher choice switching than the utilitarian condition. Consistent with prediction, individuals in the utilitarian (credit card) condition (62; 15.9%) were less likely than those in the hedonic (jacket) condition (83; 21.3%) to switch choice when given a chance. The Z test is significant ($Z = -1.617, p = .052$). This result further supports H4d.

From H5d, choice switching is expected to be higher for a hedonic than utilitarian product for the textual format, but unaffected by product type for the visual format. In the textual format, participants in the utilitarian condition (24; 12.4%) were less likely to switch than those in the hedonic condition (36; 18.6%); Z test is marginally significant ($Z = -1.481, p = .069$). In the visual format, participants in utilitarian condition (38; 19.5%) were more likely to choose the dominant choice than those in the hedonic condition (47; 24.1%); Z test is not significant ($Z = -0.859, p = .194$). H5d is partially supported.

From H6d, choice switching is expected to be higher for a hedonic than utilitarian product on large screen, but unaffected by product type for small screen. For large screen, participants in the utilitarian condition (47; 21.8%) were more likely to switch than those in the hedonic condition (68; 31.5%); Z test is significant ($Z = -2.284, p = .011$). For small screen, participants in utilitarian condition (15; 8.7%) were as likely

to switch as those in the hedonic condition (15; 8.7%); Z test is not significant ($Z = 0.244, p = .405$). H6d is supported.

From H7d, choice switching for a hedonic product is expected to be higher for visual than textual format on large screen, but unaffected by format for small screen; and for a utilitarian product to be higher on small than large screen for the textual format, but unaffected by screen size for the visual format. For the hedonic and large screen condition, participants in the textual format (28; 25.7%) were less likely to switch than those in the visual format (40; 37.4%); Z test is significant ($Z = 2.557, p = .005$). For the hedonic and small screen condition, participants in the textual format (8; 9.4%) were as likely to switch as those in the visual format (7; 8.0%); Z test is not significant ($Z = -0.377, p = .351$).

For the utilitarian and textual condition, participants in the large screen (21; 19.3%) were more likely to switch than those in the small screen (3; 3.5%); Z test is significant ($Z = -3.618, p = .000$). For the utilitarian and visual condition, participants in the large screen (26; 24.3%) were more likely to switch than those in the small screen (12; 13.6%); Z test is significant ($Z = -2.104, p = .017$). H7d is not supported.

Summary of Study 2. Table 4.2 summarizes the findings in Study 2. Findings from Study 2 provide further understanding of the visual advantage. The effect of information format disappeared except for objective quality. Screen size effect was minimal and only had an effect on ‘subjective feeling’. The interaction effects of information format and screen size on any of the dependent variables were not detected.

Product type had an effect on ‘subjective feeling’ and objective quality, and it interacted with information format and screen size to affect ‘subjective feeling’.

Disappointingly, most of the interaction effect hypotheses were not confirmed.

Table 4.2: Summary of Findings from Study 2

Independent Variables	Dependent Variables	Hypothesis	Support
Information Format	Perceived Time Spent	H1a	X
	Subjective Feeling	H1b	X
	Subjective Quality	H1c	X
	Objective Quality	H1d	✓
Screen Size	Perceived Time Spent	H2a	X
	Subjective Feeling	H2b	✓
	Subjective Quality	H2c	X
	Objective Quality	H2d	X
Product Type	Perceived Time Spent	H4a	X
	Subjective Feeling	H4b	✓
	Subjective Quality	H4c	X
	Objective Quality	H4d	✓
Information Format * Screen Size	Perceived Time Spent	H3a	X
	Subjective Feeling	H3b	X
	Subjective Quality	H3c	X
	Objective Quality	H3d	✓ partial
Product Type * Information Format	Perceived Time Spent	H5a	X
	Subjective Feeling	H5b	X
	Subjective Quality	H5c	X
	Objective Quality	H5d	✓ partial
Product Type * Screen Size	Perceived Time Spent	H6a	X
	Subjective Feeling	H6b	X
	Subjective Quality	H6c	X
	Objective Quality	H6d	✓ partial
Product Type * Information Format * Screen Size	Perceived Time Spent	H7a	X
	Subjective Feeling	H7b	✓
	Subjective Quality	H7c	X
	Objective Quality	H7d	X

As Table 4.2 shows, Study 2 fails to find support for the effect of information format. The hedonic/utilitarian effect was not all confirmed and Study 2 found

evidence to support only the hypotheses for ‘subjective feeling’ and objective quality. The next study (Study 3) was designed to further test the persistence of the visual advantage. Because consumers often make decisions under multiple contingencies, the next study (Study 3) was designed to tease out the effect of temporal distance (perceived time distance) on decision.

Study 3: Temporal Choice

Purpose. The goal of Study 3 was to add to the previous two studies and specifically test for the effect of temporal bias (i.e., temporal distance effect) in the choice task. In addition, Study 3 employed a service for its choice task stimulus, while the previous studies focused on hedonic and utilitarian products. Study 3 tests H8-H11.

Stimuli. The product selected for this study is an online streaming media and video-on-demand subscription service. This product was selected to provide relevance for the intended research participants (university students), and to provide additional tests for objective quality in a service category under the influence of temporal bias. The choice task was designed in a similar manner to the previous studies, and contains 7 alternatives varying on 4 attribute levels. The attributes selected for the stimuli follow the convention in the marketplace (e.g., Netflix, Hulu). The four attributes are subscription monthly fee, number of devices for concurrent content streaming, whether the plan includes HD content, and whether the plan comes with a first-month trial at no cost. Appendix E contains the stimuli used in this study.

Design and Procedure. The design for this study is 2 (information format: visual vs. textual) x 2 (screen size: large vs. small) x 2 (temporal frame: near-distant frame [one week] vs. far-distant frame [one month]) full factorial design. The temporal frame was manipulated with a scenario to actually buy a plan within a time period (*‘one week from today’* for near-distant condition, and *‘one month from today’* for far-distant condition). Figure 4.7 provides the Study scenario.

Figure 4.7: Study 3 Scenario (Near-Distant Frame Example)

Imagine you are shopping for an online streaming media and video-on-demand subscription plan, and have narrowed your choices down to the following options, which **differ ONLY on the following dimensions: Monthly Fee, Concurrent Streams, HD Content, and First Month Free Trial.**

As a guide, these dimensions are defined as:

- Monthly Fee: The subscription fee you pay each month.
- Concurrent Streams: The maximum number of devices on which content can be streamed concurrently.
- HD Content: Whether or not the plan includes HD content.
- First Month Free Trial: Whether or not you get the first month free of charge with no obligations.

Imagine further that **you plan to actually buy** an online streaming media and video-on-demand subscription plan **in ONE WEEK from today**. After one week, the offer terms might change.

Please choose **ONE** plan which **YOU PREFER MOST**.

Similar to the previous studies, participants read information about the randomly assigned experimental choice task, and were then asked to make a choice among the alternatives. Next, they were given an opportunity to switch their choice and to indicate a new choice for those who chose to switch. Dependent variables,

manipulation checks, and covariates are similar to those in the previous studies. An additional manipulation check measures participants' perception of the temporal frames.

Participants. A total of 1028 undergraduate students (71.5% female) at a large northeastern university were recruited for the study in exchange for extra course credit. Control on their use of device type was employed using Qualtrics survey feature and self-reported responses similar to the previous studies.

Manipulation check. The temporal frame manipulations were measured using two multiple-choice questions (see Appendix F for question details). The two question measures are significantly correlated (Pearson's $r = .99, p < .01$).

The manipulations were successful. In the near-distant condition ($M = 3.070, SD = 1.344, SE = .061$) respondents reported they had to make a choice sooner than in the far-distant condition ($M = 3.313, SD = 1.210, SE = .054$); the difference is significant ($t_{(968)} = -2.982, p = .003$). Similarly, the second question regarding length of time for the choice decision, the near-distant condition ($M = 1.780, SD = .466, SE = .021$) was perceived shorter than the far-distant condition ($M = 1.885, SD = .383, SE = .017$); the difference is also significant ($t_{(937)} = -3.845, p = .000$).

Hypothesis tests.

Statistical procedures and analyses were performed on the data, while controlling for the covariates similar to the previous studies. The independent variables in Study 3 are information format, screen size, and temporal frame. The dependent variables are 'perceived time spent on task', 'subjective feeling', 'subjective quality', and objective quality. The covariates in this study are style of processing, involvement,

numeracy, and perceived task difficulty. Similar to Study 2, tests for H1-H3 are also reported along with the findings for H8-H11.

1. Process outcomes of a service choice task

Perceived Time Spent on Task. H1a states that ‘perceived time spent on task’ is lower in visual than textual format. The analysis reveals a non-significant main effect of information format ($F_{(1,891)} = .018, p = .892$, partial $\eta^2 = .000$). H1a is not supported.

H2a states that ‘perceived time spent on task’ is lower in large than small screen. The analysis reveals a marginally significant main effect of screen size ($F_{(1,891)} = 3.159, p = .076$, partial $\eta^2 = .004$). Contrary to prediction, ‘Perceived time spent on task’ is lower for small screen ($M = 3.033, SE = .076$) than large screen ($M = 3.213, SE = .067$). H2a is not supported.

H3a states that a two-way interaction effect between information format and screen size occurs for ‘perceived time spent on task’. The analysis reveals a non-significant interaction effect ($F_{(1,891)} = 0.067, p = .795$, partial $\eta^2 = .000$). H3a is not supported.

H8a states that ‘perceived time spent on task’ is lower in near- than far-distant frame. The analysis reveals a non-significant main effect of temporal frame on ‘perceived time spent on task’ ($F_{(1,891)} = .318, p = .573$, partial $\eta^2 = .000$). H8a is not supported.

H9a states that a two-way interaction effect between temporal frame and information format occurs for ‘perceived time spent on task’. The analysis for H9a

reveals a marginally significant effect ($F_{(1,891)} = 3.428, p = .064, \text{partial } \eta^2 = .004$).

H9a is thus marginally supported. Figure 4.8 presents the interaction effect graphically.

Participants in the visual and near-distant condition ($M = 2.994, SE = .102$) perceived to have spent less time on task than those in the visual and far-distant condition ($M = 3.238, SE = .099$); those in the textual and near-distant condition ($M = 3.195, SE = .102$) perceived to have spent more time on task than those in the textual and far-distant condition ($M = 3.065, SE = .100$).

Figure 4.8: Two-way Interaction Effect of Temporal Frame and Information Format on ‘Perceived time spent on task’ (Study 3)

H10a states that there is a two-way interaction effect between temporal frame and screen size on ‘perceived time spent on task’. The analysis reveals a non-significant effect ($F_{(1,891)} = 0.917, p = .339, \text{partial } \eta^2 = .001$). H10a is not supported.

H11a states that a three-way interaction among temporal frame, information format and screen size is expected for ‘perceived time spent on task’. The analysis reveals a non-significant three-way interaction ($F_{(1,891)}=.049, p = .825$, partial $\eta^2 = .000$). Therefore, H11a is not supported.

Subjective Feeling. H1b states that ‘subjective feeling’ is more positive for visual than textual format. The analysis reveals a significant main effect of information format ($F_{(1,891)} = 8.364, p = .004$, partial $\eta^2 = .009$). The ‘subjective feeling’ in the visual condition ($M = 5.590, SE = .066$) is more positive than the textual condition ($M = 5.319, SE = .066$). H1b is supported.

H2b states that ‘subjective feeling’ is more positive for large than small screen. The analysis reveals a non-significant main effect of screen size ($F_{(1,891)} = 1.411, p = .235$, partial $\eta^2 = .002$). H2b is not supported.

H3b states that a two-way interaction effect between information and screen size is expected for ‘subjective feeling’. The analysis reveals a non-significant interaction effect ($F_{(1,891)}=.013, p = .911$, partial $\eta^2 = .000$). H3b is not supported.

H8b states that ‘subjective feeling’ is more positive in the near-distant condition than the far-distant condition. The analysis reveals a significant main effect of temporal frame ($F_{(1,891)} = 4.952, p = .026$, partial $\eta^2 = .006$). ‘Subjective feeling’ is more positive in the near-distant frame ($M = 5.558, SE = .067$) than the far-distant frame ($M = 5.351, SE = .065$). H8b is supported.

H9b states that a two-way interaction effect between temporal frame and information format occurs for ‘subjective feeling’. The analysis reveals a marginally

significant interaction effect ($F_{(1,891)} = 3.210, p = .074, \text{partial } \eta^2 = .004$). H9b is marginally supported. Figure 4.9 graphs this two-way interaction effect. Those in the textual and near-distant condition ($M = 5.507, SE = .095$) had significantly more positive ‘subjective feeling’ than those in the textual and far-distant condition ($M = 5.131, SE = .093$). Those in the visual and near-distant condition ($M = 5.610, SE = .095$) had slightly more positive ‘subjective feeling’ than those in the visual and far-distant condition ($M = 5.570, SE = .092$).

Figure 4.9: Two-way Interaction Effect of Temporal Frame and Information Format on ‘Subjective Feeling’ (Study 3)

H10b states that a two-way interaction between temporal frame and screen size occurs for ‘subjective feeling’. The analysis reveals a non-significant interaction effect ($F_{(1,891)} = .282, p = .596, \text{partial } \eta^2 = .000$). H10b is not supported.

H11b states that a three-way interaction among temporal frame, information format and screen size is expected for ‘subjective feeling’. The analysis reveals a non-significant three-way interaction ($F_{(1,891)} = .691, p = .406, \text{partial } \eta^2 = .001$); therefore H11b is not supported.

2. Decision outcomes of a service choice task

Subjective Quality. H1c states that ‘subjective quality’ is greater in visual than textual format. The analysis reveals a non-significant main effect of information format ($F_{(1,891)} = 1.872, p = .172, \text{partial } \eta^2 = .002$). H1c is not supported.

H2c states that ‘subjective quality’ is greater in large than small screen. The analysis reveals a non-significant main effect of screen size ($F_{(1,891)} = 2.180, p = .140, \text{partial } \eta^2 = .002$). H2c is not supported.

H3c states that a two-way interaction effect between information format and screen size is expected for ‘subjective quality’. The analysis reveals a non-significant interaction effect ($F_{(1,891)} = .603, p = .438, \text{partial } \eta^2 = .001$). H3c is not supported.

H8c states that ‘subjective quality’ is higher for near- than far-distant frame. The analysis reveals that temporal frame has a main effect on ‘subjective quality’ ($F_{(1,891)} = 5.893, p = .015, \text{partial } \eta^2 = .007$). ‘Subjective quality’ is higher in the near-distant frame ($M = 5.497, SE = .063$) than the far-distant frame ($M = 5.285, SE = .061$). This result supports H8c.

H9c states that a two-way interaction effect between temporal frame and information format is expected for ‘subjective quality’. The analysis reveals a non-

significant interaction effect ($F_{(1,891)} = 1.805, p = .179$, partial $\eta^2 = .002$). H9c is not supported.

H10c states a two-way interaction effect between temporal frame and screen size occurs for ‘subjective quality’. The analysis reveals a non-significant interaction effect ($F_{(1,891)} = 1.207, p = .272$, partial $\eta^2 = .001$). H10c is not supported.

H11c states that a three-way interaction among temporal frame, information format and screen size will occur for ‘subjective quality’. The analysis reveals a non-significant three-way interaction effect ($F_{(1,891)} = .085, p = .770$, partial $\eta^2 = .000$). H11c is not supported.

Objective Quality. Similar to the previous two studies, objective quality has two measures and similar statistical procedures and analyses were performed.

Objective Choice. Following from H1d, the dominant choice is expected to be chosen more often in the textual than visual format. The results show that visual format (376; 36.6%) is not significantly different than textual format (389; 37.9%), having $Z = -.557, p = .287$. H1d is not supported.

Following from H2d, participants are expected to be more likely to choose the dominant choice in the large screen than small screen condition. Consistent with prediction, the large screen condition (416, 40.5%) had higher proportion of objective choice chosen than the small screen condition (349, 34.0%). The Z test is significant ($Z = 7.299, p = 0$). H2d is supported.

Following from H3d, objective choice is expected to be higher for textual than visual format in large screen, and indifferent in small screen. In the small screen,

participants in the visual format (173; 36.4%) were slightly less likely to choose the dominant choice than those in the textual format (176; 37.1%); Z test is not significant ($Z = -0.540, p = .294$). In the large screen, participants in visual format (203; 36.8%) were slightly less likely to choose the dominant choice than those in the textual format (213; 38.6%); Z test is not significant ($Z = -0.243, p = .405$). H3d is not supported.

Following from H8d, the dominant choice is more likely to be chosen in the far-distant frame than the near-distant frame. A cross-tabulation statistics reveals a marginally significant difference in participants who chose dominant (objective) choice in the far-distant condition (395; 38.5%) more than those in the near-distant condition (370; 36.0%), with a marginally significant Z test ($Z = -1.416, p = .077$), H8d is marginally supported.

Following from H9d, the dominant choice is expected to be higher for the textual than visual format in near-distant frame, but unaffected by format in far-distant frame. In the near-distant frame, participants in the textual format (200; 39.2%) were more likely to choose the dominant choice than those in the visual format (180; 35.3%), the difference is significant ($Z = -1.729, p = .041$). In the far-distant frame, participants in the textual format (199; 38.5%) were more likely to choose the dominant choice than those in the visual format (186; 36.0%), the difference is not significant ($Z = -1.085, p = .137$). H9d is supported.

Following from H10d, preference for the dominant choice is expected to be higher in far- than near-distant frame for large screen, but unaffected by temporal frame for small screen. For large screen, participants in the far-distant condition (220; 42.6%) were more likely to choose the dominant choice than those in the near-distant

condition (196; 38.4%), the difference is significant ($Z = -2.221, p = .013$). For small screen, participants in the far-distant condition (175; 33.8%) were as likely to choose the dominant choice as those in the near-distant condition (174; 34.1%), the difference is not significant ($Z = 0.277, p = .389$). H10d is supported.

Following from H11d, the dominant choice in the near-distant frame is expected to be higher for textual than visual format on small screen, but unaffected by format for large screen. In the far-distant frame, the dominant choice is expected to be higher on large than small screen for the textual format, but unaffected by screen size for the visual format.

In the near-distant and small screen condition, participants in the textual format (95; 37.0%) were more likely to choose the dominant choice than those in the visual format (83; 32.8%), the difference is significant ($Z = -1.941, p = .026$). In the near-distant and large screen condition, participants in the textual format (105; 40.9%) were more likely to choose the dominant choice than those in the visual format (97; 38.3%), the difference is not significant ($Z = -0.591, p = .277$).

In the far-distant and textual condition, participants in the large screen (114; 43.8%) were more likely to choose the dominant choice than those in the small screen (85; 32.7%), the difference is significant ($Z = -1.786, p = .036$). In the far-distant and visual condition, participants in the large screen (102; 39.7%) were more likely to choose the dominant choice than those in the small screen (84; 32.7%), the difference is not significant ($Z = -0.998, p = .158$). H11d is supported.

Choice Switching. Following from H1d, choice switching is more likely in the visual than textual format. The results reveal that visual format (97; 10.3%) is similar to textual format (97; 10.3%), having $Z = -.149$, $p = .440$. H1d is not supported.

Following from H2d, choice switching is expected to be higher in the small screen than large screen. The cross-tab statistics reveals that the large screen (102; 10.8%) had higher proportion of switching behavior than the small screen (92; 9.8%). The Z test is not significant ($Z = 0.810$, $p = .208$). H2d is not supported.

Following from H3d, choice switching is expected to be higher for visual than textual format in large screen, and indifferent in small screen. In the small screen, participants in the visual format (57; 13.5%) were more likely to switch than those in the textual format (38; 9.0%); Z test is significant ($Z = 2.162$, $p = .015$). In the large screen, participants in the visual format (55; 10.6%) were more likely to switch than those in the textual format (44; 8.5%). The Z test is not significant ($Z = 1.079$, $p = .140$). H3d is not supported.

Following from H8d, the far-distant condition is expected to have less choice switching behavior than the near-distant condition. The observation in the data reveals that the near-distant condition (109; 11.6%) were more likely to switch choice when given a chance than the far-distant condition (85; 9.0%), and the difference between these observations is significant ($Z = 2.316$, $p = .010$). This result supports H8d.

Following from H9d, choice switching is expected to be higher for the visual than textual format in near-distant frame, but unaffected by format in far-distant frame. In the near-distant frame, participants in the textual format (42; 9.2%) were less likely to switch than those in the visual format (52; 11.3%), the difference is not significant (Z

= 1.132, $p = .129$). In the far-distant frame, participants in the textual format (40; 8.3%) were less likely to switch than those in the visual format (60; 12.4%), the difference is significant ($Z = 2.060$, $p = .019$). H9d is not supported.

Following from H10d, choice switching is expected to be higher in near- than far-distant frame for large screen, but unaffected by temporal frame for small screen. For large screen, participants in the far-distant condition (42; 8.7%) were less likely to switch than those in the near-distant condition (60; 13.1%), the difference is significant ($Z = 2.314$, $p = .010$). For small screen, participants in the far-distant condition (43; 8.9%) were about as likely to switch as those in the near-distant condition (49; 10.7%), the difference is not significant ($Z = 0.913$, $p = .181$). H10d is supported.

Following from H11d, choice switching in the near-distant frame is expected to be higher for visual than textual format on small screen, but unaffected by format for large screen. In the far-distant frame, choice switching is expected to be higher on small than large screen for the textual format, but unaffected by screen size for the visual format.

In the near-distant and small screen condition, participants in the visual format (25; 10.9%) were more likely to switch than those in the textual format (18; 7.9%), the difference is not significant ($Z = -1.234$, $p = .109$). In the near-distant and large screen condition, participants in the visual format (27; 11.7%) were more likely to switch than those in the textual format (24; 10.5%), the difference is not significant ($Z = -0.406$, $p = .340$).

In the far-distant and textual condition, participants in the large screen (20; 8.4%) were as likely to switch as those in the small screen (20; 8.4%), the difference is not significant ($Z = 0.735$, $p = .229$). In the far-distant and visual condition, participants in the large screen (28; 11.4%) were less likely to switch than those in the small screen (32; 13.1%), the difference is marginally significant ($Z = 1.586$, $p = .055$). H11d is not supported.

Summary of Study 3. Table 4.3 summarizes the findings from Study 3, which explores the bias of temporal frame on the effect of visual format and screen size on the subjective and objective decision outcomes. The findings from this study provide initial understanding of temporal bias and its interaction with information format on decision outcomes. In particular, the findings demonstrate that in the presence of the temporal frame bias, the effect of visual advantage seems to disappear as the main effect of information format did not achieve statistical significance, except for ‘subjective feeling’. The main effect of visual format on objective quality also did not reach statistical significance when decision task was presented under temporal bias.

The main effect of temporal frame was observed for all dependent variables except for ‘perceived time spent on task’. Importantly, the findings support the hypotheses that far-distant frame is better at facilitating quality choice (objective choice was chosen more in far- than near-distant frame).

Table 4.3: Summary of Findings from Study 3

Independent Variables	Dependent Variables	Hypothesis	Support
Information Format	Perceived Time Spent	H1a	X
	Subjective Feeling	H1b	✓
	Subjective Quality	H1c	X
	Objective Quality	H1d	X
Screen Size	Perceived Time Spent	H2a	X
	Subjective Feeling	H2b	X
	Subjective Quality	H2c	X
	Objective Quality	H2d	✓ partial
Temporal Frame	Perceived Time Spent	H8a	X
	Subjective Feeling	H8b	✓
	Subjective Quality	H8c	✓
	Objective Quality	H8d	✓
Information Format * Screen Size	Perceived Time Spent	H3a	X
	Subjective Feeling	H3b	X
	Subjective Quality	H3c	X
	Objective Quality	H3d	X
Temporal Frame * Information Format	Perceived Time Spent	H9a	✓ marginal
	Subjective Feeling	H9b	✓ marginal
	Subjective Quality	H9c	X
	Objective Quality	H9d	✓ partial
Temporal Frame * Screen Size	Perceived Time Spent	H10a	X
	Subjective Feeling	H10b	X
	Subjective Quality	H10c	X
	Objective Quality	H10d	✓
Temporal Frame * Information Format * Screen Size	Perceived Time Spent	H11a	X
	Subjective Feeling	H11b	X
	Subjective Quality	H11c	X
	Objective Quality	H11d	✓ partial

The next (final) chapter discusses the outcomes from this dissertation research, pointing out the implications and avenues for future research.

CHAPTER 5

DISCUSSION AND IMPLICATIONS

5.1 General Discussion

With the increasing adoption and use of hand-held digital devices and the ever-growing online activities, there is growing evidence of decision making in the dynamic online environment (Howland, 2018a, 2018b; Kressman, 2017; Nielsen, 2017). This dissertation was designed to answer a few key questions relating to information presentation format and device screen size, and their influence on decision quality – especially objective decision quality. Most of the existing evidence of information format effect was mainly established in frequently purchased product categories such as food and apparel (e.g., Kim and Lennon, 2008; Townsend and Kanh, 2014). Evidence of strong preference and ease of processing for visual information (Childers, Houston and Heckler, 1985; Delello and McWhorter, 2016; Roam, 2009; Townsend and Kanh, 2014) has seen the wide use and application of visual information in frequently to infrequently purchased products (such as credit cards and health insurance). However, there is no research on the visual effect on decision quality (especially objective quality). This research addresses this imperative gap of the effect of information format on decision quality when decision making occurs on different device screen sizes across different product categories.

Through three experimental studies that recruited both externally valid sample (Amazon M-Turk workers; Study 1 and 2) and student sample (Study 3), this research

finds that significantly higher preference for visual information format exists across different choice environments of different product categories (see Table 5.1).

Table 5.1: Preference for Format to View Offers from Three Studies

Preference for Format	Study 1: Health Insurance	Study 2: Credit Card & Jacket	Study 3: Subscription Services
Visual Format	204; 55.6%	291; 64.8%	712; 69.3%
Textual Format	163; 44.4%	158; 35.2%	316; 30.7%
	$Z = 3.026; p = .001$	$Z = 8.876; p = 0$	$Z = 17.466; p = 0$

Nonetheless, the findings of the effect of visual format on the process and outcome variables from the three studies have mixed results. The evidence collectively suggests that the visual advantage varies and does not persist in different product categories. Table 5.2 summarizes the main effect findings for process and outcome variables from the three studies.

Table 5.2: Summary of Main Effect Findings from Three Studies

<div>Dependent Variable:</div> <div>Independent Variable: Study:</div>		Process		Outcome	
		Perceived Time Spent on Task	Subjective Feeling	Subjective Quality	Objective Quality
Information Format	Study 1	✓	✓	X	✓
	Study 2	X	X	X	✓
	Study 3	X	✓	X	X
Screen Size	Study 1	✓	X	X	X
	Study 2	X	✓	X	X
	Study 3	X	X	X	✓ partial
Hedonic/Utilitarian	Study 2	X	✓	X	✓
Temporal Frame	Study 3	X	✓	✓	✓

Perceived Time Spent on Task. ‘Perceived time spent on task’ was found to be lower for visual than textual format (Study 1), and lower for large than small screen (Study 1). Information format and screen size were found to have an interaction effect on ‘perceived time spent on task’ such that it was lower for textual format on large than small screen, however the difference was not significant by screen size for visual format (Study 1). Study 2 did not find support for ‘perceived time spent on task’. Study 3 confirmed support only for the interaction between information format and temporal frame to affect ‘perceived time spent on task’ in that it was lower in the near- than far-distant frame for visual format, and higher in the near- than far-distant frame for textual format.

The lack of support for ‘perceived time spent on task’ across studies may be explained by time distortion effect. Leclerc, Schmitt, and Dube (1995, p. 110) established that the value of consumers’ time is not constant but depends on contextual characteristics of the decisional situation such as product, task complexity and risk. Other researchers established factors affecting perception of time including pleasantness, degree of urgency, amount of activity, variety, time-free tasks (Levine, 1997), and circumstances of excitement, drugs, ageing, and body temperature (Geelhoed, Toft, Roberts and Hyland, 1995; Mathew, 1998).

Subjective Feeling. ‘Subjective feeling’ was found to be more positive for visual than textual format, confirming the visual advantage (Study 1 and 3). Screen size was found to have an effect only in Study 2, wherein large screen yielded a more positive

‘subjective feeling’ than small screen did. There was also support for product type effect on ‘subjective feeling’ with hedonic product having more positive ‘subjective feeling’ than utilitarian product (Study 2). In addition, ‘subjective feeling’ was significantly more positive in the near- than far-distant frame; supporting the hypothesis for temporal frame (Study 3).

Information format and screen size were found to interact and affect ‘subjective feeling’ in that it was more positive for visual than textual format for small screen, but unaffected by format for large screen (Study 1). Information format also interacted with temporal frame to affect ‘subjective feeling’ such that ‘subjective feeling’ was more positive in near- than far-distant frame for textual format, but unaffected by temporal frame for visual format (Study 3). In addition, Study 2 also established a significant three-way interaction among information format, screen size and product type for ‘subjective feeling’ such that for the hedonic product it was more positive for large than small screen for visual format but not affected by screen size for textual format, and for the utilitarian product it was more positive for large than small screen for textual format but not affected by screen size for visual format.

Subjective Quality. Surprisingly, there was little support found for ‘subjective quality’ in the three studies where ‘objective quality’ was also measured. This seems to indicate that when ‘objective quality’ was present, the effects for ‘subjective quality’ seem to disappear; further research is needed to better understand this phenomenon.

For main effects, there was support for temporal frame effect on ‘subjective quality’ (Study 3) wherein it was higher for near- than far-distant frame. Information format and screen size also interacted to affect ‘subjective quality’ in that it was higher for textual format on large than small screen, but unaffected by screen size for visual format (Study 1).

Objective Quality. Objective quality was observed for the effects of information format (Study 1 and 2), product type (Study 2), and temporal frame (Study 3). Screen size did not have a significant effect on objective quality in any of the three studies (except for objective choice in Study 3). However, screen size and information format interacted to affect objective quality (Study 1) such that it was higher for textual than visual format on large screen, but unaffected by format for small screen. In addition, screen size also interacted with temporal frame to affect objective quality (Study 3) in that it was higher in far- than near-distant frame for large screen, but unaffected by temporal frame for small screen.

The findings confirm support for objective quality in more instances than for ‘subjective quality’; this may be explained by the evidence that prior research established on consumer attitudes that an individual’s attitude may not necessarily be a good predictor of his/her actual behaviors (Ajzen and Fishbein, 1980; Ajzen and Fishbein, 2005; Eagly and Chaiken, 1993). For instance, individuals with strong attitudes towards a cause (e.g., environment conservation) may not behave consistently with their attitudes (e.g., purchase and consume environmentally-safe products) (Ajzen, 2008).

Alternative explanation for screen size effect. The effect of screen size on the process and outcome variables was found to be limited across the three studies. This may be explained by the increasing use of smart devices (smartphones, tablets, and phablets) for e-commerce activities (Ruff, 2017; Rainie and Perrin, 2017; Smith and Anderson, 2016). This means that contemporary consumers have now become accustomed to performing tasks and making decision in smaller screen environment using their hand-held devices. In addition, contemporary consumers are very likely to migrate among devices and operate in a multiple device environment (Olmstead, 2017). Anderson (2015b) reports that at least 36 percent of American households own all three types of devices (smartphone, tablet and computer). Across the three studies, participants also indicated their tendency for device migration and preference for use of multiple devices for information viewing. When asked about their top preferred methods to view information about the offers, participants indicated a high preference for viewing it on a mobile/smartphone or a laptop computer (see Table 5.3).

Table 5.3: Top Two Preferred Methods for Viewing Information

Top Two Methods	Study 1: Health Insurance (N = 367)	Study 2: Credit Card & Jacket (N = 449)	Study 3: Subscription Services (N = 1028)
On a mobile / smartphone	197; 53.8%	265; 59.0%	557; 54.2%
On a tablet computer	60; 16.3%	87; 19.4%	84; 0.08%
On a laptop computer	246; 67.0%	247; 55.0%	795; 77.3%
On a desktop computer	178; 48.5%	149; 33.2%	175; 17.0%
As printed sent by postal mail	53; 14.4%	30; 6.7%	100; 9.7%

5.2 Theoretical Contributions

This dissertation's initial findings contribute to the body of research on information format, information processing, and consumer decision making. First, this dissertation extends existing research on the visual advantage beyond the affective, subjective measures to include objective measures of quality. Existing research mainly focuses on visual (versus textual) effect on perception of variety, complexity, and preference for choice set (e.g., Townsend and Kahn, 2014). This dissertation's focus on objective measure of choice quality provides a deeper insight into how consumer decision varies under different conditions of information format, product type, and temporal frame.

Second, existing research often examined the visual format effect in choice environments that varied by problem size as manipulated by attribute levels and number of brands (e.g., Bettman and Zins, 1979; Haubl and Trift, 2000; Townsend and Kahn, 2014). The faster, easier gestalt processing of visual information (Pavio, 1986; Townsend and Kahn, 2014) evokes a higher preference for visual format in large choice environment (Townsend and Kahn, 2014). However, today's computerized decision aids can condition consumer decision to only a handful of alternatives (e.g., the health insurance exchange marketplace webpage narrows down available insurance plans for individuals). Therefore, the manipulation of problem size (by number of attributes and alternatives) may not reflect the actuality of current market practice. This dissertation offers insights into decision making within environments of choice tasks that reflect the smaller problem size but are inherently

complex in nature, and the findings show that visual format did not hold its advantage for objective quality.

Third, while screen size has been studied and documented to have effect on performance-related measures (mainly in the domain of website design, information technology; e.g., Acton, van der Heijden and Golden, 2005; Bridgeman, Lennon and Jackenthal, 2003; Chae and Kim, 2004; Churchill and Hedberg, 2008; Kim and Albers, 2003; Maniar, Bennett, Hand and Allan, 2008; Reeves, Lang, Kim and Tatar, 1999), it had not been examined in consumer research and particularly for decision outcomes. Theories and understanding of consumer decision research needed to be clarified and tested within the different screen environments, as this dissertation has done, to reflect the current state of the consumer marketplace.

Fourth, research on the intersection of visual advantage and temporal frame has not been explored before. Given the prevalent visual culture in the marketplace, understanding how information format affects potential decision bias is insightful.

Fifth, this dissertation extends existing research and understanding of information formats into different product types and categories. More specifically, it focuses on the understanding of the visual advantage in the healthcare, financial products, apparel, and subscription services. The findings in this dissertation suggest that the visual advantage did not persist across all product categories.

5.3 Managerial Implications

The findings of the effects of information format on decision quality in this research have practical and policy-relevant implications. It is important for policy-

makers and practitioners to pay attention to information presentation in order to develop optimal communication materials (e.g., websites) to showcase products and services. This is especially important now that consumers access information from their smart devices, which demands consideration for the amount and type of information presented to be accessible, processable, and useful to consumers' tasks.

The proliferation of global visual culture (Patel, 2015) and the growing use of smart hand-held devices (Rainie and Perrin, 2017) suggest that the research findings are likely to be useful for content strategy to both managers and public policy makers. The implications from this research may be particularly insightful for emerging economies where consumers leapfrog traditional devices (Chen, 2017; World Bank Group, 2017). Despite the dominance of the visual culture, the findings in this research suggest that objective quality is better served by the textual format.

5.4 Limitations

This dissertation is not without limitations. One limitation of this research relates to the sample. As evidenced in the studies the M-Turk workers skew more toward male and in their thirties. Huff and Tingley (2015) documented that Amazon Mechanical Turk has primarily attracted younger, skewed towards Caucasian/White (75 percent) respondents that live in urban area (90 percent). While M-Turk workers provide additional external validity than the convenient student population, the samples from M-Turk workers do not closely represent the national population in demographic variables such as gender, age, household income, and educational levels.

A representative sample (such as one sourced by population-representative panels) can yield more robust findings that can be generalized to the national population.

Second, the research used hypothetical scenario-based choice tasks. While these experimental choice tasks have been used widely in the realm of consumer decision making research (Frederick, Loewenstein and O'Donoghue, 2002), field studies are often superior at measuring effects from actual behavior as they have high ecological validity (Frederick, Loewenstein and O'Donoghue, 2002, p. 386). Future research can explore the research in the natural experimental design to test the hypotheses.

Third, this dissertation research focuses on the effect of information presentation format on decision quality. In order to best construct optimal choice environment, future research should look into the strategy(ies) that consumers may use to arrive at their choice. The path to the most optimal choice will provide additional insight into how public policy can affect optimal choice making in the marketplace via appropriate choice architecture requirements. To achieve this, a suggestion is to incorporate open-ended questions to explore participants' cognitive processes as they go about selecting an alternative.

Finally, while this research examines the effect of temporal bias, and provides initial insights on how temporal frame affects the visual advantage, consumers may have multiple biases within the same decision task (e.g., visceral influences such as fatigue, fear of change). This presents opportunity for future research to explore other conditions under which the visual advantage is limited, enhanced or cancelled.

5.5 Suggestions for Future Research

In addition to the temporal framing effect, this research can also be extended to study the visual advantage under the effect of prevention (e.g., “You do not want to miss this offer”) versus promotion (e.g., “You can enjoy this offer”) framing of the choice tasks. Research on regulatory focus juxtaposes that the pain from failing to achieve a prevention-focused (or minimal) goal is more intense than the pain from failing to achieve a promotion-focused (or maximal) goal (Idson, Liberman and Higgins, 2000; Mogilner, Aaker and Pennington, 2008). When a prevention-focus is activated, individuals are more likely to favor a choice that offers avoidance of negative outcome (i.e., a prevention framed choice, ‘You must buy this health insurance now to avoid facing penalty’) than a choice that offers hope of achieving optimal outcome (i.e., a promotion framed choice, ‘You must buy this health insurance to maintain the healthiest you’). This intensity of preference toward prevention-frame alternative is higher when time draws near (Mogilner, Aaker and Pennington, 2008).

Another natural progression of this dissertation directs a promising future research on visual format under intertemporal choice that involves the evaluation of outcomes to be realized at some future point (Loewenstein, 1987; e.g., health insurance use in future point in time than at immediate point of purchase). Intertemporal consumption often faces the biased cognitive perceptions that result in “general tendency to underestimate exponential series” (Stango and Zinman, 2007). The intertemporal choice related construct, hyperbolic discounting, highlights consumers’ desire to gain immediate access to funds (even when interest rate is considerably high) than distant

access (where interest rate is comparatively lower). The key implication of this hyperbolic discounting bias is the potential vulnerability of consumers making sub-optimal choices as they misplace value on the access to fund. In fact, this bias may have been a key driver in the result that Kullgren et al. (2010) report on low-income families being more prone to choose low-premium but high-deductible health plans, resulting in them opting to forego needed care because of the high-deductible.

Finally, another avenue to extend this research on the visual thesis is to incorporate the dimension of additional information sources (i.e., consumer ratings) as widely practiced in the marketplace. This research extension can examine the credibility of sources of information (Dholakia, 1987; Sternthal, Dholakia and Leavitt, 1978). Studies have shown that availability of more information from various sources will add to the complexity and difficulty of the task environment (e.g., Formisano, Olshavsky and Tapp, 1982). Research on consumer ratings has primarily examined the processing and usefulness of such ratings as information for subjective valuations of the choice alternatives (e.g., Ashby, Walasek and Glockner, 2015). The ratings can provide consumers with much needed “social proof” (Cialdini, Reno and Kallgren, 1990), which may affect their confidence and certainty of choice. However, how much of such ratings affect the (objective) quality of choice made is unclear.

5.6 Conclusion

Time and money spent online are taking increasingly higher share of a contemporary consumer’s wallet (Gursky, 2017; Howland, 2018a, 2018b; Kressman, 2017; Nielsen, 2017; Pew Research Center, 2018). According to the U.S. Census

Bureau (2018), U.S. retail e-commerce sales accounts for 9.5 percent of total U.S. retail sales for the first quarter of 2018, with a continuous upward trend. Moreover, online activities are increasingly performed on hand-held smart digital devices (Howland, 2018a, 2018b; Pew Research Center, 2018). Trends suggest that online activities, e-commerce, m-commerce, and digital device adoption and use will continue to grow (eMarketer, 2017; Howland, 2018; Kressman, 2017; Lu, 2017; Pew Research Center, 2018; U.S. Census Bureau, 2018). Kressman (2017) reports nearly 50 percent of all U.S. m-commerce retail sales came from smartphones in 2017 and projects it to grow to 80 percent in 2021. Importantly, the dollar value of average order value of mobile-based purchases has seen an increasing trend (Kressman, 2017).

The online environment also lends itself more to visual (than textual) information (Delello and McWhorter, 2016; Roam, 2009; Kim and Lennon, 2008; Townsend and Kahn, 2014). Yet prior to this research, little was known about how this growing online environment and information formats impact the quality of consumer decision outcomes. Scholarly and practitioner interest in consumer decision outcomes arises from their concern with consequences of the outcomes. Marketing practitioners are concerned about consumer choices made among competing alternatives that affect their own market success. Public policy makers are concerned about the ‘goodness’ of outcomes that not only yield positive utility for the individual but also for society as a whole. The findings from two of the three studies confirm that visual information yields lower objective quality of decision than textual information does. This particular finding of objective quality sheds light on the possible tools to influence consumer decision quality for both marketers and policy makers. More important, it

suggests public policy requirement for appropriately adequate textual information to make available for higher quality consumer decision making.

Research avenues for decision quality remain abundant beyond the initial findings in this research. As suggested earlier, future research should further examine other conditions that may affect the influence of information format on decision quality; these additional conditions include message framing effect, intertemporal choice bias, and source effect.

APPENDICES

Appendix A: Detailed Summary of Research Study Plan

Appendix B: Pretest Experimental Stimuli

Exhibit B1: Pretest 1 Stimuli: Credit Card

(Visual Format)

	Credit Card 1	Credit Card 2	Credit Card 3	Credit Card 4	Credit Card 5
Annual Fee
APR/ Interest Rate
Rewards

(Textual Format)

	Credit Card 1	Credit Card 2	Credit Card 3	Credit Card 4	Credit Card 5
Annual Fee	\$0	\$0	\$0	\$0	\$12
APR/ Interest Rate	15.99%	16.99%	20.99%	23.99%	23.99%
Rewards	3% Cash back	3% Cash back	None	\$1 = 1 Point	1% Cash back

Exhibit B2: Pretest 2 Stimuli

(Credit Card: Visual Format)

Credit Card A	Annual Fee	APR/Interest Rate	Rewards
Credit Card B	Annual Fee	APR/Interest Rate	Rewards
Credit Card C	Annual Fee	APR/Interest Rate	Rewards
Credit Card D	Annual Fee	APR/Interest Rate	Rewards
Credit Card E	Annual Fee	APR/Interest Rate	Rewards

(Credit Card: Textual Format)

Credit Card A	\$0 Annual Fee	13.49% APR/Interest Rate	1% cash back Rewards
Credit Card B	\$95 Annual Fee	23.99% APR/Interest Rate	5% cash back Rewards
Credit Card C	\$30 Annual Fee	18.49% APR/Interest Rate	3% cash back Rewards
Credit Card D	\$0 Annual Fee	13.49% APR/Interest Rate	5% cash back Rewards
Credit Card E	\$50 Annual Fee	16.99% APR/Interest Rate	0% cash back Rewards

(Jacket: Visual Format)

Jacket A	Price	Shipping Cost	Expected Delivery
Jacket B	Price	Shipping Cost	Expected Delivery
Jacket C	Price	Shipping Cost	Expected Delivery
Jacket D	Price	Shipping Cost	Expected Delivery
Jacket E	Price	Shipping Cost	Expected Delivery

(Jacket: Textual Format)

Jacket A	\$99 Price	\$4.95 Shipping Cost	5 Days Expected Delivery
Jacket B	\$129 Price	\$7.99 Shipping Cost	2 Days Expected Delivery
Jacket C	\$99 Price	\$5.99 Shipping Cost	7 Days Expected Delivery
Jacket D	\$84 Price	\$4.95 Shipping Cost	2 Days Expected Delivery
Jacket E	\$109 Price	\$9.99 Shipping Cost	3 Days Expected Delivery

Exhibit B3: Embedded Time Stamp Feature on Qualtrics for Objective Time Spent

← → ↺ 🏠 https://co1.qualtrics.com/ControlPanel/?ClientAction=EditSurvey&Section=SV_31 🔍 Search

🔧 Look & Feel 🔄 Survey Flow ⚙️ Survey Options 🔍 Tools ▾ 🤝 Collaborate

▼ Block Preference Task Visual CreditCard Block Options ▾

☐ This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.
QTimeChoiceVCC ⚙️

☐ Imagine you are shopping for a credit card, and have narrowed your choices down to the following options, which **differ ONLY on the following dimensions: Annual Fee, APR, Sign Up Bonus, and Cash Back**.
QChoiceVisualCC ⚙️

As a guide, these dimensions are defined as:

- Annual Fee: A yearly fee charged to your credit card account for the use of a credit card.
- APR: The annual percentage rate is the interest rate applied to any outstanding balance that is not settled by each month's due date, and is charged to your credit card account.
- Sign Up Bonus: A bonus amount credited into your credit card account once when you sign up for the credit card.
- Cash Back: The incentive scheme of cash back on purchases for your use of the credit card.

Please choose **ONE** credit card which **YOU PREFER MOST**.

☐ **Credit Card A**

Appendix C: Study 1 Experimental Stimuli

Exhibit C1: Study 1: Health Insurance Stimuli

(Visual Format)

Plan A

\$3,814 Deductible	\$4,941 Out of Pocket Maximum	\$20/\$20 Primary/Specialist Copay	\$2,716 Annual Premium
Plan B

\$3,814 Deductible	\$4,903 Out of Pocket Maximum	\$20/\$30 Primary/Specialist Copay	\$2,798 Annual Premium
Plan C

\$3,814 Deductible	\$4,903 Out of Pocket Maximum	\$20/\$25 Primary/Specialist Copay	\$2,754 Annual Premium
Plan D

\$3,814 Deductible	\$4,903 Out of Pocket Maximum	\$20/\$20 Primary/Specialist Copay	\$2,716 Annual Premium
Plan E

\$3,896 Deductible	\$5,046 Out of Pocket Maximum	\$25/\$25 Primary/Specialist Copay	\$2,859 Annual Premium
Plan F

\$3,957 Deductible	\$4,941 Out of Pocket Maximum	\$25/\$35 Primary/Specialist Copay	\$2,754 Annual Premium
Plan G

\$3,852 Deductible	\$4,985 Out of Pocket Maximum	\$20/\$25 Primary/Specialist Copay	\$2,716 Annual Premium

(Textual Format)

Plan A			
\$3,814 Deductible	\$4,941 Out of Pocket Maximum	\$20/\$20 Primary/Specialist Copay	\$2,716 Annual Premium
Plan B			
\$3,814 Deductible	\$4,903 Out of Pocket Maximum	\$20/\$30 Primary/Specialist Copay	\$2,798 Annual Premium
Plan C			
\$3,814 Deductible	\$4,903 Out of Pocket Maximum	\$20/\$25 Primary/Specialist Copay	\$2,754 Annual Premium
Plan D			
\$3,814 Deductible	\$4,903 Out of Pocket Maximum	\$20/\$20 Primary/Specialist Copay	\$2,716 Annual Premium
Plan E			
\$3,896 Deductible	\$5,046 Out of Pocket Maximum	\$25/\$25 Primary/Specialist Copay	\$2,859 Annual Premium
Plan F			
\$3,957 Deductible	\$4,941 Out of Pocket Maximum	\$25/\$35 Primary/Specialist Copay	\$2,754 Annual Premium
Plan G			
\$3,852 Deductible	\$4,985 Out of Pocket Maximum	\$20/\$25 Primary/Specialist Copay	\$2,716 Annual Premium

Exhibit C2: View of the Stimuli on Large and Small Screen Device

(Large Screen)

Imagine you are shopping for an individual health insurance plan, and have narrowed your choices down to the following options, which **differ ONLY on the following dimensions: Deductible, Out-of-Pocket Maximum, Copay, and Annual Premium.**

As a guide, these dimensions are defined as:

- **Deductible:** The amount you pay for covered healthcare services before your insurance plan starts to pay. For example, with a \$2,000 deductible, you pay the first \$2,000 of covered services yourself.
- **Out-of-Pocket Maximum:** The most you have to pay for covered services in a plan year. After you hit this amount on deductibles and copays, your health plan will pay 100% of the costs of covered benefits for the rest of the plan year.
- **Copay:** A flat fee (for example, \$20) that you pay for a covered healthcare service each time you use the service, before you hit your out-of-pocket maximum.
- **Annual Premium:** The amount of premium (i.e. cost of coverage) you pay per plan year.

Please choose **ONE** plan which **YOU PREFER MOST**.

☐ **Plan E**

\$3,896	\$5,046	\$25/\$25	\$2,859
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

☐ **Plan C**

\$3,814	\$4,903	\$20/\$25	\$2,754
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

☐ **Plan F**

\$3,957	\$4,941	\$25/\$35	\$2,754
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

☐ **Plan D**

\$3,814	\$4,903	\$20/\$20	\$2,716
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

☐ **Plan B**

\$3,814	\$4,903	\$20/\$30	\$2,798
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

☐ **Plan G**

\$3,852	\$4,985	\$20/\$25	\$2,716
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

☐ **Plan A**

\$3,814	\$4,941	\$20/\$20	\$2,716
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

(Small Screen)

Imagine you are shopping for an individual health insurance plan, and have narrowed your choices down to the following options, which **differ ONLY on the following dimensions: Deductible, Out-of-Pocket Maximum, Copay, and Annual Premium.**

As a guide, these dimensions are defined as:

- **Deductible:** The amount you pay for covered healthcare services before your insurance plan starts to pay. For example, with a \$2,000 deductible, you pay the first \$2,000 of covered services yourself.
- **Out-of-Pocket Maximum:** The most you have to pay for covered services in a plan year. After you hit this amount on deductibles and copays, your health plan will pay 100% of the costs of covered benefits for the rest of the plan year.
- **Copay:** A flat fee (for example, \$20) that you pay for a covered healthcare service each time you use the service, before you hit your out-of-pocket maximum.
- **Annual Premium:** The amount of premium (i.e. cost of coverage) you pay per plan year.

Please choose **ONE** plan which **YOU PREFER MOST**.

Plan E

\$3,896	\$5,046	\$25/\$25	\$2,859
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

Plan G

\$3,852	\$4,985	\$20/\$25	\$2,716
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

Plan F

\$3,957	\$4,941	\$25/\$35	\$2,754
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

Plan C

\$3,814	\$4,903	\$20/\$25	\$2,754
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

Plan B

\$3,814	\$4,903	\$20/\$30	\$2,798
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

Plan D

\$3,814	\$4,903	\$20/\$20	\$2,716
Deductible	Out of Pocket Maximum	Primary/Specialist Copay	Annual Premium

Appendix D: Study 2 Experimental Stimuli

Exhibit D1: Study 2: Credit Card Stimuli

(Visual Format)

Credit Card A
Annual Fee	APR	Sign Up Bonus	Cash Back
Credit Card B
Annual Fee	APR	Sign Up Bonus	Cash Back
Credit Card C
Annual Fee	APR	Sign Up Bonus	Cash Back
Credit Card D
Annual Fee	APR	Sign Up Bonus	Cash Back
Credit Card E
Annual Fee	APR	Sign Up Bonus	Cash Back
Credit Card F
Annual Fee	APR	Sign Up Bonus	Cash Back
Credit Card G
Annual Fee	APR	Sign Up Bonus	Cash Back

(Textual Format)

Credit Card A			
\$50 Annual Fee	19.15% APR	\$100 Sign Up Bonus	1.5% Cash Back
Credit Card B			
\$35 Annual Fee	15.24% APR	\$200 Sign Up Bonus	1.5% Cash Back
Credit Card C			
\$35 Annual Fee	13.49% APR	\$200 Sign Up Bonus	5% Cash Back
Credit Card D			
\$85 Annual Fee	17.40% APR	\$50 Sign Up Bonus	3% Cash Back
Credit Card E			
\$85 Annual Fee	13.49% APR	\$100 Sign Up Bonus	5% Cash Back
Credit Card F			
\$99 Annual Fee	15.24% APR	\$150 Sign Up Bonus	5% Cash Back
Credit Card G			
\$35 Annual Fee	13.49% APR	\$150 Sign Up Bonus	3% Cash Back

Exhibit D2: Study 2: Jacket Stimuli

(Visual Format)

Jacket A
\$99 Price	\$4.95 Shipping Cost	5 Days Expected Delivery
Jacket B
\$129 Price	\$7.99 Shipping Cost	2 Days Expected Delivery
Jacket C
\$99 Price	\$5.99 Shipping Cost	7 Days Expected Delivery
Jacket D
\$84 Price	\$4.95 Shipping Cost	2 Days Expected Delivery
Jacket E
\$109 Price	\$9.99 Shipping Cost	3 Days Expected Delivery

(Textual Format)

Jacket A		
\$99 Price	\$4.95 Shipping Cost	5 Days Expected Delivery
Jacket B		
\$129 Price	\$7.99 Shipping Cost	2 Days Expected Delivery
Jacket C		
\$99 Price	\$5.99 Shipping Cost	7 Days Expected Delivery
Jacket D		
\$84 Price	\$4.95 Shipping Cost	2 Days Expected Delivery
Jacket E		
\$109 Price	\$9.99 Shipping Cost	3 Days Expected Delivery

Appendix E: Study 3 Experimental Stimuli

Exhibit E1: Study 3: Subscription Services Stimuli

(Visual Format)

Plan A	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial
Plan B	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial
Plan C	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial
Plan D	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial
Plan E	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial
Plan F	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial
Plan G	Pay Monthly	Concurrent Streams	HD Content	First Month Free Trial

(Textual Format)

Plan A	\$11.99 Pay Monthly	2 Concurrent Streams	Yes HD Content	Yes First Month Free Trial
Plan B	\$8.49 Pay Monthly	3 Concurrent Streams	Yes HD Content	Yes First Month Free Trial
Plan C	\$8.99 Pay Monthly	3 Concurrent Streams	No HD Content	Yes First Month Free Trial
Plan D	\$8.49 Pay Monthly	2 Concurrent Streams	Yes HD Content	Yes First Month Free Trial
Plan E	\$9.99 Pay Monthly	1 Concurrent Streams	Yes HD Content	No First Month Free Trial
Plan F	\$11.99 Pay Monthly	3 Concurrent Streams	Yes HD Content	No First Month Free Trial
Plan G	\$8.49 Pay Monthly	1 Concurrent Streams	No HD Content	Yes First Month Free Trial

APENDIX F: Details of Measurement Scales

Style of Processing Scale (SoP) (Childers, Houston & Heckler, 1985)

22-item scale measures processing preference for visual vs. verbal information

Instructions: The aim of this exercise is to determine the style or manner you use when carrying out different mental tasks. Your answers to the questions should reflect the manner in which you typically engage in each of the tasks mentioned. There are no right or wrong answers, we only ask that you provide honest and accurate answers. Please answer each question by circling one of the four possible responses. For example, if I provided the statement, “I seldom read books,” and this was your *typical* behavior, even though you might read say one book a year, you would circle the “ALWAYS TRUE” response.

		1= Always True	2= Usually True	3= Usually False	4= Always False
1	I enjoy doing work that requires the use of words. (W) ^				
2*	There are some special times in my life that I like to relive by mentally “picturing” just how everything looked. (P)				
3*	I can never seem to find the right word when I need it. (W)				
4	I do a lot of reading. (W) ^				
5*	When I’m trying to learn something new, I’d rather watch a demonstration than read how to do it. (P) ^				
6*	I think I often use words in the wrong way. (W)				
7	I enjoy learning new words. (W)				
8*	I like to picture how I could fix up my apartment or a room if I could buy anything I wanted. (P)				
9	I often make written notes to myself. (W) ^				
10*	I like to daydream. (P)				
11*	I generally prefer to use a diagram rather than a written set of instructions. (P) ^				
12*	I like to “doodle”. (P) ^				
13*	I find it helps to think in terms of mental pictures when doing many things. (P)				
14*	After I meet someone for the first time, I can usually remember what they look like, but not much about them. (P)				

15	I like to think of synonyms for words. (W)				
16*	When I have forgotten something I frequently try to form a mental “picture” to remember it. (P)				
17	I like learning new words. (W) ^				
18	I prefer to read instructions about how to do something rather than have someone show me. (W)				
19*	I prefer activities that don’t require a lot of reading. (W) ^				
20	I seldom daydream. (P) ^				
21*	I spend very little time attempting to increase my vocabulary. (W)				
22*	My thinking often consists of mental “pictures” or images. (P) ^				

(W= verbal items; P=visual items; * = reversed scoring;
^ = denotes items used in this dissertation.)

[Verbal components have reported Cronbach’s alpha of .81; visual components’ reported Cronbach’s alpha is .86]

Source: Childers, T.L., Houston, M.J. & Heckler, S.E. (1985). Measurement of individual differences in visual versus verbal information processing. *Journal of Consumer Research*, 12(September), 125-134.

Hedonic / Utilitarian Scale (Voss, Spangenberg & Grohmann, 2003)
10 items, 7-point evaluative semantic differential

Think about [product] in general, please indicate your agreement with the following statements about it.

[Product] is likely to be:

Effective	Ineffective
Helpful	Unhelpful
Not Functional	Functional
Necessary	Unnecessary
Impractical	Practical
Not Fun	Fun
Exciting	Dull
Not Delightful	Delightful
Not Thrilling	Thrilling
Enjoyable	Unenjoyable

[First five items are utilitarian items;
Reported Cronbach's alpha is .95 for hedonic items, and .93 for utilitarian items]

Source: Voss, K.E., Spangenberg, E.R. & Grohmann, B. (2003). Measuring hedonic and utilitarian dimensions of consumer attitude. *Journal of Marketing Research*, 40(3), 310-320.

Subjective Numeracy Scale (8 items) (Fagerlin et al., 2007)

Cognitive abilities (1 = *not at all good*, 6 = *extremely good*)

How good are you at working with fractions?

How good are you at working with percentages?

How good are you at calculating a 15% tip?

How good are you at figuring out how much a shirt will cost if it is 25% off?

Preference for display of numeric information

When reading the newspaper, how helpful do you find tables and graphs that are part of a story? (1 = *not at all*, 6 = *extremely*)

When people tell you the change of something happening, do you prefer that they use *words* (“it rarely happens”) or *numbers* (“there’s a 1% chance”)? (1 = *always prefer words*, 6 = *always prefer numbers*)

When you hear a weather forecast, do you prefer predictions using *percentages* (e.g., “there will be a 20% chance of rain today”) or predictions using only *words* (e.g., “there is a small chance of rain today”)? (1 = *always prefer percentages*, 6 = *always prefer words*; reverse coded)

How *often* do you find numerical information to be useful? (1 = *never*, 6 = *very often*)

[Reported Cronbach’s alpha is .82; reported average time spent on scale by subjects 5.03 minutes]

Source: Fagerlin, A., Zikmund-Fisher, B.J., Ubel, P.A., Jankovic, A., Derry, H.A. & Smith, D.M. (2007). Measuring numeracy without a math test: Development of the subjective numeracy scale. *Medical Decision Making*, Sept-Oct, 672-680.

Involvement Scale (3 items) (Mittal, 1989)

In selecting from many plans of [product] available in the market, would you say that:
(1 = *I would not care at all*, 7 = *I would care a great deal as to which one I buy*)

How important would it be to you to make a right choice of [product]?
(1 = *Not at all important*, 7 = *Extremely important*)

In making your selection of a [product], how concerned would you be about the outcome of your choice?
(1 = *Not at all concerned*, 7 = *Very much concerned*)

Source: Mittal, B. (1989). Measuring purchase-decision involvement. *Psychology and Marketing*, 6(2), 147-162.

Temporal Distance Scale (2 Items) (Created)

Based on the task of choosing a [product] that you just did, how much time were you given before you had to actually buy a plan?

- One day from today
- One week from today
- At least one month from today

Based on the task of choosing a [product] that you just did, did you feel the time given before you had to actually buy a plan was:

- Too quick
- Adequate
- Too long

Perceived Stimulus Visualness (1 item) (Created)

Please indicate whether you feel the way information was presented to you, contains more text/word or more picture/graphic.

(7-point scale; 1 = *More text/word*, 7 = *More picture/graphic*)

Screen Size (2 items) (Created)

Please select the DEVICE TYPE you use to take this survey.

- ☐ A mobile / smartphone
- ☐ A tablet
- ☐ A laptop / desktop computer

What is the display screen size of the device you used to take this survey?

- ☐ 3 to 5.9 inches
- ☐ 6 to 7.9 inches
- ☐ 8 to 10.9 inches
- ☐ 11 inches and above

Perceived Task Difficulty (adapted from Townsend & Kahn, 2014)

Please rate how difficult it was for you to complete the task of choosing a [product].
(1 = *Very easy*; 5 = *Very difficult*)

Source: Townsend, C. & Kahn, B.E. (2014). The ‘Visual preference heuristic’: The influence of visual versus verbal depiction on assortment processing, perceived variety, and choice overload. *Journal of Consumer Research*, 40(February), 993-1015.

Perceived Time Spent on Task (1 item, 7-point scale) (Created)

Based on the [product] you just chose, how much did the way information was presented affect your choice making time?

(1 = *It took much less time than I expected*, 7 = *It took much more time than I expected*)

Subjective Feeling Measures (adapted from various sources)

Based on the [product] you just chose, indicate your level of agreement with the following statements.

I felt confused while making a choice.

I felt frustrated while making a choice.

(1 = *Not at all*, 7 = *A lot*)

Subjective Quality Measures (adapted from various sources)

Based on the [product] you just chose, indicate your level of agreement with the following statements.

I am satisfied with my preferred choice.

I am confident in my preferred choice.

I like my preferred choice.

I am likely to purchase my preferred choice.

(1 = *Not at all*, 7 = *A lot*)

Appendix G: Select Statistical Analysis Outputs

Table G1: Manipulation Measures – Scale and Reliability

Manipulation Measure / Scale	No. of items and scale points (individual items are reported in the Appendix)	Source	Cronbach's alpha
Stimulus Visualness	1 item (7 point scale 'More text/word' to 'More picture/graphic')	Created	Not applicable (a 1-item measure)
Hedonic Scale	5 items (7-point scale, evaluative semantic differentials)	Voss, Spangenberg and Grohmann (2003)	Study 2: $\alpha = .73$
Utilitarian Scale	5 items (7-point scale, evaluative semantic differentials)		Study 2: $\alpha = .85$
Temporal Distance	2 items (3-point scale)	Created	Study 3: Pearson's $r = .99$ ($p < .01$)

Table G2: Scale Reliability for ‘Subjective Quality’ & ‘Subjective Feeling’ (Study 1)

	Study 1	
	<i>Component</i>	<i>Communalities</i>
<i>‘Subjective Quality’:</i>	<i>I</i>	
Satisfaction	.885	.740
Confidence	.790	.716
Attitude	.629	.456
Purchase Intention	.603	.450
Eigenvalues	2.588	
% variance explained	54.195	
Kaiser-Meyer-Olkin measure of sampling adequacy for analysis (acceptable >.5; Field, 2013)	.643	
Cronbach’s alpha	.817	

<i>‘Subjective Feeling’</i> : Correlation between Confusion and Frustration	Pearson’s $r = .615$ $p = .000$
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Correlation between ‘Subjective Feeling’ and ‘Subjective Quality’	Pearson’s $r = -.219$ $p = .000$
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* ‘Subjective Quality’ (contains satisfaction, confidence, attitude, and purchase intention)
‘Subjective Feeling’ (contains confusion and frustration)

Table G3: Scale Reliability for ‘Subjective Quality’ & ‘Subjective Feeling’ (Study 2)

	Study 2	
	<i>Component</i>	<i>Communalities</i>
<i>‘Subjective Quality’:</i>	<i>I</i>	
Satisfaction	.946	.894
Confidence	.478	.228
Attitude	.960	.922
Purchase Intention	.894	.799
Eigenvalues	3.035	
% variance explained	71.094	
Kaiser-Meyer-Olkin measure of sampling adequacy for analysis (acceptable >.5; Field, 2013)	.806	
Cronbach’s alpha	.885	

<i>‘Subjective Feeling’</i> : Correlation between Confusion and Frustration	Pearson’s $r = .764$ $p = .000$
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Correlation between ‘Subjective Feeling’ and ‘Subjective Quality’	Pearson’s $r = -.070$ $p = .141$
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* ‘Subjective Quality’ (contains satisfaction, confidence, attitude, and purchase intention)
‘Subjective Feeling’ (contains confusion and frustration)

Table G4: Scale Reliability for ‘Subjective Quality’ & ‘Subjective Feeling’ (Study 3)

	Study 3	
	<i>Component</i>	<i>Communalities</i>
<i>‘Subjective Quality’:</i>	<i>I</i>	
Satisfaction	.933	.870
Confidence	.897	.804
Attitude	.918	.842
Purchase Intention	.719	.516
Eigenvalues	3.254	
% variance explained	75.834	
Kaiser-Meyer-Olkin measure of sampling adequacy for analysis (acceptable >.5; Field, 2013)	.813	
Cronbach’s alpha	.922	

<i>‘Subjective Feeling’</i> : Correlation between Confusion and Frustration	Pearson’s $r = .741$ $p = .000$
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Correlation between ‘Subjective Feeling’ and ‘Subjective Quality’	Pearson’s $r = -.375$ $p = .000$
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*‘Subjective Quality’ (contains satisfaction, confidence, attitude, and purchase intention)
‘Subjective Feeling’ (contains confusion and frustration)

Table G5: Scales and Reliability Results for Covariates

Scale	No. of items and scale points (individual items are reported in Appendix B)	Source	Cronbach's alpha
Style of Processing	10 item (4 point scale 'Always True' to 'Always False')	Childers, Houston and Heckler (1985)	Study 1: $\alpha = .606$ Study 2: $\alpha = .802$ Study 3: $\alpha = .441$
Numeracy	8 items (6-point scale)	Fagerlin, Zikmund-Fisher, Ubel, et al. (2007)	Study 1: $\alpha = .833$ Study 2: $\alpha = .806$ Study 3: $\alpha = .801$
Involvement	3 items (7-point scale)	Mittal (1989)	Study 1: $\alpha = .825$ Study 2: $\alpha = .772$ Study 3: $\alpha = .792$

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