CONSUMER RESPONSES TO REALLY NEW PRODUCTS: EXAMINING THE IMPACTS OF LEARNING STRATEGIES AND PRESENTATION FORMATS ON PRODUCT COMPREHENSION AND ATTITUDE FORMATION

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JULY 2009

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July 2009

ABSTRACT

The difficulty for consumers to categorize a RNP using their existing knowledge structures can be a significant barrier to the success of the product. Marketing communications may help consumers learn and develop positive attitudes for these novel products. In particular, mental simulations and analogies have been identified as powerful learning tools for RNPs. Furthermore, visuals in advertising have recently been conceptualized as meaningful sources of information as opposed to peripheral cues and thus may help consumers learn about RNPs. The study of visual attention may also contribute to understanding the links between conceptual and perceptual analyses when learning for a RNP. Two conceptual models are developed. The first model consists of causal relationships between the attributes of advertising stimuli for RNPs and consumer responses, as well as mediating influences. The second model focuses on the role of visual attention in product comprehension as a response to advertising stimuli.

Two experiments are conducted: a Web-Experiment and an eye-tracking experiment. The first experiment (858 subjects) examines the effect of learning strategies (mental simulation vs. analogy vs. no analogy/ no mental simulation) and presentation formats (words vs. pictures) on individual responses. The mediating role of emotions is assessed. The second experiment investigates the effect of learning strategies and presentation formats on product comprehension, along with the role of attention (17 subjects). The findings from experiment 1 indicate that learning strategies and presentation formats can either enhance or undermine the effect of advertising stimuli on individual responses. Moreover, the nature of the product (i.e. hedonic vs. utilitarian vs. hybrid) should be considered when designing communications for RNPs. The mediating role of emotions is verified. Experiment 2 suggests that an increase in attention to the message may either reflect enhanced comprehension or confusion. The findings, implications, limitations and directions for future research are discussed.

KEYWORDS
Really New Products, Consumer Behaviour, Experimental Setting, Visual Attention

To My Parents
(Patricia and Thierry)

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my supervisors Professor Veronica Wong and Professor Amanda J. Broderick. In particular, I wish to thank Professor Veronica Wong for guiding me through all the phases of the dissertation process with insights and suggestions that greatly improved my work and helped me avoid mistakes. Her confidence in me meant more to me than I can express. The lessons I learnt from her in creating meaningful research are invaluable and I am proud to have had the opportunity to work with her. I wish to thank Professor Amanda J. Broderick for her valuable insights during the dissertation process. I also would like to thank her for allowing me to work on other research projects with her. Most importantly, I wish to thank both of them for taking a chance on me a few years ago and agreeing to supervise me at Aston University.

I am also grateful to the Marketing Group at Aston Business School for its financial support during the Phd. Moreover, I am indebted to Professors Gordon Greenley and Veronica Wong and my colleagues in the Marketing Group in Aston Business School for their constant support throughout the years and for their confidence in me.

Special thanks also go to Dr. Evmorfia Argyriou, Laura Chamberlain and Dr. Nick Lee. I wish to thank Evmorfia for her statistical advice and for always, always being available to help me. I wish to thank Laura for her help with the eye-tracking experiments, and for the hours she spent with me improving the experimental setting, pre-testing the equipment and actually helping me use it during the experiments. Her support was invaluable. I also wish to thank Nick for his great insights and support throughout the dissertation process. He always had an encouraging word and really helped me through some of the difficult steps, including my first presentation at a conference. I won't forget that!

I also wish to thank Andrew Wilson for his support with the eye-tracking experiment and with the upload of the web-experiment using html.

On a personal level, I have to thank my parents Patricia and Thierry, along with my brother Benjamin and my grandmother Christiane for always being by my side. They never doubted me, even when I did. I also have to thank my friends for their patience and support during the difficult times. Special thanks to Erik Casagrande for his friendship and support over the years.

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CHAPTER ONE

INTRODUCTION

CONTENTS: The chapter presents an introduction to the research topic. Section 1.1 introduces the research background and focuses on three key areas of research, namely cognitive learning for new concepts (section 1.1.1), openness in advertising (section 1.1.2) and human perception (section 1.1.3). Section 1.2 examines the research gap and thus the motivation for the research presented in this thesis. Section 1.3 discusses the objectives of the research and section 1.4 presents a brief outline of the thesis structure.

Really New Products (RNPs) create new product categories or at least significantly expand existing ones (Lehmann, 1994). For instance, Personal Digital Assistants (PDAs), digital cameras and MP3 players qualified as RNPs at the time of launch. These products have the potential to revolutionize the existing competitive landscape and create major shifts in market shares. For example, in the music industry, Sony introduced the walkman in 1979. The major competitors in the music industry in the early 1990's were Sony and Philips, and Philips came out with the CD-Rom in 1992. However, soon after the turn of the millennium MP3 players were introduced. As soon as Apple invented the I-Pod, the sales of MP3 players sky rocketed. Even though Apple did not invent the MP3 player, they manufactured their products to be user friendly and marketed them to younger consumers, which made I-Pod the front-runner in the industry (Hunt and Mellicker, 2008). Therefore, the competitive landscape in the music industry changed entirely as Sony and Philips used to be the biggest players whereas the arrival of a RNP i.e. MP3 players established Apple as the new market leader.

New product development is a priority for most companies as, without the success of such novel products, market shares ultimately drop off (Hoeffler, 2003). In fact, firms' capacity to successfully develop RNPs greatly affects their future growth potential. John E. Pepper, former CEO of Procter and Gamble, states: "Our greatest periods of growth have occurred when we have been able to bring truly new-to-the-world products to market". However, despite existing research on how companies can structure their activities to foster innovation (Christensen, 1997; Wheelwright and Clark 1992) and how firms can best capture consumers' needs and wants (Griffin and Hauser 1993; Urban and Hauser 1993), failure rates for new products are sky-rocketing, ranging from 40% to 90% across product categories (Cierpicki, Wright and Sharp, 2000; Griffin, 1997). Furthermore, highly innovative products, such as RNPs, fail at an even greater rate than less innovative products (Urban and Hauser, 1993). This phenomenon has been referred to as "the curse of innovation" (Gourville, 2005), as consumers are often initially reluctant to adopt very innovative products (Bass, 1969; Rogers, 1995). Recent examples of RNPs that struggled in the marketplace include the Segway scooter and Tivo (Gourville, 2005). It has been suggested that the difficulty for consumers to comprehend the nature of a RNP using their existing knowledge structures is a significant barrier to the success of the product, due to the highly innovative nature of these products (Hoeffler, 2003; Moreau, Lehmann and Markman, 2001; Gregan-Paxton et al., 2002). Because prior category knowledge plays a key role in the development of new product knowledge, a critical question is how marketers can help consumers learn about new products that are, by definition, like nothing they have seen or experienced before (Lehmann, 1997). Despite the considerable sums companies spend on new product advertising, understanding of the learning processes specific to RNPs, as well as the implications for communication strategy remain low. Thus, designing a campaign to help consumers understand these truly novel innovations is a formidable challenge (Gregan-Paxton et al. 2002).

1.1 RESEARCH BACKGROUND

In order to provide a general overview of existing research that can be related to the issue of consumer responses to RNPs and justification for the present research focus, one can usefully identify three streams of research: 1) cognitive psychology and consumer behaviour, more specifically learning strategies for new concepts and new products, 2) openness in advertising and 3) human perception including visual attention patterns. Particularly noteworthy is that the cognitive psychology and visual attention literature elaborate detailed models of how consumers process stimuli at the cognitive and physiological level, and thus focus on the human system (McQuarrie and Mick, 2003). Contrarily, the study of openness in advertising devotes efforts to examining how differentiating and structuring the stimulus is capable of evoking one or another response, thus focusing on the ad system The integration of these three streams of literature thus provides an all-encompassing approach to consumer responses to new products, by integrating the conceptual and perceptual human system and the advertising/ stimulus system.

1.1.1 Cognitive Psychology – Individual Learning for New Concepts

Studies on individual learning for new concepts implicitly consider that individual response to stimuli will be affected mainly by how consumers process stimuli. Learning theories have been the subject of investigation in a wide variety of disciplines, including economics (Arrow, 1962), organisation science (Argyris and Schon, 1978; Fiol and Lyles, 1985; Brown and Duguid, 1991), sociology (Rosa et al., 1999; Burt, 1982) and educational psychology (Halpern, Hansen and Riefer, 1990; Piaget, 1972; Vygotsky, 1978). In the field of consumer behaviour, the connectionalist perspective, which builds on associations between a stimulus and a response, can be distinguished from the cognitive perspective. The connectionalist perspective has been divided into two main streams: classical conditioning (Pavlov, 1928; Grossman and Till, 1998) and instrumental conditioning (Foxall, 1994; Holbrook and Hirschman, 1982). Instrumental conditioning introduces a significant shift in behaviourism with respect to the classical conditioning hypothesis: the stimuli do not elicit a specific response, as in classical conditioning. Instead, the stimuli signal the likely consequences of behaving in a particular manner (Foxall, 1994). As opposed to the behavioural theories of learning, cognitive learning theory underscores the centrality of internal mental processes in decision making. The present research is anchored in the cognitive learning stream of literature in psychology and consumer behaviour.

Research in cognitive psychology provides some insights regarding how the level of congruity between products and their associated product category schemas affects processing and evaluative judgments (Meyers-Levy and Tybout, 1989; Sujan, 1985; Mandler, 1982). Interestingly, products that are moderately incongruent with their associated category schemas are expected to stimulate processing that leads to a more favourable evaluation relative to products that are either congruent or extremely incongruent i.e. RNPs (Meyers-Levy and Tybout, 1989). A debate exists in the literature regarding whether product attributes are reviewed, evaluated and combined to trigger an overall evaluation, or whether simpler processes are used (Sujan, 1985).

The piecemeal approach suggests that individuals review all the information available from a source, evaluating each piece of information separately to finally reach a final judgment (Anderson 1974; Fiske, 1982). An alternative to the piecemeal approach is the categorization approach (Rosch, 1975; Sujan; 1985) which basic premise is that individuals naturally divide the world around them into categories to reach an efficient understanding of the environment. Prior experiences with the schema or category serve as a guide to evaluations (Fiske, 1982). However, RNPs by definition do not fit into an existing category and therefore individuals have very limited cognitive structures associated with these products (Lehmann, 1994), which reduces the usefulness of categorical transfer as a learning paradigm for RNPs. Categorical transfer is used primarily to organize existing information, not to learn new knowledge (Gregan-Paxton and Roedder John, 1997). Contrarily, analogical learning and mental simulation may be effective strategies to help individuals develop their knowledge (Gregan-Paxton and Roedder John, 1997; Taylor et al., 1998). This research, and in particular the studies on analogical learning and mental simulation anchored in cognitive psychology, are therefore particularly relevant to the study of consumer responses for RNPs.

1.1.2 Openness in Advertising

The literature on cognitive processing and individual learning has focused on the human system in an effort to develop models of how consumers process stimuli (McQuarrie and Mick, 2003). However, little attention has been paid in cognitive psychology to the study of the ad system itself. The present research will not only draw on the cognitive learning literature but also on the rhetorical perspective which studies how differentiating and structuring the stimulus is capable of evoking one or another response (McQuarrie and Mick, 2003), thus enabling a comprehensive understanding of scientific approaches to consumer response. In particular, research on openness in advertising (Van Gisbergen, Ketelaar and Beentjes, 2004) studies the impact of advertisements that provide little guidance toward a specific interpretation. Openness increases the possibility of polysemic readings (Fiske, 1987), and can be induced by the presence of prominent visuals which, according to the field of semiotics, are open to a multitude of interpretations (Barthes, 1977; Eco, 1976; McQuarrie and Phillips, 2005). Openness can also be affected by the presence of undercoded rhetorical figures, or artful deviations from expectations (McQuarrie and

Mick, 1996, 2003; Phillips and McQuarrie, 2004) that may suggest several meanings. In particular, tropes, such as metaphors, irony and puns, are incomplete and can be interpreted in various ways (McQuarrie and Mick, 1996). Furthermore, analogies are also a figure of rhetoric as they are a type of metaphor in which only relational predicates are mapped while attributes are not (Gentner, 1989). The present research builds on the openness literature (McQuarrie and Phillips, 2005) to examine the effect of visual claims and of analogies on consumer responses to new products.

1.1.3 Human Visual Perception

The study of the cognitive and rhetorical streams of research provides a rich understanding of consumer responses to the stylistic structure of advertisements. However, complex information must be first perceptually processed in order to be cognitively understood (Raymond, 2003). To facilitate the perceptual processing of information, humans have evolved a complex range of neural mechanisms, also called attention, which both selects and actively ignores (Raymond, 2003). Two broad determinants of selective visual attention have been identified in the human perception literature: bottom-up factors in the stimulus and top-down factors in the person and in the attentional process itself (Chun and Wolfe 2001; Posner 1980; Theeuwes 1994; Yantis 2000). The attentional processes driven by the bottom-up and top-down determinants originate in distinct but connected areas of the brain (Itti and Koch, 2001). In particular, bottom-up factors refer to features of advertisements that affect their perceptual salience (Janiszewski, 1998), such as size and shape. The features will capture attention to ad elements rapidly and almost automatically even when the consumer is not actively searching for them (Wolfe, 1998; Yantis and Jonides, 1984). Top-down factors reside in the person and in his or her attentional process, such as involvement with products or familiarity with brands (Rayner et al. 2001; Rosbergen, Pieters, and Wedel 1997). These factors will encourage subjects to voluntarily pay more or less attention to advertisements and their elements.

Moreover, text perception and scene perception rest on fundamentally different attention processes: comprehension for a message conveyed using words can only be gained through focal attentive processes which are voluntary, serial, slow and effortful (Loftus, 1983; Rayner, 1998; Reichle et al., 1998). Contrarily, scene, or picture perception relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). Therefore, although the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth, 1998), text needs more eye fixations to be comprehended. The literature on human perception and visual attention may enhance the understanding of the dynamics that link conceptual analysis during which consumers integrate information from the stimulus with their existing knowledge (Pieters and Warlop, 1999) and perceptual analyses during which individuals integrate textual and pictorial information using visual attention (Rayner et al., 2001).

1.2 THE RESEARCH GAP

Theories of learning most frequently cited in the marketing literature include category-based learning, analogies and mental simulations (Hoeffler, 2003). Categorization research adheres to the assumption that categories serve primarily as tools for organizing knowledge rather than as tools for using or applying knowledge (Fiske and Neuberg, 1990). Prior research has established that categorization plays a central role in new product learning (Sujan, 1985). However, categorical learning is mainly used to organize existing information, not to learn new knowledge (Gregan-Paxton and Roedder John, 1997). RNPs create new product categories or substantially expand existing ones (Lehmann, 1997). Therefore, the usefulness of categorical transfer as a cognitive tool to learn about RNPs is limited (Hoeffler, 2003) as for such novel products categorization is at best ambiguous (Gregan-Paxton, Hoeffler and Zhao, 2005) or impossible. Both analogies and mental simulations may be appropriate cognitive strategies to help individuals deal with uncertain environments and develop new knowledge (Gregan-Paxton and Roedder John, 1997; Taylor et al., 1998). Analogies rely on a model of internal knowledge transfer which focuses on the transfer of knowledge from one domain (the base) to another (the target), as a function of the correspondence between the two (Gentner, 1989). The analogical learning paradigm provides an understanding of knowledge transfer not only between a new stimulus and the existing knowledge used to organize it in memory, but also between a new stimulus and the knowledge used to learn about it (Gregan-Paxton and Roedder John, 1997), thus providing a broader perspective on the knowledge-transfer issue than the categorization theory.

Mental simulation is another cognitive tool that may help individuals gain new knowledge. Mental simulation, defined as the imitative representation of some event or series of events (Taylor and Schneider, 1989), involves the cognitive construction of hypothetical scenarios. Particularly noteworthy is that mental simulations obey the constraints of reality and are thus useful for anticipating the future because the imagined plans of action are unlikely to rely on improbable events along the way (Kahneman and Miller, 1986). The role of mental simulation as a cognitive tool to evaluate products is well established in the literature (Phillips, 1996; Shiv and Huber, 2000). Moreover, mental simulation may be an appropriate cognitive process to help consumers learn about new product benefits (Sujan et al., 1997), which is particularly relevant in the context of consumer learning for RNPs.

Previous research has examined both the effect of analogies (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau, 2003; Hoeffler, 2003; Roehm and Sternthal, 2001; Ait El Houssi, Morel and Hultink, 2005) and mental simulations (Castano, Sujan, Kacker and Sujan, 2008; Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007; Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007) on responses to RNPs. The merits of mental simulations and analogies have also been investigated in the domain of new product design and new product ideation (Dahl, Chattopadhyay and Gorn, 1999; Dahl and Moreau, 2002).

However, to a large extent analogies and mental simulations have been studied in different streams of research with little overlap. The sole exception is Hoeffler's (2003) study on the measurement of preferences for RNPs, which was not conducted in the context of marketing communications but using market research techniques inciting potential consumers to elaborate on the sources of uncertainty that characterize the new products. Hence, the extant literature on new products has not formerly examined the differential effects of mental simulations and analogies on consumer responses in an experimental setting. The present study intends to fill in this gap.

Moreover, the ability of nonverbal, pictorial stimuli to drive individuals to imagine themselves in a situation has been widely acknowledged in consumer research (Babin and Burns, 1997). However, previous research on mental simulations for RNPs has focused solely on the use of text containing instructions to imagine (Castano, Sujan, Kacker and Sujan, 2008; Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007; Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007). Pictures present visual images in an appropriate modality for internalization as the basis for personal imagery (Rossiter and Percy, 1980). A picture superiority effect ensues as visual information tends to be remembered over verbal information because pictures activate a visual as well as verbal encoding process (the dual-coding hypothesis; Paivio, 1986). Most studies also support the picture superiority effect on brand attitudes (Edell and Staelin, 1983; Mitchell, 1986; Mitchell and Olson, 1981; Rossiter and Percy, 1978, 1980). Therefore, mental simulation conveyed using a visual scenario may enhance consumers' ability to vicariously experience the consequences of product use to a greater extent than a verbal description. Hence, the comparison of visual vs. verbal mental simulation strategies in the context of consumer responses to RNPs is a timely endeavor.

Contrary to visual mental simulations, the use of visual analogies has received little attention in consumer research. Researchers in marketing have started to investigate the processes of internal knowledge transfer that consumers engage in when learning about a new, unfamiliar product based on work in cognitive psychology on analogical reasoning (Holyoak, Gentner, and Kokinov 2001; Vosniadou 1989). However, despite this explicit use of analogies, little research has acknowledged that analogies are rhetorical figures (Delbaere and Smith, 2007) and can thus be powerful tools for persuasive communication when conveyed either verbally or visually. The present research brings together two different streams of research: analogical learning for RNPs (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau 2003; Moreau, Lehman and Markman 2001; Moreau, Markman and Lehmann 2001, Roehm and Sternthal 2001) and the use of rhetorical works in advertising (McQuarrie and Mick, 1992, 1996, 1999, 2003). Recent findings suggest that visual metaphors in advertising may be more persuasive due to both visual argumentation and metaphorical rhetoric (Se-Hoon Jeong, 2008). As analogies are a type of metaphor (Gentner, 1989), a question is whether these findings may be replicated in the context of advertising for RNPs. Considering that visual figures have recently been conceptualized as sources of meaning and persuasion in advertising operating through indirect persuasion (McQuarrie and Phillips, 2005), the present research attempts to close a gap in the literature by comparing analogies for RNPs presented alternatively in words and in pictures.

Recent research in marketing has identified the need to distinguish between hedonic and utilitarian products in the context of convergence in the high-tech electronics sector, whereby disparate functionalities are added to existing base products (Gill, 2008). RNPs can also be conceptualized as offering predominantly utilitarian or hedonic benefits. Consistent with previous research in marketing, the term utilitarian benefits refers to the functional, instrumental, and practical benefits of a product, the term hedonic benefits refers to the product's aesthetic, experiential, and enjoyment-related benefits, and to its ability to provide feelings (Batra and Ahtola 1990; Chitturi, Raghunathan, and Mahajan 2007; Dhar and Wertenbroch 2000; Strahilevitz and Myers 1998). Based on the congruity theory (Johar and Sirgy, 1991), advertising effectiveness will be enhanced if a congruity is achieved between the nature of the product and the advertising appeal. Specifically, hedonic appeals are more effective than utilitarian appeals when the product is perceived to be more hedonic. Conversely, utilitarian appeals are more effective than hedonic appeals when the product is perceived to be utilitarian (Johar and Sirgy, 1991). Drawing on the idea that pictures have a more hedonic nature than words (Hirschman and Solomon, 1984; Hirschman, 1986), the present research intends to examine whether the use of visual appeals will be more effective when the product offers hedonic benefits while the use of words will be more effective for products that deliver predominantly utilitarian benefits, an area of research which has received little attention in the innovation literature.

Moreover, the mental simulation literature distinguishes between process simulation, which encourages individuals to imagine the step-by-step process of reaching a certain goal, and outcome simulation which encourages individuals to imagine the desirable outcomes of fulfilling the goal (Taylor et al., 1998). However, the dual nature of new products, involving a process and an outcome which can be either utilitarian or hedonic, and implications for consumer processing of RNPs has received no scholarly attention to date. Accordingly, the following classification may be identified:

- Utilitarian products (utilitarian outcomes/ utilitarian process), which provide functional, instrumental and practical benefits and require consumers to go through a utilitarian process to achieve these benefits;
- Hedonic products (hedonic outcomes/ hedonic process), which provide aesthetic, experiential and enjoyment-related benefits and which process of use is experiential in itself (Chitturi, Raghunathan and Mahajan, 2008);
- Hybrid products (hedonic outcomes/ utilitarian process), which provide hedonic benefits (aesthetic, experiential and enjoyment-related) but which require consumers to go through a utilitarian process to achieve these benefits.

A new product classification may therefore be identified and implications for consumer responses to new products examined. In particular, a question is whether hybrid products requiring individuals to go through a utilitarian process but offering hedonic benefits should be conveyed using the same learning strategies and presentation formats as utilitarian products, as hedonic products, or using alternative cognitive tools. The present research intends to fill in this gap in the literature.

Furthermore, only recently have researchers acknowledged that consumer evaluations of innovations result in emotional responses that must be considered in the development of product launch strategies (Wood and Moreau, 2006; Castano, Sujan, Kacker and Sujan, 2008), following Mick and Fournier's (1998) call for more research appraising the role of emotions as a mediator in consumer responses to technological products. Learning about a complex innovation is rarely a neutral process and can elicit strong emotions along the way (Wood and Moreau, 2006). According to self-regulatory theory (Higgins, 1987) when engaged in a learning activity, individuals set goals and monitor their progress towards these goals. Therefore, when individuals reach the goal of comprehending a new complex product, they are likely to experience strong positive emotions. However, negative emotions may arise when this goal is impeded. No research to date has examined experimentally whether positively and negatively valenced emotions mediate the effect of stimuli characteristics on consumer responses to new products. Because emotional responses are likely to be particularly strong in the first stages of learning for a new product (Wood and Moreau, 2006) and may thus affect product comprehension along with attitudinal and behavioural variables, this would seem to be an important area of research.

Finally, Wedel and Pieters (2007) have recently called for more research applying eye tracking experiments, measuring individual attention to stimuli, to make inverse inferences about fundamental communication processes. Previous eye tracking research has often been descriptive, for instance by relating perceptual aspects of the stimulus, namely size, colour or position of the brand, text and pictorial directly to measures of visual attention. However, much more can be gained from using eye-tracking measures as indicators of the latent measures of interest, such as product comprehension (Wedel and Pieters, 2007). Contrary to the accepted wisdom inspired by hierarchical models such as AIDA and its successors (Starch, 1923) that attention is a mere precondition, a gate through which information enters on its way to higher-order cognitive processes of more interest, academic research has shown that visual attention is a key coordinating mechanism that helps maintain information processing and other goals over time (LaBerge, 1995). Drawing on the inverse inference model (Feng, 2003), key indicators of unobservable cognitive processes may be derived from observed eye movements, thus providing a "window to the mind" (Pieters, Wedel and Zhang, 2007). Extant research on RNPs has not examined the role of visual attention in consumer responses to the product. However, provided that a close correspondence exists between eye movements and higher-order cognitive processes (Rizzolatti, Riggio and Sheliga, 1994), a study combining eye movement data and self-report measures may provide valuable insights into the effectiveness of advertising stimuli for RNPs.

Moreover, measuring visual attention for visual vs. verbal claims may contribute to enhancing the understanding of processing strategies for "open" advertisements. A recent stream of literature has identified visuals as powerful sources of meaning and persuasion in advertising (McQuarrie and Phillips, 2005). Based on this definition of visuals in advertising as communication artifacts, and on recent efforts to understand how individuals "read pictures" (Wang and Peracchio, 2008), a question is whether attention processes for complex advertising visuals are in line with those outlined in research on scene perception or whether they are different for rhetorical figures. A key issue involves identifying the visual mechanisms used to process the message for open vs. closed ads. On the one hand, the literature on scene perception suggests that attention to pictures relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). This stream of research suggests that no correlation should exist between attention to the pictorial element of the stimulus and product comprehension. On the other hand, the literature on visual rhetoric suggests that people process advertising images in a conscious and deliberative manner which is thought to consume cognitive resources, to be intentional and controllable (Johar, Maheswaran and Peracchio, 2006). Therefore, if visual rhetoric is like writing with pictures (Scott and Vargas, 2008), the processing of complex images may be similar to attention strategies used to extract information from text. Hence, a sustained cognitive effort and consequently an increase in attention may be required to reach comprehension, thus suggesting a correlation between attention and comprehension. In light of the different perspectives offered by the literature on scene perception and by the literature on visual rhetoric, the study of visual attention for complex visuals in advertising appears to be a fruitful area of research.

Overall, a key research gap identified highlights the lack of research examining the differential effects of mental simulations and analogies on consumer responses to RNPs, as mental simulations and analogies have been largely studied by separate streams of research. Moreover, no research to date has examined consumer responses to analogies and mental simulations conveyed using pictorials. Based on the literature on visual imagery and in particular on the dual-coding hypothesis and on the literature on rhetorical works in advertising, examining consumer responses to analogies and mental simulations compared using words vs. using pictures would be a fruitful area of research. The role of emotional responses in consumer learning and evaluation of RNPs has also received limited attention in primarily cognitive-based models of responses to innovations. Because emotional responses are likely to be particularly strong in the first stages of learning for a new product and may thus affect product comprehension along with attitudinal and behavioural variables, this would seem to be an important area of research. Moreover, a research gap exists in the literature on consumer responses to RNPs, as the dual nature of new products, involving a process and an outcome which can be either utilitarian or hedonic, and implications for consumer processing of RNPs has received no scholarly attention to date. A new product classification therefore needs to be identified and implications for consumer responses to new products examined. In particular, a question is whether hybrid products requiring individuals to go through a utilitarian process but offering hedonic benefits should be conveyed using the same learning strategies and presentation formats as utilitarian products, as hedonic products, or using alternative cognitive tools. Finally, a research gap was identified as little research has examined the links between perception and cognition in the comprehension of complex product concepts. Due to the different perspectives offered by the literature on scene perception and by the literature on visual rhetoric, the study of attention to complex visuals in advertising appears to be a promising area of research.

1.3 RESEARCH OBJECTIVES

The objectives of the present research follow on from the previous discussion. Essentially, the objectives are focused on eliciting empirical evidence regarding consumer responses to stimuli for RNPs. More specifically, the four objectives of this study are:

1. To identify the role of alternative presentation formats (i.e. words vs. pictures) and learning strategies (i.e. mental simulations and analogies) on consumer responses to RNPs (i.e. product comprehension, attitude to the product and behavioural intent);

2. To present a new conceptualisation of RNPs based on the nature of the product (i.e. utilitarian vs. hedonic vs. hybrid-utilitarian process and hedonic outcome) and examine whether individual responses to stimuli for RNPs are affected by the nature of the new product;

3. To determine whether specific positive and negative emotional responses mediate the relationship between stimuli characteristics and individual outcomes;

To achieve these objectives, the first experiment in the present study manipulates design factors in a mixed-subjects design that makes it possible to assess the effects of combinations of different learning strategies and presentation formats on product comprehension, attitudes and intentions for three different types of products: a utilitarian product, a hedonic product, and a hybrid product which requires a utilitarian process for use but offers hedonic outcomes. The mediating role of emotional responses is also assessed in this experiment.

4. To investigate the links between the perceptual strategies used by individuals to process messages conveyed using words vs. using pictures and individual comprehension for a new product.

To achieve this objective, the second study uses an eye-tracking experiment that combines physiological measures of visual attention and self-reports of product comprehension.

The attainment of these objectives is important for a number of reasons, which together form the anticipated theoretical contribution of the thesis. Specifically, attainment of objective one will contribute to research in consumer responses to RNPs by identifying which learning strategy (i.e. mental simulation vs. analogy) is best to enhance comprehension, attitudes and intentions for RNPs, as the existing scholarly literature has not compared the effects of these two strategies in an experimental procedure to date. The achievement of objective 1 is crucial since the literature has primarily examined mental simulations and analogies in separate streams of research, while it seems essential for managers to identify the circumstances under which a given strategy might be more effective in eliciting studied outcomes than another strategy. Moreover, previous research on RNPs has only examined the effects of analogies and mental simulations conveyed using text on individual responses. Given the recent conceptualisation of visuals in advertising as complex, powerful sources of meaning and persuasion (McQuarrie and Phillips, 2005), examining the effects of strategies presented using pictures on consumer responses provides an additional facet to the present study.

The classification of RNPs into utilitarian vs. hedonic vs. hybrid products is also a key objective of the study, as without a robust categorisation of new products, it is difficult for researchers to identify which strategies and presentation formats should be used to convey the benefits of new products. In particular, while the literature suggests that utilitarian products may be best conveyed using words and hedonic products using pictures (Johar and Sirgy, 1991), little attention has been given to the specific strategies required to convey the benefits of hybrid new products that require consumers to go through a utilitarian process but offer hedonic outcomes.

Researchers have recently acknowledged that consumer evaluations of innovations trigger emotional responses that must be considered in the development of product launch strategies (Wood and Moreau, 2006; Castano, Sujan, Kacker and Sujan, 2008), following Mick and Fournier's (1998) call for more research appraising the role of emotions as a mediator in consumer responses to technological products. The present study identifies an important gap and examines whether positively and negatively-valenced emotions mediate the effect of presentation formats and learning strategies used in marketing communications for RNPs on consumers' comprehension of the product and attitude to the product. Consistent with Kulviwat et al. (2007)'s recent call for conceptual models incorporating a wide variety of affective reactions consumers may experience when developing their reactions to complex innovative products, the present study intends to demonstrate that adding emotions to models of consumer responses to RNPs will contribute to a more thorough understanding of adoption decisions. This will allow for a more comprehensive examination of consumer emotional responses, while selecting a small set of emotions in an effort to keep the model as parsimonious as possible.

Finally, the last objective set intends to demonstrate the importance of visual attention when studying consumer behaviour (echoing Wedel and Pieters, 2007) and to show that the moment-to-moment attention information that eye trackers can provide offers an important tool to study visual attention in the context of advertising for RNPs. It is expected that the difference in visual patterns between a message conveyed via words vs. via pictures will further the current understanding of how changes in stimuli affect visual attention processes. Drawing on the inverse inference model (Feng, 2003), indicators of unobservable cognitive processes will be derived from observed eye movements, thus providing a "window to the mind" (Pieters, Wedel and Zhang, 2007), particularly useful in the context of learning for RNPs.

Moreover, the findings of the present study are expected to have practical implications for marketing managers, as 40% to 90% of new products fail (Cierpicki, Wright and Sharp, 2000; Griffin, 1997). Marketers need to exert caution when developing communication strategies for RNPs as consumers systematically undervalue innovations whereas firms overvalue their innovation relative to what an objective analysis would suggest (Gourville, 2005). This discrepancy between the reference points of managers and consumers may be at the origin of the difficulties faced by innovations which struggled in the marketplace, such as the Segway scooter, and TiVo (Gourville, 2005). Consumers need to enter an effortful process to understand the benefits of an innovation, and this difficulty may drive them to outweigh the potential losses from switching from their current product vs. the benefits gained. Appreciation of the challenge faced in conveying the benefits of RNPs to consumers, and an understanding of the strategies best suited to the communication of such benefits, can help NPD managers in their efforts to bring successful new products to the market.

1.4 AN OUTLINE OF THE THESIS' STRUCTURE

The thesis is structured into eight chapters, including the present chapter.

Chapter One: This chapter is an introduction to the topic and the research study. The background to the research, research gap, and objectives are identified.

Chapter Two: This chapter focuses on assessing the relevant conceptual and empirical literature regarding consumer responses to RNPs. Research in economics, sociology, organisation science, educational psychology, experimental psychology, consumer psychology and marketing is examined for insights into individual learning strategies for new products. In particular, research in cognitive learning, visual rhetoric and human perception is thoroughly examined and comments are made on the insights that this literature can offer for the present research.

Chapter Three: In this chapter, the theoretical assumptions of the two conceptual frameworks are discussed and the research hypotheses are developed and presented.

Chapter Four: This chapter covers the philosophical and methodological underpinnings of the research, and explains the design of the two experimental studies and of the data collection instrument.

Chapter Five: This chapter presents the descriptive analysis of the data collected, including the presentation of the design and sample used, the description of the respondent profiles and the exploration of the measures by means of exploratory factor analyses.

Chapter Six: This chapter comprises two parts, one for each experimental study conducted. The hypotheses developed in chapter three are tested and the main findings from the two studies are presented.

Chapter Seven: This chapter elaborates on the main findings of the research, integrating both studies. The discussion is organised around four themes of consumer responses to RNPs as they emerge from the findings.

Chapter Eight: The chapter presents the conclusions, research contributions, and implications. Finally, the limitations of the study are outlined, and following on from this, a number of recommendations for future research are presented.

CHAPTER TWO

LITERATURE REVIEW

CONTENTS: The chapter presents an extensive literature review centred upon the issue of learning. Section 2.1 introduces the content of the chapter. Section 2.2 presents a multi-disciplinary approach to learning theories in the disciplines of economics (section 2.2.1), organisation science (section 2.2.2), sociology (section 2.2.3), educational psychology (section 2.2.4), experimental psychology (section 2.2.5) and consumer research (section 2.2.6). Section 2.3 presents a multi-disciplinary integration of learning theories according to their discipline and underpinning paradigm (behaviourist, cognitivist and constructivist). Finally, section 2.4 briefly summarises the contents of the chapter.

2.1 INTRODUCTION

The purpose of the present chapter is not to present a complete overview of the learning theories across fields, but rather to interpret how theories from fields other than marketing can contribute to understanding consumer learning for RNPs. Economics, organisation science, sociology, educational psychology, experimental psychology and marketing psychology are identified as the disciplines which developed a number of theories and frameworks that can be applied to the study of consumer learning for RNPs. The main contribution of this chapter is to provide a multi-disciplinary approach to the understanding of the issues that underpin consumer learning processes through a review of the literature. The aim is to help marketing theorists build a more comprehensive understanding of the challenges that typify consumer learning for RNPs.

These key theories are also related back to their underpinning paradigms, namely behaviourist, cognitivist and constructivist. Behaviourism can be linked back to learning theories proposed by Thorndike (1932), Watson (1924), and Skinner (1974), among others. The behaviourist paradigm relies on the idea that individuals acquire knowledge by associating a stimulus with a particular behavioural response. While behaviourists argue that knowledge is acquired from ideas obtained outside the learner, cognitive learning theorists establish that knowledge is acquired from within the mind (e.g., Bruner, 1960; Chomsky, 1957; Simon, 1957). According to Markova (1991), this view originates from the rationalist philosophy of Plato and Descartes. Knowledge exists as an innate set of universal forms in the mind of a person, in the environment (i.e. in the minds or behaviours of other individuals), or in both. Finally, constructivism argues that knowledge is not passively acquired from the outside world (behaviourism) or pre-existent as an a priori representation in the mind (cognitivism) but is constructed by the mind's ability to actively explore and develop its own meaningful accounts of phenomena. The source of knowledge comes from the learner's previous interactions with his/ her social and physical environment and through his/ her ability to transform these interactions into personally constructed interpretations (Piaget, 1950). These paradigms are used to build a theoretical framework not only across disciplines but also across these paradigms. Section 2.2.1 revisits the economics literature, section 2.2.2 the organisation science discipline, section 2.2.3 moves on to the study of sociology, section 2.2.4 to educational psychology and section 2.2.5 to experimental psychology with a focus on the visual perception literature. Section 2.2.6 is particularly thorough as it focuses on consumer research, and is divided into two sections related to the key variables of interest in the present research: learning strategies (section 2.2.6.1) and presentation formats (section 2.2.6.2). Finally, the most useful theories are identified, categorised in a table according to their discipline and underpinning paradigms (Table 2.3-1) and related back to the aims of the present research (Section 2.3).

Overall, the present chapter performs a multi-disciplinary investigation of the key theories from "older" social sciences to enhance the current understanding of an issue recently identified in consumer behaviour: consumer responses, and in particular consumer learning for RNPs.

2.2. A MULTI-DISCIPLINARY APPROACH TO LEARNING THEORIES

2.2.1. Economics

Compared to other areas within the social sciences, studies into human learning in the economics literature are fairly limited. This can be explained by the implicit assumption of "perfect adaptation", as human learning is treated as a black box process of passive adaptation to the environment (Slembeck, 1998). Economists actively try to attain a situation of "economic equilibrium" where a market for a product has attained the price where the amount supplied equals the quantity demanded (Marshall, 1890; Walras, 1874).

2.2.1.1 Rational decision theory

Decision theory argues that individuals make rational choices from a range of alternatives characterized by varying prices. Thus, to reach a rational decision, an individual must evaluate conditions of uncertainty and risk. In the 18^{th} Century, the mathematician Daniel Bernouilli argued that acceptance of risk by an individual does not only depend on the nominal value of what may be at loss, but also on its intrinsic value, or utility. Decision theory does not explicitly investigate the learning process used by individuals to learn about the risks or utilities of their actions; however, a shift in economics is introduced with the theory of learning-by-doing.

2.2.1.2 Learning-by-doing

Learning-by-doing (Arrow, 1962) rests upon the hypothesis that labour learns through experience in the production process, thereby allowing economies of scale in future output. An application of learning-by-doing to a Bayesian model is proposed by Grossman et al. (1977). The concept of learning-by-doing is applied to both firms and consumers in an unfamiliar market, which can thus be extended to the study of consumer learning for RNPs. In such new markets, firms may learn about consumer expectations and consumer demand from experience by experimenting with price in an effort to improve the information acquired as they are faced with unknown demand curves. Consumers may also learn from experience when confronted with untested products and try to experiment with the products to gain information. Importantly, individuals respond to new information as it is received but are not passive about the information obtained. This is a significant shift with respect to the traditional rational economic decision theory.

According to Grossman et al. (1977), individuals learn by observing the consequences of their present actions. Thus, uncertainty, which is pervasive in unfamiliar high-tech markets, can be reduced at a cost induced by experimenting with the product. Applied to the issue of consumer learning for RNPs, this theory highlights the importance for marketers to stimulate product trial which requires the active participation of the consumer and reduces the uncertainty that surrounds these novel products (Hoeffler, 2003).

2.2.1.3 Network externalities

A more recent economic theory which can also be applied to learning for RNPs is the theory of network externalities. Direct network externalities occur when the utility of a product to each user in a network depends on the number of users (e.g., the internet) whereas indirect network externalities arise when there is a positive link between the utility of a product to each user and the number of other users of the product because of complementary products (e.g., digital cameras and digital camera printers) (Katz and Shapiro, 1986). The effects of network externalities are significantly experienced in the high-technology sector (Srinivasan et al., 2004). Network externalities are intertwined with consumer learning and can have opposite effects. On the one hand, as the leading product develops a large base of consumers and as complementary products are released, the utility of the product increases and adopters invest heavily in learning how to use the product (Choi, 1994). Consumer learning creates a "lock-in" effect (Shapiro and Varian, 1998) as the pioneer product arises as a standard and thus prevents new entrants from attracting early customers. On the other hand, products which do not exhibit a large pool of customers may create uncertainties among prospective consumers, resulting in a "wait and see" attitude which entails a situation of inertia (Farrel and Saloner, 1986) as consumers are not willing to invest in learning how to use the product due to uncertainty and risk. Thus, conflicting effects are taking place, some of which can drive consumers to invest in learning and adopt the product while others can lead to the rejection of the innovation. Therefore, the theory of network externalities examines how learning influences diffusion mechanisms and consumer adoption of innovations. From this, one may infer that consumers will tend to stick with their current high-tech products instead of adopting new ones due to the existence of a powerful "lock-in effect" specific to the high-tech industry (e.g. Word for Windows). Consumer learning remains a driver of adoption, as it is the investment in learning an existing product that creates this effect. Thus, although classical economic theory is mainly anchored in the paradigm of the rational man limited by the view of the "black box", it has some attractive constructivist ramifications which underscore the value of learning through experience and provide a valuable rationale for consumer adoption cycles studied by marketing theorists.

2.2.2 Organisation Science

Organisation-based research may provide valuable insights for consumer research as organisational learning patterns may foster the understanding of consumer learning processes. Organisational learning is defined as the process of improving actions through better knowledge and understanding (Fiol and Lyles, 1985). Organisational learning should not be regarded as the sum of each member's learning. In the same way as individuals develop personalities and personal habits, organisations develop world views and ideologies (Hedberg, 1981). Organisational science theories which are useful for the present research are identified.

2.2.2.1 Single Loop and Double Loop Learning

Argyris and Schon (1978) distinguish between single-loop and double-loop learning. In single-loop learning, entities maintain the central features of an organisation' set of rules and merely detect and correct errors within that set of rules. Single loop learning is also known as lower-level learning (Fiol and Lyles, 1985) or as behavioural-level learning (Duncan, 1974). Contrarily, in double-loop learning, the entities question the values, assumptions and policies that led to the actions in the first place: if they are able to identify and modify those, double-loop learning takes place. Double-loop learning affects the entire organisation and occurs through the use of heuristics, skill development and insights. Double-loop learning, or higher-level learning (Fiol and Lyles, 1985) can be regarded as an evolution towards a more cognitive level of learning, as a truly active process which develops an understanding of causation. It is this type of cognitive learning that consumers need to make sense of RNPs, as consumers need to understand the core benefits of the product and cannot remain "outsiders" as the benefits of such novel products generally lie in technologically innovative features that are hard, or even impossible, to observe from the outside (Ait El Houssi, Morel and Hultink, 2005). Contrarily, single-loop learning is anchored in the behaviourist theory, as it is usually the result of repetitive behaviour. Double-loop learning may become dysfunctional when it engenders the development of superstitions that may yield an unwillingness to change (March and Olsen, 1975). This situation may be compared to the existence of network externalities in economic theory which can lead to a "lock in" situation as agents are unwilling to change for a better technology as they have already invested in learning for an existing product (Srinivasan et al., 2004). An extension to consumers' adoption of new products is that when consumers have a strong understanding of how their existing product works, they may not be willing to invest in a new product, hence a resistance to change.

2.2.2.2 Tacit and Explicit Knowledge

Knowledge may be defined as the subjective storage of aggregate information (Strydom, 1994) or expertise (Maclup, 1984). Knowledge has to be conceptually distinguished from information, which refers to the conversion of an unorganised set of data (Davis and Botkin, 1994) into pertinent and focused information (Drucker, 1998; Jones, 1995). Explicit knowledge refers to codified, quantitative data which can be aggregated in a single location and stored in the organisation's routines (Akbar, 2003). By contrast, tacit knowledge can hardly be formalized and refers to subjective insights (Nonaka, 1991) and accumulated skills and experience (Leroy and Ramanantsoa, 1997). Tacit knowledge has been identified as playing a significant role in technological innovation (Howells, 1996). However, this "either-or" vision of knowledge ignores knowledge expressed verbally by views and opinions i.e. word-of-mouth. Tacit and explicit knowledge have been widely studied as independent phenomena, while little research investigated the degree and nature of the inter-relationship that exists between these two variants of knowledge (Akbar, 2003). Explicit and tacit knowledge are acquired differently: explicit knowledge is acquired rather easily by repetition, reinforcement and imitation (Leroy and Ramanantsoa, 1997). It is conceptualized as response learning, with the view that behaviours are controllable and predictable; learning is regarded as passive and adaptive. Contrarily, tacit knowledge is transmitted through metaphorization, learning histories, learning-by-doing or observation (Akbar, 2003). Thus, explicit knowledge is anchored in the behaviourist theory of learning, acquired the old-fashioned way by repetition, whereas tacit knowledge takes on a more constructivist stance with its focus on experiential learning.

Organisation science not only categorizes learning into different levels of learning but also investigates knowledge in its context, under the constructivist paradigm.

2.2.2.3 Communities-of-Practice and Situated Learning

Brown and Duguid (1991) view the organisation as a community-of-practice and define learning differently from the abstract stance of pedagogy wherein training is the transmission of explicit, abstract knowledge "from the head of someone who knows to the head of someone who does not", known as the pedagogy's behaviourist theory. Along with learning theorists (Lave and Wenger, 1990), Brown and Duguid (1991) design constructivist transfer models that isolate knowledge from practice and develop a view of learning as situated learning (Lave and Wenger, 1990), putting knowledge back into its context. Learners construct their understanding out of social and physical circumstances. Learning is fundamentally a social phenomenon and occurs through action and experience. This aspect of learning is paramount in learning for RNPs, as learning is profoundly entangled with the context in which it occurs: consumers construct their understanding not only out of marketing communications, but also social interaction, product trial and experience.

2.2.3 Sociology

The sociology discipline provides a rich understanding of the conditions in which learning occurs through social interaction. In addition, the theory of product markets adopts an innovative standpoint by integrating social and cognitive learning processes.

2.2.3.1 Social Exchange Theory

Social exchange theory rests on the pioneering work of Homans (1961). This theory views individuals as self-interested actors who transact with other self-interested actors to reach individual goals that they cannot achieve alone. Self-interest and interdependence are central properties of social exchange. Two or more actors, each of whom has something of value to the other, decide what to exchange and in what amounts. Such actors are normally viewed as unemotional beings who hold information, process this information, and make decisions concerning the pattern and nature of exchange with others (Homans, 1961). In this theory, learning is not investigated *per se*.

2.2.3.2 Social Network Theory

The term "social network" was first introduced in 1954 by J. A. Barnes. Social network theory focuses on the importance of relationships between interacting units (Davern, 1997). Four basic components of social networks may be identified. One is the *structural component* which describes the configuration of the actors and ties within a network. Networks take different shapes depending on the number of actors. Second, the *resource component* of social networks considers the actors' resources (e.g., ability, knowledge, class, estate, race, prestige and gender) that distinguish different individuals in similar structural network positions. Third, the *normative aspect* refers to the norms that influence the behaviour of actors. Fourth, the *dynamic component* takes into account the opportunities and constraints for tie formation in the changing network structure. These components may interact to influence consumer learning for RNPs and the adoption process.

2.2.3.3 Contagion Theory

Contagion theory provides insights on how consumers may learn about new products through contagion by cohesion or contagion by structural equivalence (Burt, 1982). Contagion by *cohesion* describes influences through interpersonal communication on a one-to-one basis while contagion by *structural equivalence* explains adoption decisions by symbolic influences such as peer pressure. To affirm in-group membership, individuals in structurally similar positions are expected to express similar perceptions and attitudes (Burt, 1982). The focus of the theory is on the social process, not on the mechanism of learning. Empirical evidence favours structural equivalence over cohesion (Burt and Doreian, 1982). The superiority of contagion by structural equivalence indicates that consumers' adoption processes may be influenced not only by personal contacts with peers, but also by individuals' grasp of the normative pressures from other individuals that belong to the same group. Both contagion processes may operate to stimulate consumer learning when a RNP is first launched on the market. Contagion by cohesion operates through word-of-mouth and contagion by structural equivalence occurs when innovative actors perceive that other innovators expect them to buy new high-tech products, hence a form of indirect pressure.

Other findings from the sociological field highlight the need to distinguish between marketing efforts and contagion effects. Van den Bulte and Lilien (2001) differentiate between four mechanisms of social influence: information transfer (or contagion by cohesion; Burt, 1992), normative pressures (or contagion by structural equivalence; Burt, 1992), competitive concern and performance network effects (also known as network externalities in economic theory). *Information transfer* refers to the use of word-of-mouth which takes place when early adopters discuss the product with prospective adopters. *Normative pressures* are associated with the concept of dissonance, which occurs when peers whom they respect have adopted an innovation but they haven't (Coleman et al., 1966). *Competitive concern* may occur when a rival who adopted an innovation might gain a competitive advantage (Hannan and Mc Dowell, 1987). Finally, *performance network effects*, or network externalities refer to a mechanism by which network externalities influence the diffusion of innovations. At a broader level, another distinction is made between such social influence effects and marketing efforts. Van Den Bulte and Lilien (2001) criticize previous models which conclude that there is a direct relationship between prior adoption among one network and the likelihood of adoption, while these models do not account for contextual variables such as marketing efforts, thus confounding social influence and marketing efforts. Van Den Bulte and Lilien (2001) examine the diffusion of a medical innovation, the tetracycline. The authors find that social influence does not have a tremendous impact on physicians' adoption of this medicine, whereas marketing efforts such as advertising are key drivers of the adoption process, which supports the rationale of the present research to study consumer responses to advertising stimuli for RNPs. This model can be related back to the established Bass (1969) model of diffusion of innovations which distinguishes between the influence of the marketing stimulus (α) and the contagion component (β).

2.2.3.4 Theory of Product Markets

The socio-cognitive theory of product markets (Rosa et al., 1999) integrates cognitive and social mechanisms to acknowledge the centrality of learning in the diffusion of new products. In this view, product markets are a meeting place for consumers and producers (Frenzen and Davis, 1990) and are socially constructed through sense making and market stories (Rosa et al., 1999). Market stories refer to articles by journalists or word-of-mouth between dealers, producers or consumer communities. Consumers and producers both accumulate knowledge about a new product and this knowledge is integrated in consumer and producer conceptual systems through learning. The resulting meaning assigned to the product is a result of the interaction of consumer and producer conceptual representation of the product (Rosa et al., 1999). As new experiences and market behaviours create new knowledge, they disrupt existing conceptual systems. This evolution is called "enactment". When new products such as RNPs greatly differ from existing knowledge structures, changes in behaviour are necessary and conceptual systems are disrupted. Learning is necessary for consumers to recombine elements from their existing conceptual system into a brand new representation (Rosa et al., 1999). Individuals may use metaphorical transfer between product domains and knowledge from alternative domains to make sense of an innovation for which category they do not have any existing knowledge. Interestingly, this idea can be related to the process of analogical learning described in recent years by marketing academics for RNPs (Gregan-Paxton et al., 2002). Metaphorical creations do not involve an introspective sense making of direct experiences, as they are personal creations that can be shared in social settings, but without the aura of internalized/historical criteria and scientific authority (Rosa and Porac, 2002). This research integrates social and cognitive processes and economic-behaviour dynamics into a consistent framework, which is why it is classified here at the frontier of the cognitive and constructivist paradigms. In this perspective, learning is not a purely cognitive, micro-level phenomenon: knowledge plays a major part in shaping the market dynamics at the aggregate level.

2.2.4 Educational Psychology

Educational psychology, since Socrates and the Ancient Greeks, has put learning at the heart of debates regarding the best ways to educate.

2.2.4.1 Stimulus-Response Framework

Older "instructivist" perspectives on learning tend to regard knowledge as a substance in the mind of individuals that is independent of context and to reductively structure learning in terms of the accumulation of pieces of information. Notably, Thorndike (1932) views learning as the formation of links between stimuli and responses through the application of rewards by teachers. This emphasis on S-R (Stimulus-Response) pairing reflects behaviourism's base by analysing the human condition relying on observations of behaviour as opposed to mental constructs. Learning occurs as a result of associations formed between stimuli and responses. Such associations become strengthened or weakened by the frequency of the S-R pairings: learning occurs through repetition. In line with Pavlov's experiments in classical conditioning, Thorndike's S-R theory is based on animal studies. This behaviourist view of learning is used in education by some teachers who reward or punish students and make them learn by rote. The S-R model may be used to explain imitation effects, as late adopters adopt an innovation after observing the benefits obtained by early adopters or reject innovations because of the lack of observability of their benefits. However, the S-R model is of little interest for the study of consumer responses to RNPs, which are by definition products that are new to the market and which benefits are difficult to observe from the outside (Roehm and Sternthal, 2001).

A shift was introduced with cognitive theories of learning which are concerned with the study of mental processing. They focus on helping individuals give birth to the knowledge that they might already have inside, rather than imparting one's own knowledge. One learning theory which is particularly relevant for the study of consumer learning for RNPs is singled out: analogical learning.

2.2.4.2 Analogical Learning

Analogies are used in everyday life and in various intellectual fields including sciences (Halpern, Hansen and Riefer, 1990) and politics (Spellman and Holyoak, 1992). Analogical transfer typically involves using knowledge about a source analogue to make inferences about a target. It is useful to distinguish between the different component processes in analogical transfer (e.g., Gentner, 1989; Gick and Holyoak, 1980; Keane, 1988; Novick and Holyoak, 1991). According to structure-mapping theory (Gentner, 1989), successful transfer necessitates (a) the retrieval of a potentially useful source; (b) finding a mapping, or set of appropriate correspondences between the elements of the source and target; (c) using the mapping, together with knowledge of the source, to construct inferences about the target; and (d) evaluating and possibly adapting the inferences in light of what is actually known about the target. Source analogues are often explicitly presented in the contexts of teaching and argumentation.

The field of educational psychology provides useful insights on the process within which individuals form an analogy. A basic characteristic of analogy is that common relations are essential but common objects are not (Gentner, 1997). For instance, an analogy between the attraction between two magnets and the attraction between the sun and a planet is possible based on the commonality between the causal relationships of both, even though there is no physical commonality between the magnets and the planets. An analogy involves an alignment of relational structure, which needs to display parallel connectivity and one-to-one correspondence. The alignment must also show a relational focus. Given the alignment of structure, the base domain is aligned with the target domain and further statements, or inferences, can be projected from the base to the target (Gentner, 1997).

To clarify the specificities of analogies, it may be useful to relate them to alternative cognitive processes (Gentner, 1997). *Analogy* occurs when comparisons show a high degree of relational similarity with little attribute similarity. For example, a consumer may create an analogy between a PDA and a librarian as they can fulfil the same functions although they do not display any physical similarity (Gregan-Paxton et al., 2002). As opposed to analogies, *mere-appearance matches* share object descriptions but not relations. An illustration may be the comparison of a PDA with a calculator, as such comparisons are based on physical similarities but are unable to adequately convey the benefits of new products. *Metaphors* range from relational comparisons to attribute comparisons and build a bridge between analogies and mere appearance comparisons. *Literal similarities* display both a high degree of relational similarity and attribute similarity. Literal similarities are conceptually related to the categorisation process (Gregan-Paxton and Moreau, 2003). Analogies range from pure mapping to pure carry-over (Gentner, 1989). In pure matching, the learner already knows something about both base and target, whereas in pure carry-over the learner initially knows something about the base domain but little to nothing about the target domain. This latter case of maximal new knowledge applies to learning for RNPs as individuals have little to no knowledge about the novel product.

In an experiment, Gentner (1988) asked subjects to write down descriptions of objects and then to interpret analogical comparisons containing these objects. The results showed that object descriptions included both relational and object-attribute information, while the interpretation of comparisons tended to include relations and omit object attributes. On the contrary, when subjects were given metaphors, the interpretations were mainly in terms of common relational information. These findings are consistent with a recent study showing that analogies reduce the quantity of thoughts experienced by individuals and focus thoughts on commonalities between base and target (Gregan-Paxton et al., 2002).

Analogies, commonly used in all the sciences both in instruction and for theory development (Halpern, Hansen and Riefer, 1990), make abstract concepts concrete and therefore easier to remember. Halpern, Hansen and Riefer (1990) distinguish between near-domain analogies and distant-domain analogies, also referred to as within-domain and between-domain analogies (Ait El Houssi, Morel and Hultink, 2004). Near-domain analogies display high similarities in terms of appearance between the two domains compared (e.g., a basket ball and a base ball). Contrarily, distant-domain analogies have low surface similarities as they come from very different domains (e.g., the lymph system and movement of water through spaces in a sponge). Arguably, distant-domain analogies yield higher comprehension of scientific principles (Halpern, Hansen and Riefer, 1990), due to their reliance on comparisons which are more accessible to students as they come from well-known, non scientific domains, like the analogy between the lymph system and the sponge. Distant-domain analogies are a powerful learning tool to understand complex concepts, and thus are particularly relevant for the study of learning for innovative RNPs (Gregan-Paxton and Roedder John, 1997) which, just like scientific concepts, can be explained to novice consumers through a comparison with concepts from more familiar domains.

The structure-mapping theory has been criticised by researchers arguing that content-knowledge or pragmatic information is used to guide the analogical selection process, rather than principles like systematicity (Holyoak's pragmatic account, 1985). Holyoak's (1985) alternative viewpoint seeks to replace structure with individual goal relevance. This work has the merit of calling attention to the important issue of how plans and goals can be integrated into a theory of analogy. However, the structure-mapping theory is regarded as a more appropriate framework for the study of learning for RNPs as Holyoak's (1985) theory classifies some literal similarity comparisons as analogies. Moreover, it can be argued that individuals are capable of processing analogies without any prior goal context which is often the case for RNPs, a situation which is not envisaged by the pragmatic account theory.

2.2.4.3 Theory of Child Development

Cognitive constructivism argues that knowledge acquisition is an adaptive process and results from an active involvement by the individual learner (Dole and Sinatra, 1998). Knowledge is regarded as the product of the accurate internalization and construction of external reality. Based on this vision of knowledge, Piaget (1972) describes a very influential theory of Child Development and identifies two processes used by the individual to adapt to the environment: assimilation and accommodation. *Assimilation* is the process of using or transforming the environment so that it can be placed in pre-existing cognitive structures. *Accommodation* refers to the process of changing cognitive structures to accept something from the environment. Simply said, assimilation is the fit of practice to theory whereas accommodation is the fit of theory to practice. Piaget (1972)'s accommodation concept has an interesting application to the study of consumer learning for RNPs as adopting a radically new innovation requires to modify and disrupt one's existing cognitive structure to integrate a new category of products.

2.2.4.4 Social Development Theory

The Social Development Theory (Vygotsky, 1978) is characterized by its allegiance to social constructivism. Social constructivism is located between the creation of knowable reality of the cognitive constructivists and the construction of a personal and coherent reality of the radical constructivists. Social constructivism emphasizes the social nature of knowledge and the belief that knowledge is the consequence of social interaction and of the use of language. Thus, knowledge is a shared rather than an individual experience (Prawatt and Floden, 1994). Moreover, this social contact always takes place in a socio-cultural context, hence knowledge is bound to a particular time and place (Vygotsky, 1978). Culture is the prime determinant of individual development and humans are the only species to have created culture, and every human child develops in the context of a culture. According to Bakhtin (1984), truth is born between people collectively searching for truth, in the process of their interaction. Truth, in this case, is neither the objective reality of the cognitive constructivists nor the experiential reality of the radical constructivist, but rather a socially constructed and agreed upon truth resulting from co-participation in cultural practices (Cobb and Yackel, 1996). Overall, social development theory argues that knowledge is the consequence of social interaction and of the use of language. This social contact always takes place in a socio-cultural context, hence knowledge is bound to a specific time and place.

2.2.4.5 Kolb s Experiential Learning Theory/ Learning Styles

The concept of learning styles is rooted in the classification of psychological types. As a result of heredity, education, and environmental demands, different individuals have a tendency to perceive and process information differently. Kolb (1976) classifies individuals based on the following learning styles: (1) Concrete and abstract perceivers: Concrete perceivers take in information through direct experience, by acting, sensing, and feeling. Abstract perceivers, however, take in information through analysis, observation, and thinking (2) Active and reflective processors: Active processors make sense of an experience by immediately using the new information. Reflective processors understand an experience by thinking about it. As these learning styles develop as a result of the environment, Kolb's (1976) theory is presented as constructivist. The concept of learning styles can be linked back to the study of individual style of processing (Childers, Heckler and Houston, 1985) in consumer research. However, while learning styles in educational psychology are anchored in the constructivist paradigm, individual style of processing takes a more cognitive approach to the study of individual responses.

2.2.5 Experimental Psychology

The purpose of this section is to bring recent knowledge about human visual perception covered in research in neuroscience and experimental psychology to contribute to the study of learning for RNPs by examining the links between perceptual and cognitive processes. Visual attention may be defined as "a brain operation producing a localized priority in information-processing i.e. an attentional "window" or "spotlight" that locally improves the speed and reduces the threshold for processing events" (Deubel and Schneider, 1993, p.575). Visual attention can be operationalised by eye movements, divided into fixations and saccades (Henderson and Hollingworth, 1999). During a saccade, the point of regard sweeps rapidly across the scene (Carpenter, 1988). During a fixation, the point of regard is relatively, although not perfectly still. Information is acquired during fixations as useful information for perceptual and cognitive analysis cannot usually be acquired during a saccade (Matin, 1974; Volkmann, 1986). Understanding of scene perception includes understanding of the processes that control where the fixation point is centred and how long the fixation position remains centred on a specific location.

The study of eye movements during the viewing of pictorial representations dates back to the Yarbus (1967) study which asked viewers to examine coloured paintings. Yarbus (1967) found that individuals tended to concentrate their fixations on people and particularly on their faces. Yarbus also observed the systematicity in eye movements across respondents. Later on, Antes (1974) found that the first fixation from a viewer was more likely to be within an informative than an uninformative region of a scene. The idea that fixation positions reflect ongoing cognitive operations as well as perceptual scene viewing received further support in a study that showed that fixation density was greater for semantically informative than for uninformative regions (Loftus and Mackworth, 1978). These early studies and more recent research (De Graef et al., 1990; Henderson et al., 1999) suggest that fixation placement in a scene is initially based on a combination of visual characteristics of scene regions, knowledge of the scene category and global visual properties of the scene. Fixation placement does not seem to depend initially on semantic analysis of peripheral scenes vision (De Graef et al., 1990) however once a region has been fixated, immediate refixations can be based on semantic informativeness.

A key theory in visual perception research is the computational modeling of visual attention. This framework suggests that individuals selectively direct attention to objects in a scene using both bottom-up, image based saliency cues and top down, task-dependent cues (Itti and Koch, 2001). The present research focuses primarily on the role of bottom-up factors. Four key trends have emerged from recent work on computational models of focal attention that emphasize this bottom-up control of attention. The first processing stage of any model of bottom-up attention is the computation of early features (Itti and Koch, 2001). The input image is decomposed through several pre-attentive feature detection mechanisms i.e. sensitive to colour or intensity (Koch and Ullman, 1985). Attention can modulate early visual processing in a manner equivalent to an increase of stimulus strength, which supports the metaphor of attention as a stagelight (Reynolds, Pasternak and Desimone, 2000). Neurons in each feature map compete for salience. This model predicts that attention activates a winner-take-all competition among neurons tuned to different orientations, which detects the point of highest saliency at any given time (Lee et al., 1999). Importantly, what seems to matter in guiding bottom-up attention is feature contrast rather than absolute feature strength, so that responses depend heavily on contextual influences (Nothdurft, 1990). Feature maps refer to the mental mapping of image areas, and come from different modalities and with unrelated ranges, such as colour and shape (Itti and Koch, 2001). Second, the multiple feature maps are combined into a unique saliency or master map (Treisman and Gelade, 1980). The saliency map is a two-dimensional map which topographically encodes for stimulus conspicuity over the visual scene and acts as a bottom-up control strategy (Itti and Koch, 2001). Third, the saliency map is sequentially scanned by attention through the interplay of a winner-take-all network described above and an inhibition of return mechanism which suppresses the last attended location from the saliency map (Koch and Ullman, 1985). Inhibition of return is a very important component of attention because it allows viewers to rapidly shift the attentional focus over different locations with decreasing saliency rather than being bound to attend only the location of maximal saliency at any given time (Posner and Cohen, 1984). Finally, scene understanding and object recognition strongly constrain the selection of attended locations (Itti and Koch, 2001). A more complete model of attentional control should include top-down biasing influences as well. Examples of models that combine bottom-up and top-down factors can be found with Schill et al. (2001) or Rybak et al. (1998). A more extreme viewpoint is held by the "scanpath theory" held by Stark (1994), in which the control of eye movements is almost exclusively under top-down control. The scanpath theory argues that a cognitive model of what we expect to see is the basis for our precept and the sequence of eye movements that we make to analyze a scene is mostly controlled by our cognitive model of that scene.

Another area that may provide insights into the way individuals process information contained in a stimulus is the physiology of reading (Rayner, 1998). Key aspects of this physiology include eye movements (or saccades) and eye fixations during which visual attention takes place. As Rayner et al. (2001) point out, although a substantial amount of research in experimental psychology has studied the characteristics of eye movements when either reading or looking at pictures (Rayner, 1998), little research has addressed the characteristics of eye movements when text and pictures have to be integrated in a comprehension process. Most skilled readers should be adept at alternating between text and pictures to produce a mental model of the overall message, yet researchers know little about this process. This is particularly relevant in the context of print advertising: advertisements usually consist of a combination of pictorials and words, yet little is known about the extent to which viewers look at the pictures versus the text. Previous findings in experimental psychology suggest that processing of the picture and of the text may be relatively isolated events and that the picture may not be given full inspection until the caption is read (Carroll et al., 1992). Hegarty (1992) found that viewers presented with a text and a diagram had a tendency to inspect the diagram at the end of sentences, suggesting that the comprehension process is largely text-directed. Advertising research has also developed an interest in visual marketing and eye-tracking techniques.

The study of eye-movements to print ads parallels studies on scene perception in psychology, which involves the integration of several objects in the scene into a meaningful whole (Henderson and Hollingworth, 1998; Yarbus, 1967). Eye movement behaviour may be used to infer cognitive processes. The relationship between eye movements and attention has been extensively investigated (Klein, 1980; Klein, Kingstone and Pontefract, 1992; Remington, 1980; Shepherd, Findlay and Hockey, 1986). Covert attention has to be distinguished from overt attention. Covert attention refers to the ability to pay attention to a part of the visual assortment without moving the eyes. Overt attention refers to the ability to align the fovea[1] with an object in the visual field (Findlay and Gilchrist, 2003). In the present research, it is argued that the processing advantage obtained by fixating an object with the fovea is greater than the advantage gained with covert attention. Thus, visual attention needs to be primarily about overt attention (Findlay and Gilchrist, 2003). This argument is based on the finding that for complex stimuli, it is more efficient to move the eyes for attention (He and Kowler, 1992; Sclingensiepen et al., 1986). Although individuals can easily decouple the locus of attention and eye location in simple discrimination tasks (Posner, 1980), in complex information processing tasks such as reading, the link between eye movements and covert attention is tight (Rayner, 1998). Eye movements are therefore diagnostic of underlying

[1] The fovea is located at the center of the retina and is the area of the eye that gives the sharpest vision.

cognitive processes. For example, eye movement data can indicate whether a viewer is familiar with a face (Althoff and Cohen, 1999) or whether a student is following an algorithm in solving a mathematical problem (Salvucci, 1999). These findings provide a rationale for the use of the eye-tracking technique as a methodological tool which measures the successive locations of the fovea on a specific stimulus: eye movements are a valid physiological measure of visual attention. Thus, eye movements may be used to make inverse inferences and infer cognitive processes at work during visual attention (Feng, 2003).

In one of the only studies that examined eye movements as a response to advertisements composed of pictures and text, Rayner et al. (2001) found that viewers tend to spend more time looking at the text than at the picture part of the ad. About 70% of the time spent looking at the ad was dedicated to the text. The reason that more time was spent on the text than on the picture is most probably that viewers can encode much more information per fixation from the pictorial information than from the textual information (Rayner et al., 2001).

For the text portion of an ad, information tends to be rather densely packed, and the resolving power of the retina to discriminate important letter information deteriorates rapidly from the center of the fovea. Thus, in reading, eye movements tend to be much smaller and much more numerous than when viewers are looking at pictorial information (Rayner, 1998). Contrarily, the information contained in pictures is not as densely packed and information about objects in a scene can be resolved at greater distances from the fixation point. Thus, the perceptual span (or span of effective vision) is much larger for pictorials than for text (Rayner, 1998). Viewers do not need to spend as much time looking at the picture part of the ad as at the text for comprehension. This is also supported by the finding that even though participants spent far more time on the text than on the picture part of the ad, the ads that were viewed favourably were often not identified by brand name but were described in terms of some aspect of the pictorial representation (Rayner et al., 2001). Overall, a fundamental difference exists between scene and text perception: in reading, comprehension can be gained only through focal attentive processes which are voluntary, serial, slow and effortful (Loftus, 1983; Rayner, 1998; Reichle et al., 1998). Contrarily, scene, or picture perception relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). Therefore, although the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth, 1998), text necessitates more eye fixations to be comprehended.

2.2.6 Consumer Research

As the fields of marketing, psychology and consumer behaviour are greatly intertwined in the investigation of individual learning processes, these traditions will be examined under the same section. Again, this review does not intend to be exhaustive due to the proliferation of learning theories in marketing and psychology over the course of the 20th (and 21st) centuries. Instead, learning theories identified as being most adequate to promote understanding of consumer learning for RNPs are put forward. This section is divided into the study of learning strategies (Section 2.2.6.1) and presentation formats (Section 2.2.6.2), so as to provide a more complete understanding of learning processes for RNPs.

2.2.6.1. Learning Strategies

Behavioural learning theories approach the mind in a similar way as the dominant paradigm in economics, regarding it as a "black box". According to behavioural learning theory, a response has been explained when the environmental factors that account systematically for the rate at which this response is emitted have been identified (Foxall, 1994). Classical conditioning and operant conditioning dominate behavioural learning theories in consumer psychology.

2.2.6.1.1 Classical Conditioning

In the same vein as the Stimulus-Response framework discussed in section 2.2.4.1, classical conditioning theory regards learning as a response to external events, as demonstrated by the now famous experiments led by the Russian physiologist Ivan Pavlov (Pavlov, 1927). Pavlov's experiment consists in presenting an arbitrary stimulus (a bell), also referred to as a conditioned stimulus, to a hungry dog. The Conditioned Stimulus was followed by another stimulus, called the unconditioned stimulus (food). The Unconditioned Stimulus automatically yielded an unconditioned response, i.e. salivation. As a result of this pairing, the Conditioned Stimulus came to elicit a part of the unconditioned response even when presented alone. The response was then called the Conditioned Response. However, classical conditioning has its limitations, including the Garcia effect (Garcia and Koelling, 1966): if the choice of the Conditioned Stimulus that is paired with the Unconditioned Stimulus is inadequate, then classical conditioning will fail to occur (Sweeney and Bierley, 1984). From a historical point of view, the classical conditioning theory grew from the work of Pavlov and Watson, partly as a response to the excesses of introspectionists in the early 20th century. Many of the introspectionist hypotheses were not open to scientific analysis, and the conditioning theorists intended to correct this weakness by insisting on the use of observable behaviour as the basis of social science. Therefore, conditioning theory and behaviourism grew together, entangled as a methodological and theoretical approach to social science.

Classical conditioning principles have been applied in advertising by marketing practitioners in an effort to elicit positive consumer responses. A significant body of advertising research has studied the impact of repetition on consumer responses. A review of this literature reveals that by providing additional processing opportunities, repetition leads to improved ad recall (Burke and Srull 1988; Campbell and Keller 1999), increases the accessibility of a brand name (Pham and Vanhuele 1997) and yields more positive brand and ad attitudes (Cacioppo and Petty 1979). Besides, advertising practitioners attempt to generate conditioned responses from consumers through the pairing of voices of famous sportscasters with advertised products (Nord and Peter, 1980), or by playing consumers' favourite music to alter consumers' choice and product preferences (Gorn, 1982). Clearly, advertising practitioners do not intend to create advertising that conforms strictly to classical conditioning procedures in animal studies (Kahle, Beatty and Kennedy, 1987). However, they often pair images with their brands so that consumers can associate the images with the product. Imagery is a tool which can be used by advertisers for low-involvement products (i.e. mouthwash; Grossman and Till,

1998) to stimulate an automatic pairing of the advertised brand with positive images. In the present research, it is argued that imagery can also be used as a powerful cognitive tool to foster consumer understanding of complex high-involvement products (Hoeffler, 2003).

Interestingly, classical conditioning has been applied to the study of affective learning as a response to text vs. pictorials (Rossiter and Percy, 1980). Early findings suggest that dominant pictorial content combined with little verbal content yields more positive affective learning than dominant verbal content with less pictures, which points to the superiority of pictures over text in creating positive affective reactions (Rossiter and Percy, 1978). Rossiter and Percy (1980) introduce a theory based on visual imagery and classical conditioning which challenges the classical stance held by belief-based attitude theorists. Attitude is defined according to the multi-attribute models (Fishbein and Ajzen, 1975) as the consumer's overall degree of affect or liking for the product. As opposed to the classic "belief referral" models (Wright and Barbour, 1975), Rossiter and Percy (1980) put forward an "affect referral" model, which argues that the reason why cognitive beliefs can change attitude is because of their own affective connotations. The affect accompanying the belief is fundamental in the process of attitude formation, as indicated by the formula:

$Ao=\sum BiEi$

With: Ao=the overall attitude toward the object

Bi=belief about attribute i in relation to the object

Ei=the evaluative consequence of the belief (Fishbein and Ajzen, 1975)

Thus, it is the satisfaction that a consumer experiences in learning that a product possesses a specific attribute that enhances the attitude towards it, not the knowledge itself (Rossiter and Percy, 1980). Following this logic, the classical conditioning theory may be applied to the process of attitude formation, the favourable emotional consequence of the belief acting as an unconditioned stimulus (UCS), paired with the product-conditioned stimulus (CS) (Rossiter and Percy, 1980).

However, a controversy has arisen regarding the validity of the conditioning paradigm due to its reliance on animal studies which may not be a legitimate topic of study in consumer behaviour. The classical conditioning paradigm relies on an analogy between animals and humans; however the differences in terms of cognitive and physiological processes between humans and animals tend to indicate that this analogy is flawed (Kahle, Beatty and Kennedy, 1987). Besides, classical conditioning has come under heavy criticism from the cognitive scientists who tackle the fundamental question of social sciences: Can future actions be best predicted from previous behaviour, as behaviourists maintain, or would a cognitive factor better explain future actions? If behaviour is not a satisfactory area for investigation, then classical conditioning theory is inadequate in its explanation of social behaviour (Kahle, Beatty and Kennedy, 1987).

2.2.6.1.2 Instrumental Conditioning

Instrumental conditioning, along with classical conditioning, originates in animal studies that show how animals learn how to dance by systematically rewarding them when they perform the desired behaviour. However, instrumental conditioning introduces a shift in behaviourism with respect to the classical conditioning hypothesis: the stimuli do not elicit a specific response, as in classical conditioning. Instead, the stimuli signal the likely consequences of behaving in a particular manner (Foxall, 1994). This causal mechanism can be summarized as the "three-term contingency": a response, the discriminative stimulus which creates the response, and the reinforcing and punishing consequences produced (Skinner, 1953, p. 110).

In line with instrumental conditioning theory, the Behavioural Perspective Model (BPM) (Foxall, 1994) contextualizes pre-purchase, purchase and post-purchase responses by situating them at the interaction of the consumer and the behaviour setting in which he or she acts. The consequences of purchase lie in consumer reinforcement, either hedonic or informational. Hedonic reinforcement has a strong potential for increasing purchase and consumption responses through the generation of feelings, fantasies, fun, arousal, sensory stimulation and enjoyment (Holbrook and Hirschman, 1982; Hirschman and Holbrook, 1982). These covert feelings reinforce consumers' overt actions. Rewards in the form of incentives are an example of hedonic reinforcement. Informational reinforcers operate by providing feedback on products' performance or achievement by the individual which influences the rate at which that performance continues. This feedback encapsulates not only immediate economic factors but also socio-economic consequences such as status, prestige and social acceptance. It consists in the acquisition of symbols of social and economic achievement, like being seen consuming status goods such as luxury brands.

2.2.6.1.3 Opinion Leadership and Word-of-Mouth Influence

Rogers' (1995) seminal work on the sociology of innovations was originally connected with the theories anchored in socio-economics and can be linked back to Burt's (1982) contagion theory discussed in section 2.2.3.3. Rogers' (1995) work spread to the marketing discipline later on as marketing theorists interpreted how Rogers' categories of adopters and adoption diffusion processes might be used in understanding the Product Life Cycle (PLC) and commercialization of innovations. Opinion leadership is described by Rogers as "the degree to which an individual is able to informally influence other individual's attitudes or overt behaviour in a desired way with relative frequency" (Rogers, 1983, p.271). Opinion leadership is an interpersonal communication which is best understood in the context of the network of social relationships in which it occurs. Dimensions of opinion leadership include interpersonal word-of-mouth (WOM) communication and influence. The role of interpersonal communications is acknowledged by the Bass (1969) model which identifies the effect on consumers' adoption of innovations not only of mass communications but also of internal influences provoked by (WOM) processes. Although WOM influence is not a learning process *per se,* it is a powerful source of learning in the diffusion of innovation, anchored in the constructivist paradigm, which should be acknowledged.

Cognitive learning theory underlines the importance of internal mental processes in individual decision making. This learning process aims at a deeper level of understanding, which makes it particularly relevant to the study of consumer learning for RNPs. The present review will not go into details in the memory processes tackled by the cognitive tradition. Instead, a traditional cognitive learning process which is not deemed appropriate for research on RNPs will be highlighted: categorisation. The focus will then move on to two cognitive learning processes that should be better suited to the understanding of individual responses for RNPs: analogical learning and mental simulation.

2.2.6.1.4 Categorisation

Categorisation research adheres to the assumption that categories serve primarily as tools for organising knowledge (Fiske and Neuberg, 1990). Previous research in consumer behaviour suggests that schema incongruity constitutes a basis for product evaluation (Meyers-Levy and Tybout, 1989; Mandler, 1982). Congruity is conceptualized as the extent to which structural correspondence is achieved between the entire configuration of attribute relations associated with the object, such as the product, and the configuration specified by the individual's schema (Mandler, 1982). The favourability of an evaluation is a function of how readily the processor can satisfactorily resolve the incongruity and fit the new concept in an existing category. The explanation of the schema theory lies in the categorical structure of the semantic memory (Rosch et al., 1976) which states that cognitive categories are organised in three levels. First, the "super ordinate" level refers to a very general category of products, wherein products share few attributes (i.e: beverage). Second, the "basic" level groups together products that share common attributes (i.e: soft drinks). Third, the "subordinate" level refers to the grouping of products that share a large number of features (i.e: all natural soft drinks).

Consumers can resolve moderate schema incongruity, which occurs when a few features of the product are incongruent with their activated product category schemas, by moving either from the superordinate level to the basic level or from the basic level to the subordinate level, which requires only moderate effort. On the opposite, extreme incongruities, which occur when all the features of the product are incongruent with the consumer's schema, cannot be solved by referring to the next lower level of the hierarchy, which may cause frustration, hence a negative evaluation of the product (Meyers-Levy and Tybout, 1989). Thus, the category-based learning process enables consumers to refer to their existing cognitive categories to build an understanding of new products and fit them into an existing category.

The trend in recent consumer research has been to emphasize the similarities between analogies and categorization. It has been established that in order to use existing knowledge to understand a novel concept, knowledge for the familiar base should be mapped onto corresponding knowledge in the target (Gentner, 1989). Mappings can be created based on two characteristics: attributes and relations. An attribute is an independent property or component of an object. A relation, on the other hand, is a link that defines the relation between attributes or other relations. A key difference between analogy and categorization lies in their treatment of attributes and relations in the mapping and transfer process (Gregan-Paxton and Moreau, 2003). Saying that a new object is a member of an existing category signals that both the attributes and relations associated with the category can be mapped and transferred to the target (Gentner and Markman, 1997; Yamauchi and Markman, 2000). Contrarily, communicating that a new object or concept is like a member of an existing category signals an analogy match wherein only certain relations associated with the category can be mapped and transferred to the target (Gentner, 1988). The aim of categorization is to maximize within-category similarity while reducing the similarity across categories, thus encouraging extensive transfer from the category to the target (Medin and Schaeffer, 1978; Rosch and Mervis, 1975). Recent research suggests that because RNPs do not fit into any existing category, categorization is inappropriate to convey the benefits of such novel products, and academics have turned to analogies to examine how the transfer of information across categories can help individuals build new knowledge for RNPs (Gregan-Paxton and Roedder John, 1997).

2.2.6.1.5 Analogical Learning

As detailed in section 2.2.4.2, analogical transfer typically involves using knowledge about a source analogue to make inferences about a target. Source analogues are often explicitly presented in marketing communications using analogies between RNPs and existing objects or individuals (Ait El Houssi, Morel and Hultink, 2005). In such cases, it is the mapping process that is most crucial to analogical transfer. An example of analogy used in marketing can be made between a PDA (Personal Digital Assistant) and a secretary as they fulfil common roles (Gregan-Paxton et al., 2002). Reasoning by analogy thus enables individuals to learn the core benefits of the RNP rather than associating it with products sharing a mere physical resemblance.

In the field of marketing, analogies may help consumers deal with the novelty that characterises RNPs (Gregan-Paxton and Roedder John, 1997; Hoeffler, 2003). The Consumer Learning by Analogy (CLA) model (Gregan-Paxton and Roedder John, 1997) puts forward a conceptual model that explains how previously acquired knowledge is transferred in the process of consumer learning, i.e. internal knowledge transfer. The analogical learning paradigm is useful to provide a detailed understanding of knowledge structures used not only to organise incoming information but also to learn about a novel stimulus (Gregan-Paxton and Roedder John, 1997). This model of internal knowledge transfer rests largely on Gentner's (1989) structure mapping theory, identifying the stages of analogical learning and distinguishing analogies from alternative comparison processes such as mere appearance matches or literal similarities. The authors argue that because RNPs require the induction of entirely new knowledge structures, analogical transfer is uniquely suited to the study of learning for RNPs. Importantly, in line with evidence provided by analogical learning researchers, the ability to perceive relational matches and thus understand an analogy is linked to base domain expertise (Gentner et al., 1993; Vosniadou, 1989). Hence, the present research will use analogies which base domains are familiar to consumers in an effort to facilitate analogical processing.

Specifically, between-domain analogies (Vosniadou, 1989), which focus on the transfer of knowledge between two systems or concepts that belong to fundamentally different conceptual models were found to increase benefit comprehension to a greater extent for certain RNPs than within-domain analogies (Vosniadou, 1989) which focus on the transfer of knowledge of common surface attributes between concepts within highly similar domains (Ait El Houssi, Morel and Hultink, 2004). This finding may be explained by the greater explanatory power of between-domain analogies over within-domain analogies (Clement and Gentner, 1991), in line with the finding that between-domain analogies cause consumers to focus on corresponding relationships between target and base and to disregard dissimilarity in attributes (Gregan-Paxton et al., 2002). The focus on structural relationships increases comprehension because structural relations are more informative about what benefits a product offers than common surface similarities (Cummins, 1992; Simons, 1984). This is because many RNPs result from abstract changes in technology which can benefit from the comparison with a concrete base domain. Hence, contrary to the bulk of consumer behaviour studies that have examined analogical learning for RNPs using within-domain analogies i.e. Moreau, Lehmann and Markman, 2001, digital camera compared to a film-based camera and to a computer; Roehm and Sternthal, 2001, nutritional management software compared to a financial management software and PDA compared to a mobile phone, the present research focuses on the use of between-domain analogies. Examples of such analogies include comparisons between a PDA and a secretary or a librarian, or between an autonomous lawn mower and a robot and between a device that biometrically identifies its user and a fingerprint (Ait El Houssi, Morel and Hultink, 2002; 2003; Gregan-Paxton et al., 2002).

However, one notable characteristic of analogical learning is that errors in transfer can occur (Novick, 1988). Theorists in advanced knowledge acquisition correctly point that analogical inferences are only guesses and therefore the inferences drawn may be erroneous (Spiro et al., 1989). Two types of analogy-induced misconceptions are identified: overextensions which exist in the base but cannot be found in the target and omissions of important information about the target that do not have any equivalent in the base (Spiro et al., 1989). Although the potential for incorrect transfer does not diminish the importance of analogical learning as a mechanism of consumer knowledge transfer (Gregan-Paxton and Roedder John, 1997), another learning strategy which has been identified as useful to deal with uncertainty and knowledge development is discussed (Taylor et al., 1998; Hoeffler, 2003): mental simulation.

2.2.6.1.6. Mental Simulation

Advertising often encourages consumers to mentally imagine using a new product. Recently, the "Samsung imagine" campaign invited consumers to "imagine the world's slimmest mobile phone". Mental simulation is defined as the imitative mental representation of some event or series of events (Taylor and Schneider, 1989). The use of mental simulation as a learning strategy for product evaluations is well established (Phillips, 1996; Shiv and Huber, 2000). Consumer research has recently begun to examine some related concepts such as imagery in advertising and consumption visions. MacInnis and Price (1987) define imagery as "a process (not a structure) by which sensory information is represented in working memory" (p. 473). Conceptually, mental simulation is also closely related to MacInnis and Price's (1987) notion of pre-consumption mental imagery, whereby the consumer vicariously experiences product use prior to actual consumption. Similarly, Walker and Olson (1997, pp. 159, 161) explain how consumers form "visual images of certain product-related behaviours and their consequences" to "vicariously experience the consequences of product use". Phillips (1996) refers to the notion of consumption visions. A consumption vision consists of a series of mental images of product-related behaviours, which allows consumers to try and anticipate the actual consequences of product use (Phillips, Olson and Baumgartner, 1995; Walker and Olson, 1994). Mental simulations obey the constraints of reality and are thus useful for anticipating the future because the imagined plans of action are unlikely to rely on improbable events along the way (Kahneman and Miller, 1986). Mental simulations have been used to improve utility predictions (McGraw and Mellers, 1997). Moreover, mental simulation may be an appropriate cognitive process to help consumers learn about new product benefits (Sujan et al., 1997), which is particularly relevant in the context of consumer learning for RNPs.

Due to its flexibility and to the capacity it provides for trying out several solutions to a problem, mental simulation has been shown helpful in a variety of uncertain environments (Taylor et al., 1998). It may help reduce the uncertainty of purchasing a RNP (Hoeffler, 2003) by helping consumers evoke relevant personal experiences and integrate the RNP with their existing usage patterns (Taylor et al., 1998). Mental simulation is a useful cognitive substitute for experience when actual experience through product trial is impossible. Mental simulation has been identified as an appropriate strategy to help individuals deal with knowledge development (Sujan et al., 1997) and uncertainty (Taylor et al., 1998). Although recent research using mental simulations for RNPs has not examined the effect on product comprehension and learning per se, it has highlighted that the uncertainties regarding the product benefits that arise from the newness of the product separate these adoption decisions from corresponding decisions for other products (Hoeffler, 2003; Lehmann, 1994) and the ability of mental simulations to reduce these uncertainties (Hoeffler, 2003). Reducing consumers' uncertainty towards the benefits of the product is likely to be translated in an increase in product comprehension. The need to use mental simulation to imagine a situation of product use may be higher for RNPs than for regular products, as there is a need to link the product to consumer goals, and to assess the consequences of product use (Oliver, Robertson and Mitchell, 1993). Mental simulations for RNPs are likely to stimulate understanding of the RNP's fit with existing usage habits (Taylor et al., 1998), thus decreasing uncertainty (Hoeffler, 2003). Mental simulation may provide experience value (Kahneman and Tversky, 1984) when product trial is impossible, as it often is for RNPs: product trial in the consumer's mind is used as a proxy for experience. Because mental simulations make events seem real and increase perceived likelihood of occurrence (Taylor et al., 1998), they provide a means to deal with uncertain future such as learning to use a new product.

Due to its flexibility and to the capacity it provides for trying out several solutions to a problem, mental simulation may help reduce the uncertainty of purchase of a RNP (Hoeffler, 2003). However, findings in the field of mental simulation for the specific case of RNPs are conflicting. On the one hand, mental simulations may be successful in evoking personal experiences and merging the RNP with existing usage patterns (Taylor et al., 1998) and creating a surrogate experience with a RNP leading to preference stability (Hoeffler, 2003). Mental simulation is likely to create more open-ended thinking about the benefits of the product whereas analogies yielded inferences that were directed more at developing specific linkages to the analogue's properties (Hoeffler, 2003). However, recent findings offer a more nuanced view of mental simulation as self-related images were shown to be difficult to imagine in a really new product context (Dahl and

Hoeffler, 2004). Individuals may experience difficulties when trying to imagine how a complex novel innovation could fit into their existing lifestyles and habits.

The literature review conducted suggests that past studies on analogical learning for RNPs have examined the effect on memory outcomes, namely the recall of attributes (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau, 2003) and features (Gregan-Paxton and Moreau, 2003), on attitudinal variables, namely product judgments (Gregan-Paxton et al., 2002), evaluations (Roehm and Sternthal, 2001), preferences (Ait El Houssi, Morel and Hultink, 2005) and purchase interest (Hoeffler, 2003) and on comprehension, namely the transfer of shared relational information and attribute transfer from the base to the target (Gregan-Paxton and Moreau, 2003), base associations (Roehm and Sternthal, 2001) and benefit comprehension (Ait El Houssi, Morel and Hultink, 2005). However, previous research on consumer responses to mental simulations for RNPs has focused solely on the effect on attitudinal and behavioural variables, such as product evaluation (Dahl and Hoeffler, 2004), preferences and purchase interest (Hoeffler, 2003). Nonetheless, by helping consumers evoke relevant personal experiences and integrate the RNP with their existing usage patterns (Taylor et al., 1998) and by stimulating more open-ended thinking than analogies (Hoeffler, 2003), mental simulations are likely to be a powerful cognitive tool in the context of individual learning for RNPs.

2.2.6.2 Presentation Formats

The present research intends to examine consumer responses to RNPs conveyed using visuals vs. text. Two distinct perspectives may be identified in the study of visuals vs. words in advertising in consumer research. One is the field of cognitive and social psychology which focuses on the human system and on elaborating more detailed models of how consumers process stimuli. The second is the field of rhetoric which focuses on the ad system, and devotes its attention to differentiating and structuring the stimuli capable of evoking one or another response (McQuarrie and Mick, 2003).

2.2.6.2.1 Human System

Within this perspective, two streams of research are discussed: a) the effect of words vs. pictures on learning and b) the effect of words vs. pictures on consumer attitudes.

Research in cognitive psychology suggests that pictures are remembered better than words (Alesandrini, 1982; Paivio, 1971). In a consumer context, interactive pictures should be distinguished from non-interactive pictures. An interactive picture includes both the brand name and the product class in a pictorial format. Non interactive pictures include either the brand or the product class, but not both, in a visual format (Lutz and Lutz, 1977). A comparison of consumer memory for interactive, non interactive and all-verbal adverts taken from the Yellow Pages shows that only for interactive pictures was the learning of pictures superior to the learning of text in a test of brand name recall (Lutz and Lutz, 1977). Similarly, Edell and Staelin (1983) found that brand-related information was recalled better for framed pictures (i.e. ads in which verbal information is related the picture to the brand) than for unframed pictures. Additionally, verbal information accompanied by a pictorial representation of the verbal content should yield a better recall than verbal information alone (Kisielus, 1982). Experiments also suggest that pictures are superior in immediate memory when processed at a sensory level but not when processed at a semantic level, in line with the conceptualization of pictures as sensory cues (Childers and Houston, 1984).

Three explanations for the effects of pictures on memory processes, activated via the operation of imagery processing, may be identified (Childers and Houston, 1984). First, the dual-coding hypothesis states that concrete pictures activate verbal representations in addition to visual representations thus triggering a dual code whereas verbal claims and abstract pictures activate a single code (Paivio 1986). In line with the dual-coding hypothesis, concrete pictures have been shown to be more effective than abstract pictures, particularly for recall (Paivio 1969; Paivio and Csapo 1969).

Second, the relational organisation stance argues that imaginal processing of paired items enables the individual to find a connective relationship between the items. The viewpoint rests on associative network models (Anderson, 1984; Anderson and Bower, 1973) which postulate that memory consists of a system of nodes that are linked to each other via pathways at different degrees of association. In retrieval, a node is activated and activation spreads through the network via established pathways (Anderson and Reder, 1979). Imagery is likely to enhance the use of meaningful connectives that link two terms together and provide connections (Bower, 1970; 1972). Imagery creates relationships between items so that perceptual unity is achieved. The result is a stronger single memory trace and retrieval path.

Third, the stimulus differentiation stance suggests that imagery results in a more distinctive, more isolated single memory code. Imagery is viewed as a more reliable encoding process than verbal encoding (Bower, 1970). Verbal encoding can focus on a letter or a syllable which entails a lack of stability. Imaginal encoding on the opposite is more stable, hence a more distinct memory trace. In imaginal processing, encoding distinctiveness occurs when the viewer discriminates one stimulus from another at encoding. As opposed to elaboration, distinctiveness of encoding does not refer to the quantity of information encoded but to the tendency of an individual to discriminate one stimulus from another at encoding (Jacoby and Craik, 1979). According to Nelson, Reed and Walling (1976), the picture superiority effect is due to encoding distinctiveness at the sensory level of processing. Pictures have qualitatively superior sensory codes, composed of lines and curves which are more distinctive than lines and curves composing textual elements. This superior sensory coding enables pictures to be encoded more distinctively when sensory processing occurs.

Another stream of research within the human perspective examines the impact of images on attitudinal responses, specifically on attitude toward the ad (Mitchell 1986; Mitchell and Olson 1981), attitude toward the brand (Miniard et al. 1991; Mitchell, 1986; Mitchell and Olson 1981; Rossiter and Percy 1980) and inferences (Smith 1991). These studies have also developed several psychological models to theorize the way visual elements in advertising affect consumer response including classical conditioning (Rossiter and Percy, 1978 – see section on classical conditioning theory), the affect-transfer model (Mitchell, 1986; Mitchell and Olson, 1981), the elaboration-likelihood model (Petty, Cacioppo and Schumann, 1983), brain lateralization (Janiszewski, 1990), visual/ verbal loops (Rossiter and Percy, 1980) and information processing (MacInnis and Price, 1987). Research on the impact of visual versus verbal advertising on consumers' brand attitudes indicates that viewers can develop inferences for the attributes of a product based on minimal and purely visual information on the product, in line with the affect-transfer model (Mitchell and Olson, 1981). In Mitchell and Olson's (1981) study, the most positive brand attitudes were obtained for pictures of a fluffy kitten and of a sunset. Moreover, the advert featuring a picture of the fluffy kitten created a stronger belief that the tissues were soft than the advert with the statement itself. Thus, respondents effectively converted visual information that was not directly related to the product into meaningful semantic information and developed inferences based on minimal brand-specific information (Mitchell and Olson, 1981). This view was challenged by Kisielius and Sternthal (1984), whose experiments indicate that verbal statements accompanied by a picture result in the recall of more brand information but less positive brand attitudes than the verbal statements alone.

However, the human system perspective has largely conceptualized pictures as purely affect-laden. By contrast, Miniard et al. (1991) examine the effect of affect-laden vs. pictorial product information on attitudes. The results show that the impact of affect-laden pictures devoid of product-relevant information declines as involvement increases, involvement exerts the opposite effect for product-relevant pictures. The moderating role of involvement is consistent with the Elaboration Likelihood model (ELM) (Petty and Cacioppo, 1981). The results also demonstrate that the images evoked by pictures and thoughts about a picture's appropriateness play an important mediating role in the persuasion process underlying peripheral pictures. Nonetheless, the product advertised was low-involvement and the pictorials were used in addition to a largely verbal copy, thus ignoring the power of visually-dominant claims as a source of meaning and persuasion in its own right.

Little research has examined the impact of visual claims on product comprehension, although research has been conducted on inferences (Mitchell and Olson, 1981; Smith, 1991). Early evidence suggests that individuals can effectively convert visual information into meaningful semantic information and develop inferences based on minimal brand-specific information (Mitchell and Olson, 1981). Research with non-advertising stimuli (Baggett, 1975) indicates that individuals infer missing conceptual information to make a coherent story and that the inferred information exhibits a positive relationship to the actions explicitly portrayed in the pictures. In line with these findings, more recent research suggests that consumers can form visually-based inferences, although inferential beliefs appear to be weaker than those derived from copy. Moreover, when advertising copy and pictures focus on different product attributes, the pictures disproportionately influence inferences (Smith, 1991). However, the pictorials used were largely peripheral as opposed to conveying the core meaning of the product. Moreover, the products advertised were low involvement as opposed to RNPs which are usually high-involvement products.

Overall, the studies conducted under the information-processing cognitive paradigm (MacInnis and Price, 1987; Miniard et al., 1991) make a remarkable contribution compared to the classical conditioning/ affective response paradigm (Rossiter and Percy, 1978) because they replace the affective theory of pictures with a theory that recognizes the potential for visuals to signify and therefore persuade (Scott, 1994). However, the efforts of the information-processing paradigm are constrained by several assumptions about pictures that are still in line with affective response research. The most limiting assumption is the insistence on conceptualizing the visual as a sensory cue rather than a symbolic form (Scott, 1994). As an example, Mitchell and Olson (1981) state that for the pictorial adverts including a sunset and abstract art, individuals formed beliefs about the product, making "inferences about other characteristics of the four brands even though no relevant information was provided" (p. 329). The meaning of the sunset as a cultural symbol of colourfulness, and the potential similar meaning of the abstract art painting is thus ignored (Edell and Staelin, 1983) or reinterpreted as mere affect (Mitchell, 1986). Hence, there is a need for a theory that conceptualizes images as figurative statements (Scott, 1994). The field of rhetoric which focuses on the ad system and acknowledges the power of images as sources of meaning and persuasion per se should provide further insights into the use of images as a source of learning and comprehension for a new product.

2.2.6.2.2 Ad System

While the previous stream of research treats visuals as sensory data, another stream of research, operating under rhetorical theory, presumes that images are communicative artifacts (Scott and Vargas, 2008). The present research is based on the idea that the binary vision of text as argument and pictures as cues is too simplistic and doesn't account for the argumentative power of pictorial elements in advertisements for RNPs.

In human systems approaches, the visual element tends to be treated as a black box, defined primarily in opposition to other elements i.e. visual vs. verbal (McQuarrie and Mick, 2003). Initial attempts to differentiate the visual ad elements have been largely mechanical and deprived of theoretical framework (Greenberg and Garfinkle, 1963; Motes, Hilton and Fielden, 1992). More recent efforts have focused on more subtle distinctions such as camera angle and use of colour (Meyers-Levy and Peracchio, 1992, 1995, 1996). Only recently have authors acknowledged the role of rhetoric and semiotics to analyse images in advertising. Three key related streams are reviewed: Scott's (1994) approach which is rhetorical and positioned away from semiotics, Messaris' (1997) approach which is anchored in semiotics and McQuarrie and Mick's (1996; 1999) which reconciles the rhetorical approach with a broader approach to semiotics following the work by Eco (1976).

Rhetoric Scott's (1994) research makes a key contribution by criticizing the underlying assumption of advertising images: that pictures are reflections of reality. An alternative view is formulated, in which visuals are a convention-based symbolic system. In this alternative view, pictures must be cognitively processed as opposed to peripherally absorbed. Advertising images are further conceptualised as a complex form of visual rhetoric. Rhetoric is an interpretive theory that frames a message as an interested party's attempt to influence an audience. The sender's intention is understood to be manifest in the argument, the evidence, the order of argumentation and the style of delivery (Burke, 1969; Corbett, 1965). The sender designs the message according to shared knowledge as well as common experiences. Receivers of the message use the same body of knowledge to read the message, infer the sender's argument and formulate a response (McQuarrie and Mick, 1992; Mick and Buhl, 1992; Scott and Vargas, 2008). The interpretation of the message is rendered possible because sender and receiver use the same body of cultural knowledge (Scott, 1990; 1994). Scott's (1994) approach is radically different from past approaches to advertising images, in so far as it conceptualizes pictures as information in symbolic form that must be processed cognitively via complex combinations of learned pictorial schemata. Hence, visual elements can convey concepts, abstractions, metaphors and do not necessarily bear a resemblance to the real world (Scott, 1994).

Scott's (1994) approach is therefore rhetorical in nature but is positioned away from semiotics. Scott (1994) argues that semiotic theory, the study of sign processes, and especially structuralist approaches, often states that pictures signify by virtue of their resemblance to an object (Barthes, 1977; Peirce, 1931-1958). Under this assumption, semiotics does not accommodate pictures as a form that can signify beyond representation versus misrepresentation and therefore a theory that re-situates the pictorial sign in culture is warranted (Scott, 1994). Scott (1994) also develops a case against copy theory or the argument that pictures resemble reality (Goodman, 1976). Contrary to the assumptions of copy theory, pictorial artifacts are highly conventional constructions which do not necessarily intend to represent reality, mostly as far as advertising is concerned. Visual artifacts are much more fully understood as a symbol system, a kind of picture-writing that does not rely on a concrete referent to signify (Scott, 1994). Advertising images are thus capable of sophisticated rhetorical tasks. Importantly, images are conceptualized as a discursive form, like writing, but differ from other symbolic systems in several ways. For example, separating the units of meaning in a visual claim is even more difficult than in language: "The image is syntactically and semantically dense in that no mark may be isolated as a unique, distinctive character (like a letter of an alphabet)" (Mitchell, 1986, p.67, see Goodman, 1976, pp. 59-69).

Overall, Scott's (1994) contribution is a more sophisticated approach to the visual element, drawing on art theory, among other disciplines, to study advertising visuals. Scott (1994) also introduces the concept of style to discussions of consumption phenomena. Scott (1994) criticizes the copy theory and its applications in advertising research (Miniard et al., 1991) to develop a new theory of visual rhetoric which conceptualises visual artifacts as powerful symbols, sources of meaning and persuasion. This approach is positioned away from semiotics, however this rejection of semiotic analysis may be due to a narrow focus on structuralist semiotic (McQuarrie and Mick, 2003). Recent work suggests that acknowledging Pierce's semiotic icon/ symbol distinction in advertising research may help make more progress in developing a thorough understanding of the ad system (Larson, 2008; Messaris, 1994).

Semiotic The triadic classification by the philosopher Charles Sanders Pierce (1839-1914) is by far the most widely used scheme in semantics, which studies the relation between signs and the things they refer to. Three categories of images are identified, namely the icon, the index and the symbol. Iconic signs are signs that imitate their referent; for instance, a drawing of a building is an iconic representation of the building: it has the same shape but not the same size. Indexical signs are caused by their object and indicate the object's existence, such as a bullet whole in a paper. Symbols are an arbitrary convention: nothing but social convention links the prototypical symbol to its referent. Indexicality and iconicity are positive characteristics of visual communication that are specific to images. Scott (1994) challenged the validity of the icon/ symbol distinction in semiotics and McQuarrie and Mick (2003) suggest that this distinction lacks scientific utility in the analysis of visual persuasion. However, semiotics has been identified as the approach to images that is most likely to balance understanding of the human system with a commensurate understanding of the ad system (Larsen, 2008). It may thus help remedy the deficit in understanding of visual persuasion highlighted by Malkewitz, Wright and Friestad (2003).

Scott's (1994) criticism of copy theory rejects the idea that a picture may be iconic, and thus may represent reality. In this view, the icon/ symbol distinction is illusory as icons do not exist and all images are symbols. Messaris (1994) develops an argument in favour of the icon vs. symbol distinction. Citing various empirical studies, he shows that there is no great disconnect between art and reality, contrary to what the symbol theorists assert. This argument is supported by research indicating that direct perception of a thing and indirect, iconic perception produce similar physiological effects and are processed by the same physiological machinery (Levin and Simons, 2000). Overall, Scott's (1994) argument takes on an either/ or form: visuals are either simple icons which are processed simply and directly or symbols i.e. complex human artifacts that resonate on multiple social and cultural dimensions. However Messaris (1994) and Larsen (2008)'s classification argue in favour of a both/ and analysis which preserves the icon vs. symbol dimension which actually account for a richer, more complex nature of images. Representational images are regarded as icons, however many icons are also symbols if in addition to their mimetic relationship to a referent they have certain arbitrary meanings by social agreement (Larsen, 2008). For example, a bald eagle will always have a mimetic relationship with its referent animal, but may also, by arbitrary convention, symbolically signify the United States or the Boy Scouts. Rhetorical richness may therefore be more fully understood by acknowledging both the iconic and symbolic aspects of signs (Larsen, 2008).

To sum up, the icon vs. symbol distinction is not only valid but should also be an integral part of the nuanced understanding of images forged by Scott (1994). Applied to the present research, a picture of the product may be categorised as an icon as it resembles the real product. However, visual analogies and visual mental simulations conveying the core argument of the advertisement should be conceptualized as symbols and thus powerful sources of meaning and persuasion.

In line with the semiotic tradition, visual images can play three major roles in an advert, as they can elicit emotions by simulating the real presence of a person or object; they can serve as photographic proof that something really did happen; and they can establish an implicit link between the product that is being sold and other image(s) (Messaris, 1997). Thus, visual images have their own specific contribution in persuasive advertising, which cannot be ignored. Images display not only sensory properties (Mitchell and Olson, 1981) but also semantic and syntactic properties. Semantic properties refer to the way elements of an image are related to their meaning while syntactic properties refer to the interrelationships between the elements themselves as they combine to create larger meaningful units (Messaris, 1997).

As for syntactic properties of visual communication, apart from conventions to determine spatial relationships between objects, visual communication lacks explicit means to identify other ways in which images might be related to each other (Messaris, 1997). This is a particularly relevant point for the present research which studies the impact of ads containing visual analogies on consumer learning for RNPs. Words and sentences can explicitly create a link or evoke an analogy between two products but visual images do not have an equivalent of this type of syntax to express analogies, contrasts, causal claims and similar propositions (Messaris, 1997). For instance, images put in parallel can evoke different meanings: analogy, causality or another relationship. Visual syntax is much more flexible than verbal syntax and more subject to individual imagination and interpretation. In general, this relative indeterminacy plays an active part in visual persuasion and far from being a "deficiency" it may be one of the principal strengths of visual communication (Messaris, 1997).

Four main categories of visual propositions can be identified: causality, contrasts, analogies and generalizations (Messaris, 1997). Causality can be achieved by the juxtaposition of the product with people, lifestyles or images. Contrast is used mainly for product comparison and before-and-after juxtapositions. Visual representations of environmental disasters (before-and-after) can be a powerful instrument of persuasion as far as aesthetics are concerned, whereas words could appeal to a more scientific aspect of persuasion. Such an emotional response to a visual argument can be more effective to some viewers than more objective verbal arguments (Messaris, 1997). Analogy has an ability to act as a partial substitute for adjectives and adverbs, which cannot be expressed directly by images as verbal syntax has no direct visual counterpart (Messaris, 1997). Additionally, a visual analogy has no explicit starting point, although the viewer will usually assume that the target of the comparison is the product. However, in the case of an analogy between a RNP and an existing product, the viewer may not know for sure which product is the target of the advert; the addition of a verbal argument may be necessary (Messaris, 1997).

Generalization can be achieved by presenting several concrete examples of where a product is used, or by indicating that it is used worldwide using an image of earth taken from space. Images can also be used as an argument in themselves, as opposed to a mere cue in the advert. For instance an environmentalist advert by the Advertising Council features 7 images. The first six are photos of the eyes of endangered species. The last image is a photo of a human baby eye. These images make the argument that we should care about these species as much as we care about our babies (Messaris, 1997). However, one is forced to acknowledge that due to the lack of explicitness of visual syntax and hence to the high demands placed on the viewer's interpretive abilities, the syntactic complexity that images can be expected to deliver by themselves is limited. Most adverts tend to rely on the four categories expressed above, or use verbal arguments in addition to the visual components of the advert.

Combining Semiotic and Rhetorical Approaches. McQuarrie and Mick (1996; 1999; 2003) draw from the perspectives of semiotics and rhetoric to develop an explanation of visual effects in advertising. From semiotics[2], they draw the ideas of sign and text, and from rhetoric they draw the idea of figure of speech (McQuarrie and Mick, 2003). In this perspective, figures do not need to be embodied in language but can be defined more abstractly so that the framework accounts for visual figures. Importantly, rhetoric and semiotics are text-centered disciplines, and thus have relatively straightforward assumptions about the human system (McQuarrie, 1989; Mick, 1986). McQuarrie and Mick's (2003) approach intends to combine a return to text with insights gained from

[2] For the purpose of clarity, it should be highlighted that the branch of *semantics* refers to the study of the relations between signs and the things that they refer to; the branch of *syntactics* studies the relations between different signs in formal structures; the branch of *pragmatics* studies the relations of signs to their impacts on those who use them. Semantics, syntactics and pragmatics are all branches of semiotics, which is the study of sign processes and which includes the study of how meaning is constructed and understood.

human psychology to progress toward an integration of ad systems with human systems. McQuarrie and Mick (2003)'s approach is shaped by the semiotic tradition, in particular the work by Eco (1976). The main distinction compared to Scott's approach (1994) is that the outcomes in terms of consumer response are given more consideration as opposed to focusing only on the abilities of the communicator and analyst (Scott, 1994).

Rhetorical figures are defined as artful deviations i.e. incongruities that both require resolution and point the way to resolution (McQuarrie and Mick, 1996; Toncar and Munch, 2001). The figure of metaphor, for instance, specifically invites a comparison of two objects by suggesting that one object is like another even though they come from different domains (Stern, 1990). To resolve the incongruity, consumers must draw inferences that find similarities between the two objects. Metaphors are a type of indirect claim because the statements are made in a figurative rather than a literal way (Mothersbaugh, Huhmann and Franke, 2002).

According to the field of pragmatics, two types of inferences may be drawn from a claim: strong and weak implicatures (Sperber and Wilson, 1986). Strong implicatures call for one interpretation which varies little across individuals. Contrarily, weak implicatures yield a wider range of inferences. A figure of rhetoric conveyed using words is likely to trigger strong implicatures whereas a figure conveyed with pictures can fuel a range of weak implicatures, as visuals tend to be opened to multiple interpretations (McQuarrie and Phillips, 2005). Therefore, the use of words should ensure that the meaning intended in the advert is understood by most individuals. In contrast, information conveyed using pictures may be interpreted differently across individuals. This is consistent with the view in semiotics of pictures as more open to interpretation due to their implicitness (Eco, 1976; Marchand, 1985). Weak implicatures, which are attempts to guess the advertiser's intent, are less likely to function as distracting thoughts (Edell and Staelin, 1983). Recent experiments support the idea that when consumers are presented with an indirect metaphorical claim, they become more receptive to multiple positive inferences about the advertised brand (McQuarrie and Phillips, 2005). Moreover, when the indirect metaphor takes the form of a picture, consumers are more likely to spontaneously generate positive inferences at the time of exposure.

A recent review of audience-response effects of rhetorical figures suggests that rhetorical figures have significant effects on comprehension. Studies among children (Billow, 1975; Pawlowski, Badzinski and Mitchell, 1998) show that metaphors easily comprehended by older children are not understood by younger children, suggesting that metaphors require complex inferences. Further evidence comes from studies (Frisson and Pickering, 1999; Gibbs, 1990; Hubbell and O'Boyle, 1995, McQuarrie and Phillips, 2005) that use response times in different ways to find evidence of cognitive processing. Moreover, adding a rhetorical figure to an advertising message increases respondents' elaboration as they attempt to comprehend the message. This increased elaboration occurs when respondents attempt to resolve the incongruity of rhetorical figures (McQuarrie and Mick, 1999). The visual figures examined i.e. rhyme, antithesis, metaphor and pun produce more elaboration and lead to more favourable attitudes to the ad, without being more difficult to comprehend. However, these effects are culturally bound for visual tropes (metaphors and puns) as they diminish or disappear in the case of individuals who lack the cultural competency required to appreciate the ads (McQuarrie and Mick, 1999). In a re-enquiry of visual and verbal rhetorical figures under directed processing versus incidental exposure to advertising, the authors demonstrate that ads with figures are recalled more often and trigger more positive attitudes toward the ad. Visual figures are more effective regardless of processing condition, whereas verbal figures perform better only when subjects are directed to process the ads (McQuarrie and Mick, 2003). The observation of participants to a focus group exposed to ads containing visual metaphors also enabled the identification of a progression of inferences, capturing the "aha!" moment of understanding (Phillips, 1997).

Huhmann (2008) recently developed a framework of rhetorical figures after synthesizing several sources of advertising rhetoric (e.g. Huhmann, Mothersbaugh and Franke, 1999, 2002; Leech, 1966; Mothersbaugh, Huhmann and Franke, 2002; Nelson and Hitchon, 1999; Pandya, 1977; Tanaka, 1994) which intention was to be more exhaustive than the list put forward in McQuarrie and Mick's (1996) seminal work. Huhmann's (2008) and McQuarrie and Mick (1996) both distinguish between schemes and tropes. Schemes alter the arrangement of elements to create repeating or reversed patterns. Contrarily, tropes have literally false meanings, from which the intended meaning must be interpreted through simple substitution of the intended literal meaning i.e. substitution trope or deciphered through greater cognitive effort i.e destabilization tropes. The meaning of destabilization tropes, such as metaphors, is initially unclear.

A metaphor compares two unlike things to imply that the qualities of the second object should be applied to the first even though these qualities are not literally applicable. For example: "STP is a cough medicine for your car" (Huhmann, 2008). Metaphors can also be conveyed visually (Phillips, 2000; McQuarrie and Phillips, 2005). However, both taxonomies of rhetorical figures (Huhmann, 2008; McQuarrie and Mick, 1996) fail to acknowledge analogies as rhetorical figures (Gentner, 1989) and more specifically as destabilization tropes, which are the figures that have the most open meaning (Huhmann, 2008), thus placing a strong pressure on cognitive processing. Overall, this work greatly contributes to the present research, as it integrates both semiotics and rhetorical approaches and ad system and human system, thus taking a step further in the understanding of the effects of visuals in advertising (McQuarrie and Mick, 2003). However, further research is needed to integrate research on rhetorical figures (McQuarrie and Mick, 1999, 2003; McQuarrie and Phillips, 2005; Scott, 1994) with research on analogies for RNPs (Ait El Houssi, Morel and Hultink, 2005; Roehm and Sternthal, 2001; Hoeffler, 2003). The present research intends to address this gap.

2.2.6.3 Visual Attention

Finally, another stream of research that can contribute to the understanding of consumer responses to pictures vs. words in advertising is the study of visual attention in marketing, which focuses on the human perceptual system. The competition for consumer attention is greater today than ever before, as more and more advertisements coexist while consumers' attention remains limited. Despite this evidence, while academics have gone to great lengths to examine the impact of advertising characteristics on consumers' cognitive responses and attitudes, little research has been conducted on consumer attention (Janiszewski and Bickart, 1994). Thus, whereas the conceptual analyses used by consumers when they integrate new information from the stimulus with pre-existing knowledge have been widely examined in past research (Petty and Cacioppo, 1986; Payne, Bettman, and Johnson, 1993), consumers' perceptual analyses (Greenwald and Leavitt, 1984) which take place when consumers give focal attention to the stimulus and examine several elements of the stimulus have not been examined thoroughly by marketing academics.

Most research examines the impact of physical properties on attention using memory measures, which indicate whether the consumer remembers specific parts of the advert. Such self-reports from the consumer's part are limited and possibly biased indicators of consumer attention to the advert. Indeed, memory scores are retrospective active answers from the consumer while attention does not need to be "conscious" (Kellogg, 1980) and can only be approached adequately during its process. Thus, physiological measures using an eye-tracking procedure should be more appropriate than memory scores (Rosbergen, Pieters and Wedel, 1997) to measure visual attention. Such methods enable consumers to have a flexible and rapid access to information (Payne, Bettman and Johnson., 1993). In this respect, eye movements are used as an operational definition of visual attention in the present research (Pieters, Rosbergen and Hartog, 1996).

Drawing on capacity theories of attention (Broadbent, 1971; Kahneman, 1973), research in marketing did investigate the impact of several consumer characteristics including consumer motivation (Pieters, Rosbergen and Hartog, 1996; Pieters and Warlop, 1999) and ad familiarity (Pieters, Warlop and Wedel, 2002; Pieters and Warlop, 2002), of different physical ad properties such as advertisement originality (Pieters, Warlop and Wedel, 2002, Pieters and Warlop, 2002), moment to moment entertainment and information value (Woltman Elpers, Wedel and Pieters, 2003) or argument quality (Pieters, Rosbergen and Hartog, 1996) and of contextual factors such as repetition

(Pieters, Rosbergen and Hartog, 1996) or time pressure (Pieters and Warlop, 1999) on consumers' attention.

Pieters and Wedel (2004) examined attention capture and transfer for brand, pictorial and text in advertisements. Attention capture was operationalised as the percentage of participants fixating a selected ad object at least once. Attention transfer was operationalised as the effect of gaze duration for one of the ad objects on gaze for the other objects. The pictorial was superior in capturing attention, independent of its size. The text best captured attention in direct proportion to its surface size. The brand most effectively transferred attention to the other objects. Although these studies further the current understanding of visual attention processes in advertising, they do not use eye movements as indicators of latent attention processes. Moreover, the identified consequences of consumer visual attention to an advert are the probability to chose a brand (Pieters and Warlop, 1999) and memory for the advertised brand (Pieters and Warlop, 2002; Pieters, Warlop and Wedel, 2002). However, no past research has investigated the impact of the content of advertisements using different learning strategies for RNPs on consumers' visual attention and ultimately on consumers' comprehension of the product.

A model which explains the links between perceptual and cognitive processes is put forward by Wedel and Pieters (2000) and may be divided into three main steps: attention and information extraction, information accumulation and memory storage and memory retrieval (Wedel and Pieters, 2000; Pieters, Warlop and Wedel, 2002). When viewing print adverts, consumers visually explore and extract information from the advert. Consumers obtain information from advertisements and their elements during eye fixations, which are moments of visual attention (Sperling and Weichselgartner, 1995). When consumers cannot extract the information from an ad element during one fixation, they refixate (Henderson, 1992). This is the first step: attention and information extraction. Then, during information accumulation and memory storage, the information of each ad element that is extracted during a fixation is added to the information already present in long-term memory. There, it shapes new and strengthens existing memory traces and forms associations with other memory traces (Hintzman, 1988; Raaijmakers and Shifrin, 1992). Memory retrieval is the third step, during which an advertised brand is retrieved from memory provided that the total amount of the stored information about the brand exceeds a specific threshold (Pieters, Warlop and Wedel, 2002). This conception is consistent with the work in psychology on memory thresholds (Dougherty, Gettys and Ogden, 1999; Kruschke, 1996; Nelson, Lalomia and Canas, 1991). Such a threshold varies across advertisements and consumers. Two elements increase the probability of accurate memory retrieval for the brand: increasing the amount of information about the brand in long-term memory and decreasing the memory threshold.

The present research focuses on the role of visual attention in product comprehension. Wedel and Pieters (2007) have recently called for more research applying eye tracking measures to make inverse inferences about fundamental communication processes. Previous eye tracking research has often been descriptive, for instance by relating perceptual aspects of the stimulus, namely size, colour or position of the brand, text and pictorial directly to measures of visual attention. However, more can be gained from using eye-tracking measures as indicators of the latent measures of interest, such as product comprehension (Wedel and Pieters, 2007). Contrary to the accepted wisdom inspired by hierarchical models such as AIDA and its successors (Starch, 1923) that attention is a mere precondition, academic research has shown that visual attention is a key coordinating mechanism that helps maintain information processing and other goals over time (LaBerge, 1995). Drawing on the inverse inference model (Feng, 2003), key indicators of unobservable cognitive processes may be derived from observed eye movements (Pieters, Wedel and Zhang, 2007).

2.3 MULTIDISCIPLINARY INTEGRATION OF LEARNING THEORIES

A summary of the key theories is built and presented in table 2.3-1. This table is helpful to position the present study in cognitive consumer research in relation to other areas of research (i.e. economics, organisation science, sociology, educational psychology, experimental psychology) and to other philosophical streams (i.e. behaviourist and constructivist).

TABLE 2.3-1 MULTIDISCIPLINARY ROOTS OF CONSUMER LEARNING FOR RNPs

Field	BEHAVIOURIST	COGNITIVIST	CONSTRUCTIVIST
ECONOMICS	• Rational decision theory		• Learning-by-Doing • Network Externalities
ORGANISATION SCIENCE	• Single-loop learning • Explicit Knowledge	• Double-loop learning	• Communities-of-Practice • Tacit knowledge
SOCIOLOGY	• Social Exchange Theory	• Socio-Cognitive Dynamics in a Product Market	• Socio-Cognitive Dynamics in a Product Market • Social Network theory • Contagion Theory
EDUCATIONAL PSYCHOLOGY	• S-R Framework	• Analogical Learning	• Theory of Child Development • Social Development Theory • Experiential Learning/Learning Styles
EXPERIMENTAL PSYCHOLOGY		• Human Perception	
MARKETING PSYCHOLOGY	• Classical Conditioning • Instrumental Conditioning	• Categorisation • Analogical Learning • Mental Simulation • Human System • Rhetoric • Semiotics • Visual Attention	• Opinion leadership and WOM influence

From the above review of the contributing literatures to learning theory, two main findings may be identified. First, all the disciplines of the social sciences tend to rely on three paradigms: Behaviourism, Cognitivism and Constructivism, which underpinnings are defined in section 2.1. Additionally, from a historical point of view, all fields seem to have evolved from an original behaviourist conception of learning resting on the idea of the rational individual to a more cognitive view of learning which operates at a deeper level of understanding and toward a constructionist approach where experience is paramount.

The second finding is rather paradoxical: although all the disciplines of the social sciences seem to have evolved simultaneously in the same direction, there is an evident lack of integration across disciplines, suggesting that the field of learning theory is heavily fragmented. Although there is some indication of attempts to integrate cross-disciplinary findings between two disciplines (Staats, 1975), an overview of learning theories across disciplines was lacking. In particular, marketing researchers should benefit from the insights of "older" social disciplines such as economics, sociology or educational psychology to broaden and deepen their understanding of consumer learning. Besides, the understanding of organisational learning processes may provide new opportunities to better capture the essence of consumer learning, and the study of experimental psychology and neuroscience may further the understanding of the links between conceptual and perceptual analyses when processing information for RNPs. The purpose of this review was not to offer a complete review of all the learning theories developed in each discipline, but rather to integrate findings identified as relevant to further the understanding of consumer responses to innovations, and in particular to RNPs.

As far as the behavioural theories are concerned, the single-loop learning theory (Argyris and Schon, 1978) developed in organisation science demonstrates that only a lower level of learning can be acquired through repetitive behaviours. Consumers' low-level learning does not disrupt consumer habits and thus cannot lead to the adoption of radical innovations. The idea of consumer reinforcement, either hedonic or informational, developed in operant conditioning is useful for the purpose of the present research. In line with recent efforts to differentiate between utilitarian and hedonic base vs. functionalities in the context of convergence in the high-tech sector (Gill, 2008), the present research argues that acknowledging the nature of RNPs i.e. hedonic vs. utilitarian and the possibility that the RNP combines utilitarian and hedonic aspects i.e. hybrid is essential to develop effective communication strategies for such products.

The evolution toward a more constructivist stance indicates the recognition of the value of experience in learning. In economics, learning-by-doing (Arrow, 1962) introduces a shift with respect to the traditional rational economic decision theory. According to Grossman et al. (1977), the individual learns by observing the consequences of his/ her present actions. Thus, uncertainty, which is pervasive in unfamiliar high-tech markets, can be reduced at a cost induced by experimenting with the product. Applied to the area of consumer learning for RNPs, this theory highlights the importance for marketers to stimulate product trial which requires the active participation of the consumer and reduces the uncertainty that surrounds novel products (Hoeffler, 2003).

In organisation science, the idea of tacit knowledge has been identified as playing a significant role in technological innovation (Howells, 1996) and can be transmitted through metaphorization (Akbar, 2003). This stream of research can be linked back to the study of analogies for RNPs (Gregan-Paxton and Roedder John, 1997) and provides further support to the idea that analogies may be appropriate cognitive tools to convey the benefits of complex new products. The principle of accommodation which refers to the process of changing cognitive structures to accept something from the environment in the theory of child development in cognitive constructivism (Piaget, 1972) also has an interesting application to the study of consumer learning for RNPs. Adopting a radically new innovation requires to modify and disrupt one's existing cognitive structure to integrate a new category of products.

According to the constructivist paradigm experience is crucial to stimulate learning. Transferred to the marketing field, this has implications for consumer learning and adoption of innovations. In particular, product trial, by creating a real experience with the product should enhance consumers' willingness to purchase the product by creating a concrete understanding of the product's features and benefits. The most interesting contribution of constructivist theories lies in the realisation that the process of mental simulation, although anchored in the cognitivist paradigm, can also be regarded as a vicarious experience of the product which replaces concrete experience when product trial is impossible, which is often the case with RNPs, and may therefore be a powerful cognitive tool to stimulate learning for RNPs.

The cognitive theories of learning developed in several fields of the social sciences enrich the view of learning as an in-depth experience which focuses on understanding and problem-solving. Double-loop learning, or higher-level learning (Fiol and Lyles, 1985) can be regarded as an evolution towards a more cognitive level of learning, as a truly active process which develops an understanding of causation. It is this type of cognitive learning that consumers need to make sense of RNPs, as consumers need to understand the core benefits of the product and cannot remain "outsiders" as the benefits of such novel products generally lie in technologically innovative features that are hard, or even impossible, to observe from the outside (Ait El Houssi, Morel and Hultink, 2005).

Consumer research for RNPs suggests that because RNPs do not fit into any existing category, categorization is inappropriate to convey the benefits of such novel products. Academics have turned to analogies to examine how the transfer of information across categories can help individuals build new knowledge for RNPs (Gregan-Paxton and Roedder John, 1997). Analogies have also been studied in educational psychology (Gentner, 1989). The literature review highlights that between-domain analogies, as opposed to within-domain analogies are a powerful learning tool to understand complex concepts, and thus are particularly relevant for the study of learning for innovative RNPs (Gregan-Paxton and Roedder John, 1997). This idea can be found both in educational psychology (Halpern, Hansen and Riefer, 1990) and in marketing (Ait El Houssi, Morel and Hultink, 2004). The focus on structural relationships increases comprehension because structural relations are more informative about what benefits a product offers than common surface similarities (Cummins, 1992; Simons, 1984).

However, one notable characteristic of analogical learning is that errors in transfer can occur (Novick, 1988) as inferences are only guesses and therefore the inferences drawn may be erroneous (Spiro et al., 1989). Therefore, another learning strategy is discussed (Taylor et al., 1998): mental simulations, defined as the imitative mental representation of some event or series of events (Taylor and Schneider, 1989). Mental simulation may be an appropriate cognitive process to help consumers learn about new product benefits (Sujan et al., 1997), which is particularly relevant in the context of consumer learning for RNPs.

The literature review also focuses on the effects of alternative presentation formats, namely words vs. pictures. Two key streams of literature are reviewed: one that treats visuals as sensory data (Mitchell, 1986; Mitchell and Olson, 1981; Rossiter and Percy, 1978; 1980) and another stream of research, operating under rhetorical theory, which presumes that images are communicative artifacts (Scott, 1994; Scott and Vargas, 2008; McQuarrie and Mick, 1996; 1999; 2003). Little research under the first stream has examined the effect of visuals on comprehension because of the conceptualization of images as sensory data, unable to communicate the core message of a stimulus.

The present research is based on the idea that the binary vision of text as argument and pictures as cues is too simplistic and does not account for the argumentative power of pictorial elements in advertising for RNPs (Scott, 1994). Scott (1994) criticizes the copy theory and its applications in advertising research (Miniard et al., 1991) to develop a new theory of visual rhetoric which conceptualizes visual artifacts as powerful symbols. Larsen (2008) and Messaris (1997) agree with this idea but argue that rhetorical richness may be more fully understood by acknowledging both the iconic and symbolic aspects of visuals (Larsen, 2008). To sum up, in this perspective the icon vs. symbol distinction is not only valid but should also be an integral part of the nuanced understanding of images forged by Scott (1994). Applied to the present research, a picture of the product may be categorised as an icon as it resembles the real product. However, visual analogies and visual mental simulations conveying the core argument of the advertisement should be conceptualized as symbols and thus powerful sources of meaning and persuasion.

The syntactic properties of visual communication also put forward a key dimension of visual communication, as visuals lacks explicit means to identify ways in which images may be related to each other (Messaris, 1997). This is particularly relevant for the present research which studies the impact of ads containing visual analogies on consumer learning for RNPs. Words and sentences can explicitly create a link or evoke an analogy between two products but visual images do not have an equivalent of this type of syntax to express analogies, contrasts, causal claims and similar propositions (Messaris, 1997). Finally, the work by McQuarrie and Phillips (1996; 1999; 2003) extends this stream of research by integrating rhetorics with the semiotic tradition by Eco (1976) and by considering the outcomes in terms of consumer response as opposed to focusing only on the abilities of the communicator and analyst (Scott, 1994), thus providing a greater integration between studies into the human system and studies into the ad system.

The literature review also addresses the role of visual attention, examined both in experimental psychology (Rayner, 1978; 1998; Henderson and Hollingworth, 1998) and in marketing (Pieters and Warlop, 1999, 2002; Pieters, Warlop and Wedel, 2002). Key findings include the fundamental differences that exist between scene and text perception: in reading, comprehension can be gained only through focal attentive processes which are voluntary, serial, slow and effortful (Loftus, 1983; Rayner, 1998; Reichle et al., 1998). Contrarily, scene, or picture perception relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). Therefore, although the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth, 1998), text necessitates more eye fixations to be comprehended. This is likely to affect visual processing of advertising stimuli for RNPs in which the main argument is conveyed using pictures vs. text.

Furthermore, the present research focuses on the role of visual attention in product comprehension, in line with Wedel and Pieters' (2007) recent call for more research applying eye tracking measures to make inverse inferences about fundamental communication processes. Eye-tracking measures can be used as indicators of the latent measures of interest, such as product comprehension (Wedel and Pieters, 2007). This review brings about a key question for the study of individual responses to RNPs: what do consumers look for when they build an understanding of a new product? Do they intend to build a personal, subjective knowledge of the product, which may not completely match the "real world"? Or do they wish to reach a personal experiential reality by concretely experiencing the product in use and its resulting benefits in daily life? The present research considers that if individuals intend to build a subjective knowledge of the product, analogical learning may be most appropriate (Gregan-Paxton and Roedder John, 1997). However, if individuals need to vicariously experience the product in use, mental simulation should trigger the most positive responses (Taylor et al., 1998).

2.4. CHAPTER SUMMARY

This chapter has provided a multi-disciplinary assessment of theories relevant to consumer learning for RNPs in a variety of disciplines (economics, organisation science, sociology, educational psychology, experimental psychology and consumer research), underpinned by three philosophical paradigms: behaviourism, constructivism and cognitivism. The contributions of the key theories to the present research have been identified.

Additionally, it was established that although previous research has identified that categorisation is not ideally suited to the study of learning for RNPs as these products do not fit into any existing category, previous research has been unable to compellingly identify whether analogical learning or mental simulation is best suited to the communication of the benefits of RNPs. Moreover, the review of the literature on consumer response to alternative presentation formats i.e. words vs. pictures suggests that information-processing studies that treat pictorials as sensory data are unable to account for the powerful role of pictorials used in advertising to convey the key message of the advert in order to persuade and communicate meaning. Progress in the fields of rhetoric and semiotics are in line with this conceptualisation of visual artifacts as symbols, which is adopted in the present research. The literature review also demonstrated that no research to date has tackled the issue of consumer response to RNPs conveyed by words and pictures, leaving a gap in the literature that the present research intends to address.

Finally, in line with recent calls that research in visual attention should use eye movements to make inverse inferences the present research intends to use an eye-tracking experiment to further the understanding of conceptual and perceptual analyses at stake when learning about RNPs. Based on these notions, the next chapter builds the conceptual framework and research hypotheses of the current study.

CHAPTER THREE

CONCEPTUAL FRAMEWORK

CONTENTS: The chapter presents a theoretical account of consumer responses to RNPs. Section 3.1 introduces the content of the chapter and presents the two conceptual frameworks developed. Section 3.2 introduces the theoretical assumptions underlying the conceptual frameworks. Section 3.3 formulates the hypotheses about the effects of learning strategies and presentation formats on the outcome variables (Section 3.3.1), the mediating effects of emotional responses (Section 3.3.2) and the role of visual attention (Section 3.3.3). The chapter ends with a summary (Section 3.4).

3.1. INTRODUCTION

The following chapter integrates knowledge from marketing, consumer research, social psychology and experimental psychology to generate a set of formal hypotheses regarding the causal relationships between advertising stimuli and consumer responses to RNPs. Two conceptual frameworks are developed. The first framework examines the relationships between the characteristics of advertising stimuli, namely the learning strategy presented (mental simulation vs. analogy vs. no analogy/ no mental simulation) and the presentation format used to convey the message (words vs. pictures), and outcomes in terms of consumer responses, namely comprehension for the RNP, attitude to the product and behavioural intent. The framework also addresses the mediating role of emotional responses such as discouragement, scepticism and positive emotions. Moreover, differences in consumer responses due to the nature of the product (i.e. utilitarian vs. hedonic vs. hybrid) are examined. This conceptual framework is presented in Figure 3.1-1. The second conceptual framework focuses on the role of visual attention in consumer responses to the new product. Specifically, the model examines whether an increase in attention to the advertising message is correlated with an increase in product comprehension. The basic rationale for these models lies in the difficulty for consumers to comprehend and develop positive attitudes toward RNPs, hence the need to enhance the effectiveness of advertising messages for such novel products and to increase the current understanding of the conceptual and perceptual mechanisms that lead to positive outcomes for such products. This conceptual framework is presented in Figure 3.1-2.

Figure 3.1-1 First Conceptual Framework

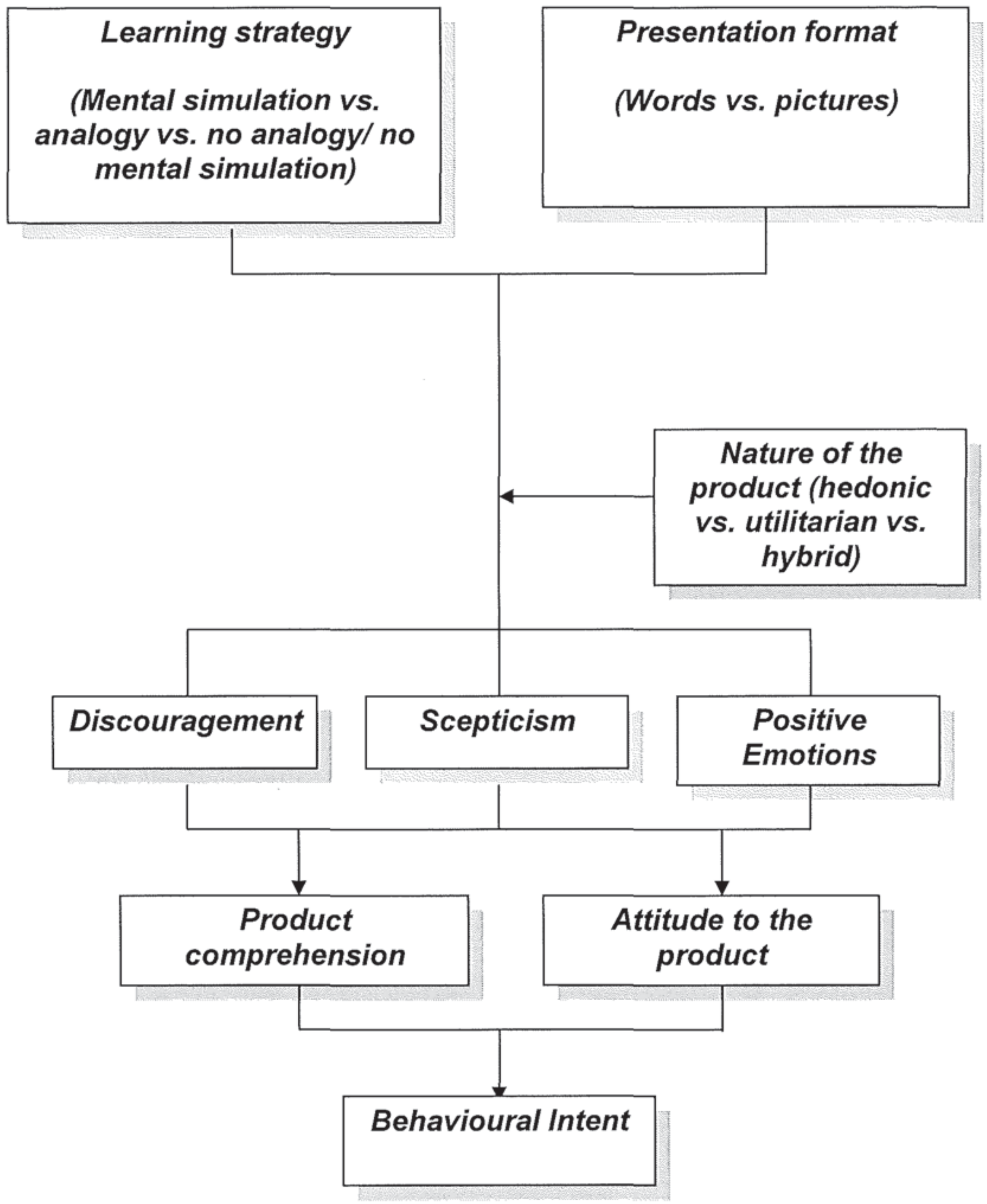
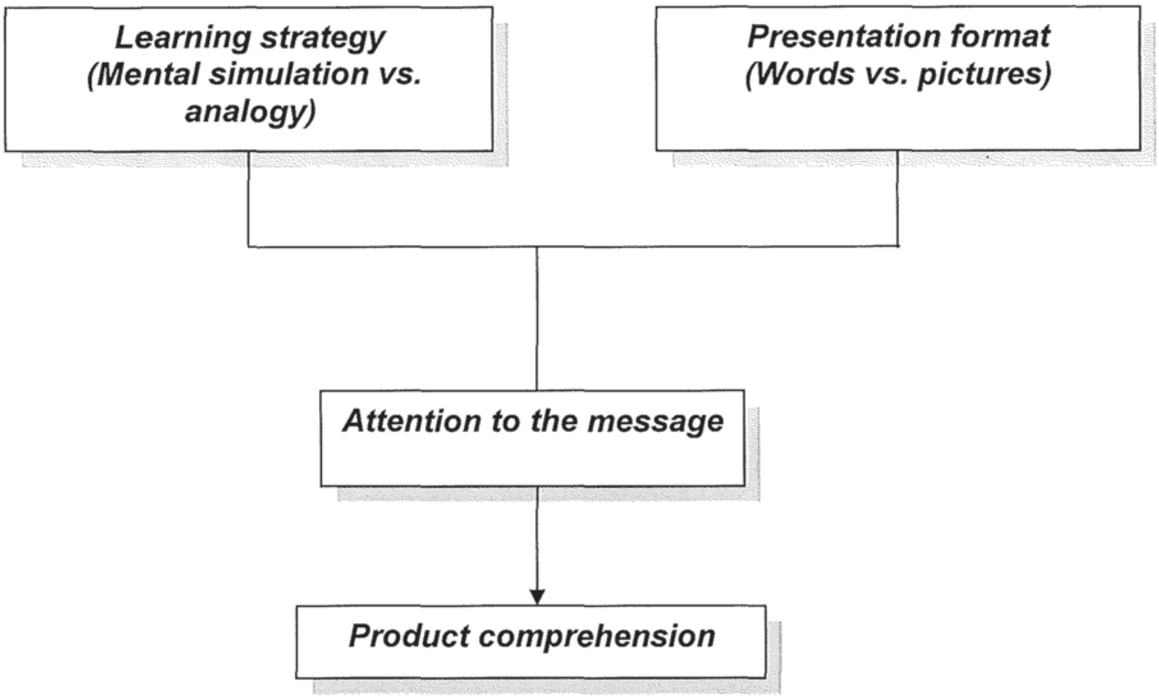


Figure 3.1-2 Second Conceptual Framework



3.2 THEORETICAL ASSUMPTIONS

Theories of learning most frequently cited in the marketing literature include category-based learning, analogies and mental simulations (Hoeffler, 2003). Prior research has established that categorization plays a central role in new product learning (Sujan, 1985). However, categorical learning is mainly used to organize existing information, not to learn new knowledge (Gregan-Paxton and Roedder John, 1997). RNPs create new product categories or substantially expand existing ones (Lehmann, 1997). Therefore, the usefulness of categorical transfer as a cognitive tool to learn about RNPs is limited (Hoeffler, 2003) as for such novel products categorization is at best ambiguous (Gregan-Paxton, Hoeffler and Zhao, 2005). Both analogies and mental simulations may be appropriate cognitive strategies to help individuals deal with uncertain environments and develop new knowledge (Gregan-Paxton and Roedder John, 1997; Taylor et al., 1998). Analogies rely on a model of internal knowledge transfer which focuses on the transfer of knowledge from one domain (the base) to another (the target), as a function of the correspondence between the two (Gentner, 1989). The analogical learning paradigm provides an understanding of knowledge transfer not only between a new stimulus and the existing knowledge used to organize it in memory, but also between a new stimulus and the knowledge used to learn about it (Gregan-Paxton and Roedder John, 1997), thus providing a broader perspective on the knowledge-transfer issue than the categorisation theory.

Mental simulation is another cognitive tool that may help individuals understand a new product. Mental simulation, defined as the imitative representation of some event or series of events (Taylor and Schneider, 1989), involves the cognitive construction of hypothetical scenarios. Particularly noteworthy is that mental simulations obey the constraints of reality and are thus useful for anticipating the future because the imagined plans of action are unlikely to rely on improbable events along the way (Kahneman and Miller, 1986). The role of mental simulations as a cognitive tool to evaluate products is well established in the literature (Phillips, 1996; Shiv and Huber, 2000). Moreover, mental simulation may be an appropriate cognitive process to help consumers learn about new product benefits (Sujan et al., 1997), which is particularly relevant in the context of consumer learning for RNPs. A comprehensive review of the literature on consumer responses to RNPs was conducted. The results of this literature review are presented in table 3.2-1. Previous research has examined both the effect of analogies (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau, 2003; Hoeffler, 2003; Roehm and Sternthal, 2001; Ait El Houssi, Morel and Hultink, 2005) and mental simulations (Castano, Sujan, Kacker and Sujan, 2008; Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007; Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007) on responses to RNPs. The merits of mental simulations and analogies have also been investigated in the domain of new product design and new product ideation (Dahl, Chattopadhyay and Gorn, 1999; Dahl and Moreau, 2002).

TABLE 3.2-1 PREVIOUS RESEARCH ON CONSUMER RESPONSES TO RNPs

Authors	Antecedents	Consequences	Mediators *Moderators*
	Studies on Analogical Learning		
Ait El Houssi, Morel and Hultink (2005)	3 (comparison type: explicit analogy vs. implicit analogy vs. literal similarity) x 2 (product: Auto Mower, Smart Pen)	Benefit Comprehension Product Preference	
Gregan-Paxton and Moreau (2003)	Studies 1 and 2: Analogy vs. categorization cue Study 3: Categorisation and analogy cues vs. categorization only cue	Study 1: Transfer of shared relational information from the base (category) to the new product Attribute transfer from the base (category) to the new product Confidence in inferences held Studies 2 and 3: Recall of alignable and non-alignable features	
Gregan-Paxton et al. (2002)	Analogy vs. no analogy	Number of attributes recalled Corresponding vs. non corresponding features recalled Affect produced by processing Product judgment	
Roehm and Sternthal (2001)	Studies 1 and 2: Cue type (analogy vs. literal similarity) Study 3: Analogy with training vs. Analogy with no training Study 4: Analogy with positive mood induced vs. Analogy with neutral mood	Studies 1 to 4: Evaluations Base Associations	*Studies 1 to 4: Expertise* *Studies 1 to 4: Need for Cognition* Studies 3 and 4: Base associations (Comprehension)
	Studies on Mental Simulations		
Castano, Sujan, Kacker and Sujan (2008)	Study 1: Temporal frame (near future vs. distant future) Study 2: Temporal frame (near future vs. distant future) x type of communication strategy (process focused vs. outcome focused vs. control) Study 3:Temporal frame (near future vs. distant future) x type of communication strategy (process focused vs. outcome focused) x Product newness (more vs. less)	Study 1: Uncertainty thoughts Emotions Behavioural Intentions Study 2: Uncertainty thoughts Emotions, Behavioural Intentions Study 3: Uncertainty thoughts Behavioural Intentions	

Dahl and Hoeffler (2004)	Product newness (Really New Product vs. Incremental New Product) Visualization Form (Self-Related vs. Others-Related)	Product Evaluation	Difficulty of the visualization-based evaluation process
Hoeffler (2003)	Study 1: Product Category (TVs vs. computer displays vs. cameras vs. automobiles) x 2 (INP vs. RNP) Study 2: 4 Between-subjects factor (standard full-profile conjoint vs. mental simulation, followed by full-profile conjoint vs. mental simulation with free-form analogies, followed by full-profile conjoint vs. mental simulation with marketer-provided analogies, followed by full-profile conjoint x 2 within-subjects (product type : INP vs. RNP) x 2 within subjects(time of measurement: before and after usage of the product). Study 3: 2 within-subjects (time of preference measurement: after exposure to product information vs. three weeks later) x 2 between-subjects (type of preference measurement: conjoint analysis vs. mental simulation) x 2 between subjects (product trial vs. no product trial)	Study 1: Product Benefits Drawbacks Social Implications Purchase Intention Comprehension Uncertainty in Estimating Utility Study 2: Preference Purchase Interest Study 3: Preference Structure Changes Evaluation Purchase Interest	
Zhao, Hoeffler and Dahl (2007)	Visualization focus (memory vs. imagination) Product type (RNP vs. INP)	Product evaluation	Perceived ease of visualization
Zhao, Hoeffler and Zauberman (2007)	Study 1: 2 (time: near future versus distant future) x 3 (simulation: control versus outcome simulation versus process simulation) Study 2: Same design for multi-attribute product	Studies 1 and 2: Preferences and preference stability Study 2: Choice	
	Additional studies on consumer responses to RNPs		
Alexander, Lynch and Wang (2008)	Product perceived newness (INP vs. RNP) Time Frame	Intention to buy Following through on Intentions Timing of Acquisition Implementation Intention Level of Abstractness in Representation of Product Use	

Gill (2008)	2 (utilitarian or hedonic base product) □2 (congruent or incongruent added functionality of the convergent product)	Actual Use Expected Use Incremental value Incremental pleasure (hedonic value) Perceived change in image of the base	*Prior ownership (owners vs. non owners of the base product)* *Goal congruence* Incremental pleasure
Gill and Dube (2007)	Study 1: Property mapping (functional vs. non functional properties) Relational linking (more frequent than less frequent relations) Study 2: Combination of two basic level concepts from the same super-ordinate category vs. from different super-ordinate categories	Study 1: Response time in the comprehension of new concepts Study 2: Interpretation using property mapping vs. relation linking Response time in the comprehension of new concepts	
Gregan-Paxton (2001)	Study 1: Mere-appearance vs. Literal similarity Study 2: 2 (brand knowledge: abstract or specific) × 3 (attribute similarity: high, medium, or low) × 2 (access to learning materials: free or restricted)	Nature of the brand-product mapping (Attribute mappings vs. relational mappings) Nature of the transfer process (Exemplar-based knowledge transfer vs. Schema-based knowledge transfer) Study 2: Performance prediction	*Knowledge level (Experts vs. Novices)*
Gregan-Paxton, Hoeffler and Zhao (2005)	Studies 1, 2 and 3: High Familiarity vs. Low Familiarity category Perceptual vs. Conceptual Representation	Studies 1, 2 and 3: Inferences using a single-category or multiple-category inference strategy	
Herzenstein, Posavac and Brakus (2007)	Study 2: Regulatory focus (promotion vs. prevention) Risk salience (explicit vs. implicit) Study 3 : Regulatory focus (Promotion vs. prevention) Newness of the product (New or Existing)	Study 1: Purchase of new and really new products Ownership of established products Studies 2 and 3: Purchase intentions Performance Uncertainty	*Study 1: Regulatory focus (promotion vs. prevention focused)* Studies 2 and 3: Performance Uncertainty
Moreau, Lehmann and Markman (2001)	Studies 1 and 2: Innovation continuity (continuous vs. discontinuous)	Studies 1 and 2: Consumer Comprehension Perceived Relative Advantage Perceived Risk Product Preferences Net Benefit Study 2: Attribute-based questions Relation-based questions	*Studies 1 and 2: Knowledge in Primary Base Domain* *Knowledge in Supplementary Base Domain* Comprehension Net Benefits

Moreau, Markman, Lehmann (2001)	Study 1: Order of exposure to the ads (camera first vs. scanner first) Timing of the categorization task (after 1 ad vs. after both ads) Study 2: Identical design, but with explicit mappings to the category in the ads.	Categorization Performance Expectations Preferences	
Rijsdijk and Hultink (2003)	3 Product (vacuum cleaner vs. television set vs. refrigerator) x 3 level of autonomy (low vs. medium vs. high)	Product Autonomy Relative Advantage Perceived Complexity Perceived Risk Consumer Appreciation	*Desire for Control*
Rijsdijk, Hultink and Diamantopoulos (2007)	Product Intelligence	Relative Advantage Compatibility Complexity Consumer Satisfaction	Relative Advantage Compatibility Complexity
Selinger, Dahl and Moreau (2006)	Study 1: Product exposure (Product only vs. Product and category) Study 2: Information level (demo vs. no demo) x product prototypicality (prototypical vs. non prototypical)	Product newness	Categorization accuracy
Wood and Moreau (2006)	Study 1: 2 (product demonstration: no versus yes) x2 (prior PDA experience: no versus yes) Study 2: 2 (high versus low experience) x2 (demonstration versus no demonstration) x Timing (Before Use vs. After First Use vs. After Extensive Usage)	Study 1: Product-related expectations Complexity expectations Disconfirmation of complexity expectations Emotions Product Evaluations Study 2: Expectations, Emotions, Evaluations	*Study 1 and 2: Expertise*
Ziamou and Ratneshwar (2002)	Studies 1 and 2: Functionality Newness (Preexisting vs. New) x Amount of Information about the Interface (Less vs. More)	Study 1: Perceived Uncertainty about the performance of the new interface Intention to adopt the new product Study 2: Generation of failure scenarios and confirming scenarios about the performance of the interface	Studies 1 and 2: Perceived Uncertainty about the performance of the new interface
Ziamou and Ratneshwar (2003)	Studies 1 and 2: 2 (typical vs. atypical product) x 2 (comparative vs. noncomparative advertisement)	Studies 1, 3 and 4: Consumer judgment of a new functionality Study 2: Generation of thoughts that	

	Study 3: 3 Task focus (similarities-task focus, differences-task focus, no-task focus) x 2 typicality of the product (typical versus atypical product) Study 4: Comparative advertisement with comparison at the functionality-level only vs. comparison at the benefit-level vs. no comparison	evaluate the new functionality in a comparative manner Negatively valenced comparative thoughts Positively valenced comparative thoughts
Ziamou and Veryzer (2005)	Study 1: Temporal Distance (Near vs. Distant Future) Product (Superior Functionality vs. Superior Interface) Study 2: Availability (Current vs. Distant Future) Product (Superior Functionality vs. Superior Interface)	Study 1: Consumer Preference Study 2: Consumer Choice

However, to a large extent analogies and mental simulations have been studied in different streams of research with little overlap. The sole exception encountered during the literature search was Hoeffler's (2003) study on the measurement of preferences for RNPs, which was not conducted in the context of marketing communications but using market research techniques inciting potential consumers to elaborate on the sources of uncertainty that characterize the new products. Hence, the extant literature on new products has not formerly examined the differential effects of mental simulations and analogies on consumer responses in an experimental setting. The present study intends to fill in this gap.

Moreover, the ability of nonverbal, pictorial stimuli to drive individuals to imagine themselves in a situation has been widely acknowledged in consumer research (Babin and Burns, 1997). However, previous research on mental simulations for RNPs has focused solely on mental simulations conveyed with text containing instructions to imagine (Castano, Sujan, Kacker and Sujan, 2008; Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007; Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007). Pictures present visual images in an appropriate modality for internalization as the basis for personal imagery (Rossiter and Percy, 1980). A picture superiority effect ensues as visual information tends to be remembered over verbal information because pictures activate a visual as well as verbal encoding process (the dual-coding hypothesis; Paivio, 1986). Most studies also support the picture superiority effect on brand attitudes (Edell and Staelin, 1983; Mitchell, 1986; Mitchell and Olson, 1981; Rossiter and Percy, 1978, 1980). Therefore, mental simulation conveyed using a visual scenario may enhance consumers' ability to vicariously experience the consequences of product use to a greater extent than a verbal description. Hence, the comparison of visual vs. verbal mental simulation strategies in the context of consumer responses to RNPs is a timely endeavour.

Contrary to visual mental simulations, the use of visual analogies has received little attention in consumer research. Researchers in marketing have started to investigate the processes of internal knowledge transfer that consumers engage in when learning about a new, unfamiliar product based on work in cognitive psychology on analogical reasoning

(Gentner and Gentner, 1983; Holyoak, Gentner, and Kokinov 2001; Vosniadou 1989). However, despite this explicit use of analogies, little research has acknowledged that analogies are rhetorical figures (Delbaere and Smith, 2007) and can thus be powerful tools for persuasive communication when conveyed either verbally or visually. The present research brings together two different streams of research: analogical learning for RNPs (Gregan-Paxton, Hibbard, Brunel and Azar 2002; Gregan-Paxton and Moreau 2003; Moreau, Lehman and Markman 2001; Moreau, Markman and Lehmann 2001, Roehm and Sternthal 2001) and the use of figures of rhetoric in advertising (McQuarrie and Mick, 1992, 1996, 1999, 2003). Recent findings suggest that visual metaphors in advertising may be more persuasive due both to visual argumentation and metaphorical rhetoric (Se-Hoon Jeong, 2008). As analogies are a type of metaphor (Gentner, 1989), a question is whether these findings may be replicated in the context of advertising for RNPs. Considering that visual figures have recently been conceptualized as sources of meaning and persuasion in advertising operating through indirect persuasion (McQuarrie and Phillips, 2005), the present research attempts to close a gap in the literature by comparing analogies for RNPs presented alternatively in words and in pictures.

Recent research in marketing has identified the need to distinguish between hedonic and utilitarian products in the context of convergence in the high-tech electronics sector, whereby disparate functionalities are added to existing base products (Gill, 2008). RNPs can also be conceptualized as offering predominantly utilitarian or hedonic benefits. Consistent with previous research in marketing, the term utilitarian benefits refers to the functional, instrumental, and practical benefits of a product, the term hedonic benefits refers to the product's aesthetic, experiential, and enjoyment-related benefits, and to its ability to provide feelings (Batra and Ahtola 1990; Chitturi, Raghunathan, and Mahajan 2008; Dhar and Wertenbroch 2000; Strahilevitz and Myers 1998). Based on congruity theory (Johar and Sirgy, 1991), advertising effectiveness will be enhanced if a congruity is achieved between the nature of the product and the advertising appeal. Specifically, hedonic appeals are more effective than utilitarian appeals when the product is perceived to be more hedonic. Conversely, utilitarian appeals are more effective than hedonic appeals when the product is perceived as utilitarian (Johar and Sirgy, 1991). Drawing on the idea that pictures have a more hedonic nature than words (Hirschman and Solomon, 1984; Hirschman, 1986), the present research intends to examine whether the use of visual appeals is more effective when the product offers hedonic benefits while the use of words is more effective for products that deliver predominantly utilitarian benefits. Moreover, the present research develops a new classification of RNPs by acknowledging the existence of hybrid products which require a utilitarian process but offer hedonic outcomes. Consumer responses for hybrid products after exposure to alternative stimuli are also investigated.

Only recently have researchers acknowledged that consumer evaluations of innovations result in emotional responses that must be considered in the development of product launch strategies (Wood and Moreau, 2006; Castano, Sujan, Kacker and Sujan, 2008). Learning about a complex innovation is rarely a neutral process and can elicit strong emotions along the way (Wood and Moreau, 2006). When engaged in a learning activity, individuals set goals and monitor their progress towards these goals. Therefore, when individuals reach the goal of comprehending a new complex product, they are likely to experience strong positive emotions. However, negative emotions may arise when this goal is impeded. The present study draws together the literature on regulatory focus in social psychology (Higgins, 1987), transportation theory (Green and Brock, 2000) and indirect persuasion (McQuarrie and Phillips, 2005) to examine whether positively and negatively valenced emotions mediate the effect of learning strategies (mental simulation vs. analogy vs. no analogy/ no mental simulation) and presentation formats (words vs. pictures) on consumer responses to the new product.

Past studies on analogical learning for RNPs have examined the effect on memory outcomes, namely the recall of attributes (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau, 2003) and features (Gregan-Paxton and Moreau, 2003), on attitudinal variables, namely product judgments (Gregan-Paxton et al., 2002), evaluations (Roehm and Sternthal, 2001), preferences (Ait El Houssi, Morel and Hultink, 2005) and purchase interest (Hoeffler, 2003) and on comprehension, namely the transfer of shared relational information and attribute transfer from the base to the target (Gregan-Paxton and Moreau, 2003), base associations (Roehm and Sternthal, 2001) and benefit comprehension (Ait El Houssi, Morel and Hultink, 2005). However, previous research on consumer responses to mental simulations for RNPs has focused solely on the effect on attitudinal and behavioural variables, such as product evaluation (Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007), preferences (Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007), choice (Zhao, Hoeffler and Zauberman, 2007), purchase interest (Hoeffler, 2003) and behavioural intentions (Castano, Sujan, Kacker and Sujan, 2008).

The present study intends to examine the effect of mental simulations and analogies, conveyed using words or using pictures, on product comprehension, attitude to the product and behavioural intent. Analogies are likely to enhance product comprehension through internal knowledge transfer (Gregan-Paxton and Roedder John, 1997) whereby existing knowledge about the base is transferred to the target product. Although little research has studied the process by which mental simulation enhances comprehension, mental simulation may be an appropriate cognitive process to help consumers learn about new benefits (Sujan et al. 1997), by producing experiential or "how thinking" and yielding imagined scenarios of the self interacting with the product rich with episodic details.

As for the impact of these learning strategies on persuasion, analogies are likely to persuade by prompting elaboration of message information, that is, the association of message content with information already in memory (McQuarrie and Mick, 1999). The mapping process generates elaboration on structural relations, which are thought to be more informative about the benefits of the product than attributes (Gregan-Paxton and Roedder John, 1997), and should therefore prompt more favourable evaluations (Roehm and Sternthal, 2001), likely to result in message persuasion. Mental simulations are likely to persuade through imagery processing (Lutz and Lutz, 1977; Childers and Houston, 1984; Houston, Childers, and Heckler, 1987), characterized by nonverbal product-related thoughts, as opposed to more semantic, reasoned analytic processing (Childers, Houston, and Heckler, 1985). Verbal mental simulations are also likely to persuade via a specific type of imagery referred to as narrative transportation, or the extent to which individuals become "lost" in a story (Green and Brock, 2000). Imagery is a holistic process which does not facilitate analytic choice processes, such as making trade-offs between attributes or comparisons between alternatives (MacInnis and Price, 1987; McGill and Anand, 1989). However, it is well-suited for constructing a detailed product-usage scenario for one alternative, with the aim of constructing an attitude for the product (Smith, Mitchell and Meyer, 1982). Imagery is thus particularly suited to the development of attitudes for innovations such as RNPs (Oliver, Robertson and Mitchell, 1993). Imagery processing has been shown to positively influence product-related affect and intention to buy in the context of new product advertising (Oliver, Robertson and Mitchell, 1993).

Furthermore, the conceptual model developed posits that product comprehension and attitude to the product mediate the effects of presentation format and learning strategies on behavioural intent. To develop a positive intent towards RNPs, consumers typically have to learn about the benefits of the product (Lehmann, 1994; Urban, Weinberg and Hauser, 1996) and to have a positive impression of these key benefits (Ait El Houssi, Morel and Hultink, 2005). Persuasion theorists have long maintained that comprehension is a prerequisite to the formation of attitudes, intentions and behaviour, particularly under the central or systematic processing route (Ratneshwar and Chaiken, 1991). The LSC (Levels of Subjective Comprehension) model developed by Mick (1992) suggests that deep comprehension levels have strong and positive relations with post-exposure brand attitudes. The comprehension of the self-relevant product consequences is likely to lead to evaluative thoughts about the product (Maheswaran and Sternthal, 1990) and should have stronger effects on brand/ product attitudes (MacInnis and Jaworski, 1989). Because RNPs are by definition complex, high-involvement products, it is expected that consumers will develop positive attitudes and behavioural intent for the product provided they comprehend and learn about product-relevant information (Bettman, 1979). Hence, the conceptual model predicts that product comprehension and positive attitudes will mediate the effect of the stimuli characteristics on behavioural intent.

The second conceptual model developed focuses specifically on the role of visual attention in product comprehension and is tested in a separate experiment combining eye-tracking data and self-report measures. Wedel and Pieters (2007) have recently called for more research applying eye tracking measures to make inverse inferences about fundamental communication processes. Previous eye tracking research has often been descriptive. However, much more can be gained from using eye-tracking measures as indicators of the latent measures of interest, such as product comprehension (Wedel and Pieters, 2007). Academic research has shown that visual attention is a key coordinating mechanism that helps maintain information processing and other goals over time (LaBerge, 1995). Drawing on the inverse inference model (Feng, 2003), key indicators of unobservable cognitive processes may be derived from observed eye movements (Pieters, Wedel and Zhang, 2007). Extant research on RNPs has not examined the role of visual attention in consumer responses to the product. However, provided that a close correspondence exists between eye movements and higher-order cognitive processes (Rizzolatti, Riggio and Sheliga, 1994), a study combining eye movement data and self-report measures may provide valuable insights into the effectiveness of advertising stimuli for RNPs. Hence, the present study intends to examine whether an increase in visual attention to the message is correlated with an increase in product comprehension, and whether this correlation applies to both visually and verbally-dominant stimuli.

3.3 RESEARCH HYPOTHESES

3.3.1 Effects of Learning Strategy and Presentation Format on the Outcome Variables

Researchers in a variety of fields including psychology (Gentner, 1980, 1982; Holyoak, 1985), instruction (Halpern, Hansen and Roefer, 1990), management science (Nadler, Thompson and Boven, 2003) and politics (Spellman and Holyoak, 1992) have examined the value of analogies as an aid to learning new concepts. Researchers in psychology build on the structure-mapping theory of analogy (Gentner, 1989) to define an analogy as the mapping of knowledge from one familiar domain (the base) onto an unfamiliar, unknown domain (the target). Analogical learning may be divided into several key steps (Gentner, 1989; Holyoak and Thagard, 1989; Winston, 1980), including access, mapping and transfer. The goal of the access phase is to activate the learner's mental representation of a base domain to be considered as a potential source of information about the target domain. The goal of the mapping stage is to align the base and target domains such that knowledge associated with the base can transfer to the target. At this stage, the individual understands the similarities between base and target. The mapping process constructs one-to-one correspondences between the elements of the representation of the base and of the target domains (Gentner, 1983, 1989; Holyoak, 1984; Holyoak and Thagard, 1989). These correspondences create paths between the base and the target across which knowledge can be transported (Gregan-Paxton and Roedder John, 1997).

The next stage in analogical learning is the actual transfer of information. It is during that stage that learning occurs, with knowledge from the base being transferred to the target. The individual infers that, because the domains are similar in some respects, they are likely to be similar in other respects as well. The use of an analogy to compare the RNP (i.e., target) with an existing, familiar domain (i.e., base) provides the structural knowledge needed to elaborate on new product information. This point is perhaps best illustrated by a concrete example. Nike recently teamed up with Apple to launch the Nike I-Pod Sport kit, a pedometer system designed to give runners feedback on their workout (Champagne, 2007). This system has been compared to a ''coach'' (AppleInsider, 2006). This analogy underlines that the kit will be similar to a coach in some respects. For instance, as a coach gives feedback on one's progress from one training to another, one may infer that the kit possesses a similar progress-tracking function. This mapping occurs despite the evident lack of physical similarity between the two but makes sense when one considers that the RNP and the coach occupy the same role in the common relational structure, linking the coach to the product (i.e. both of them help individuals in their daily workout).

Much of the existing work on consumer knowledge transfer has typically been guided by the categorization literature in social and cognitive psychology (Barsalou, 1991) as well as in marketing (Loken and Ward, 1990; Sujan and Dekleva, 1987). The categorization paradigm is valuable to understand the organization of knowledge and the transfer of beliefs that occurs when an incremental innovation receives a category label i.e. the beliefs that occur after a new camera is categorized with existing cameras (Gregan-Paxton and Roedder John, 1997). However, the categorization paradigm overlooks situations where products do not fit into any existing category, which is the case for RNPs (Lehmann, 1994). Knowledge about such unfamiliar products cannot be gained from their own category, and should therefore be acquired from alternate, more familiar domains that can provide valuable information about the product.

Mental simulation is another learning strategy that has been identified as helpful to deal with uncertainty and knowledge development (Taylor et al., 1998). Advertising often encourages consumers to mentally imagine using a new product. Recently, the "Samsung imagine" campaign invited consumers to "imagine the world's slimmest mobile phone" or "imagine lying around with the world's lightest 14 inch mobile computer". Mental simulation is defined as the imitative mental representation of some event or series of events (Taylor and Schneider, 1989). The use of mental simulation as a learning strategy for product evaluations is well established (Phillips, 1996; Shiv and Huber, 2000). While there is a long history of mental simulation research in psychology, consumer research has recently begun to examine some related concepts such as imagery in advertising. MacInnis and Price (1987) define imagery as "a process (not a structure) by which sensory information is represented in working memory" (p. 473). Conceptually, mental simulation is also closely related to MacInnis and Price's (1987) notion of pre-consumption mental imagery, whereby the consumer vicariously experiences product use prior to actual consumption. Similarly, Walker and Olson (1997, pp. 159, 161) explain how consumers form "visual images of certain product-related behaviours and their consequences" to "vicariously experience the consequences of product use". Phillips (1996) refers to the notion of "consumption visions". A consumption vision consists of a series of mental images of product-related behaviours, which allows consumers to try and anticipate the actual consequences of product use (Phillips, Olson and Baumgartner, 1995; Walker and Olson, 1997).

The primary antecedents to imagery are instructions to imagine and pictures (Babin and Burns, 1997). A pictorial description of the consumption experience is likely to help consumers anticipate what the actual consumption may be like (Miniard et al., 1991). A visual representation of the situation should help consumers imagine or picture themselves acting within the consumption context. Imagery consists of two main components: the self and the consumption situation. If the situation is presented in the advertisement using a visual scenario, one half of the foundation for the mental simulation is established. All the individual has to do is to imagine himself or herself in that situation (Phillips, 1996). In addition, imagery can be triggered by an explicit instruction to imagine. Such an invitation should greatly facilitate the construction of a cognitive scenario. This is supported by studies which found that compared to subjects who were not given explicit instructions, subjects who did receive these instructions imagined more complex mental images and more detailed product attributes (McGill and Anand, 1989).

However, the question of the effects of imagery stimulated using words vs. pictures in the context of learning for new product concepts has not been investigated to date, as extant research in the area has focused solely on instructions to imagine (Dahl and Hoeffler, 2004; Castano, Sujan, Kacker and Sujan, 2008). Moreover, previous research on mental simulations for RNPs has examined mainly the role of this cognitive strategy in persuasion mechanisms but not in the learning processes that enable consumers to reach comprehension for a new product.

The effectiveness of words vs. pictures for imagery-evoking strategies is likely to depend upon the nature of the key benefits of the product, i.e. utilitarian vs. hedonic (Chitturi, Raghunathan, and Mahajan 2008). Based on the expectancy value model, previous research investigating utilitarian products has demonstrated that objective claims, as opposed to subjective claims, yield higher purchase intentions (Darley and Smith, 1993). In contrast, subjective claims should be more effective than objective claims for hedonic products (Park and Young, 1986). According to the definition by Edell and Staelin (1983), an objective message describes physical properties of the product by giving factual and verifiable information i.e. information not subject to individual interpretation. Subjective information is open to individual interpretation, primarily because there is no universal agreement on the scale used to measure the product performance attribute mentioned. Because visuals are more open to individual interpretation than words (McQuarrie and Phillips, 2005) it can be argued that visuals are more subjective whereas words are more objective. Hence, visuals in advertising appeals are likely to be more suited to convey the benefits of hedonic products as these products' aesthetic and experiential aspects are best represented using visuals. Contrarily, words should be more appropriate to convey the benefits of utilitarian products, as functional and practical benefits should be best described using words. Moreover, words in advertising should be perceived as more utilitarian whereas visuals may be perceived as more aesthetic (Hirschman and Solomon, 1984; Hirschman, 1986). According to social learning theory, the western cultural emphasis on reading, literacy and education as dominant modes of rationality and logic may cause written presentations to be perceived as more utilitarian and rational than pictorial presentations (Polanyi and Prosch, 1976). Contrarily, visual images are more generally regarded as aesthetic objects than text passages (Holbrook and Zirlin 1983; Poianyi and Prosch 1976). Importantly, this claim is not based on the content of the advertising claim and on the presence of emotion-laden words or pictures in the appeal, but rather on the nature of the format itself (Hirschman, 1986).

According to congruity theory (Johar and Sirgy, 1991), advertising effectiveness will be enhanced if a congruity is achieved between the nature of the product and the advertising appeal. Specifically, value-expressive appeals are more effective than utilitarian appeals when the product is perceived to be more value-expressive or hedonic rather than utilitarian. Conversely, utilitarian appeals are more effective than value-expressive appeals when the product is perceived to be utilitarian (Johar and Sirgy, 1991). The rationale behind this is that hedonic appeals may be more effective than utilitarian appeals when the product is hedonic mainly because consumers experience a match between the image characteristics of the product and the consumer's self-concept *(self-congruity),* resulting in enhanced persuasion (based on self-image congruence models, Sirgy, 1982; 1985). Utilitarian appeals may be more effective than hedonic appeals when the product is utilitarian, mainly because consumers experience a match between the functional characteristics of the product and their desired set of characteristics expected in that product *(functional congruity),* resulting in greater persuasion (based on multi-attribute attitude or expectancy-value models, Currim 1982; Grether and Wilde 1984; Hagerty, 1983; Miniard and Cohen 1983; Myers, 1976; Oliver and Bearden 1985; Punj and Stewart 1983; Shimp and Kavas 1984).

Following this, drawing on congruity theory (Johar and Sirgy, 1991), mental simulation conveyed using words, because it should be perceived as a more utilitarian appeal compared to pictures, is likely to trigger more positive responses in terms of comprehension and attitudes than mental simulation using pictures for utilitarian RNPs. Contrarily, mental simulation conveyed using pictures, because it may be perceived as a more hedonic appeal, is likely to trigger more positive responses than mental simulation conveyed using words for new products of a more hedonic nature.

Moreover, the present research identifies a third type of RNP: hybrid products. Based on the argument that RNPs can be categorized according to the nature of the process required to use them and of the outcomes they deliver, RNPs can be classified as fully utilitarian, fully hedonic or hybrid. The definition of RNPs according to this classification is as follows:

- Utilitarian products (utilitarian outcomes/ utilitarian process), which provide functional, instrumental and practical benefits and require consumers to go through a utilitarian process to achieve these benefits;
- Hedonic products (hedonic outcomes/ hedonic process), which provide aesthetic, experiential and enjoyment-related benefits and which process of use is experiential in itself (Chitturi, Raghunathan and Mahajan, 2008);
- Hybrid products (hedonic outcomes/ utilitarian process), which provide hedonic benefits (aesthetic, experiential and enjoyment-related) but which require consumers to go through a utilitarian process to achieve these benefits.

Importantly, while consumers focus mainly on the benefits when thinking of products with a low complexity (i.e. INPs), they focus both on the benefits and the outcomes when thinking about products with a high level of complexity (i.e. RNPs) (Mukherjee and Hoyer, 2001). Accordingly, recent findings suggest that while consumers naturally focus more attention on the benefits than on the process of using a product for INPs, they focus equally on the process and the benefits for RNPs (Zhao, Hoeffler and Zauberman, 2008). Consequently, for a hybrid product, individuals are likely to focus both on the utilitarian process and on the hedonic outcomes of the product when evaluating a hybrid RNP. Therefore, one may expect that a mental simulation conveyed using pictures will be equally capable of enhancing comprehension, attitudes and intent for a hybrid RNP as a mental simulation conveyed using words. Thus:

Hypothesis 1: When the learning strategy is a mental simulation a) the use of words will trigger higher levels of product comprehension than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of product comprehension than the use of words for hedonic products and c) the use of words will trigger similar levels of product comprehension as the use of pictures for hybrid products.

Hypothesis 2: When the learning strategy is a mental simulation a) the use of words will trigger higher levels of attitude to the product than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of attitude to the product than the use of words for hedonic products and c) the use of words will trigger similar levels of attitude to the product as the use of pictures for hybrid products.

Hypothesis 3: When the learning strategy is a mental simulation a) the use of words will trigger higher levels of behavioural intent than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of behavioural intent than the use of words for hedonic products and c) the use of words will trigger similar levels of behavioural intent as the use of pictures for hybrid products.

However, the pattern previously put forward for mental simulations may not hold for analogies due to their complex rhetorical nature and to their reliance on shared knowledge between sender and receiver (Scott, 1994). Although researchers in marketing have started to investigate the processes of internal knowledge transfer that consumers engage in when learning about a new, unfamiliar product based on work in cognitive psychology in analogical reasoning (Gentner and Gentner, 1983; Holyoak, Gentner, and Kokinov 2001; Vosniadou 1989), little research has acknowledged that analogies are rhetorical figures (Delbaere and Smith, 2007) that can be presented in advertising using words or using pictures.

Studies of responses to advertising images follow parallel streams: the first one treats visuals as sensory, peripheral data whereas the second one builds on rhetorical theory and identifies images as sources of meaning and persuasion (Scott and Vargas, 2008). According to the second stream, visuals are viewed as a convention-based symbolic system which must be cognitively processed, rather than absorbed peripherally or automatically (Scott, 1994). Rhetoric is an interpretive theory that frames a message as an interested party's attempt to influence an audience. The sender's intention is understood to be manifest in the argument, the evidence, the order of argumentation and the style of delivery (Burke, 1969; Corbett, 1965). The sender designs the message according to shared knowledge as well as common experiences. Receivers of the message use the same body of knowledge to read the message, infer the sender's argument and formulate a response (McQuarrie and Mick, 1992; Mick and Buhl, 1992; Scott and Vargas, 2008). This leads to a key issue for the use of rhetorical figures in advertising for RNPs. Due to their highly innovative nature, individuals have limited existing cognitive structures for such products (Lehmann, 1994), and therefore the knowledge shared between sender and receiver is likely to be scarce. Consequently, there is a significant risk that consumers may not understand the meaning of the ad and thus may not fully comprehend the nature of the product.

Two types of inferences may be drawn from a claim: strong and weak implicatures (Sperber and Wilson, 1986). Strong implicatures call for one interpretation which varies little across individuals. Contrarily, weak implicatures yield a wider range of inferences. A figure of rhetoric conveyed using words is likely to trigger strong implicatures whereas a figure conveyed with pictures can fuel a range of weak implicatures, as visuals tend to be opened to multiple interpretations (McQuarrie and Phillips, 2005). Therefore, the use of words should ensure that the meaning intended in the advert is understood by most individuals. In contrast, information conveyed using pictures may be interpreted differently across individuals.

Analogies rely on inferences, cognitive processes which unique characteristic is to go beyond the given information (Fishbein and Ajzen, 1975). Importantly, the inferences that arise from analogical transfer are only guesses and may not convey an accurate representation of the target product (Gentner and Markman, 1997). Past research on RNPs has shown that verbal analogies can be effective learning strategies for RNPs but also run the risk of misinforming consumers (Hoeffler, 2003). Using a visual analogy instead of a verbal analogy should increase the risk of misinforming consumers as one of the main syntactic properties of visual communication is its lack of explicit means to identify how images relate to each other (Messaris, 1997). Words can explicitly evoke an analogy between two products whereas visuals do not have an equivalent type of syntax to express analogies. Moreover, the wide range of inferences induced by visual analogies (McQuarrie and Phillips, 2005) increases the risk that subjects choose the wrong inference and reach an inappropriate conclusion about the nature of the RNP. Thus, visual analogies are likely to be too difficult to understand for a RNP, independent of the nature of the product (hedonic vs. utilitarian vs. hybrid). This is consistent with the view of humans as cognitive misers (Bettman, Luce and Payne, 1998; Fiske and Taylor, 1991), reluctant to engage in the extensive cognitive thinking that might be required by a visual analogy, regardless of the nature of the benefits conveyed by the product. Thus:

Hypothesis 4: When the learning strategy is an analogy the use of words will trigger higher levels of product comprehension than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.

Rhetorical images in advertising persuade via indirect persuasion techniques (McQuarrie and Phillips, 2005). Several researchers contend that it is the implicitness and ambiguity of visual images that makes them so persuasive. This is consistent with the argument by Messaris (1997) that associating two unrelated objects through pictures causes viewers to accept the association without questioning it. Indirect persuasion strategies can be effective because consumers must self-generate the implicit claim (Kardes, 1993). Such self-generated claims have been identified as more accessible and less subject to counter-arguing (Lee and Olshavsky, 1995). In the same vein, Sperber and Wilson (1986) assert that indirect claims can lead to the generation of multiple inferences via a relatively undemanding process.

In the context of consumer attitudes for RNPs, the wide range of inferences generated by visual analogies may actually hinder the persuasive effect of the advertisement as it is likely to be a demanding cognitive process. The openness of analogical claims and the lack of constraints on their interpretation have been identified as the source of their persuasive advantage (McQuarrie and Phillips, 2005). However, the weak-implicature model of indirect persuasion (Sperber and Wilson, 1986; McQuarrie and Phillips, 2005) which relies on the effortless, spontaneous generation of inferences may only hold for existing or incremental products for which individuals have well-developed knowledge structures. For RNPs, visual analogies may reach the point of diminishing returns. Because individuals are novices with respect to RNPs, it is likely that they will be unable to solve the analogical incongruity conveyed using visuals which are by nature implicit. Given that consumers typically have to learn about new benefits in order to appreciate RNPs (Lehmann 1994; Urban, Weinberg, and Hauser 1996), their attitude and behavioural intent toward the product are likely to be more favourable when the product is conveyed with verbal analogy than with visual analogy. Thus:

Hypothesis 5: When the learning strategy is an analogy the use of words will trigger higher levels of attitude to the product than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.

Hypothesis 6: When the learning strategy is an analogy the use of words will trigger higher levels of behavioural intent than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.

Mental simulation has been identified as an appropriate strategy to help individuals deal with knowledge development (Sujan et al., 1997) and uncertainty (Taylor et al., 1998). Although recent research using mental simulations for RNPs has not examined the effect on product comprehension per se, it has highlighted that the uncertainties regarding the product benefits that arise from the newness of the product separate these adoption decisions from corresponding decisions for other products (Hoeffler, 2003; Lehmann, 1994; Urban, Weinberg and Hauser, 1996). The ability of mental simulations to reduce these uncertainties has also been recognized (Hoeffler, 2003). Reducing consumers' uncertainty towards the benefits of the product is likely to be translated in an increase in product comprehension. The need to use mental simulation to imagine a situation of product use may be higher for discontinuous products like RNPs than for incremental products, as there is a need to link the product to consumer goals, and to assess the consequences of product use (Oliver, Robertson and Mitchell, 1993). Consumers can make decisions about future consumption via consumption visions of the future that visualize the self enacting with the new product or service (Bettman, 1992). Mental simulations for RNPs are likely to stimulate understanding of the RNP's fit with existing usage habits (Taylor et al., 1998), thus decreasing uncertainty (Hoeffler, 2003). Mental simulation may provide "experience value" (Kahneman and Tversky, 1984) when product trial is impossible, as it often is for RNPs: product trial in the consumer's mind is used as a proxy for experience. Because mental simulations make events seem real and increase perceived likelihood of occurrence (Taylor et al., 1998), they provide a means to deal with an uncertain future such as learning to use a new product.

By decreasing the uncertainty associated with the product (Hoeffler, 2003), mental simulations are likely to enhance consumers' comprehension of RNPs. This is consistent with previous research findings showing that successfully managing and reducing uncertainty via mental simulations is more effective when the degree of newness is high (Castano, Sujan, Hacker and Sujan, 2008). The role of mental simulations as a cognitive tool to evaluate products is well established in the literature (Phillips, 1996; Shiv and Huber, 2000) and mental simulations have been used to improve utility predictions (McGraw and Mellers, 1997). Moreover, mental simulation may be an appropriate cognitive process to help consumers learn about new product benefits (Sujan et al., 1997), which is particularly relevant in the context of consumer learning for RNPs.

Although verbal analogies are recognized in consumer research and psychology as a useful strategy in the acquisition of new knowledge, it has been argued that marketers should exercise caution in the use of analogies. Analogies are only guesses and the inferences resulting from analogical transfer may be false, which is an inherent risk of analogical processing (Gentner and Markman, 1997). Thus, analogies run the risk of misinforming consumers. Researchers in advanced knowledge acquisition argue that analogies, by reducing concepts to a simpler and more familiar core, may prevent individuals from attaining the mastery of complexity, or the acquisition of those aspects of conceptual complexity that are necessary for a correct understanding of important concepts (Spiro, Feltovich and Coulson, 1988). Well-intended analogies, in an attempt to simplify complex concepts, may result in oversimplified knowledge, as the incomplete representation offered by the analogy often remains the only representation of the target concept. Two types of misconceptions about the nature of the target may arise: overextensions and omissions (Spiro, Feltovich and Coulson, 1988). Overextensions occur when a salient characteristic of the base domain that has no analog in the target domain is nevertheless exported to the target. In the analogy between the Nike + I-Pod kit and a coach, consumers may erroneously be led to believe that the product has a feature to keep them motivated in the long term, as a coach would do. Omissions take place when an important characteristic of the target domain has no counterpart in the base domain, and that missing characteristic does not get incorporated in the understanding of the target. In the analogy between the Nike + I-Pod kit and a coach, a consumer may not realize that the kit has a feature that can track the calories burned as you run, as their coach may usually only track the time and distance run. Therefore, drawing on the advanced knowledge acquisition theory (Spiro, Feltovich and Coulson, 1988) and on the conceptual limitations of analogical processing (Gentner and Markman, 1997), it can be expected that verbal mental simulations will trigger a higher level of product comprehension than verbal analogies. This is consistent with the finding that a mental simulation in a preference measurement exercise for RNPs enabled respondents to develop a more accurate estimate of the product's utility than did analogies (Hoeffler, 2003), which may indicate a higher product comprehension. Thus, it is hypothesized:

Hypothesis 7: The use of verbal mental simulation will trigger higher levels of product comprehension than verbal analogy for a) utilitarian products, b) hedonic products and c) hybrid products.

Furthermore, it is expected that verbal mental simulations will also be more persuasive and thus trigger higher attitude to the product and behavioural intent than verbal analogies. Social psychologists have demonstrated that mental simulation can lead to positive changes in attitudes, brand evaluations and actual behaviour (Anderson, 1983; Carroll, 1978; Gregory, Cialdini and Carpenter, 1982). This finding is consistent with recent research in advertising suggesting that mental simulation for a target product leads to a higher evaluation of that product (Escalas, 2004). In the context of persuasion for RNPs, previous findings indicate that mental simulation improves behavioural intentions (Castano, Sujan, Kacker and Sujan, 2008) and preference stability (Hoeffler, 2003). However, existing literature on RNPs has paid little attention to the processes which explain the persuasive effect of mental simulations.

The dominant explanation for this positive effect rests on Tversky and Kahneman's (1982) availability heuristic, as to the extent that an idea or event is cognitively available it will be perceived as likely. Previous research has argued that mental simulation persuades via narrative transportation (Escalas, 2004). Mental simulations are usually in the form of stories or narratives (Fiske, 1993) and thus persuade via narrative transportation or "immersion into a text" defined as the extent to which individuals become lost in a story (Green and Brock, 2000, p. 702), likely to trigger a "positivity bias" (MacInnis and Price, 1987). Transportation differs from analytical processing traditionally studied in dual-process models of persuasion (e.g. Elaboration Likelihood

Model, Petty, Cacioppo and Schumann, 1983). Analytical elaboration can lead to attitude change via logical consideration and evaluation of arguments, while transportation persuades through reduced negative cognitive responding, realism of experience and strong affective responses (Green and Brock, 2000). The mediation effect of narrative transportation which persuades via positive feelings and reduced critical thinking (Green and Brock, 2000) has been empirically verified (Escalas, 2004; 2007) which supports transportation theory.

Analogies are likely to persuade by prompting elaboration of message information, that is, the association of message content with information already in memory (McQuarrie and Mick, 1999). The mapping process generates elaboration on structural relations, which are thought to be more informative about the benefits of the product than attributes (Gregan-Paxton and Roedder John, 1997), and should therefore prompt more favorable evaluations (Roehm and Sternthal, 2001), likely to result in message persuasion (e.g., Petty and Cacioppo 1981). Little research has compared the differential persuasive effects of verbal analogies and mental simulations for RNPs (see Hoeffler, 2003 for an exception). Because of the conceptual limitations of analogical processing (Gregan-Paxton and Roedder John, 1997) and of the potential difficulties associated with the access and transfer of relational similarities (Gentner, Rattermann and Forbus, 1993), the persuasive impact of an analogy may be lower than the impact of a mental simulation. Therefore:

Hypothesis 8: The use of verbal mental simulation will trigger higher levels of attitude to the product than verbal analogy for a) utilitarian products, b) hedonic products and c) hybrid products.

Hypothesis 9: The use of verbal mental simulation will trigger higher levels of behavioural intent than verbal analogy for a) utilitarian products, b) hedonic products and c) hybrid products.

Most research on consumer responses to RNPs has focused exclusively on the effects of verbal analogies and mental simulations, whereas no interest has been paid to the impact of their visual counterparts on product comprehension and persuasion. Following the conceptualization of images in advertising as communicative artifacts (Scott, 1994), visual analogies and mental simulations are likely to have differential effects on product comprehension.

For incrementally new products, the use of visual analogy is likely to enhance persuasion and recall. As consumers have significant stored knowledge structures for existing product categories, they can easily infer from a visual analogy what the advertised benefits of the product are. However, the context is different when a visual analogy is used to advertise a product for which consumers do not have existing knowledge structures. Visual analogies use images put in parallel, which can evoke different meanings: analogy, causality, or some other relationship (Messaris, 1997). Thus, arguments using an analogy through the sole use of images cannot be completely explicit. This indeterminacy is likely to hinder consumer comprehension in the context of consumer learning for RNPs, as consumers may lack assistance to understand the link between the new product and the base. For instance, a visual analogy showing a picture of the Nike + Ipod kit next to a picture of a coach may confuse respondents as this may indicate that the new product is like a coach, but also could drive them to believe that the product is used by a coach. Additionally, a visual analogy has no explicit starting point; in the case of an analogy between a RNP and an existing product, the viewer may not know for sure whether it is the base or the target which is the focus of the advert (Messaris, 1997).

However, visual mental simulation has long been identified as a key mechanism in learning (Rossiter, 1982). Childers and Houston (1984) identify imagery as a powerful mediator for learning, which is significantly improved by the use of pictures. The visual representation of product use takes the form of a scenario within which pictures create relationships between the steps of product trial so that comprehension is encouraged. Little attention has been paid in consumer research to the impact of visual analogies and visual mental simulation on the comprehension of new product concepts. This is surprising due to the strong potential of visual mental simulations to act as a surrogate for a product demonstration of RNPs to truly show the product in use, all the more powerful as these brand new products may not always be available for demonstrations. Overall, mental simulation strategies conveyed by pictures benefit from a high interactivity, as they show the product in use and may generate more open-ended thinking about the product's benefits. Contrarily, visual analogies do not show the product in use and may lead to inferences that are only related to the properties that the new product shares with the analogue base (Hoeffler, 2003). Therefore:

Hypothesis 10: The use of visual mental simulation will trigger higher levels of product comprehension than visual analogy for a) utilitarian products, b) hedonic products and c) hybrid products.

Even though RNP research has not capitalized on the opportunity offered by conveying new products using visuals, consumer research on incremental products suggests that the use of pictures stimulates imagery processing, which in turn influences attitudinal judgments (Babin and Burns, 1997). Pictures are as capable as words to convey a "positivity bias" as instructions to imagine. The mediational function of imagery which enhances the effects of mental imagery advertising tactics conveyed using pictures on attitudes has been verified experimentally (Babin and Burns, 1997). The use of a visual scenario of product use seems particularly persuasive for RNPs because product trial is often unavailable for this type of complex products and a visual mental simulation may operate as a product demonstration which conveys a holistic representation of the product (Hoeffler, 2003). However, visual analogies may not be well-suited to convey RNPs as the implicitness of visuals increases the difficulties associated with analogical processing which may hinder the persuasiveness of visual analogies. Consequently:

Hypothesis 11: The use of visual mental simulation will trigger higher levels of attitude to the product than visual analogy for a) utilitarian products, b) hedonic products and c) hybrid products.

Hypothesis 12: The use of visual mental simulation will trigger higher levels of behavioural intent than visual analogy for a) utilitarian products, b) hedonic products and c) hybrid products.

Overall, it is hypothesized that for utilitarian products the verbal mental simulation will trigger more positive responses than visual mental simulation and verbal analogy, which will both trigger more positive responses than visual analogies. For hedonic products, the visual mental simulation will trigger more positive responses than the verbal mental simulation, which will yield more positive responses than the verbal analogy, itself superior to the visual analogy. For hybrid products, the visual mental simulation and verbal mental simulation should both trigger more positive responses than the verbal analogy, itself superior to the visual analogy. The most positive responses should thus be obtained a) for the utilitarian product: by the verbal mental simulation; b) for the hedonic product: by the visual mental simulation and c) for the hybrid product: by the verbal and the visual mental simulation.

3.3.2 The Mediating Role of Emotions, Product Comprehension and Attitude to the Product

Although the preceding hypotheses are useful by themselves, it is also interesting to understand why a specific stimulus has an effect. In the last few decades, scholars and practitioners have increasingly tried to understand the factors that influence technology acceptance. However, theories and models developed by scholars have mostly focused on the role of cognition and have rarely included affect (Kulviwat et al., 2007), while there remains limited understanding of the complexity of emotions in response to new products. Complexity in emotional experience is likely to be a uniquely important aspect of consumer responses to RNPs and is likely to trigger mixed emotions. Potential users are free to adopt or reject an innovation based on how they feel as well as how they think. Therefore, integrating emotions into adoption of innovations models is likely to lead to substantial improvements in the prediction of consumer responses to innovations.

Persuasion research acknowledges the role that emotions play on attitudinal variables such as satisfaction (Westbrook and Oliver, 1991) and product evaluation (Wood and Moreau, 2006). However, little attention has been paid to the role of emotions in the comprehension of new products. Importantly, emotions experienced in response to new products are not simply reflective of the products' perceived benefits but arise directly from the learning efforts. As an illustration, an experiment that required 100 Phillips managers to learn about new Phillips products yielded strong emotional reactions from the managers, including either frustration and anger or pride (Endt, 2004). Importantly, these emotions are not captured in existing models through cognitive assessment of net benefits.

Learning about a complex innovation is rarely a neutral process and can elicit strong emotions (Wood and Moreau, 2006). This role is strengthened for consumer response to RNPs, as their complex nature should elicit stronger emotional reactions than those experienced for incremental products. When incremental new products are launched on the market, consumers should experience little uncertainty about the difficulty in consuming the product. However, when consumers need to actively learn about a new category, strong emotions associated with the difficulties inherent to the learning process and the uncertainty that characterizes the product (Hoeffler, 2003) are likely to arise.

The simultaneous occurrence of positive and negative affect in learning for RNPs is consistent with recent literature examining attitudinal and emotional ambivalence (Labroo and Ramanathan, 2007; Priester and Petty, 2001; Ramanathan and Williams, 2007; Thompson, Zanna and Griffin, 1995; Williams and Aaker, 2002). This perspective suggests that affective valence is represented by two independent dimensions rather than a single bipolar continuum (Cacioppo, Gardner, and Berntson 1997). The presence of two separate dimensions indicates that consumers may sometimes simultaneously experience negative and positive feelings. This is particularly relevant to the context of consumer response to technological products. Because of the 'technology paradox', consumers are likely to experience strong conflicting emotions related to the expected enjoyment that the innovation may procure but also to the fear of being overwhelmed by the technology

(Mick and Fournier, 1998). Feelings of conflict, ambivalence and stress are readily implicated by the use of technological products, stemming from the eight central paradoxes of technological products: control/ chaos, freedom/ enslavement, new/ obsolete, competence/ incompetence, efficiency/ inefficiency, fulfils/ creates needs, assimilation/ isolation, engaging/ disengaging. In particular, the freedom/ enslavement paradox refers to the way technology can facilitate independence but can also lead to more dependence. This paradox can lead to strong emotions including scepticism about adopting new high-tech products. An informant in Mick and Fournier's (1998) study on the paradoxes of technology explains that he feels "sceptical [...] about loading up [his life] with too many things, too many consumer products] (p. 129). The new/ obsolete paradox states that new technologies provide the user with the most recently developed benefits of scientific knowledge, and are soon to be outmoded as they reach the marketplace. This paradox triggers feelings of discouragement among consumers. As Jay Jaroslav (quoted in Flint, 1995) puts it: "By the time a product hits the general market, it's long obsolete in terms of technology". The competence/ incompetence paradox can facilitate feelings of intelligence and efficacy, but can also lead to feelings of ignorance or ineptitude. This paradox will also trigger feelings of discouragement. Specifically, consumers may feel overwhelmed and discouraged when trying to learn about new products because they are unable to grasp how the technology works. However, learning about high-tech products can also trigger positive emotions. Hoffman and Novak (1996) reported human-computer interaction that indicate "flow", i.e. optimal experiences characterized by intrinsic enjoyment, loss of self-consciousness, and self-reinforcement.

This taxonomy on the paradoxes of technology is consistent with the literature on goal conflict and mixed emotions (Carver and Scheier, 1990) and with the view of emotions arising from goal-based behaviours during purchase opportunities (Mukhopadhyay and Venkataramani Johar, 2007). When faced with a learning task, individuals develop goals and monitor progress toward those goals. Emotions communicate key information relative to expected progress toward goal achievement (Bagozzi, Gopinath, and Nyer 1999; Luce, Bettman. and Payne 2001) and are likely to occur spontaneously when consumers first come across a new complex product. Positive emotions occur when expected progress toward the goal is accelerated or when the goal is attained while negative emotions arise when expected progress toward the goal is impeded (Carver and Scheier, 1990; Luce, Bettman. and Payne 2001). As technological products involve trade-offs due to their paradoxical nature, mixed emotions may therefore arise when learning about these new products (Carver and Scheier, 1998). This viewpoint is conceptually distinct from the conflicting emotions in advertising literature (Labroo and Ramanathan, 2007). While this stream of research examines how the manipulation of conflicting emotions in advertising appeals can yield mixed emotions thus affecting persuasion, the present thesis argues that conflicting emotions toward new products arise directly from the learning process (Wood and Moreau, 2006), independent from emotions that may be featured in the appeal.

The regulatory focus theory in social psychology (Higgins, 1987) builds on classic inconsistency theories such as Heider's (1958) balance theory and Festinger's (1957) cognitive dissonance theory and acknowledges that inconsistencies among cognitions reflect personal costs and emotional problems, not simply cognitive experiences. Two main categories of emotions that are associated with different types of negative psychological situations are identified (Higgins, 1987). Discrepancies between the actual self-state (i.e. the self-concept) and ideal self-state (i.e. representations of an individual's beliefs about his or her own or a significant other's hopes, wishes, or aspirations for the individual) indicate the absence of positive outcomes, which is associated with *dejection-related* emotions (ranges from cheerfulness, eagerness and delation to disappointment, dissatisfaction, sadness). In contrast, discrepancies between the actual/ own self-state and ought self-states (i.e. representations of an individual's beliefs about his or her own or a significant other's beliefs about the individual's duties, responsibilities, or obligations) indicate the presence of negative outcomes, which is associated with *agitation-related* emotions (ranges from quiescence, relief and contentment to agitation, fear and anxiety). Specific emotions also arise according to the individual's goal. Goals play a central role in understanding a wide range of consumer behaviours and are defined as the cognitive representations of desired or undesired end states that serve as standards for guiding behaviour (Huffman, Ratneshwar, and Mick 2000). As Bagozzi and Dholakia (1999, p.

19) put it: "Much of consumer behaviour is goal-directed". The goal literature broadly distinguishes between two general and orthogonal classes of goals that are thought to be fundamental to human behaviour (Carver, Sutton and Scheier, 2000). Dejection-related emotions arise from goals that are associated with achievements. These have been discussed in terms of approach goals (Carver and Scheier, 1990) and promotion focus (Higgins, 1987). On the other hand, agitation-related emotions arise from goals associated with the prevention of failures, also discussed in terms of avoidance goals (Carver and Scheier, 1990) or prevention focus (Higgins, 1987).

These two goal-relevant emotional dimensions correspond closely to a variety of dimensional models that have been developed to represent the structure of affect in general (see Yik et al., 1999). These include models that focus on the valence of the affect (Watson and Tellegen's (1985) two-dimensional structure of valence: high vs. low positive affect and high vs. low negative affect), on activation (Thayer's (1986) two dimensional structure of activation: tension vs. calmness and energy vs. tiredness). The typology is closest however to psychometric models including both valence and activation as separate and equally emphasized dimensions within one descriptive structure (Russell's (1978) pleasure vs. misery and arousal vs. sleep typology; Larsen and Diener's (1992) pleasant vs. unpleasant and high activation vs. low activation model).

Applied to learning for a complex product concept, individuals are most likely to experience discrepancies between their own actual and ideal self-state, specifically between the goals they aspire to in terms of learning and their actual comprehension of the product. Hence, dejection-related emotions related to disappointment, dissatisfaction and frustration are likely to arise. These discrepancies tend to arise automatically as part of the learning process. Individuals are usually unaware of these discrepancies and their impact on processing (Higgins, 1987). Conversely, the absence of an actual/ ideal discrepancy was found to be associated with feelings of happiness and satisfaction (Higgins, 1987). Similar positive emotions are likely to be experienced by individuals who achieve their goals in a learning task for a new product concept. According to Russell's (1978) typology, such feelings are likely to be of a medium arousal nature and range from a positive (i.e. happiness, cheerfulness) to a negative continuum (i.e. sadness, dejection) in terms of pleasantness.

Emotions that arise from the comparison between a current state and desired state (i.e. goal) inform individuals on how well they are doing in they pursuit of a goal (Carver and Scheier, 1990). Moreover, such appraisals are a source on which to base judgments and decisions regarding the target object, especially under conditions in which one is unable or unwilling to appraise the object further (Shah and Higgins, 2001). Such brief appraisal includes consumer exposure to an advertising appeal and suggests that the emotions that arise directly from the learning process are likely to affect subsequent product evaluations, regardless of their level of activation (Bosmans and Baumgartner, 2005).

It is worth noting that goals set in a learning task are goals for attaining desirable behaviours and are typically graded. These goals have to be distinguished from "all-or nothing goals" (e.g. quitting smoking) that set a specific reference point as a target. Anything short of this target would be coded as a failure (Cochran and Tesser 1996; Heath et al. 1999). Thus, all-or-nothing goals hold people to a stricter standard than graded goals. Past research on all-or-nothing goals found that failure to achieve a goal led to poorer subsequent performance (Soman and Cheema, 2004), possibly as a result of the negative emotions that arose from failure (Heath et al., 1999). The present research adds to these studies by examining whether the specific appraisals associated with an emotion mediate the effects of advertising strategies on subsequent judgments in the context of a graded goal i.e. learning for a new product.

It is expected that the emotions that arise directly from the learning process will mediate the effect of the learning strategy used on the outcome variables. The view that specific emotions can have a differential impact on evaluations and behaviour is not new (Batra and Ray, 1986; Holbrook and Batra, 1987; Holbrook and Hirschman, 1982). However, only recently have researchers begun to take a substantive interest in this notion (Raghunathan and Pham 1999). Prior research suggests that emotional responses mediate the effects of advertising on attitudes toward the advert or attitudes toward the brand (Holbrook and Batra, 1987).

The emotional response created by a marketing communication for a RNP is in turn likely to affect consumers' evaluations of the RNP. A debate exists in the literature regarding whether emotions that arise from 'temporary' learning such as reading an advert about a RNP will influence long-lasting product evaluations. Scholars have shown that affective influence is often more far-reaching than expected (Bagozzi, Gopinath, and Nyer 1999) and have highlighted the link that exists between emotions and satisfaction (Westbrook and Oliver 1991: Phillips and Baumgartner, 2002). In the case of consumer response to RNPs, strong emotional reactions are likely to affect product evaluations in such early stages of product learning. As consumers do not have any existing cognitive knowledge of the new product (Lehmann, 1994), they are likely to experience learning difficulties which are usually combined with strong emotions. Emotional influence is likely to be greatest during the early stages of product learning, as consumers have very limited information on the product and lack previous experience (Wood and Moreau, 2006). Thus, consumers' initial emotions, which are derived from usage expectations (e.g. how easy will it be to learn how to use this product?) are likely to be a strong signal when evaluating the new product. This is consistent with Wood and Moreau's (2006) finding that emotions predict consumers' evaluations of the handwriting-recognition software for a new PDA and with literature on incidental emotions suggesting that specific emotions, despite sharing a common, negative valence, may have distinct effects on processing and judgments (Bodenhausen, Sheppard, and Kramer, 1994). For instance, past research showed that anger induces heuristic processing while sadness leads to systematic processing (Bodenhausen, Sheppard, and Kramer, 1994) and that frustration influences product evaluations in the context of country-of-origin effects (Maheswaran and Chen, 2006).

The present study builds on this body of research and argues that specific emotions will mediate the relationship between advertising content and evaluative judgments for a RNP by reflecting independently measured dimensions of advertising content, determining more global reactions to the product, thereby intervening between the message and its overall attitudinal effects (Holbrook and Batra, 1987). Previous research has shown that mental simulation triggers emotional responses, which in turn are primary and powerful predictors of behavioural responses in the context of service failure (Maute and Dube, 1999). In the specific case of consumer responses to RNPs, recent research has demonstrated empirically that mental simulation in advertising shapes consumer emotions including anxiety and optimism, along with behavioural intentions (Castano, Sujan, Kacker and Sujan, 2008). Mental simulation of episodes involving the self has been shown to evoke strong responses in feelings (Taylor and Schneider, 1989). In the context of the present study, positive emotions should arise when participants simulate usage scenarios to reach an understanding of the product. As these emotions arise directly from the learning process and the consumer's contentment to have achieved their learning goal, these positive emotions are likely to affect the consumer's product comprehension.

The positive affect that is generated is also likely to affect attitudinal responses and behavioural intent when the positive feelings of achievement generated by the learning process become associated with the product advertised (Green and Brock, 2000; Sujan, Bettman and Baumgartner, 1993). A recent study manipulating mental simulation for a target product found that participants displayed higher evaluations for the product, and that this persuasion effect occurred through the generation of positive affect (Escalas, 2004). Therefore, positive emotions are likely to mediate the relationship between mental simulation on the one hand and attitudinal/ behavioural outcomes on the other hand. It should be noted that these emotions arise from the learning process created by the mental simulation and are thus independent of the product's net benefits (Wood and Moreau, 2006).

However, mentally simulating product use for a RNP is likely to lead to mixed emotions due to the complex nature of these products and the uncertainties associated with them (Hoeffler, 2003; Castano, Sujan, Kacker and Sujan, 2008). The risks and uncertainties associated with new products have been widely documented as barriers to innovation adoption. These uncertainties include uncertainties about the benefits of the innovation, such as performance uncertainty (e.g. How useful will the product be?), symbolic uncertainty (e.g. How socially desirable and appropriate will the product be perceived?). Furthermore, switching cost uncertainty (e.g. How difficult will it be to switch from the current product to the new product?) has been identified as the principal deterrent to the adoption of new products (Hoeffler, 2003). Mental simulations for RNPs are used to manage consumer uncertainties, however the emotions associated with uncertainties are the likely accompaniments of any new product decisions (Castano, Sujan, Kacker and Sujan, 2008). During the learning process, the uncertainties associated in anticipation of product use may trigger feelings of discouragement and scepticism. Research on scepticism suggests that consumers who are sceptical are more likely to be critical of an ad, which is likely to lower individual responses (Escalas, 2007). When consumers are sceptical, they develop persuasion knowledge that helps them "identify how, when and why marketers try to influence them" (Friestad and Wright, 1994, 1). When a consumer processes an ad with scepticism, consumer thoughts will tend to be a critical analysis of the ad, in line with analytical thought processes (Obermiller and Spangenberg, 1998). Hence, scepticism is likely to mediate the effect of advertising variables on individual outcomes.

It is also expected that analogies in marketing communications for RNPs will trigger strong emotions. Schema congruity theory (Meyers-Levy and Tybout, 1989; Perracchio and Tybout, 1996) has established that the process of reconciling an incongruity between a new product and existing knowledge can create positive affect in itself. An analogy builds a link between the new product and a familiar base, thus facilitating the resolution of the incongruity between the novel nature of the product and the consumer's existing knowledge and reducing the cognitive effort needed to build new knowledge. If the analogy helps the consumer to represent the RNP as an extension of a familiar domain as opposed to an entirely new structure, analogical transfer should yield positive emotions (Gregan-Paxton et al., 2002). This is supported by the pleasure-of-the text standpoint in the field of rhetorics which suggests that rhetorical figures in advertising often generate pleasure for individuals who are able to decipher them (McQuarrie and Mick, 1996; 1999). Analogies are types of metaphors which are particularly deviant artful deviations

(McQuarrie and Mick, 1999). According to semiotics, readers enjoy the pleasure of a text (Barthes, 1985). To the extent that an analogy is neither simple and multi-dimensional nor too complex it is likely to trigger positive affect. The initial ambiguity offered by the analogy acts as an incentive and the ensuing resolution is gratifying (Eco, 1979; McQuarrie and Mick, 1992; Peracchio and Meyers-Levy, 1994).

Particularly relevant is Gregan-Paxton et al.'s (2002) finding that under certain circumstances an analogy can trigger more positive affect than a no-analogy condition. According to the reader-response tradition (Scott, 1994), as a reader the consumer approaches advertisements as complex texts to be interpreted. To be successful, analogical processing necessitates the resolution of an initial incongruity, and will thus be a rewarding and pleasurable experience for subjects who are capable of solving this difficulty (McQuarrie and Mick, 1999). However, previous research did not examine the negative emotional consequences that may arise as part of analogical processing if the analogy is too complex to interpret. In this case, the cognitive efforts involved to try and solve the incongruity may trigger negative affect and lower the product comprehension and evaluation of the product. Research on advertising rhetoric has shown that if the message is so complex to decipher that it reaches the point of diminishing returns, it will have a negative impact, creating confusion rather than interest (McQuarrie and Mick, 1992). The difficulty to resolve the ambiguity will prevent consumers from reaching their goal to understand the new product, which is likely to be accompanied by negative dejection-related (Higgins, 1987) feelings of discouragement and scepticism, which mirror the failure to attain achievement goals (Carver, Sutton and Scheier, 2000), specifically the difficulty to comprehend the nature of the product.

Therefore, we posit that positive emotions, discouragement and scepticism will act as latent explanatory variables in the relationship between the learning strategy used in the appeal and the outcome variables (i.e. product comprehension, attitude to the product and behavioural intent). These specific emotions are likely to arise as part of the learning process, consistent with the phenomenological interviews conducted by Mick and Fournier (1998) and with experiments conducted among Philips managers (Endt, 2004).

These emotional responses created by the learning strategy used in the appeal will in turn colour evaluations of the product as positive emotions will increase the persuasiveness of the message and negative emotions will decrease its persuasiveness, thus affecting attitude to the product and behavioural intent. The effect of learning strategy on product comprehension will also be mediated by emotions, as these emotions arise as a signal of the individual's failure achieve the goal of understanding the nature of the product (Carver, Sutton and Scheier, 2000; Wood and Moreau, 2006).

Research on indirect persuasion (McQuarrie and Phillips, 2005) suggests that visuals are implicit in nature. According to the literature on conclusion implicitness (Sawyer and Howard, 1991), an implicit message is accompanied by a major degree of risk: the audience may not process the central message arguments correctly. Therefore, a message conveyed visually will be more difficult to process. This enhanced cognitive effort is likely to strengthen the role of emotions in the visual conditions. For individuals who are able to understand the nature of the new product the positive emotions experienced should be amplified. However, the individuals who are unable to process the message should feel more discouraged/ sceptical than when the message is conveyed using words. This is consistent with the viewpoint that messages that are moderately difficult to decipher should generate more pleasure for the reader than those that are either not at all difficult or extremely difficult to decipher (McQuarrie and Mick, 1999). Individuals who understand a visual analogy should thus find the process particularly rewarding, hence the generation of positive affect, but individuals who cannot decipher it should become increasingly discouraged and sceptical. Contrarily, the explicitness of the verbal format is likely to provide the help necessary for the audience to understand the product and minimize discouragement. Conversely, the message will also be less difficult to decrypt, and therefore the positive emotions felt as a result of comprehending the message will be lessened, as the analogy should be perceived as easy to understand and therefore less rewarding to process (Gregan-Paxton et al., 2002).

Hence, it is expected that positive emotions, scepticism and discouragement will be latent constructs operating as explanatory variables in the relationship between learning strategy and presentation format on the one hand and product comprehension, attitude to the product and behavioural intent on the other hand. Thus:

Hypothesis 13 a) Discouragement, b) scepticism and c) positive emotions will mediate the interaction effect of learning strategy and presentation format on product comprehension.

Hypothesis 14 a) Discouragement, b) scepticism and c) positive emotions mediate the interaction effect of learning strategy and presentation format on attitude to the product.

Hypothesis 15 a) Discouragement, b) scepticism and c) positive emotions mediate the interaction effect of learning strategy and presentation format on behavioral intent.

Persuasion theorists have long maintained that comprehension is a prerequisite to the formation of attitudes, intentions and behaviour, particularly under the central or systematic processing route (Ratneshwar and Chaiken, 1991). Early work suggests that reduced comprehension might decrease persuasion through negative affect (Eagly, 1974). The data relevant to the comprehension-as-mediator hypothesis report conflicting results as some studies find strong positive correlations between memory for message content and post-message attitudes (Chattopadhyay and Alba, 1988; Eagly and Warren, 1976) whereas other studies have found no relation (Cacioppo and Petty, 1979; Osterhouse and Brock, 1970). However, in spite of the above data it may be premature to conclude that comprehension does not play an important role in persuasion. The memory measures used in the above studies are not wholly valid indices of comprehension because they reflect not only comprehension (the encoding of message information) but also the storage of message content in memory and its subsequent retrieval (Ratneshwar and Chaiken, 1991).

The LSC (Levels of Subjective Comprehension) model developed by Mick (1992) suggests that deep comprehension levels have strong and positive relations with post-exposure brand attitudes. The comprehension of the self-relevant product consequences is likely to lead to evaluative thoughts about the product (Maheswaran and Sternthal, 1990) and should have stronger effects on brand/ product attitudes (MacInnis and Jaworski, 1989). Because RNPs are by definition complex, high-involvement products, it is expected that consumers will develop behavioural intent for the product provided they comprehend and learn about product-relevant information (Bettman, 1979).

The Heuristic-Systematic model (HSM) presented in Chaiken (1980; 1987) and Chaiken, Liberman and Eagly (1989) and the related elaboration likelihood model (ELM) of Petty and Cacioppo (1986) hypothesize message comprehension to be an important prerequisite for systematic processing. The present research rests on alternative frameworks, as the learning strategies are likely to stimulate behavioural intent through narrative transportation and imagery processing (for the mental simulations) and through analogical transfer (for the analogy conditions). To develop behavioural intent towards RNPs, consumers typically have to learn about the benefits of the product (Lehmann, 1994; Urban, Weinberg and Hauser, 1996) and to have a positive impression of these key benefits. This is supported by the recent finding that benefit comprehension has a positive effect on product preferences for a RNP (Ait El Houssi. Morel and Hultink, 2005). Consumers must positively evaluate the benefits of the product in order to appreciate the product. Furthermore, it is expected that the impact of the advertising strategies on behavioural intent will be mediated by attitude to the product. According to self-generated validity theory (Feldman and Lynch 1988), self-reported intentions to engage in behaviour are strongly associated with the attitudinal responses that precede them in a measurement setting. Hence, it is expected that consumers' behavioural intentions will be contingent on their attitudes. This link has been implicit in recent work on consumer preferences for RNPs (Hoeffler, 2003) and is empirically tested in the present study. Thus:

Hypothesis 16 a) Product comprehension and b) attitude to the product will mediate the interaction effect of learning strategy and presentation format on behavioural intent.

3.3.3 The Role of Visual Attention

Wedel and Pieters (2007) have recently called for more research applying eye-tracking measures to make inverse inferences about fundamental communication processes. Previous eye tracking research has often been descriptive, relating perceptual aspects of the stimulus, namely size, color or position of the brand, text and pictorial directly to measures of visual attention. However, much more can be gained from using eye-tracking measures as indicators of the latent measures of interest, such as product comprehension (Wedel and Pieters, 2007). Contrary to the accepted wisdom inspired by hierarchical models such as AIDA and its successors (Starch, 1923) that attention is a mere precondition, a gate through which information enters on its way to higher-order cognitive processes of more interest, academic research has shown that visual attention is a key coordinating mechanism that helps maintain information processing and other goals over time (LaBerge, 1995).

One area that may provide insights into the way individuals process information contained in a stimulus is the physiology of reading (Rayner, 1998). Key aspects of this physiology include eye movements (or saccades) and eye fixations during which visual attention takes place. The capture of consumers' attention is an increasingly important aim for print advertising (Pieters and Wedel, 2004). As Rayner et al. (2001) point out, although a substantial amount of research in experimental psychology has studied the characteristics of eye movements when either reading or looking at pictures (Rayner, 1998), little research has addressed the characteristics of eye movements when text and pictures have to be integrated in a comprehension process. Most skilled readers should be adept at alternating between text and pictures to produce a mental model of the overall message, yet researchers know little about this complex process. This is particularly relevant in the context of print advertising: advertisements usually consist of a combination of pictorials and words, yet little is known about the extent to which viewers look at the pictures versus the text.

Previous findings in experimental psychology suggest that processing of the picture and of the text may be relatively isolated events and that the picture may not be given full inspection until the caption is read (Carroll et al., 1992). Hegarty (1992) found that viewers presented with a text and a diagram tended to inspect the diagram at the end of sentences, suggesting that the comprehension process is largely text-directed. Advertising research has also developed an interest in visual marketing and eye-tracking techniques. The study of eye-movements to print ads parallels studies on scene perception in psychology, which usually involves an integration of several objects in the scene into a meaningful whole (Henderson and Hollingworth, 1998; Yarbus, 1967). Findings indicate that when the design of a health warning in advertising is unlike that of existing warnings, or when the color of the warning contrasts sharply with the color in that region of the advertisement, the warning attracted attention more quickly and held attention longer (Fox et al., 1998; Krugman et al., 1994). An early study in marketing (Treistman and Gregg, 1979) observed relationships of eye-movement patterns with involvement and familiarity as top-down influencing factors and with purchase intent as a desirable down-stream effect. This study lays an important foundation for further research in visual attention to print ads in establishing the role of top-down factors and down-stream measures of effectiveness (Wedel and Pieters, 2007). Other studies have examined the heterogeneity in visual attention effects across consumers (Rosbergen, Pieters and Wedel, 1997) and attention wearout during repeated exposures to print advertisements (Pieters, Rosbergen and Wedel, 1999). Pieters and Wedel (2004) examined attention capture and transfer for brand, pictorial and text in advertisements. Attention capture was operationalized as the percentage of participants fixating a selected ad object at least once. Attention transfer was operationalized as the effect of gaze duration for one of the ad objects on gaze for the other objects. The pictorial was superior in capturing attention, independent of its size. The text best captured attention in direct proportion to its surface size. The brand most effectively transferred attention to the other objects. Although these studies further the current understanding of visual attention processes in advertising, they do not use eye movements as indicators of latent attention processes.

Eye movements are diagnostic of underlying cognitive processes. For example, eye movement data can indicate whether a viewer is familiar with a face (Althoff and Cohen, 1999) or whether a student is following an algorithm in solving a mathematical problem (Salvucci, 1999). Furthermore, eye-tracking studies have used a combination of physiological measures and self-reports to explore the relationships between visual attention and brand memory (Pieters, Warlop, and Wedel, 2002). Findings indicate that advertisements that are both original and familiar attract the largest amount of attention to the advertised brand, which also improves subsequent brand memory. However, very little attention has been paid in consumer research to the impact of visual attention patterns on the comprehension of new concepts. Using eye movements to understand learning processes requires the ability to make real-time inferences from eye movements to cognition. Eye tracking experiments help make inverse inferences and discriminate the state of the cognitive processing from observed patterns of eye movements (Feng, 2003), thus providing a "window to the mind" (Pieters, Wedel and Zhang, 2007).

Past research has shown that attention increments have positive effects on attitudes, preferences, consideration, and choice (Pieters and Warlop, 1999). Extant research on RNPs has not examined the role of visual attention in consumer responses to the product. However, provided that a close correspondence exists between eye movements and higher-order cognitive processes (Rizzolatti, Riggio and Sheliga, 1994), a study combining eye movement data and self-report measures may provide valuable insights into the effectiveness of advertising stimuli for RNPs. One may infer that an increase in attention will also have a positive effect on comprehension. However, this relationship may be dependent on the presentation format used to convey product information as words and pictures are encoded differently. When the information is conveyed using words, attention increments are likely to lead to an increased comprehension as encoding information from words is an effortful process, which requires a large number of fixations. However, because individuals do not need to spend as much time to extract information from pictures, an increase in attention to the pictorials may actually indicate confusion.

From a linguistic perspective, "the term confusion (or *confusion mentalis*) has its origins in the psycho-medical literature where it is used to describe a disturbance of consciousness that can cause an individual to be restless and scatty, to misjudge the environment and to act futilely" (Walsh, Hennig-Thurau and Mitchell, 2007, p. 699). In the present research, consumer confusion reflected in an increase in visual attention which does not result in an increase in product comprehension is likely to arise as a result of ambiguity confusion. Ambiguity confusion may arise because of consumers' difficulty in processing an ambiguous stimulus (Walsh, Hennig-Thurau and Mitchell, 2007). Because messages conveyed using visuals are open to multiple interpretations, they can be categorised as more ambiguous than visuals conveyed using words, which have usually one main interpretation (McQuarrie and Phillips, 2005).

Consistent with this view, Rayner et al. (2001) found that when looking at advertisements containing both textual and pictorial information viewers tended to spend more time looking at the text than at the picture part of the ad. About 70% of the time spent looking at the ad was dedicated to the text. The reason that more time was spent on the text than on the picture is most probably that viewers can encode much more information per fixation from the pictorial information than from the textual information (Rayner et al., 2001). For the text portion of an ad, information tends to be rather densely packed, and the resolving power of the retina to discriminate important letter information deteriorates rapidly from the center of the fovea. Thus, in reading, eye movements tend to be much smaller and much more numerous than when viewers are looking at pictorial information (Rayner, 1998). Contrarily, the information contained in pictures is not as densely packed and information about objects in a scene can be resolved at greater distances from the fixation point. Thus, the perceptual span (or span of effective vision) is much larger for pictorials than for text (Rayner, 1998). All these factors add up to the point made earlier on that viewers do not need to spend as much time looking at the picture part of the ad as at the text for comprehension. This is also supported by the finding that even though participants spent far more time on the text than on the picture part of the ad, the ads that were viewed favorably were often not identified by brand name but were described in terms of some aspect of the pictorial representation (Rayner et al., 2001). This memorial emphasis on the pictorial aspect of the ad is consistent with the hypothesis that participants do not need much time on the pictures to extract a lot of information from them. Therefore, an increase in attention to the picture may actually reflect an underlying difficulty to extract meaning from this element. It is the unique combination of eye movement measures and cognitive (comprehension) measures which will make it possible to identify which higher-order cognitive process is taking place during visual attention: comprehension or confusion. Therefore:

Proposition 1a: For the visual mental simulation, an increase in visual attention to the message will not be correlated with an increase in product comprehension

Proposition 1b: For the visual analogy, an increase in visual attention to the message will not be correlated with an increase in product comprehension.

Proposition 2a: For the verbal mental simulation, an increase in visual attention to the message will be correlated with an increase in product comprehension.

Proposition 2b: For the verbal analogy, an increase in visual attention to the message will be correlated with an increase in product comprehension.

3.4. CHAPTER SUMMARY

This chapter developed two conceptual frameworks of consumer responses to RNPs. The first framework examines the relationships between the characteristics of advertising stimuli, namely the learning strategy presented (mental simulation vs. analogy vs. no analogy/ no mental simulation) and the presentation format used to convey the message (words vs. pictures), and consumer response outcomes, namely comprehension for the RNP, attitude to the product and behavioural intent. The framework also examines the mediating role of emotional responses such as discouragement, scepticism and positive emotions. The differences in consumer responses due to the nature of the product (i.e. utilitarian vs. hedonic vs. hybrid) are also investigated. The second conceptual framework focuses on the role of visual attention in consumer responses to the new product. Specifically, the model examines whether an increase in to the advertising message is correlated with an increase in product comprehension. The basic rationale for these models lies in the difficulty for consumers to comprehend and develop positive attitudes toward RNPs, hence the need to enhance the effectiveness of advertising messages for such novel products and to increase the current understanding of the conceptual and perceptual mechanisms that lead to positive outcomes for such products. For greater clarity, table 3.4-1 presents a glossary of some of the key terms and theories used in this chapter. The following chapter describes the methodology implemented in order to test these conceptual frameworks.

TABLE 3.4-1 GLOSSARY

Advanced knowledge acquisition theory: This theory refers to the learning that follows initiation into the rudiments of a knowledge domain and precedes the attainment of expertise.

Analogical transfer: The transfer of knowledge from one familiar domain (the base) onto an unfamiliar, unknown domain (the target).

Availability heuristic: To the extent that an idea or event is cognitively available it will be perceived as likely.

Congruity Theory: Advertising effectiveness will be enhanced if a congruity is achieved between the nature of the product and the advertising appeal.

Functional congruity: Individuals experience a match between the functional characteristics of the product and their desired set of characteristics expected in that product.

Self-congruity: Consumers experience a match between the image characteristics of the product and the consumer's self-concept.

Goals: The cognitive representations of desired or undesired end states that serve as standards for guiding behaviour.

Hedonic benefits: The product's aesthetic, experiential, and enjoyment-related benefits, and to its ability to provide feelings.

Utilitarian benefits: The functional, instrumental, and practical benefits of a product.

Imagery: A process (not a structure) by which sensory information is represented in working memory.

Implicatures (technical term used in the linguistic branch of pragmatics): This term refers to what is suggested in an utterance, even though not expressed explicitly by the utterance. Strong implicatures call for one interpretation which varies little across individuals whereas weak implicatures yield a wider range of inferences.

Inverse inferences: Real-time inferences from eye movements to cognition.

Mental simulation: The imitative representation of some event or series of events.

Narrative transportation: The extent to which individuals become "lost" in a story.

Really New Products: Innovative products that create new product categories or substantially expand existing ones and can lead to major shifts in market shares.

Regulatory focus theory: This theory delineates how people engage in self-regulation, the process of bringing oneself into alignment with one's standards and goals.

Rhetoric: The art or study of using language effectively and persuasively.

Self-generated validity theory: Self-reported intentions to engage in behaviour are strongly associated with the attitudinal responses that precede them in a measurement setting.

Schema congruity theory: The affect generated by responding to moderate incongruity between a product and a more general product category schema will be more favourable than that typically generated by responding to either congruity or extreme incongruity.

Sensory-semantic model: Stimuli are represented in memory in terms of distinctive features: sensory (visual or appearance features) and semantic (meaning or significance).

CHAPTER FOUR

RESEARCH METHODOLOGY

CONTENTS: The chapter is a discussion of the philosophical and methodological underpinnings of the thesis. Section 4.1 introduces the general research approach. Section 4.2 discusses the philosophy of the research. Section 4.3 presents the design for Study 1 and section 4.4 the design for Study 2. Section 4.5 discusses sampling considerations and sample size decisions. Section 4.6 details the methods used to select the RNPs used in the studies and section 4.7 presents the pre-tests implemented to design the stimuli. Section 4.8 discusses validity and reliability considerations while section 4.9 presents the design of the measuring instrument. Section 4.10 details the strategies used to pre-test the experiments and section 4.11 presents the methods used to improve the response rate to the web-experiment. Finally, chapter 4 ends with a summary (Section 4.12).

4.1 INTRODUCTION

In the previous chapter, two conceptual frameworks were put forward. The focus now moves to the process used to generate data to test the above mentioned theoretical models. Causal models typically take the form of experiments, which enable researchers to control and manipulate causality (Churchill and Iacobucci, 2004). Consequently, the thesis consists of two independent experimental studies developed in accordance with the objectives of the research: a Web Experiment (study 1) and an eye-tracking experiment (Study 2). While study 1 only collects verbal measures, study 2 gathers both verbal and physiological measures (i.e. eye movements). In this chapter, the methodological and experimental designs selected for the web-experiment and for the eye-tracking study are discussed. Subsequently, the steps undertaken to choose the RNPs advertised, ascertain the validity of the stimuli and measuring instrument developed are presented. Decisions related to the sample size are also presented and justified using a-priori power analysis. Finally, a discussion regarding the strategies used to improve the response rate for the web-experiment, along with the pre-tests and pilot study undertaken before the main data collection is provided.

4.2 PHILOSOPHY OF RESEARCH

In recent years, various research paradigms have been fiercely competing for acceptance as the paradigm to guide inquiry in the marketing field. Table 4.2-1 summarizes the terminologies used by academics to refer to the main research paradigms and the basic beliefs underlying each paradigm (Guba and Lincoln, 1994; Healey and Perry, 2000).

TABLE 4.2-1: RESEARCH PARADIGMS AND THEIR UNDERLYING ONTOLOGY AND EPISTEMOLOGY (based on Guba and Lincoln, 1994; Healey and Perry, 2000)

Authors	Paradigms			
	Positivism	Realism	Critical Theory	Relativism
Ontology (What is the form and nature of reality?)	Naive realism: Reality is "real" and apprehensible	Critical realism: Reality is "real" but only imperfectly and probabilistically apprehensible	Historical realism: "Virtual" reality is shaped by social, economic, ethnic, political, cultural and gender values crystallized over time	Relativism: Local and specific constructed realities
Epistemology (What is the nature of the relationship between the knower and what can be known?)	Objectivist: Findings true – efforts to verify a priori hypotheses	Modified objectivist: Findings probably true – efforts to falsify a priori hypotheses	Subjectivist: Value-mediated findings	Subjectivist: Created findings

The critical theory and relativist paradigms are not deemed appropriate for the present research. Critical theory and one of its strands, postmodernism, offers a broad scope of investigation as the research is embedded in a historical, cultural and social context. This paradigm emphasizes how knowledge has grown and changed through a dialectic process of historical revision (Guba and Lincoln, 1994). However, conducting the research under this paradigm makes it impossible to generalize the findings as post-modern analyses of marketing communications only represent the idiosyncratic views of the participants. The relativist paradigm argues that realities are apprehensible in the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature and dependent for their form and content on the individual persons or groups holding their constructions (Guba and Lincoln, 1994). In the positivist and realist paradigms, the aim of inquiry is explanation, generalization and the creation of cause-effect linkages whereas the aim of critical theory is critique and transformation. The aim of relativism is understanding and reconstruction. Moreover, the nature of knowledge also differs from one paradigm to another. Specifically, knowledge in the positivist paradigm refers to verified hypotheses established as facts or laws. In the realist paradigm, knowledge rests on non-falsified hypotheses that are probable facts or laws. In the critical theory paradigm, knowledge emerges from structural and historical insights. Finally, under the relativist paradigm, knowledge rests on individual reconstructions (Guba and Lincoln, 1994). Consequently, according to this review of the four key research paradigms, the positivist and realist paradigms which aim to explain, generalize and create cause-effect linkages are best suited to the present research.

Positivism is regarded as the "received view" that has dominated the formal discourse in the physical and social sciences for some 400 years (Guba and Lincoln, 1994). Historically, positivism arose from the views of practicing scientists part of the Vienna Circle, which primary members were Moritz Schlick (1882-1936), Otto Neurath (1882-1945) and Rudolf Carnap (1891-1970) (Lee and Lings, 2008). Positivism relies on empiricism and its principles, which was founded by 17th century philosophers including John Locke (1632-1704). Empiricism holds that the only knowledge individuals can have comes from their observations. In the same line, positivism, also referred to as "logical positivism" (Lee and Lings, 2008), argues that ideas are only meaningful if they are verifiable, or can be empirically tested. Moreover, knowledge of anything not directly observable is considered impossible. Due to its reductionism, true logical positivism died out in the 1960s and the post-positivist (Guba and Lincoln, 1994), also referred to as realist paradigm (Healey and Perry, 2000) became the accepted scientific paradigm.

Realism was developed by another member of the Vienna Circle, Herbert Feigl (1902-1988). Under the realist paradigm, the researcher endeavours to apprehend reality as closely as possible. Truth becomes the goal of marketing science, although absolute truth is unattainable (Peter, 1992). The researcher uses theory as the basis of investigation, from which unobservable concepts can be deduced using the principle of causality. The researcher intends to explain a phenomenon and ultimately to predict and control it. Knowledge is built on non-falsified hypotheses that can be regarded as probable facts or laws (Guba and Lincoln, 1994). Accordingly, the realist paradigm focuses on efforts to falsify a-priori hypotheses or "mathematical (quantitative) propositions that can be easily converted into precise mathematical formulas expressing functional relationships" (Guba and Lincoln, 1994). A key difference between positivism and realism is that, in contrast to positivism, realism holds that while many things scientists are interested in, such as internal human processes, cannot be directly observed, researchers can measure them and study them in the context of theoretical explanations (Lee and Lings, 2008). The present research is therefore anchored in the realist paradigm, as it focuses on phenomena which cannot be directly observed i.e. consumer responses to RNPs but which are measured using self-reports and physiological tools in the context of cognitive theory. Moreover, while positivists contend that since only associations can be truly observed, causality is an irrelevant concept, realists attempt to uncover the complexity of causal relations (Lee and Lings, 2008). This viewpoint is also consistent with the present study which developed two conceptual frameworks and a set of hypotheses predicting causal relationships between the variables of interest.

Although the methods used to confirm or disconfirm hypotheses are not epistemologically bound, certain methods are more appropriate for a realist project. Specifically, the method used is deductive as opposed to inductive, as theory is the basis of investigation which leads to hypotheses formulation and ultimately to generalization and abstraction (Lee and Lings, 2008).

As with any practically focused research study, the choice of the methodological design should be guided by the objectives underpinning the study. Regarding the present case, the key objectives include both determining the effect of advertising stimuli for RNPs on consumers' cognitive and affective responses to the products and examining how visual attention to a marketing communication affects learning outcomes. The researcher therefore needs to decide which of quantitative or qualitative data is most appropriate to achieve the research objectives and test the hypotheses and propositions developed in the conceptual models.

Qualitative methods regard human behaviour as the consequence of how individuals interpret their world and attempt to capture this process of interpretation. Qualitative research requires what Weber referred to as "Verstehen"[1], the empathic understanding or the capacity to produce on one's mind the feelings and motives behind the actions of others (Bogdan and Taylor, 1975). This ability can only be acquired by being an active member in the life of the participant and obtaining insights using introspection. Qualitative research techniques can help generate hypotheses, particularly in the early stages of a research project (Bartos, 1986). Such techniques are more inductive than deductive in nature as rather than beginning with hypotheses, the act of building theory starts with understanding interactions which are examined for broader patterns (Deshpande, 1983). The main strength of qualitative research is the thick description of a phenomenon, which can lead to a thorough understanding of the research problem. Qualitative research is deeply concerned with understanding human behaviour from the actor's frame of reference (Bogdan and Taylor, 1975). However, the methods used to assess the value of a qualitative research, such as reliability, validity, objectivity and relevance are ambiguous (Gummeson, 2000).

Quantitative research requires the use of structured questions in which the response options have been predetermined and involves a large number of respondents (Burns and Bush, 2003). Traditionally, quantitative research is associated with a logical positivist

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[1] "Verstehen" is the opposite of "Erklaren" or process of objectivist clarification

view of the world while the idealist view of the world is linked to the qualitative paradigm (Deshpande, 1983). The quantitative paradigm is looking for "causes" and "facts" (Bogdan and Taylor, 1975) of social phenomena, is objective and outcome-oriented. It emphasizes the reliability of numbers, so as to produce statistical evidence for a study. Quantitative research is useful for theory testing (Deshpande, 1983) while qualitative methods are more valuable for theory generation. Quantitative research has the advantage to answer exactly the question which was asked in the hypotheses (Hackley, 2003). Furthermore, only quantitative research can provide enough data for generalization purposes.

The research method used should be consistent with the key purpose of the present study, which is to uncover relationships between the key variables of our conceptual framework and test a set of developed hypotheses. While qualitative research can help generate hypotheses, particularly in the early stages of a research project (Bartos, 1986), quantitative research is more appropriate to test existing hypotheses. Therefore, quantitative research is selected as the main method of investigation. Although qualitative data is not appropriate for theory testing (by definition), the reader will note that it proved highly useful in earlier stages of the research, particularly pre-tests and development of the stimuli.

Due to the objectives of the study which include both determining the effect of advertising stimuli for RNPs on consumers' cognitive and affective responses to the products and examining how visual attention to a marketing communication affects learning outcomes, two studies are conducted. Study 1 is a Web-experiment which uses verbal measures to evaluate participants' responses to the products advertised. Study 2 consists of a lab experiment using an eye tracking technique which combines verbal and physiological measures.

4.3 EXPERIMENTAL DESIGN – STUDY 1

The first conceptual framework of the present research identifies two advertising variables that influence consumer responses to RNPs, namely presentation format (words vs. pictures) and learning strategy (analogy vs. mental simulation). Moreover, the nature of the product, namely utilitarian vs. hedonic vs. hybrid is a key variable of the framework. These variables are controlled experimentally in order to detect their systematic effects on participants' responses to RNPs. Hence, the design adopted in study 1 is a three-way experiment.

4.3.1 Experimentation

The key driver to choose an experimental type of study is that this method is most consistent with the objective of the research: to determine the effect of advertising stimuli for RNPs on consumers' cognitive and affective responses to the products. Experiments are classified as causal designs: the key strengths of this technique are the identification of causal connections and the capacity to distinguish between the supposed causes from the observed effects (Churchill and Iacobucci, 2004). This is particularly suitable for hypothesis testing. Experiments enable the use of scenarios, photos, videos or computer simulations, which help make tasks more meaningful. An experiment has a greater ability to supply evidence of causality because of the control it affords investigators. Because investigators are able to control at least some manipulations of the presumed causal factor, they can be more confident that the relationships discovered are "true" relationships (Churchill and Iacobucci, 2004). Therefore, an experiment is capable of providing convincing evidence of causal relationships and enables the display of advertising stimuli. Because the first conceptual framework examines causal relationships between the key constructs of interest and the effect of advertising stimuli on consumer responses to RNPs, an experiment is selected as the most appropriate method of investigation.

It should be noted that alternative research designs include exploratory research and descriptive research designs (Churchill and Iacobucci, 2004). Exploratory research designs place the emphasis on the discovery of ideas and insights. Techniques such as focus groups can be considered as part of the data collection process. However, exploratory designs are unsuitable for the present research as they can help generate hypotheses but are not the most appropriate design to test existing hypotheses.

Furthermore, descriptive research designs typically study the frequency with which something occurs or the relationship between two variables (Churchill and Iacobucci, 2004). Descriptive research data may be collected using longitudinal or cross-sectional surveys. However, this type of design does not account for cause/ effect relationships. Any causal implications which are suggested by the pattern of correlations found can be considered as tentative, and it is impossible to safely reject alternative implications which may arise from the same pattern of correlations (Cadogan et al., 2001). Thus, descriptive research designs are discounted from consideration in the present research due to the specific objective to uncover "true" causal relationships between the key constructs of the conceptual framework. As the theory on consumer responses to new products has reached an advanced stage, it makes sense to use experimental research directly examining causality rather than a descriptive design which is more appropriate for the very early stages of theory development.

4.3.2 Factorial Design of Experimental Treatments

Factorial designs are rich with information because they involve the variation of multiple independent variables within a single study (Keppel and Wickens, 2004). In a factorial design, every level of one factor is combined with every level of the other. There are three general factorial designs (Keppel and Wickens, 2004; Hair et al., 2006). At one extreme is the between-subjects factorial design, in which every condition contains a unique sample of subjects. At the other extreme is the within-subject factorial design, in which a single sample of subjects serves in every condition. Between these two types are factorial designs with some within-subjects factors (the same subjects serve at all levels) and some between-subjects factors (different samples are used at each level). This type of design is called a mixed factorial design. Between-subjects designs are easy to design and analyse, and require the smallest number of statistical assumptions. The main disadvantage of between-subjects design is that because different samples are used, they are less sensitive than some other approaches and require a large number of subjects. Contrarily, within-subject designs make the groups more comparable and the tests more sensitive as the same subjects serve at each level. The disadvantage of within-subject designs however, is that such designs introduce a nuisance variable that is not present in a between-subjects study, namely the order or the conditions. Furthermore, exposure to all treatments may be cumbersome for participants (Keppel and Wickens, 2004).

In the present study, the design used is a mixed factorial design, with presentation format (words vs. pictures) and product type (hedonic vs. utilitarian vs. hybrid) manipulated as between-subjects factors and learning strategy (analogy vs. mental simulation vs. no analogy/ no mental simulation) as a within-subjects factors. The rationale to use a mixed design is to benefit from the advantages of both within-subject and between-subject designs. The use of a complete between-subject design was considered but was not deemed appropriate as it would have resulted in an overly complex design (i.e. eighteen groups). Also, a between-subject design would have significantly reduced the sample of respondents for each group, leading to a diminution of the power of the experimental design. Moreover, a within-subject design would have been too demanding for the respondents who would have been required to evaluate too many advertisements, triggering respondent fatigue. A mixed design enables the researcher to keep the complexity of the experimental design at a manageable level (i.e. six groups of respondents) and to reduce consumer fatigue (i.e. three adverts viewed per respondent) while being able to test all the hypotheses of the conceptual framework. To reduce the nuisance introduced by the order in which the conditions are tested, the presentation order of the learning strategies was varied as presented in Table 4.3-1. With regards the independent variables, presentation format, learning strategy and product type are controlled by directly manipulating them. Specifically, presentation format is controlled by conveying the message of the stimuli using either pictorials or words. Learning strategy is controlled by presenting the product using either an analogy, a mental simulation, or no analogy and no mental simulation. Finally, product type is varied by using a hedonic, a utilitarian or a hybrid product (utilitarian process and hedonic outcomes) as the focus of the advert.

TABLE 4.3-1 FACTORIAL DESIGN OF TREATMENTS

Group	Advert	Presentation format	Learning Strategy	Product type
Group 1	Advert 1	Visual	Mental Simulation	Hybrid
	Advert 2	Visual	Analogy	Utilitarian
	Advert 3	Visual	No Analogy/No MS.	Hedonic
Group 2	Advert 1	Visual	No Analogy/ No MS.	Utilitarian
	Advert 2	Visual	Mental Simulation	Hedonic
	Advert 3	Visual	Analogy	Hybrid
Group 3	Advert 1	Visual	Analogy	Hedonic
	Advert 2	Visual	No Analogy/ No MS.	Hybrid
	Advert 3	Visual	Mental simulation	Utilitarian
Group 4	Advert 1	Verbal	Mental simulation	Hybrid
	Advert 2	Verbal	Analogy	Utilitarian
	Advert 3	Verbal	No Analogy/No MS.	Hedonic
Group 5	Advert 1	Verbal	No Analogy/ No MS.	Utilitarian
	Advert 2	Verbal	Mental Simulation	Hedonic
	Advert 3	Verbal	Analogy	Hybrid
Group 6	Advert 1	Verbal	Analogy	Hedonic
	Advert 2	Verbal	No Analogy/ No MS.	Hybrid
	Advert 3	Verbal	Mental simulation	Utilitarian

4.3.3 Method of Administration

Once the overall study type (in the present study, an experiment) is decided upon, the researcher is required to turn towards issues concerning the method of administration of the study (in this case a web-experiment).

In the last decade, a new protocol for sending information on the World Wide Web (WWW), hypertext transfer protocol (HTTP), created a new way to conduct psychological research: Web experiments (Birnbaum, 2004). Musch and Reips (2000) noted that the first psychological experiments (with manipulated variables) conducted via the Web were those of Welch and Krantz (1996) and Krantz, Ballard and Scher (1997).

Krantz (1998) currently maintains a Web site, "Psychological Research on the Net," (http://psych.hanover.edu/research/exponnet.html) that lists experiments running on the Internet in a variety of areas including psychology, social psychology and cognitive psychology.

Web-experimentation is not applicable in situations that require the experimenter to be present, namely when manipulations or measurements involve physiological reactions. However web-experiments have substituted successfully a variety of classic cognitive experiments (see Birnbaum 2004 for a review). Due to many laboratory experiments currently being conducted on computers anyway, no information is lost when an experiment is designed on the web (Reips, 2002). Furthermore, web-research benefits from the absence of the experimenter and "experimenter bias" to the results (Birnbaum 2001). In addition, compared to traditional field experiments, web-experiments have the benefits of control over the distribution of treatments, speed, lower cost, experimenting around the clock, and higher degree of automation (Birnbaum 2004; Reips 2002). Finally, the automation of the web allows the researcher to design a dynamic and interactive environment that combines the delicacy of laboratory manipulations, with survey research and real-time recording of responses, while allowing participants to complete the web-experiment at their own convenience. The result is a more realistic experimental setting compared to laboratory experiments.

Following the above considerations, web-experimentation was chosen as the most suitable administration method for this study.

Birnbaum (2004) identifies three web-experimentation techniques: client-side programming, server-side programming and running one's own server. Client-side programs such as JavaScript run on the participant's computer. A potential problem with running a program on the client's computer is that the researcher relies on the participant to have the proper software installed. Software incompatibilities can result in significant dropout rates, as there is no guarantee that all participants will be able to participate in the experiment. Contrarily, server-side programs run on the server and do not require the participant to have any special hardware or software (beyond the basic ability to read HTML Web pages). Schwarz and Reips (2001) find considerably lower participant dropout rates in server-side than client-side programs.

In the current study, the experiment on the researcher's own server which provides maximum control over the experiment and reduces the possibility of respondents dropping out (Birnbaum, 2004). The experimental material includes:

- An introduction to the survey which contains ethical guidelines for the participants;
- Instructions regarding the tasks that the participants will need to accomplish (i.e. view three stimuli and fill in associated questionnaires);
- The advertising stimuli;
- Three web-questionnaires per survey.

4.3.4 The Development of a Web-Experiment

The web survey was created using the software Perseus Survey Solutions 7. Perseus Development Corporation is the global leader in web-based survey solutions [http://www.perseus.com/survey/news/releases/release_software500.html accessed on 17/04/08]. The questionnaire was written using the Perseus software and each page of the questionnaire was then uploaded onto the Web Server. The researcher then wrote the introduction to the survey and the instructions for the tasks in HTML language using Notepad (an example of web-page written in html is presented in Appendix 1). Six experimental conditions were then created according to the factorial design discussed beforehand (Table 4.3-1) and uploaded separately onto the server. Appropriate links were created in each condition to ascertain that the relevant stimuli were related to the appropriate questionnaires[2]. The links to the web-experiments can be found in Appendix 2 and the introduction page to the web experiment is presented in Appendix 3.

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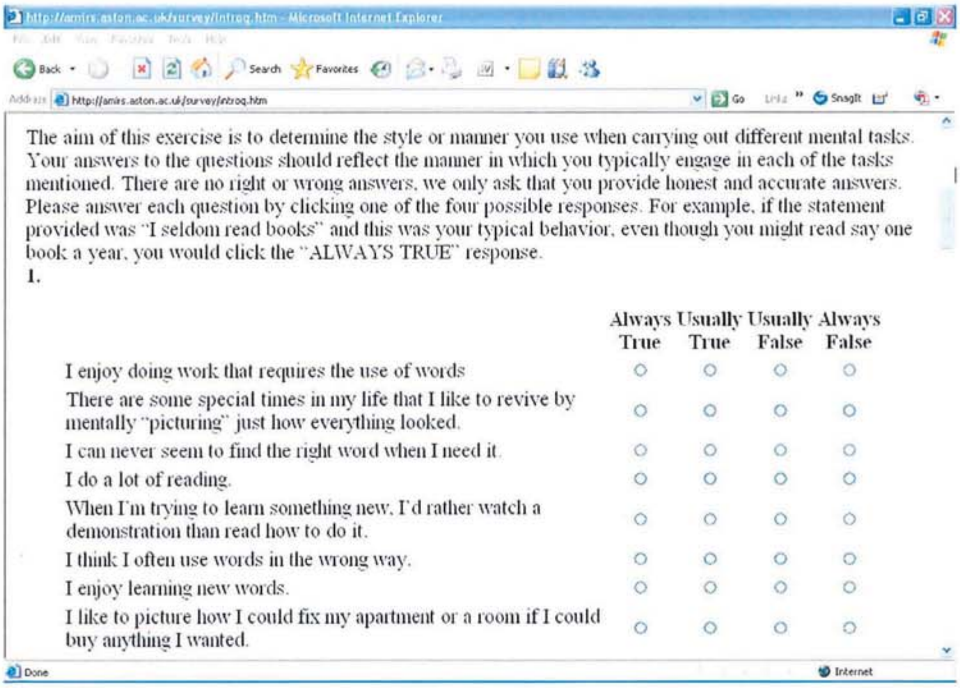
[2] The researcher is grateful to Andrew Wilson, director of the Aston Multimedia Interactive Research Suite (AMIRS), for his invaluable assistance in programming the experiment and uploading it onto the server.

Figure 4.3-1 shows an example of a survey web page, while figures 4.3-2 and 4.3-3 illustrate web pages showing two examples of stimuli (visual mental simulation and verbal mental simulation) for the video glasses.

Figure 4.3-1 Sample Survey Page



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 clicking one of the four possible responses. For example, if the statement provided was "I seldom read books" and this was your typical behavior, even though you might read say one book a year, you would click the "ALWAYS TRUE" response.

1.

	Always True	Usually True	Usually False	Always False
I enjoy doing work that requires the use of words	○	○	○	○
There are some special times in my life that I like to revive by mentally "picturing" just how everything looked.	○	○	○	○
I can never seem to find the right word when I need it.	○	○	○	○
I do a lot of reading.	○	○	○	○
When I'm trying to learn something new, I'd rather watch a demonstration than read how to do it.	○	○	○	○
I think I often use words in the wrong way.	○	○	○	○
I enjoy learning new words.	○	○	○	○
I like to picture how I could fix my apartment or a room if I could buy anything I wanted.	○	○	○	○

Figure 4.3-2 Web Page Visual Mental Simulation Video Glasses

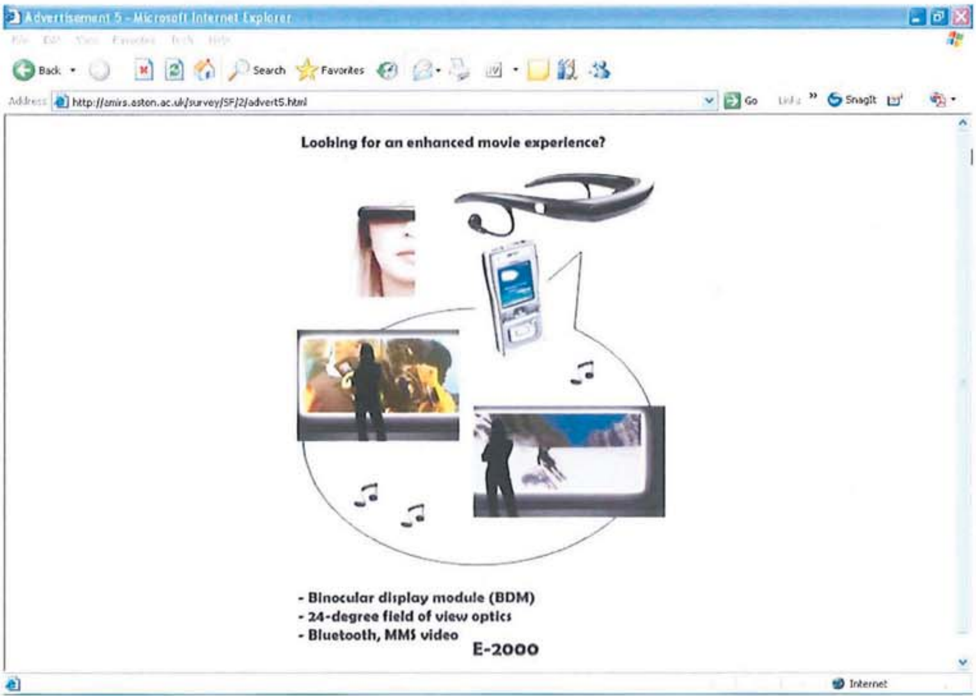
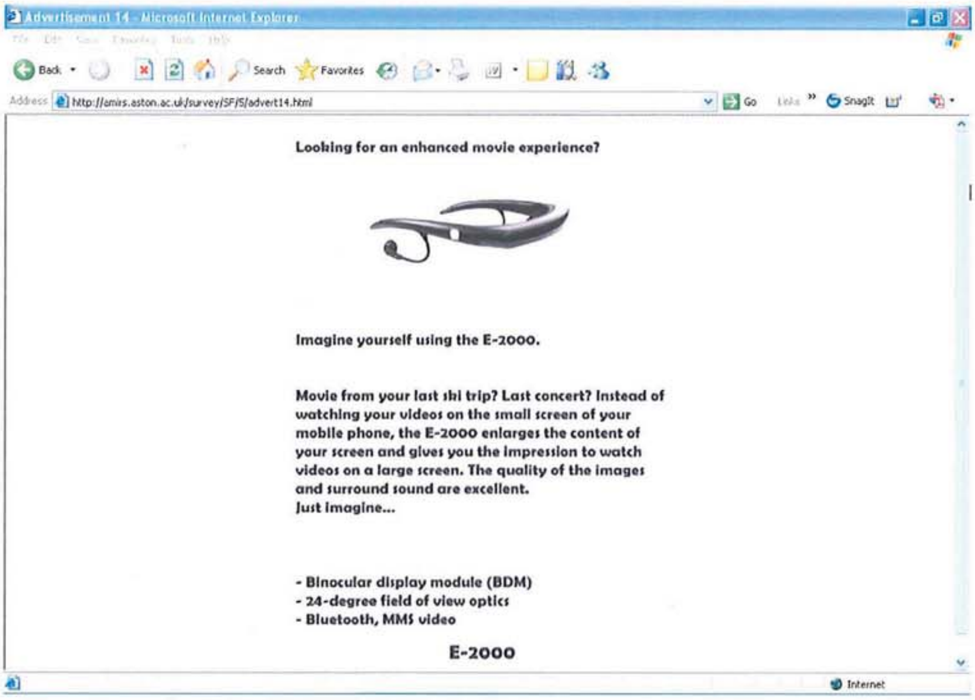


Figure 4.3-3 Web Page Verbal Mental Simulation Video Glasses



Identifiers were included in the Web-Experiment by asking respondents to provide their email address to prevent multiple submissions (Birnbaum, 2004). Furthermore, respondents were required to provide a password for the questionnaire. This password was needed for the data analysis as each page of the questionnaire (personality measures, responses to the first advert and responses to the second advert) were transferred to different SPSS pages. Thus, a common password was needed in each section to be able to link all the responses of the questionnaire to their author and ultimately test the impact of moderating variables on responses to the RNPs. The final version of the web-experiment was uploaded and operational in March 2007.

Random assignment to the experimental conditions was achieved using HTML. Birnbaum (1999) suggested a simple solution to randomize a web-experiment. This solution involves creating a page with a list of months and asking the participants to click on the month of their birth. Each month is linked to one of the conditions of the study. However, this method is applicable only if the experiment has twelve conditions. To randomly assign the respondents to one of the experimental conditions, a technique similar to the one suggested by Birnbaum (1999) was utilised. In the emails that the potential respondents received they read the following instructions: *"All you need to do is to pick a number between 1 and 6 ... Now, click on the link next to the number you chose and complete the survey"*. Depending on their answers, the participants were automatically directed to one of the six experimental conditions.

4.4 EXPERIMENTAL DESIGN - STUDY 2

Study 2 was an eye tracking experiment which objective was to examine the role of respondents' eye movements and visual attention processes in individual comprehension for a RNP. The combination of self-reports and physiological measurements (i.e. eye tracking technique) may enhance our understanding of the links between conceptual analyses during which consumers integrate information from the stimulus with their existing knowledge (Pieters and Warlop, 1999) and perceptual analyses during which individuals integrate textual and pictorial information using visual attention (Rayner et al., 2001).

4.4.1 The Design of the Eye Tracking Experiment

As mentioned previously, factorial designs are rich with information because they involve the variation of multiple independent variables within a single study (Keppel and Wickens, 2004). The researcher considered applying the factorial design presented in table 4.3-1 to the eye tracking experiment, which initially seemed a logical decision as the same independent variables were to be examined. However, the researcher eventually opted against this possibility. Instead, it was decided that respondents would be divided into two groups: the respondents allocated to group 1 would view a visual analogy for the video glasses and a visual mental simulation for the Digipen while the respondents of group 2 would evaluate a verbal analogy for the video glasses and a verbal mental simulation for the Digipen. The design is presented in Table 4.4-1.

TABLE 4.4-1 DESIGN OF THE EYE TRACKING EXPERIMENT

Group	Advert	Presentation format	Learning Strategy	Product
Group 1	Advert 1	Visual	Mental Simulation	Video Glasses
	Advert 2	Visual	Analogy	Digipen
Group 2	Advert 1	Verbal	Mental simulation	Video Glasses
	Advert 2	Verbal	Analogy	Digipen

Two reasons guided the choice to opt for this design.

First, applying the factorial design to the eye tracking experiment would have proved very consuming in terms of time and resources. The overall eye tracking experiment takes approximately forty-five minutes to complete per respondent[3] and can only be conducted with one respondent at a time. Furthermore, two researchers had to be present during each experiment to manipulate the equipment. Therefore, recruiting enough respondents for each of six groups of respondents did not seem realistic.

Second, although previous research has already been conducted with the aim to infer higher-order cognitive processes from eye movement data (Rayner et al., 2001), it must be recognised that the theory developed in the present study, specifically the analysis of visual attention patterns to infer consumer comprehension for new concepts is at a very early stage in development. Therefore, one would not necessarily expect to see a factorial experimental design at that stage. In fact, it makes sense to begin by trying to discover correlational patterns between comprehension and fixation duration to the elements of the adverts for two products to be used as a guide for future research. The present study can be considered as an early step on the incremental testing path, with the aim to get a 'broad' indication of the relationships between visual attention patterns to an advertising stimuli and comprehension for a RNP. This is consistent with the second conceptual framework presented in chapter 3 and with the design of research propositions as opposed to hypotheses. This design is also consistent with the objectives of the study, which do not intend to examine the effect of product type on the correlation between

[3] This includes the time spent setting up and calibrating the eye-tracking equipment.

visual attention and comprehension. Future research can then build on this to take a 'finer' approach, using a full factorial experimental method to test a set of hypotheses.

4.4.2. Eye-Tracking Technique

Physiological measures refer to the measurement of physical reactions of the human body to a certain stimulus. These may include galvanic skin response, vascular constriction, papillary constriction/ dilation, electroencephalograms (EEG) and eye tracking techniques (Bagozzi, 1991). In the present research, study 2 is an eye-tracking experiment.

Developments in the cognitive neuropsychological literature point to the key role that attention plays as a coordination system for cognitive processes (Pieters, Wedel and Zhang, 2007). Visual attention to the adverts will be captured via eye tracking technology which measures participants' eye movements to a given stimulus. Eye movements control overt attention and are well-established measures of the covert attention processes that regulate behaviour because they share the same neural circuitry (Findlay and Gilchrist, 2003). Eye movements indicate how and when the respondents' eyes move over the stimulus studied (Rayner, 1998).

The measurement device used to measure eye movements is known as an eye tracker. The first method for objective eye measurements was reported in 1901 (Robinson, 1968). To improve accuracy, techniques using a contact lens were then developed in the 1950s. Devices attached to the contact lens ranged from small mirrors to coils of wire. The obvious drawback of these devices is their invasive requirement of wearing the contact lens. Contrarily, so-called non-invasive (also called remote) eye-trackers typically rely on the measurement of visible features of the eye (e.g. the pupil, iris-sclera boundary or a corneal reflection) (Duchowski, 2002). Popular eye tracking techniques now include electro-oculography (EOG), scleral contact lens (SCL) and video/ infrared oculography (VOG/IROG). EOG has been the most widely applied eye movement recording method for about forty years. The EOG relies on the measurement of the skin's electric potential differences of electrodes placed around the eye, which vary with eye rotation. SCL involves attaching a mechanical or optical reference object mounted on a contact lens which is then worn directly on the eye. The principal method uses a wire coil, which is then measured moving through an electromagnetic field. The eye movements are measured relative to the position of the head. However, this method is invasive and the lenses can cause discomfort to the participants.

In study 2, the VOG/IROG eye tracking technique was implemented. As opposed to the eye tracking methods discussed above, the VOG/IROG measures POR (Point of Regard), even with minor head movements. Two ocular features are measured to disambiguate head movement from eye rotation: the corneal reflection of a light source, usually infra-red and the pupil center (Duchowski, 2002). The corneal reflection is measured relative to the location of the pupil center. Corneal reflections are known as the Purkinje reflections or Purkinje images (Crane, 1994). The positional difference from the pupil to the corneal reflection varies between reference points with eye rotation but is fairly constant even with minor head moves. In addition, a MHT (Magnetic Head Tracker) was used to guarantee to reliability of the data collected even if the respondents were to move their head.

4.4.3 The Neurological Substrates of the Human Visual System

A key prerequisite to understand the principles that guide visual search is to familiarise oneself with the neural substrates of the human visual system discussed in the neurological literature.

Neurophysiological and psychophysical literature on the human visual system suggests the field of view is inspected through brief fixations over small regions of interest. This allows perception of detail through the fovea. Approximately 90% of viewing time is spent on fixations. When visual attention is directed to a new area, fast eye movements (saccades) reposition the fovea (Rayner, 1978; 1998).

Because of the optical structure of the eyes, the increase in cone density in the retina, and the superior mapping of foveal photoreceptors onto visual cortical tissue, acuity is highest at the point of fixation and drops off precipitously in the parafoveal and peripheral zones (Anstis 1974). Only foveal vision makes it possible to see details. The parafoveal vision only enables the individual to see less detail while the peripheral vision is outside of direct gaze (Rayner, 1978). Importantly, eye movements are a reliable measure of attention because when individuals want to see something in detail then need to bring it into focus in the fovea, and therefore move their eyes to the point of gaze (Rayner, 1978).

Central foveal vision subtends 1 – 5 degrees (visual angle), which allows fine scrutiny of only a small portion of the entire visual field. This is equivalent to only 3% of the size of a large (21 inches) computer monitor seen at 60 cm viewing distance. The human visual-cognitive system takes advantage of the high resolving power of the fovea by reorienting the fixation point around the viewed scene an average of three times each second via saccadic eye movements. During a fixation, the point of regard is relatively (though not perfectly) still. Information is acquired during the fixations; information useful for ongoing perceptual and cognitive analysis of the scene normally cannot be obtained during a saccade (Matin 1974, Volkmann 1986). Eye movements reflect not only visual selection, but also the intensity and nature of ongoing higher-order cognitive processes, thereby providing "a window to the mind" (Pieters, Wedel and Zhang, 2007).

Figure 4.4-1 displayed below illustrates the anatomy of the human eye while table 4.4-2 provides a glossary of the key components of the eye.

Figure 4.4-1 The Anatomy of the Human Eye

TABLE 4.4-2 GLOSSARY OF THE ANATOMY OF THE HUMAN EYE

Cornea
The clear outer part of the eye's focusing system located at the front of the eye and protecting the iris.

Fovea
The center of the macula; gives the sharpest vision.

Iris
The coloured part of the eye that regulates the amount of light entering the eye.

Lens
A clear part of the eye behind the iris that helps to focus light, or an image, on the retina.

Macula
The small sensitive area of the retina that gives central vision. It is located in the center of the retina and contains the fovea.

Optic Nerve
A bundle of more than one million nerve fibers that carries visual messages from the retina to the brain.

Pupil
The opening at the center of the iris through which light enters the eye. The iris adjusts the size of the pupil and controls the amount of light that can enter the eye.

Retina
The light-sensitive tissue lining at the back of the eye. The retina converts light into electrical impulses that are sent to the brain through the optic nerve.

Vitreous Gel
A clear gel that fills the inside of the eye.

Cones
Light-sensitive nerve cells of the retina that function chiefly in bright light and are sensitive to color.

Rods
Light-sensitive nerve cells of the retina that function chiefly in dim light.

http://www.afb.org/Seniorsite.asp?SectionID=63&DocumentID=3343 information provided by the National Eye Institute, National Institute of Health (NEI/ NIH), accessed 29/04/08.

The human visual system is functionally described by the connections between retinal and brain regions, known as visual pathways. 80% of the signals obtained from the retina are sent to the LGN (Lateral Geniculate Nucleus) via the optic nerve/ tract, while 20% (mostly peripheral) are sent to the superior colliculus which directs visual attention and eyes toward visual stimuli. The neurons of the LGN project the information through the optic radiation to the primary visual cortex (Duchowski, 2002).

The dynamics of visual attention probably evolved in harmony (or perhaps in response to) the perceptual limitations imposed by the neurological substrate of the visual system. The brain is composed of numerous regions classified by their function (Zeki, 1993).

A simplified view of the brain and visual pathways relevant to eye movements is presented in Figure 4.4-2. The neural regions which are of particular importance to dynamic visual perception and eye movements are explained in the glossary in Table 4.4-3.

Figure 4.4-2 A Simplified View of the Brain and the Visual Pathways relevant to Eye Movements and Attention

Duchowski, 2002, page 19

TABLE 4.4-3 GLOSSARY OF THE BRAIN REGIONS RELEVANT TO ATTENTION

LGN (Lateral geniculate nucleus)

Receives information directly from the retina and sends projections directly to the primary visual cortex.

SC (Superior Colliculus)

Involved in programming eye movements and contributes to eye movement target selection for both saccades and smooth pursuits, possibly in conjunction with the Frontal Eye Fields (FEF) and area Lateral Intra-Parietal (LIP)

Area V1 (primary visual cortex)

Low level image processing: edges, spatial frequency, depth, colour

Area V2

Higher level image processing: form, color and motion processing

Area V3

Direction and orientation sensitive

Area V4

Tuned for colour: intermediately complex forms, spatial vision

Area V5

Motion analysis

Area LIP (Lateral Intra-Parietal)

Contains receptive fields which are corrected ("reset") before execution of saccadic eye movements

PPC (Posterior Parietal Complex)

Involved in fixations

Duchowski, 2002, p.17-19

4.4.4 The Experimental Procedure of the Eye Tracking Experiment

The eye tracker used for the present experiment was an ASL VOG/IROG eye-tracker. The associated software, Gazetracker, developed by Eye Response Technologies, was used to conduct the eye movement study. The GazeTracker serves three important functions as it:

1. Presents and records stimuli, including sequences of still images or video files;
2. Synchronizes the data it captures;
3. Allows analysis and visualization of the data it collects.

The researcher received a training session to learn how to use the ASL eye tracker and the GazeTracker software[4].

While setting up the eye tracking lab equipment, several elements had to be taken into consideration for an optimal setup (Optimal Set Up in ASL Tutorials, 2006).

- The sensor of the MHT (Magnetic Head Tracker) was placed as close as possible to the right eye of the respondent, as the recommended distance is 1 inch. Therefore, it was decided that the sensor would be placed on a headband worn by the participants.
- The distance from the eye-tracking camera to the eye of the respondent had to be between 20 and 30 inches; the distance achieved in the lab was 26 inches.
- The distance from the MHT to the eye of the respondent should be less than 36 inches as the MHT transmitter creates a magnetic field hemisphere 36 inches in diameter in front of the unit; the distance achieved was six inches.
- The camera was placed below the computer screen and not in front of the screen. The aim was also to minimize the distance between the top of the camera and the bottom of the screen.
- An adjustable height chair was used and the chair was adjusted for each respondent to make sure that the centre of the screen was at eye level.
- The room was equipped to make sure that no sun light could enter the lab as this would have affected the effectiveness of the eye tracker. As a rule, lighting with a high infra-red component (i.e. the sun, incandescent bulbs, and halogen lamps) will cause difficulties when using an eye tracker. Fluorescent lights were used as they do not produce IR light and do not cause the system any difficulty. The same level of lighting was used for all the respondents because the amount of light used affects the size of a person's pupil, which becomes smaller in bright light and larger in dim light. The pupil size will affect how easy it is to track an individual, so a moderate level of lighting was used.
- The researcher made sure that no metallic objects were placed nearby the MHT as these may distort the field produced by the head tracker.

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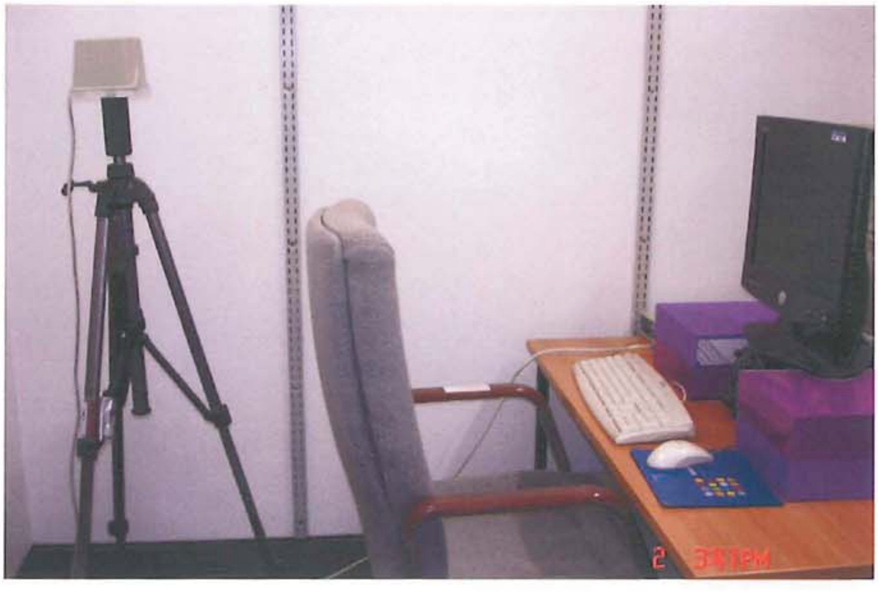
[4] The researcher thanks Andrew Wilson, director of the AMIRS suite, who conducted the eye tracking training session.

The set-up of the lab experiment is shown in Figures 4.4-3 and 4.4-4.

Figure 4.4-3 Set-Up of the Eye-Tracking Experiment
(from the researcher's side)

Figure 4.4-4 Set-up of the Eye-Tracking Experiment (participants' side)



The participants recruited were then invited to come to the eye-tracking lab to participate in the study. The experimental procedure that took place with each participant is detailed in table 4.4-4.

TABLE 4.4-4 EXPERIMENTAL PROCEDURE FOR THE EYE TRACKING EXPERIMENT

Step 1: At the beginning of the experiment, the researcher explained the aim of the experiment and what the participant would be required to do. If the participant agreed to take part in the study, he/she was asked to read carefully and sign the Consent Form.

Step 2: The researcher then proceeded to place the MHT sensor on the participant's forehead using a headband. The researcher checked that the sensor was placed one inch above the participant's eye and made sure that he/ she was comfortable. The chair was also adjusted so that the centre of the screen was at eye level.

Step 3: Then, the respondent was asked to answer a set of personality and demographic questions displayed on the computer screen (see questionnaire used for the on-line experiment)

Step 4: While the respondent answered the questionnaire, the researcher started to set-up the eye-tracking system.

Step 5: The respondent then viewed the calibration screen displayed on the computer screen. The calibration screen was a white screen with nine numbers (1 to 9). The respondent was asked to look at each number displayed on the screen (1 to 9), one by one. This step is necessary to calibrate the eye tracker and teach the system what the respondent's eye looked like when looking at each corner of the screen. The effectiveness of the procedure was verified by asking the respondent to look at each point again and make sure that the eye tracker registered the correct position.

Step 6: Then, the respondent read the first advertisement at his/her own pace. Meanwhile, the eye fixations of the respondent were recorded using the eye tracker. While the respondent was exposed to the advertisement displayed on the screen, the eye tracking camera remained focused on the respondent's pupil. The MHT sensor also guaranteed that the camera would stay focused on the pupil even if the participant was to slightly move his/her head.

Step 7: The respondent was then asked to answer questions related to their reactions to the product advertised (see questionnaire used for the on-line experiment)

Step 8: The researcher then recalibrated the eye-tracker if necessary, and made sure that the camera was still focused on the respondent's pupil.

Step 9: Steps 6 and 7 were repeated for advert 2.

Step 10: The respondent then received a debriefing of the session.

The researcher also designed a step-by-step guide to using the ASL eye-tracker. This guide is presented in appendix 4.

An important stage of the eye-tracking experiment, namely the calibration of the eye-tracker, should be discussed in more details, as without a proper calibration, the data collection will be inadequate.

The calibration of the eye-tracker is divided in three steps.

First, the researcher needs to calibrate the MHT to the eye tracking camera. By calibrating the sensor of the MHT to the eye-tracking camera, the researcher guarantees that the system will track the position of the sensor (placed above the respondent's eye), and therefore the eye of the participants even if they slightly moved they heads.

Second, the researcher needs to adjust correctly the eye tracker's optics and threshold levels to allow the device to properly recognise critical visual elements of the eye: the pupil and the corneal reflection (Duchowski, 2002). The eye tracker software offers a mechanism to adjust both pupil and corneal reflection thresholds. Both must be set so that the eye tracker can easily detect the centres of the pupil and of the corneal reflection, without either losing these targets or confusing them with distracting artefacts such as eyelashes or contact lenses[5].

As explained in Table 4.4-2, the *pupil* is an aperture in the retina which allows the light to enter into the eye. The pupil normally appears black since, under most perspectives, light does not exit the inside of the eye. The *cornea* is a thin film-like tissue that covers the eye. The cornea is mostly transparent; however there is a small amount of reflection as light poses through it. This causes a small reflection to be visible somewhere on the eye and is what is referred to as corneal reflection (Duchowski, 2002). Importantly, the location of the reflection remains the same no matter how the eye turns. Therefore, the pupil moves and can be used to track the "center" of the eye. As the corneal reflection remains fixed, it can be used as an anchor point. The eye-tracking system uses the vector

[5] Rims of glasses are can also be very problematic due to the light reflection on the glasses. The researcher thus made sure that all participants had either normal vision or vision corrected with lenses to limit calibration issues.

from pupil to corneal reflection to identify the spot where the participant is looking at each point in time. Figure 4.4-5 illustrates the location of the pupil and corneal reflection.

Figure 4.4-5 The Pupil and Corneal Reflection

[http://www.areato.org/noquadri/ausiliDinamici/eyegaze/egz_PupilAndCornealReflection.jpg accessed on 01/05/08]

Third, once the eye tracking camera has successfully detected the centres of the pupil and corneal reflection, the calibration can take place. The purpose of the calibration is to present on the computer screen a sequence of points or numbers at fairly extreme viewing angle ranges. These points should be chosen to provide a sufficiently large enough coordinate range to allow the eye tracker to interpolate the viewer's POR (Point of Regard) between extreme points (Duchowski, 2002). The calibration screen consisted of a white screen with nine black numbers (1 to 9). The participant was invited to look at each number one by one. For each number, the researcher registered the position of the eye as seen by the eye tracking camera. This step was needed to teach the system what the participants' eyes looked like when they were looking at points on the screen that are known to the system (specifically the nine target points). A test is available on the GazeTracker. The respondent was asked to look again at each number one by one, while a cross appeared showing the exact spot where the respondent was looking, as recognised by the eye-tracking system. If the calibration was successful, the cross appeared exactly on each number. If the cross appeared distant from the number the respondent was actually focusing on, then the researcher has to start the calibration again (ASL Tutorials, 2006).

4.5 SAMPLING CONSIDERATIONS AND SAMPLE SIZE DECISION

4.5.1 Choice of Respondents for Study 1 (Web Experiment)

The nature of the sample of respondents should be consistent with the key objective of the study, which is to evaluate consumer responses to advertising stimuli for RNPs. Previous studies on consumer responses to RNPs have primarily used student samples (Hoeffler, 2003; Dahl and Hoeffler, 2004; Gregan-Paxton, Hoeffler and Zhao, 2005; Gregan-Paxton and Moreau, 2003; Gregan-Paxton et al., 2002; Moreau, Markman and Lehmann, 2001).

For the present study, students and staff from Aston University were used as the sample. This is a non-probabilistic, judgment sample (Churchill and Iacobucci, 2004) as it is believed to be representative of the population of interest. The choice of this sample is guided by previous research on the characteristics of innovation adopters. The majority of empirical studies in the area have found that early adopters of innovations have more education, more income, and higher status than do non-adopters (Robertson 1971; Rogers and Shoemaker 1971). Members of staff at Aston University match these characteristics as they are likely to have higher education, income and status than the general population. Furthermore, university students also have higher education than the general population and are likely to have a high income and status in the future. This is particularly relevant for the study of RNPs as these very innovative products are likely to be released in future years.

When it comes to the adoption of RNPs, a higher income could mean that the financial risk associated with the purchase of a RNP is smaller, since the cost is a smaller portion of the individual's disposable income. More education could be related to a better understanding of the functions performed by the RNPs. A higher status occupation is likely to mean that the individual has had more experience with high-tech products. Therefore, members of staff and students at Aston University are regarded as an appropriate sample to examine consumer responses for RNPs as they are potential adopters of such novel products (current and future).

4.5.2 Choice of Respondents for Study 2 (Eye-Tracking Experiment)

The sample used for the eye-tracking experiment consisted of students at Aston University. As explained in section 4.5.1, this sample was deemed appropriate as university students are potential future targets for companies wishing to bring RNPs to market.

4.5.3 Sample Size (Study 1)

One goal in research is to generalize a set of findings beyond the participants to the experiment. Researchers are not specifically interested in the behaviour of the people who actually participate in the experiment, but in their behaviour as representative of the population (Keppel and Wickens 2004). A non-probabilistic sample composed of students and staff at Aston University was used. An important decision regarding the sample of the experimental study is the size required to estimate the desired effects. An a-priori power analysis facilitates the choice of adequate sample size (Cohen 1988). Power analysis essentially involves the specification of Type I and Type II errors with respect to null hypothesis testing.

Experimenters often stipulate the power instead of Type II error rate (e.g. Keppel and Wickens, 2004), and define power of the test as the probability to reject the null hypothesis when the null hypothesis is false, i.e. the probability to find an effect provided that it exists. Table 4.5-1 summarizes type I and type II errors along with the power of the statistical test.

TABLE 4.5-1 TYPE I AND II ERRORS AND POWER

Statistical Decision	True State of Null Hypothesis	
	HO True	**H0 False**
Reject H0	Type 1 Error (α)	Power of the test (1-β)
Do not reject H0	Correct	Type II Error (β)

The power of the experiment depends on a number of factors, including the significance level α, the sample size *n*, and the magnitude or size of the treatment effects (Keppel and Wickens, 2004). The most direct way to increase the prospective power of a test is to increase the sample size *n*. A priori power calculations help determine an adequate sample size for the estimation of experimental treatment effects and are therefore very important at the planning stage. Researchers can pre-define the desired significance level, the size of the effects that they wish to detect, and the desired power of the test, and calculate the appropriate sample size. When many factors and interactions are involved, as in the present case, power calculations can be difficult, thus the use of power charts or software packages (Erdfelder, Faul and Buchner 1996) is imperative. Computer software has the potential to make power analysis more accurate, interactive, and easy to perform. For the purpose of a priori power analysis in this study, GPOWER was used. GPOWER is a software application (Faul, Erdfelder, Lang and Buchner, 2007) which performs various types of power analyses including a priori F-tests for multi-factor experimental designs and multiple regression analyses.

For an a priori power analysis for multi-factor experiments with a mixed subjects design in GPOWER, the researcher needs to set the α level, the desired effect size measure (f), the desired power level, the number of groups and the number of repetitions in the design. According to Cohen (1988), there are small, medium, and large effect sizes (Keppel and Wickens, 2004). For an a priori power analysis of a multi-factor F-test in ANOVA, GPOWER uses the following f effect size conventions: small: f=0.10, medium: f=0.25 and large: f=0.40.

In order to have a good chance of detecting even small effects, the standard was set to an effect size of f=0.1. The significance level alpha was set at 0.05 and the desired power level at 0.95. For simplicity reasons, the researcher assumes all factors and interactions equally important for the analysis. As previously mentioned, the design of the experiment is a 2 between-subjects (presentation format) x 3 within-subjects (learning strategy) x 3 between-subjects (product type) mixed design. Hence, the number of groups in the experiment is six and the number of repetitions is three as each respondent views three adverts. Based on this option, the a priori power analysis in GPOWER suggests that the study requires a minimum of 414 participants in order to estimate the factorial effects with a power of 0.9516. This implies a minimum of 69 respondents in each cell.

TABLE 4.5-2 RESULTS OF A PRIORI POWER ANALYSIS

Parameters	Effects
Effect size *f*	0.10
α error probability	0.05
Power (1-β error probability)	0.95
Number of groups	6
Repetitions	3
Non-centrality parameter λ	24.84
Critical F	1.84
Minimum sample size	414
Minimum cell size	69
Actual power	0.9516

4.5.4 Sample Size (Study 2)

The sample size then had to be determined for the eye-tracking experiment. The researcher decided to opt for a sample size of at least fifteen respondents. Several key reasons guided the choice to opt for a small sample size.

First of all, this sample size is comparable to the sample sizes used in previous eye tracking studies (Albert et al., 2005; Fleetwood and Byrne, 2006). Eye-tracking studies are very time-consuming as respondents can only be tracked one at a time. Consequently, the samples used in eye-tracking studies are often much smaller than the samples used in regular experiments.

Second, as explained in details in section 4.4.1, the theory developed in the present study, specifically the analysis of visual attention patterns to infer consumer comprehension for new concepts is at a very early stage in development. Therefore, one would not necessarily expect to see a large sample study at that stage. The present study can be considered as an early step on the incremental testing path, with the aim to get a 'broad' indication of the relationships between visual attention patterns to an advertising stimuli and comprehension for a RNP. Future research can then build on this to improve the power of the analysis using larger samples. The researcher will take into account the fact that small and medium effect sizes will be harder to detect due to the small sample size.

4.6 SELECTION OF THE RNPs

4.6.1 Initial Selection

Following the mixed design presented in table 4.3-1, three RNPs had to be selected for inclusion in the experiment for study 1. Two of these RNPs would be included in study 2.

Examples of RNPs used in previous research include:

- The Aquada, a vehicle that could function as a car and a boat (Herzenstein, Posavac and Brakus, 2007);
- The Auto Mower (i.e. an autonomous lawn mower) and the Smart Pen (i.e., a device that biometrically identifies its user) (Ait El Houssi, Morel and Hultink, 2005)
- PDAs (Gregan-Paxton, Hibbard, Brunel and Azar, 2002)
- The IBM TransNote-a new mobile personal computer with a digital notepad that enables handwritten ideas to be captured and to be transferred to a digital computer file. (Dahl and Hoeffler, 2004),
- A 3-D television and camera (Hoeffler, 2003)
- Dryel from Procter & Gamble: Dryel is a new product that enables consumers to clean their dry clean-only clothes at home in their dryer (Hoeffler, 2003).

In order to select the RNPs that would be used as stimuli in the studies, a large set of new products was identified by scanning on-line reviews of cutting-edge consumer electronic products (http://www.ubergizmo.com, http://us.gizmodo.com/) and issues of magazines (BusinessWeek, The Economist and PC Magazine) in 2006.

A series of criteria guided this search to select three RNPs.

First, one product had to be of a utilitarian nature (utilitarian process and utilitarian outcomes), one product of a hedonic nature (hedonic process and hedonic outcomes) and one product of a hybrid nature (utilitarian process and hedonic outcomes).

Second, the products had to be perceived as high in innovativeness and newness, and participants had to be unfamiliar with the products, since a representation of the products had to be absent or at least limited (Gregan-Paxton et al., 2002).

Third, as half of the conditions had to convey the product using visuals, pictures of the product itself, but also of the product in use had to be available. This issue greatly reduced the pool of products considered for inclusion in the experiment, as many concepts under development do not have any visuals available.

Fourth, a knowledge domain that could serve as a base for an analogy had to be readily available (Hoeffler, 2003).

Following these criteria, a range of six products was selected:

- The e-book Reader: also referred to as the "electronic paper book", the e-book reader is an electronic device which combines a high-resolution paper display, portability and room for hundreds of digital books. The e-books can be stored on the device, and then read directly on the Reader (possible analogy: a bookshelf). The e-book Reader can be classified as a hybrid product, as it requires a utilitarian process for use, but offers hedonic outcomes.

- The Reliefband: a product which looks like a watch and can stop motion sickness by sending gentle electronic signals which restore stomach rhythm to normal (possible analogy: a medicine against motion sickness). The Reliefband can be classified as a utilitarian product, as it uses a utilitarian process and offers utilitarian outcomes.

- The Robocleaner: an electrical appliance that vacuums and sweeps everywhere in the house all by itself (possible analogy: a cleaning lady). The Robocleaner can be classified as a utilitarian product.

- The Video Glasses: a head set which enables the viewer to watch videos downloaded on a mobile on a large screen (possible analogy: a cinema projector). The Video Glasses can be classified as a hedonic product, as it offers a hedonic process and hedonic outcomes.

- The Digipen: a pen which transforms handwritten notes into electronic documents (possible analogy: a secretary). The Digipen can be classified as a utilitarian product.

- The Intelligent Oven: an oven which also works as a fridge and can be programmed remotely to start cooking (possible analogy: a cook). The Intelligent oven can be classified as a hybrid product.

4.6.2 Pre-Test 1: Ten Interviews

Interviews were organised with a sample of ten respondents who were students at Aston University to collect their views on these six products and reduce the set of products down to three.

The main aims of this pre-test were to identify the products which were viewed as most innovative and which had the most positive feedback. Furthermore, the relevance of the analogies used was also examined in the pre-test. Specifically, the researcher examined whether some of the participants spontaneously evoked the analogical bases when describing the product, and whether alternative analogical bases were mentioned.

The key findings from the pre-test were as follows:

- The Digipen: the product was regarded as innovative, viewed positively and perceived as relevant to a wide range of consumers.

"The product is useful for people like me who do not like to keep tons and tons of paper notes but still love to take notes in the written manner. I like the product"

"I like this product; it is very innovative and very useful since everyone takes hand written notes but needs to transfer the information into a computer at one point since everything (at school, at work etc…) is computer based now".

Furthermore, the analogy was used by two of the respondents when describing the product which confirmed the suitability of the analogy to convey the nature of the RNP. The analogy was regarded as relevant by all the participants.

"This product would be very useful for any secretary or even help doctors, or even executives who wouldn't need their secretary any longer!".
"Saving time for secretaries"

- The Robocleaner: The product was viewed positively by the participants.

"The product is very practical for those who hate housework or love cleanliness".

However, participants were expected to have limited existing knowledge structures for the product (Gregan-Paxton et al., 2002). This criterion was not satisfied, as some of the participants were already familiar with the product.

"It is the Electrolux automated vacuum cleaner".
"I have already seen a TV ad for this product about 2 years ago".
Therefore, the product was removed from the set of stimuli under consideration.

- The Video Glasses: The product was viewed positively by most respondents and regarded as highly innovative.

"The product is useful for people who are into innovative technology".
"Very interesting and useful for long train-bus-airplane trips"
"Futuristic technology, quite advanced"
Furthermore, the analogical base was used by one of the participants to describe the product; all the participants regarded the analogy with a cinema projection as appropriate to convey the nature of the product.

"Brilliant, it is like being in a cinema, better than a PSP"

- The Reliefband: The product was perceived as very high in innovativeness. However, the product was viewed negatively by many of the participants, as some of them found the product description unbelievable while others found that the product sounded dangerous.

"I don't believe in it! How would you stop nausea just by having a watch?"
"I don t believe in it and I would be scared to use it without knowing more about the whole system and the origin of the product"
"Sounds dangerous!"

In addition, the product had a limited reach as it was relevant only to respondents who were affected by motion sickness.
"And I don't feel concerned since I have a solid stomach".
"Not for me but might be useful for my mother".

On the basis of these findings, the Reliefband was removed from the pool of stimuli.

- The e-Book Reader was not perceived as very high in innovativeness as it was regarded as similar to established products. Furthermore, the product was viewed negatively by several respondents.

"The product is not an innovation at all and I dislike the product. I like to read my own book and reading on an electronic device puts me to sleep. Adobe reader has the same function and it is free".
"I won't really need this product because I like and prefer reading books in larger characters. I am still old-fashioned and enjoy bringing the book wherever I go and then displaying it in my library".
"I think books need to remain books and be read from paper; I think it is so nice to have a book with paper page. I hate spending all my time in front of a computer screen and this will just make things worse".
The e-Book Reader was therefore deemed as inappropriate for inclusion as part of the stimuli for our experiment.

- The Intelligent Oven: The product satisfied the criteria in terms of perceived innovativeness and relevance.

"Very innovative"
"Brilliant - no need to rush back home to cook, when we arrive back home it will be ready"
Furthermore, the analogical base was used by two of the participants to describe the product. All the other participants appreciated the relevance of the analogy.

"It's like your own personal chef"
"It is a high tech cook that performs the cooking via phone or Internet".

Consequently, the three products selected were the Digipen, the Video Glasses and the intelligent oven. These products were regarded as particularly relevant for the present study as they appeared to fit in the three categories which are the focus of investigation of the present thesis: utilitarian (Digipen), hedonic (Video Glasses) and hybrid (Intelligent Oven). In order to verify the validity of the product manipulation and of the nature of the RNPs, another pre-test was conducted.

4.6.3 Pre-test 2: Fifteen Respondents

Fifteen respondents who were students from Aston University were interviewed via a face-to-face interview led by the researcher in order to ascertain that each product pertained to the category identified: Digipen (utilitarian), Video Glasses (hedonic) and intelligent oven (hybrid). The respondents were first presented with a description of the three products. This description had a similar layout for all three products and contained a text illustrated with a picture of the product. The respondents were asked to read the three product descriptions at their own pace.

Then, the respondents were presented with three categories:

- Utilitarian product: A product which is utilitarian is primarily functional and instrumental, and practical;
- Hedonic: A product which is hedonic is primarily experiential, provides enjoyment-related benefits, and is able to create feelings;
- Hybrid: A hybrid product requires the user to go through a utilitarian process to use the product, which is primarily functional. However, the benefits offered by the product are hedonic, that is to say experiential, enjoyment-related and able to provide feelings.

The respondents were then asked to fit one product into each of the above three categories.100% agreement was reached among the participants, who all identified the Digipen as utilitarian, the Video Glasses as hedonic and the Intelligent Oven as hybrid. This ascertains the validity of the nature of experimental manipulation regarding the nature of the products.

4.6.4. Pre-test 3: Fifty-three Respondents

Following these interviews, a quantitative pre-test was conducted among fifty-three respondents drawn from a student population. The aim of this second pre-test was to ensure the validity of the product choice manipulation. The researcher first ascertained that the respondents had limited familiarity with the products, and that the products did not significantly differ in terms of familiarity. Participants were asked to indicate their familiarity with the products using a seven-point scale (not very=1 to very=7). As expected, the three products all rated low in familiarity and did not significantly differ in terms of respondents' familiarity ($mean._{video\ glasses}=2.68$; $mean._{intelligent\ oven}=2.22$; $mean._{Digipen}=2.92$; $p>0.05$ on a seven-point scale). This suggested that participants had limited existing cognitive structures for the products. The respondents were then required to rate the three products in terms of innovativeness using a 7-point scale (not very=1 to very=7). The products were rated highly and did not significantly differ in terms of perceived innovativeness ($mean._{video\ glasses}=4.55$; $mean._{Digipen}=4.14$; $mean._{intelligent\ oven}=4.79$; $p>0.05$ on a seven-point scale).

The researcher then aimed to ascertain the validity of the analogical base manipulation. It is recommended that the analogies should have similar abilities to transfer the structural knowledge needed to form a meaningful representation of the new product (Gregan-Paxton et al., 2002). Participants were asked to rate how easy it was to understand the comparison between the base and the target, using a seven point-scale (not easy at all=1 to very easy=7). The pre-test showed that the ease of understanding the analogy between base and target did not significantly differ across products ($mean._{video\ glasses}=4.12$; $mean._{intelligent\ oven}=4.71$; $mean._{Digipen}=4.92$; $p>0.05$). Furthermore, Hoeffler (2003) identifies participants' unfamiliarity with the base domain as one of the reasons explaining why an analogy may be ineffective in terms of educating individuals about the benefits of the RNP. Thus, participants were asked to rate how familiar they were with the base domain on a seven-point scale (not familiar at all=1 to very familiar=7). Respondents were familiar with the base domain and no significant differences across products were identified ($mean._{cinema\ projector}=4.78$; $mean._{cook}=5.66$; $mean._{secretary}=5.08$; $p>0.05$).

As a result of the pre-test, the three RNPs selected for the experimental procedure were:

- the Digipen (utilitarian),
- the Intelligent Oven (hybrid),
- the Video Glasses (hedonic).

4.7 DESIGN OF THE STIMULI

4.7.1 Components of the Advertising Stimuli

Eighteen stimuli were developed (six per product). The constant elements of the adverts were a headline at the top, the brand name at the bottom and a list of three product features. The other elements of the advertisements manipulated presentation format (words vs. pictures) and learning strategy (mental simulation vs. analogy vs. no analogy/ no mental simulation).

To construct the verbal analogy condition, a picture of the product was placed at the top of the advert, followed by a verbal description of the product, starting with an analogy using words such as "The E-2000 is like a cinema projector". For all three products, two additional references to the base were made to stimulate analogical transfer in the text (e.g. for the Video Glasses: "gives the impression of watching videos projected on a cinema screen" and "similar to a cinema projection").

The verbal mental simulation was identical except for changes in wording to stimulate mental imagery instead of analogical transfer. Mental simulation using words was stimulated using instructions to imagine and concrete words (Babin and Burns, 1992). The first sentence intended to stimulate mental imagery "Imagine yourself using the E-2000". For all three products, two additional elements were used to stimulate imagery, using concrete words ("Movies from your last ski trip? Last concert?") and instructions to imagine ("Just imagine…"). Furthermore, while in the analogy condition the consumer was referred to as "the owner", in the mental simulation the consumer is presented in the second person (e.g. "you") in order to stimulate imagery in the mental simulation condition and limit the amount of imagery used in the analogy condition (Escalas, 2004). The verbal no analogy/ no mental simulation was identical to the previous two conditions, except that no analogy and no instructions to imagine were included.

To construct the visual analogy condition, a picture of the RNP was related to a picture of the base domain (e.g. for the Video Glasses, a cinema projection). The visual mental simulation contained a visual scenario of product use intending to stimulate mental imagery with concrete pictures. The visual no analogy/ no mental simulation was identical to the previous two conditions, except that no visual analogy and no visual mental simulation was included: the stimulus only featured a picture of the product. The pictures used in the visual conditions were extracted from websites and on-line reviews presenting the products.[6]

4.7.2 Factors Controlled for in the Stimuli

In order to guarantee the internal validity of the manipulation, the researcher controlled for a range of potential nuisance factors.

- Nature of the analogies (Distant vs. near domains): the present research only uses analogies from distant domains as opposed to analogies from near domains (Ait El Houssi, Morel and Hultink, 2005). Examples of analogies from distant domains include an analogy between a PDA and a secretary (Gregan-Paxton et al., 2002) whereas an example of a near-domain analogy could be an analogy between two types of management softwares (Roehm and Sternthal, 2001). A near domain analogy may drive the individual to focus on surface comparisons without considering underlying similarities. Contrarily, a distant domain analogy requires the individual to seek underlying structural relationships to render the analogy meaningful. In the domain of educational psychology, findings suggest that analogies from distant domains promote comprehension of and memory for scientific text (Halpern, Hansen and Riefer, 1990).

[6] Intelligent oven: http://www.tmio.com/
Digipen : http://www.logitech.com/
Video glasses: http://www.agence-revolutions.com/orange_lunettes_video_mobile_revolutions.html
All accessed 17/07/2007

Thus, only distant-domain analogies are used in the stimuli using an analogical learning strategy.

- Nature of the analogies (consumer or marketer-provided): Only marketer-provided analogies are used as consumer-provided analogies may misinform consumers in some way as they lack knowledge about RNPs. Contrarily, marketer-provided analogies may help consumers to evoke knowledge more accurately from related product domains (Hoeffler, 2003).

- Brand name: Hypothetical brand names that convey minimal information about product attributes were selected so inferences were necessarily based on the contents of the stimuli rather than on prior knowledge or attitudes about existing brands. The brand names did not give away any information on the products in terms of pleasantness/appropriateness (e.g.: R-4000, E-2000 and D-350).

- Size of the elements: The pictures used in the same condition (such as visual analogy) had a similar size across products. In addition, the visual element had roughly the same size in the visual analogy and visual mental simulation conditions. Furthermore, the differences in terms of paragraph length and number of words were kept to a minimum. The number of words contained in the verbal descriptions of the product (verbal analogies and verbal mental simulations) ranged from 49 to 58 (15.5% variation). Besides, the number of words conveying the message in the verbal mental simulation for the video glasses and the verbal analogy for the Digipen i.e. the stimuli used in the eye-tracking condition was roughly the same as it varied only from 56 to 58 (3% variation).

- Ad layout: Ad layout was held constant across products to improve internal validity by controlling for extraneous sources of stylistic variation.

4.7.3 Pre Test 4: Ten Marketing Expert Judges

A panel of ten marketing expert judges was interviewed. The aim of this pre-test was to ascertain the validity of the visual vs. verbal manipulation. First, the researcher established that all the pictures of the base domains used in the visual analogies were easy to identify. Each judge was shown a picture of each base domain (e.g. cook, cinema projection and secretary) and asked "If you had to describe this picture using one sentence, what would you say?". A 100% agreement was reached across judges, indicating that the pictures of the base domains were easily identifiable as a cook, a secretary and a cinema projection. Feedback was also collected from the judges to confirm that these pictures were all viewed positively.

Second, the judges were asked: "If you were given the assignment of conveying the message of the pictorial element into words, what would you say? Please try and provide a detailed explanation". Based on these suggestions, the stimuli were modified to improve the similarity between the message conveyed in the visual and the verbal conditions.

After modification of the stimuli according to the suggestions of the expert judges, the same sample was asked to rate whether the visual condition conveyed the same message as the verbal one, both in the analogy and mental simulation conditions, using a 3-item scale (Smith, 1991). The judges were asked whether the pictorial element conveyed the same message as the text, whether the text was an accurate translation into words of the message conveyed by the pictorial element and whether they would write what was written in the text if they were given the task of translating the pictorial element into words. The results indicate that the similarity of the message conveyed in the mental simulation conditions ($mean_{Video\ Glasses}=5.9$; $mean_{Digipen}=5.5$; $mean_{oven}=5.6$, $p>0.05$) and in the analogy conditions ($mean_{Video\ Glasses}=5.1$; $mean_{Digipen}=4.9$; $mean_{oven}=5.0$, $p>0.05$) was rated highly. The difference across conditions did not reach significance and the expert judges were satisfied with the equivalence of the message conveyed across conditions, which confirms the validity of the visual vs. verbal manipulation. The final stimuli used in experiment 1 are available in appendix 8.

4.8 RELIABILITY AND VALIDITY CONSIDERATIONS

4.8.1 Methods Used to Increase the Reliability and Validity of the Experiments

The similarity of results provided by independent but comparable measures of the same object, trait or construct is called reliability (Churchill and Iacobucci, 2004). Thus, if the questionnaire was to be re-tested, the answers of the respondent would remain the same. Reliability is distinguished from validity in that validity is represented in the agreement between two attempts to measure the same trait through maximally different methods, whereas reliability is the agreement between two efforts to measure the same trait through maximally similar methods (Campbell and Fiske, 1959).

Evaluating the reliability of any measuring instrument consists of determining how much of the variation in scores is due to inconsistencies in measurement (Peter, 1979). One of the main issues of reliability is internal consistency (Webb, 1992), implying that the reliability of a measure is associated with the extent to which a single respondent's score for a set of items measuring a single construct is the same as another set of items measuring the same construct. Four methods may be used to evaluate reliability. These include test-retest, where the same questionnaire is distributed twice to the same respondents; alternative forms, where different questions that have an equivalent meaning are used in a questionnaire; the split-half reliability which involves comparing the answers of two identical sample groups; and the coefficient alpha or Cronbach's alpha, which is the average of all possible split-half coefficients resulting from different ways of splitting the scale items (Malhotra and Birks, 2000). In the present research, this last method is used with the SPSS software. Furthermore, all the constructs are measured using existing scales previously tested for reliability by their authors.

However, a measure could be reliable but still not be valid. A valid measure is one that is truthful and which is accurate in measuring what it is trying to measure (Burns and Bush, 2003). The researcher distinguishes between internal and external validity. Internal validity increases when the researcher controls for a range of potential confounding factors, while external validity is enhanced when the experimental setting is more naturalistic and less controlled (Churchill and Iacobucci, 2004). Thus, these two types of validity are often at odds. Marketing researchers have typically sacrificed external validity for internal validity, under the assumption that theory application research does not need to be externally valid (Calder et al., 1982). Nevertheless, when an experiment lacks external validity the theoretical constructs also lack validity (Lynch 1982). Hence, the researcher should strive to achieve both internal and external validity.

In the present research, internal validity was achieved by controlling for a variety of potential confounding factors related to the design of the stimuli. These factors are discussed in section 4.7. Furthermore, study 2 was conducted in a laboratory setting, which affords a greater degree of control as the conditions of the experiment are the same across participants (Churchill and Iacobucci, 2004).

External validity focuses on the problem of collecting data that demonstrate that the changes in the criterion variable observed in the experiment as a result of changes in the predictor variables can be expected to occur in other situations. The prerequisites for external validity include ecological validity, statistical generalizability and robustness (Lynch, 1982). Ecological validity was enhanced in two ways. First, the design of the stimuli was realistic, as all the stimuli used contained both text and pictorials, although the main message was either conveyed using words or using pictures, in line with experiments on visual vs. verbal metaphors conducted by McQuarrie and Philips (2005). Second, study 1 was a web-experiment, thus ensuring that respondents viewed the stimuli in more naturalistic conditions (i.e. at home or at work) than a laboratory experiment. The statistical generalizability and robustness of the findings were increased by using a randomisation technique in the web-experiment of study 1.

4.8.2 Validity of the Eye-Tracking Experiment

A key question regarding the validity of the eye tracking experiment is whether eye-movements (i.e. overt attention) actually reflect covert attention. Attention has a unique role as it connects the anatomical level studied in neuroscience (i.e. overt attention) and the mental level of description of processes used in cognitive science (i.e. covert attention) (Posner and Petersen, 1990). Overt attention is external and observable using eye movements and head movements whereas covert attention is internal and unobservable, and is experimentally separable from eye movements (Rayner, 1998). Posner and Petersen (1990) identify three components of attention, namely the capacity to disengage from a given stimulus, to shift attention to another point in space and to engage on a new stimulus. Each component is heavily related both to eye movements (covert attention) and to areas of the visual brain (overt attention). Specifically, the disengagement from a given stimulus occurs during fixation and is supported by the posterior paretal lobe. The shifting of attention occurs during the fixation and the start of a saccade and is related to the superior colliculus. Finally the engagement on a new stimulus occurs during a new fixation and is motivated by the pulvinar area of the brain (Posner and Petersen, 1990). This connection between eye movements and areas of the brain suggests that eye movements tap higher-order processes.

Seminal work on visual attention (Von Helmholtz, 1925) argued that attention could be controlled by a conscious and voluntary effort, allowing attention to peripheral objects without making eye movements to that object. If this was the case, this would imply that individuals may be attending to an object even though attention is not reflected in their eye movements and thus not measured by the eye tracker. Nevertheless, more recent work in experimental psychology has uncovered that only central foveal vision makes it possible to see details (Rayner, 1978; 1998). The parafoveal vision only enables the individual to see less detail while the peripheral vision is outside of direct gaze (Rayner, 1978). Hence, eye movements are a valid measure of attention because when individuals want to see something in detail then need to bring it into focus in the fovea, and therefore move their eyes to the point of gaze (Rayner, 1978). Only the central or foveal region of vision can be perceived at high resolution. Consequently, the eyes move where attention is allocated (Rayner, 1995; Findlay and Gilchrist, 2003). As overt and covert attentional shifts are under the influence of the same neural networks, under normal conditions the point of regard or fixation reflects the focus of attention. Thus, eye movements are widely regarded as an unobtrusive and valid measure of visual and cognitive information processing, providing a “window to the mind” (Findlay and Gilchrist, 2003; Rayner, 1978; Pieters and Wedel, 2004; Henderson and Hollingworth, 1999; Krugman et al., 1994; Rosbergen, Pieters and Wedel, 1997).

4.9 DESIGN OF THE MEASURING INSTRUMENT

The next task was to determine which measures were necessary in order to collect information regarding the first conceptual framework outlined in the previous chapter.

There were two important considerations in developing the questionnaire for the experiments: a) deciding the number of items needed to measure each construct, and b) deciding whether to borrow existing or develop new measures. Regarding the number of items needed to measure the constructs, Nunnally and Bernstein (1994) and Spector (1992) provide a comprehensive argument for using multi-item measures instead of single-item scales to analyze psychological responses. First, single-item scales have substantial random measurement error, which researchers can average out by summing individual scores of multi-item scales. Secondly, single-item scales lack scope. According to McIver and Carmines (1981), it is doubtful that a single item can fully represent a complex mental construct. Therefore single-item scales are less valid, less reliable, and less accurate than multi-item equivalent scales. However, the most fundamental problem with single-item measures is that they provide researchers with insufficient information to estimate the above measurement properties. Thus, their degree of validity, reliability, and accuracy is unknown (McIver and Carmines 1981). Therefore, the questionnaire instrument consists of multi item measures.

In order to decide on the use of existing versus the development of new measures, the researcher re-visited the literature in search for reliable and valid measures. The literature suggests that such measures exist for all the constructs that make up the conceptual models. Hence, existing measures in the context of the study. Following the guidelines put forward by Bearden and Netemeyer (1999), the criteria for adapting existing scales from the literature in the current study were:

1. The measure had a reasonable theoretical base and conceptual definition;

2. The measure comprised at least two items or questions;
3. The measure was developed within the psychology, marketing or consumer research literature and is relevant to the consumer behaviour literature;
4. Scaling procedures were employed during scale development;
5. Estimates of reliability and/or validity of the constructs in the studies from which they are adapted were above the recommended standards.

In order to retain the constructs' reliability and face validity, they were adapted at a minimum level. In most cases, adaptation merely involved changes in the wording of items to match the specific research context, and in the number of scale intervals, which was set at seven points for uniformity[7]. The format chosen was a closed-ended format. There are a number of reasons for the choice of a closed-ended format, one of which was the fact that with so many different constructs, it was crucial to reduce participant fatigue. Furthermore, as one of the objectives of the present study was to test relationships between the constructs presented in the conceptual frameworks, closed-ended Likert scales (i.e. rating scales) were deemed appropriate. Similar methods of data collection have been used in many experimental research procedures in the past and thus a large amount of evidence points to their success in measuring consumer responses to new products.

Most constructs were measured either by 7-point Likert scales or by 7-point bipolar adjective scales. However, verbal-visual processing style was operationalised using a 4-point scale as suggested by Childers, Houston and Heckler (1985) in their original scale. The latter scale was not strictly a Likert scale as it was anchored by "Always True/ Always False".

The demographic measures were evaluated by nominal scales. The method used to access the survey was measured on a scale where the respondent was asked to choose between five different methods and an "other – please specify" option was provided for the sake of exhaustiveness. Similarly, educational level was measured on a nominal scale where

[7] Exceptions to this rule are discussed in the next section.

the respondent was asked to select their highest educational achievement. The question related to the age measure was open-ended. The respondents' nationality was measured using a nominal scale with a wide range of nations to choose from. Finally, the question pertaining to the gender of the respondent was asked using a dichotomous question, where the respondent was asked to choose either 'male' or 'female'.

Following these considerations and based on the requirements set in the first conceptual framework, the questionnaire was divided into four sections. The first section of the questionnaire collects data on consumers' individual traits, which include individual style of processing, social desirability bias and demographics. The second section follows participants' viewing of the first experimental stimulus and intends to measure emotional responses, attitude to the product, behavioural intent and product comprehension. The third and fourth sections contained the same questions as the second part of the questionnaire, but measuring responses to the second and third stimuli respectively.

Furthermore, because it was crucial to ensure that the data was not corrupted as a result of respondent confusion, instructions on how to complete each section and proceed to the rest of the experiment were provided where appropriate. Furthermore, respondents were thanked for their time and effort at the end of the experiment. This questionnaire was used for study 1, while the only self-report question used in study 2 was product comprehension.

4.9.1 Individual Style of Processing

Although the present thesis did not develop formal hypotheses for the role of individual style of processing on consumer responses to RNPs, individual style of processing was measured in the Web-Experiment and will be used as a covariate in the data analysis to control for any potential confounding effect. The full version of the scale which comprises twenty-two statements measuring a person's preference for processing information in either a verbal or visual modality was employed. The researcher used a four-point response scale ranging from 'Always True' to 'Always False'. The scale was developed by Childers, Houston and Heckler (1985) after work with another measure, the

Verbal-Visualizer Questionnaire (VVQ, Richardson, 1977) failed to display satisfactory reliability and dimensionality. Half of the items tap the visual component and the other half taps the verbal component. The final version of the scale includes the six items from the VVQ.

In terms of reliability, Childers, Houston and Heckler (1985) and Bezjian-Avery, Calder and Iacobucci (1998) reported a Cronbach alpha of 0.88 (n=96) for the overall scale. Which is more, closer examination of the SOP scale indicated that coefficient alpha was 0.81 for the verbal component and 0.86 for the visual component (Childers, Houston and Heckler, 1985). A confirmatory factor analysis using LISREL also supported the structure and consistency of the SOP scale. The scale's discriminant validity was evidenced by insignificant correlations with two measures of processing ability (not style) by Childers, Houston and Heckler (1985). The scale also had no correlation with a measure of social desirability. Criterion validity was established by the scale's significant correlations with measures of recall and recognition.

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 clicking one of the four possible responses. For example, if the statement provided was "I seldom read books" and this was your typical behavior, even though you might read say one book a year, you would click the "ALWAYS TRUE" response.

PROC1 (W) I enjoy doing work that requires the use of words

PROC2 (P) There are some special times in my life that I like to revive by mentally "picturing" just how everything looked (R).

PROC3 (W) I can never seem to find the right word when I need it (R).

PROC4 (W) I do a lot of reading.

PROC5 (P) When I'm trying to learn something new, I'd rather watch a demonstration than read how to do it (R).

PROC6 (W) I think I often use words in the wrong way (R).

PROC7 (W) I enjoy learning new words.

PROC8 (P) I like to picture how I could fix my apartment or a room if I could buy anything I wanted (R).

PROC9	(W) I often make written notes to myself.
PROC10	(P) I like to daydream (R).
PROC11	(P) I generally prefer to use a diagram rather than a written set of instructions (R).
PROC12	(P) I like to "doodle" (R).
PROC13	(P) I find it helps to think in terms of mental pictures when doing many things (R).
PROC14	(P) After I meet someone for the first time I can usually remember what they look like but not much about them (R).
PROC15	(W) I like to think of synonyms for words.
PROC16	(P) When I have forgotten something I frequently try to form a mental "picture" to remember it (R).
PROC17	(W) I like learning new words.
PROC18	(W) I prefer to read instructions about how to do something rather than have someone show me.
PROC19	(W) I prefer activities that don't require a lot of reading (R).
PROC20	(P) I seldom daydream.
PROC21	(W) I spend very little time attempting to increase my vocabulary (R).
PROC22	(P) My thinking often consists of mental "pictures" or images (R).

(W)= Verbal items; (P)= Visual items

4.9.2 Social Desirability Bias

Social desirability bias is not a construct presented as part of the conceptual framework. It is a summated ratings scale purporting to measure the degree to which people describe themselves in socially acceptable terms in order to gain the approval of others (Crowne and Marlowe, 1960). The original version of the scale has thirty-three items and uses a True/ False response format. However, abbreviated versions have typically been used in marketing research and Likert-type response scales have been applied in a few cases. The scale was developed by Crowne and Marlowe (1960) by generating items related to behaviors that are culturally sanctioned but unlikely to occur. Most of the studies have not provided information regarding the reliability of the scale. In the present study, a reduced ten-item version of the scale used by Goldsmith and Hofacker (1991) in a True/ False format was adopted. The authors reported a significant positive correlation between the social desirability scale and a lie scale (Eysenck, 1958), which provides some evidence of the ten-item scale's convergent validity. No specific examination of the scale's validity was conducted in the other studies. However, the scale has typically been used to provide evidence of other scales' discriminant validity: if the correlation between scores on the social desirability scale and another measure is high then that suggests the latter is measuring respondents' desire to answer in socially acceptable ways.

Respondents should receive a point each time they answer in a socially desirable manner. The answers suggest social desirability if respondents answer as indicated at the end of each item. For example, if a respondent answers "False" to item 1, that is considered to be answering in a socially desirable manner.

Please indicate whether the following statements are true or false:	
SOC1	I like gossip at times. (F)
SOC2	There have been occasions when I took advantage of someone. (F)
SOC3	I'm always willing to admit it when I made a mistake. (T)
SOC4	I always try to practice what I preach. (T)
SOC5	I sometimes try to get even rather than forgive and forget. (F)
SOC6	At times I have really insisted on having things my way. (F)
SOC7	There have been occasions when I felt like smashing things. (F)
SOC8	I never resent being asked to return a favour. (T)
SOC9	I have never been irked when people expressed ideas very different from my own. (T)
SOC10	I have never deliberately said something that hurt someone's feelings. (T)

4.9.3 Demographic Variables

The last part of the section of the web-experiment intending to measure individual differences collected information about the demographic profile of the sample, as well as the way they accessed the survey. Nominal scales were used to measure these demographic variables. Effectively, there were five questions in this part of the survey, concerning respondents' age, education, nationality, gender and mode of access.

While the first section of the web-experiment intended to collect data on respondents' individual traits, the second section of the survey aimed to evaluate participants' responses to the new products after viewing each experimental stimulus.

4.9.4 Emotional Responses

In order to assess the emotions elicited by the novel products, a combination of scales were used to appraise three key emotional responses: discouragement, scepticism and positive emotions. Particularly noteworthy is that these measures refer to the subjects' reactions to the ads, not to how they would describe the ads. These variables are theoretically distinct from constructs that measure respondents' attitudes toward the ad (Mitchell and Olson, 1981).

Firstly, discouragement was measured using a three-item scale developed by Murry and Dacin (1996) based on Plutchik's (1980) original set of adjectives. The respondents were asked whether they felt "puzzled", "discouraged" and "bewildered" while reading each advert. Murry and Dacin (1996) reported a reliability of 0.91. Furthermore, although no explicit examination of the scale's validity was made by the authors, they conducted a confirmatory factor analysis on a full set of 25 emotion-related items including our three items. As expected, a second-order negative emotion factor was found to underlie the discouragement subscale.

Second, scepticism was measured by means of a three-item scale (Holbrook and Batra, 1987). Respondents were asked how "sceptical", "suspicious" and "distrustful" they felt while reading each ad. Holbrook and Batra (1987) compiled a list of different types of emotions identified in an exhaustive review of the literature. The three items were selected from this list so as to reflect the scepticism construct. The authors conducted reliability tests on their overall measure of emotional response which includes 94 items and report a Cronbach alpha of 0.81 which is likely to indicate a good reliability for the scepticism scale. As the validity of the scale has not been thoroughly examined, factor analysis will be used to evaluate the scale's unidimensionality.

Finally, positive emotions were assessed with a four-item scale (Edell and Burke, 1987). Respondents reported how "happy", "pleased", "contented" and "proud" they felt. Edell and Burke (1987) report Cronbach alphas of 0.98 (n=29) in their first study and 0.95

(n=32) in their second study for the full 32-item scale, which is likely to indicate a high reliability for the reduced four-item scale.

Thinking back on how you felt while reading the advert, please use the following scales to describe how you felt:	
DIS1	Puzzled
DIS2	Discouraged
DIS3	Bewildered
SKE1	Sceptical
SKE2	Suspicious
SKE3	Distrustful
PEM1	Happy
PEM2	Pleased
PEM3	Contented
PEM4	Proud

4.9.5 Attitude to the Product

The scale used to measure attitude to the product consists of four bi-polar adjectives (Holbrook and Batra, 1987). Various versions of bi-polar scales have been used in the literature to assess attitude to the product, also referred to as product evaluation (Muthukrishnan and Ramaswami, 1999). The various versions of the scale are similar in that they are not specific to any particular product or brand under investigation. One must acknowledge that many other semantic differential scales have been used in the literature to measure attitude to the product (Aaker and Maheswaran, 1997; Mitchell, 1986), however the version used by Holbrook and Batra (1987) displays one of the highest reliability with a Cronbach alpha of 0.98, suggesting a high internal consistency for this measure. Holbrook and Batra (1987) report a mean inter judge reliability for the four items of 0.58 (median = 0.58). This approaches Nunnally's (1967) criterion of 0.60 for scales still under development and, in light of the small sample of 12 judges, argues for a fair degree of homogeneity across people.

How would you describe your attitude toward the product?	
ATT1	Bad/ Good
ATT2	Unfavourable/ Favourable
ATT3	Dislike/ Like
ATT4	Negative/ Positive

4.9.6 Behavioural Intent

Behavioural intent towards the product was measured using a four-item scale. This four-item scale is combined of two scales: a) a three-item scale extracted from a five-item scale used by Ait El Houssi, Morel and Hultink (2005) to measure product preference: "This is a product I would like to try/ I would like to have more information about this product/ I would like to see a demonstration of this product" (Cronbach alpha = 0.84 for the 5-item scale) and b) a one-item scale intending to measure word-of-mouth intention (Smith, 1991). Thus, the scale covers behavioural intent, including trial intent, need for information and demonstration and intention to recommend. The scale will be examined for reliability using Cronbach alpha and for reliability using exploratory factor analysis to guarantee its unidimensionality.

Please indicate the extent to which you agree with the following statements by clicking on your answer.	
BEH1	This is a product I would like to try
BEH2	I would like to have more information about this product
BEH3	I would like to see a demonstration of this product
BEH4	I would recommend this product to a friend

4.9.7 Product Comprehension

Product comprehension was measured by a six-item scale composed of two existing scales: a 2-item scale (Phillips, 2000) and a 4-item scale (Moreau, Lehmann and Markman, 2001). The 2-item scale was developed by Phillips (2000) and used by Hoeffler (2003) to assess respondents' comprehension level of the description of product concepts for RNPs and INPs. Phillips (2000) reported a Cronbach alpha of 0.89 (n=96).

Because this scale was only composed of two items and considering that the scale would be submitted to exploratory factor analysis for potential item reduction, the researcher decided to complement the scale with another 4-item scale intending to assess product comprehension. The 4-item scale was adapted from a 7-item scale developed by Moreau, Lehmann and Markman (2001). The authors report a Cronbach alpha of 0.80 for the 7-item scale. Factor analysis will also be used to evaluate the scale's unidimensionality.

Please complete the following statements:

I found the product description:

COM1 Difficult to understand/ Easy to understand

COM2 Confusing/ Straightforward

Please indicate the extent to which you agree with the following statements:

COM3 After reading the advert, I have a very strong understanding of how this product works.

COM4 After reading the advert, I would be able to use the product.

COM5 After reading the advert, I understand what the main features of this product are.

COM6 After reading the advert, I understand what the main benefits of this product are.

Table 4.9-1 presents a summary of the operationalisation of the constructs in the experiment.

TABLE 4.9-1 OPERATIONALISATION OF THE CONSTRUCTS

Construct	Operationalisation	Level of Measurement	Literature
Individual Style of Processing	22 items, 4-point scale: Always True-Always False	Interval	Childers, Heckler and Houston (1985)
Discouragement	3 items, 7-point scale: Did Not Feel At All-Felt Very Strongly	Interval	Murry and Dacin (1996)
Scepticism	3 items, 7-point scale: Did Not Feel At All-Felt Very Strongly	Interval	Holbrook and Batra (1987)
Positive Emotions	4 items, 7-point scale: Did Not Feel At All-Felt Very Strongly	Interval	Edell and Burke (1987)

Product Comprehension	6-item, 7-point scale 2 items: bi-polar adjectives 4 items: Strongly Disagree-Strongly Agree	Interval	Phillips, 2000; Moreau, Lehmann and Markman (2001)
Product Attitude	4 items, 7-point scale: bi-polar adjectives	Interval	Holbrook and Batra (1987)
Behavioural Intent	4 items, 7-point scale: Strongly Disagree-Strongly Agree	Interval	Ait El Houssi, Morel and Hultink, 2005; Smith, 1991
Age	Respondents were asked to write down their age	Nominal	Various Studies
Education	6 options to choose from	Nominal	-
Nationality	Wide range of options to choose from	Nominal	-
Gender	2 options to choose from	Nominal	-
Mode of Access	5 options to choose from	Nominal	-

4.9.8 Physiological Measures

While study 1 only collected verbal measures using the questionnaire presented in details in the prior sections, study 2 gathered both verbal measures and physiological measures (i.e. eye movements). An infrared corneal reflection eye tracking system was used to display the stimuli and collect eye movement recordings (see Muller et al., 1993 for details). This system sampled eye positions every 4 milliseconds, with an average error in determining the location of fixation of less than 0.5 degrees.

According to marketing research in the domain of visual attention, the evaluation of an advertisement's potential to gain attention should be based on the duration, position, and pattern of these fixations on the stimuli (Pieters, Rosbergen and Wedel, 1999). However, while basic research on reading (Rayner 1995) and visual scanning (Viviani 1990) typically analyzed the exact position and duration of each fixation, there are advantages to assigning fixations to areas instead of retaining their exact positions in the study of print advertising. First, dividing the stimuli into zones of interest is consistent with the hypotheses developed in the conceptual framework which intend to examine the correlations between key elements of the adverts (i.e. pictorial or text depending on the condition) and respondents' comprehension of the product. Second, in advertising development, the aim is to understand how frequently consumers attend to advertising elements, such as product, headline, and pictorial, rather than to know the exact coordinates of consumers' fixations (Pieters and Wedel, 2004). Third, with the number of fixations and saccades that occur during a single exposure to an advertisement, the dimensionality of the data becomes prohibitively large when based on exact fixation positions instead of on a limited number of areas, and can be difficult to analyze (Pieters, Wedel and Zhang, 2007).

Consequently, each advert was divided into zones of interest (i.e. headline, pictorial, text and brand) using the Lookzones function of the GazeTracker software (GazeTracker Reference Manual, 2005). Lookzones, or regions of interest, generate statistics only for the section of a stimulus that the Lookzone covers. Lookzones may be of any size or shape, and may be created either before or after the data is collected.

As a result, the key measures obtained with the ASL eye-tracking instrument were:

(i.) Fixation locations and durations for the overall stimulus;
(ii.) Fixation locations and durations for each Lookzone (i.e. fixation density)
(iii.) The "scanpath" (Noton and Stark, 1971; Stark, 1994), or sequence of fixations and saccades in time and space.

Fixation duration has been identified as the key operational measure of visual attention (Rayner, 1998) and will thus be used to measure visual attention in the present research.

4.10 PRETESTING THE EXPERIMENTS

Essentially, the pre-test consists in conducting the experiment in a small-scale study to examine how well it works without consuming large amounts of time and expense. Satisfactory pre-testing is essential to the success of any data collection (Churchill and Iacobucci, 2004; Hunt, Sparkman and Wilcox, 1982; Reynolds, Diamantopoulos and Schlegelmilch, 1993).

It has been suggested that there be two pretests (Churchill and Iacobucci, 2004). The first of these should be by personal interview, regardless of the actual mode of administration. This type of pre-test, also called "protocol" (Diamantopoulos, Reynolds and Schlegelmilch 1994) can provide information on problematic questions, confusion, and formatting issues (such as the sequencing of questions). Assuming any changes are minor, the modified instrument can then be pre-tested using the actual method to be used in the main data collection process, so as to uncover problems in administration of the Web experiment (Churchill and Iacobucci, 2004). Furthermore, study 2 will also need to be pre-tested, both to verify that the experimental procedure works smoothly and to get a better idea of the time required to conduct the eye-tracking procedure.

Therefore, the development procedure followed a three-stage process, discussed in the following sections.

4.10.1 Protocols

Protocols consist of watching a respondent complete the experiment and receive feedback on any issues as the respondent proceeds through each stage of the experiment (Diamantopoulos, Reynolds and Schlegelmilch 1994). While a large amount of crucial information can be generated by protocols, it should be acknowledged that the presence of the researcher may bias the feedback given as the respondent may not want to criticize the questionnaire in front of its creator. The protocols were conducted with six participants who were all students at Aston University.

Positive comments from the interviewees about the interest of the questionnaire were encouraging, as they found the new products presented interesting and asked for more information about these products. However, the protocols revealed some confusion among the participants in terms of the experimental procedure. Specifically, at the start of the experiment the respondents were not sure how many adverts they would have to evaluate. They also suggested the researcher gave an indication of the time the experiment would take to complete so that respondents could organize their schedule accordingly. Following these comments, the researcher added a section at the beginning of the experiment which read:

"In the first part of the questionnaire, you will be asked to answer demographic and personality questions. In the second part of the questionnaire, you will view three advertisements. After each advertisement, you will be asked to answer a short questionnaire which will examine your reactions to the advert. The questionnaire takes approximately 20 minutes to complete".

Moreover, the respondents noted that the adverts were not ready for commercialization but could be regarded as drafts of marketing communications that companies use to test the potential of future innovations. To ascertain that participants' reactions to the products were not negatively affected by this impression, a note was added before the respondents viewed the adverts:

"You will now view three adverts which will be displayed on the screen of your computer. Please note that these are not in their finished form but rather drafts of marketing communications that companies may use to test the potential of products that they are planning to launch".

Finally, the researcher had originally set a forced exposure to the adverts to 40 seconds each. However, the respondents reported that they did not have enough time to read the verbal conditions and had too much time to read the visual conditions. This issue was to be expected as it takes more time to extract information from text that from pictures (Rayner, 1998). Therefore, after discussing this issue with the respondents, the decision was made to allow participants to read the adverts at their own pace as opposed to force exposure for a limited period of time. This decision intended to increase the external validity of the experiment, as in a real life setting consumers choose for how long that attend to a print advertisement. This choice is also supported by previous research on consumer responses to RNPs (Gregan-Paxton and Min Zhao, 2005; Roehm and Sternthal, 2001) and studies using eye tracking procedures (Rayner et al., 2001) which allowed participants to read the adverts at their own pace. Following these improvements, the experiment was prepared for the next stage of the pretest.

4.10.2 Web Experiment Pre-Testing

Following the personal interview stage of the pre-test process, a small-scale web experiment was undertaken in order to anticipate any potential problems in the final experimental design. This pre-test was conducted using a sample of 65 students from Aston University (61% were male). The sample was collected using a snowball technique. The researcher located an initial set of fifteen respondents who forwarded the web-experiment to other potential respondents (Churchill and Iacobucci, 2004).

One of the most positive aspects of the pre-test was that no real modifications to the questionnaire instrument itself or to the stimuli were deemed necessary. All the scales were filled in correctly by the respondents. However, one change was made to the programming of the experiment as the pilot study revealed that the questionnaire could only be opened on the web engine Internet Explorer but not on Mozilla Firefox. The html language script was modified to ascertain that the experiment was compatible with Mozilla Firefox for the main study.

4.10.3 Pre-Testing of the Eye-tracking Experiment

Separate pre-tests were organized for the eye-tracking experiment. The researcher received a training session on the eye-tracker, but it was important to get some practice on the equipment before the actual data collection could start. Pre-tests were first organized with a colleague from the Marketing Department at Aston Business School who volunteered as a participant[8]. These were very useful to help the researcher familiarize herself with the eye-tracking equipment. In particular, several sessions were indispensable for the researcher to fully master the calibration process. Furthermore, issues related to the set-up of the lab, such as the lighting of the room or the position of the eye-tracking camera and of the MHT sensor, were fixed at that point in time. As a result of these sessions, the researcher developed a step-by-step guide to using the eye-

[8] The researcher wishes to thank Laura Chamberlain, Research Fellow at Aston Business School, for her precious help during the pre-testing of the eye-tracking experiment.

tracker to guarantee the uniformity of the experimental procedure during the main data collection (see appendix 4).

These extensive pre-tests were followed by another two sessions with two volunteers who were students at Aston University. These did not reveal any further issues with the eye-tracking experimental procedure. As a result of these pre-tests, both studies 1 and 2 were fully ready for the main data collection process.

4.11 IMPROVING THE RESPONSE RATE FOR THE WEB-EXPERIMENT

A variety of techniques were used to try and increase participation to the web experiment (Churchill and Iacobucci, 2004). These techniques were crucial to reach a sample size of 414 participants and detect even small effect sizes at the analysis stage (see section 4.4.3).

- **Non-Monetary Gifts**

Monetary incentives were not used as they would have proved too expensive, and there is some doubt over their utility in increasing response rates (Diamantopoulos and Schlegelmilch, 1996). Instead, a more cost-effective option was chosen, which was to enter respondents in a prize draw. After careful consideration, the prizes to win were as follow:

✓ Pilot study: 1 Ipod Shuffle (value: £55)

✓ Main study: 2 iPod Nano 4GB (value: £129 each) and 3 iPod Shuffles (value: £55 each)

[Source: Apple Store UK (http://store.apple.com/Apple/WebObjects/ukstore accessed 10/01/2007]

These products were likely to be attractive to both students and members of staff.

- Accompanying e-mail

To recruit the participants to the Web-experiment, an e-mail was sent to all students and staff at Aston University. The e-mail gave an indication of the approximate time it would take to complete the experiment, details about the prize draw and stressed the contribution of the study to the area of consumer response. The specific aim of the study which was to examine responses to RNPs was not discussed to avoid causing any bias in consumer reactions. To randomize the allocation of the respondents to the experiments, respondents were then asked to pick a number from 1 to 6 and click on the associated experiment.

Two versions of the accompanying email were crafted to specifically target students vs. members of staff. Although the content of the email was fairly similar, the email targeted to members of staff was written in a more professional manner. Furthermore, the email targeted to the students focused more on the prize draw while the email targeted to members of staff placed greater emphasis on the contribution to research and used an emotional appeal to remind members of staff of their own experience collecting data (i.e. "You may have already experienced how difficult it is to collect data in the context of your own research-therefore I hope you will agree to help me by filling in this on-line experiment!). The email sent to the students is presented in table 4.11-1 and the email sent to the members of staff is detailed in table 4.11-2.

TABLE 4.11-1 ACCOMPANYING EMAIL TARGETED TO STUDENTS

Hello Everyone

Want the chance to win an IPod? Just give me 20 minutes of your time and a brand new IPod NANO 4GB could be yours!

Simply complete an online experiment and you will be entered into the prize draw. You will also be making a valuable contribution to the advancement of research in the area of consumer response.

All you need to do is to pick a number between 1 and 6 ...

Now, click on the link next to the number you chose and complete the experiment:

1 http://amirs.aston.ac.uk/survey/SF/1/intro.html

2 http://amirs.aston.ac.uk/survey/SF/2/intro.html

3 http://amirs.aston.ac.uk/survey/SF/3/intro.html

4 http://amirs.aston.ac.uk/survey/SF/4/intro.html

5 http://amirs.aston.ac.uk/survey/SF/5/intro.html

6 http://amirs.aston.ac.uk/survey/SF/6/intro.html

(If clicking doesn't work, just "Copy" and "Paste" the link into your Web browser's address bar)

Important: I am only interested in your own thoughts based on the material provided. Please do not look for external information while filling in the questionnaire. If you are interested in the products presented, please feel free to contact me after you have finished the experiment!

If you have any questions, please feel free to email me.

Thank you!

Stephanie Feiereisen
Doctoral Researcher
Marketing Group
Aston Business School

PS. Remember - you could win one of 2 new iPod NANOs 4GB in the colour of your choice (value: £129 each) of one of 3 new iPod Shuffles(value: £55 each)

TABLE 4.11-2 ACCOMPANYING EMAIL TARGETED TO MEMBERS OF STAFF

Dear all

My name is Stephanie Feiereisen and I am a doctoral researcher in the area of consumer behaviour at Aston. In the context of my research, I have developed an on-line experiment targeted to members of staff at Aston University.

You may have already experienced how difficult it is to collect data in the context of your own research-therefore I hope you will agree to help me by filling in this on-line experiment! The survey takes about 20 minutes to complete.

Your contribution is highly appreciated and your input will provide valuable insights to the area of consumer response!

As a "thank you", you will also be entered into a prize draw to win one of 2 new iPod NANOs 4GB in the colour of your choice (value: £129 each) or one of 3 new iPod Shuffles (value: £55 each)

All you need to do is to pick a number between 1 and 6 ...

Now, click on the link next to the number you chose and complete the experiment:

1 http://amirs.aston.ac.uk/survey/SF/1/intro.html

2 http://amirs.aston.ac.uk/survey/SF/2/intro.html

3 http://amirs.aston.ac.uk/survey/SF/3/intro.html

4 http://amirs.aston.ac.uk/survey/SF/4/intro.html

5 http://amirs.aston.ac.uk/survey/SF/5/intro.html

6 http://amirs.aston.ac.uk/survey/SF/6/intro.html

(If clicking doesn't work, just "Copy" and "Paste" the link into your Web browser's address bar)

Important: I am only interested in your own thoughts based on the material provided. Please do not look for external information while filling in the questionnaire. If you are interested in the products presented, feel free to email me after you have finished the experiment!

If you have any questions, please do not hesitate to ask.

Thank you for your contribution!

Stephanie Feiereisen
Doctoral Researcher
Marketing Group
Aston Business School

- **Assurance of Confidentiality**

The ethical guidelines outlined at the beginning of the experiment intended to circumvent possible concerns over confidentiality. The experiment was not anonymous as respondents were required to provide their email address if they wanted to be considered for the prize draw connected to the experiment. However, participants were reassured that the prize draw entry details would be kept separate from their answers to the questionnaire and that the data would be related to their participant number, not to their name.

4.12 CHAPTER SUMMARY

The chapter presented the philosophical underpinnings and the methodological approach of the research. Consistent with the objectives of the research and with the conceptual frameworks developed, two experiments were designed, which aim at acquiring knowledge about the process via which consumers construct their cognitive and attitudinal responses toward RNPs. Study 1 is a web experiment which gathers verbal measures, including participants' trait characteristics and their responses towards the RNPs presented. Study 2 is an eye-tracking experiment conducted in a laboratory which collects both verbal (i.e. self-reports) and physiological measures (i.e. eye movements).

Study 1 uses a mixed design with presentation format (words vs. pictures) and product type (hedonic vs. utilitarian vs. hybrid) manipulated as between-subjects factors and learning strategy (analogy vs. mental simulation vs. no analogy/ no mental simulation) as within-subject factors. The design results in six different groups of respondents. Due to the objective of study 2 which is to discover correlation patterns between product comprehension and attention to the message to be used as a guide for future research, a smaller design is developed for study 2. Both studies are conducted with a convenience sample, i.e. students and members of staff at Aston University for Study 1 and students for study 2. Based on a priori power analysis the researcher aims at a minimum of 414 participants for study 1, while study 2 will be conducted on a much smaller scale with fifteen to twenty participants. In order to measure the effects of the experiments on respondents, the researcher adapted self-report measures from the literature. A series of pre-tests and pilot study were also conducted to ascertain the validity of the stimuli developed and to test both experiments before the main data collection. Overall, the chapter presents a comprehensive and systematic guide to the design of a web-experiment and to the experimental procedure using an eye-tracking technique.

CHAPTER FIVE

DESCRIPTIVE ANALYSIS

CONTENTS: The chapter presents the preliminary analyses conducted before testing the hypotheses and propositions developed in the conceptual frameworks. Section 5.1 introduces the content of the chapter. Section 5.2 presents the design and sample used in Experiment 1 (Section 5.2.1), along with a demographic profile of the respondents (Section 5.2.2). Section 5.2.3 discusses the psychometric properties of the main constructs. Section 5.2.4 presents individual scale results using EFA while section 5.2.5 focuses on the results of group analyses using EFA. Section 5.2.6 is a descriptive analysis of the constructs of interest. Section 5.3 presents the design and sample used in Experiment 2 (Section 5.3.1) and a demographic profile of the respondents (Section 5.3.2). Section 5.3.3 presents the psychometric properties of the main construct. Section 5.3.4 is a descriptive analysis of the constructs. Section 5.4 summarizes the chapter.

5.1 INTRODUCTION

In the previous chapter, details were given of the general methodology used in the present research. The following two chapters intend to clearly present the analysis of the data obtained, and to detail the results of this analysis. The analysis is presented in two distinct sections, each discussed in a separate chapter. The first section relates to the preliminary analyses conducted prior to testing the hypotheses and propositions developed and the second section focuses on the testing of the hypotheses and propositions. The present chapter is concerned with the preliminary analysis section. First, the participants to both experiments were profiled according to their age, education, gender, occupation and nationality. To present the data more clearly, and aid its interpretation, graphical techniques were used. The second task of the preliminary analysis was to explore and develop the measures used in both experiments by means of exploratory factor analyses (EFA). Descriptive analyses were conducted and focused on the distribution of the measures, including a search for outliers and statistical testing of the distribution. These analyses are essential as the testing of the hypotheses will include analyses of variance

(ANOVA) techniques. Therefore, the identification of the characteristics of the variables of interest is necessary in order to identify, and if possible minimise, any violations of the test assumptions and enable a more robust interpretation of the results.

5.2 EXPERIMENT 1

5.2.1 Design and Sample

Emails were sent to all students and members of staff at Aston University with links to the Web Experiment. One-thousand two hundred and nine (1209) responses were reached. However, three hundred fifty one (351) respondents had to be eliminated because the respondents only filled in the first section of the questionnaire related to personality measures. Hence, the first experiment included eight hundred fifty eight (858) valid responses. This is largely above the minimum of 414 recommended by the GPOWER analysis (see Chapter 4, Section 4.5.3). However, some of the participants did not complete the questionnaire for the three adverts, resulting in a number of cases of two thousand two hundred thirty (2230). Therefore, the sample size is adequate for the analysis of a 2 between subjects (presentation format: visual vs. verbal) x 3 within subjects (learning strategy: mental simulation vs. analogy vs. no analogy no mental simulation) x 3 between subjects (product type: hedonic vs. utilitarian vs. hybrid) design. The experimental cells and cell sizes are presented in Table 5.2-1. As can be seen in the table, all cell sizes are equal to or above 69, the minimum cell size recommended by the GPOWER analysis (see Chapter 4, Section 4.5.3).

TABLE 5.2–1 EXPERIMENTAL CELLS AND CELL SIZES

Group 1	**Visual M S Oven (119)**	**Visual Analogy Digipen (104)**	**Visual No Analogy/ No M S Video Glasses (98)**
Group 2	**Visual No Analogy/ No M S Digipen (95)**	**Visual M S Video Glasses (86)**	**Visual Analogy Oven (84)**
Group 3	**Visual Analogy Video Glasses (136)**	**Visual No Analogy/ No M S Oven (113)**	**Visual M S Digipen (100)**
Group 4	**Verbal M S Oven (170)**	**Verbal Analogy Digipen (145)**	**Verbal No Analogy/ No M S Video Glasses (145)**
Group 5	**Verbal No Analogy/ No MS Digipen (119)**	**Verbal M S Video Glasses (102)**	**Verbal Analogy Oven (100)**
Group 6	**Verbal Analogy Video Glasses (189)**	**Verbal No Analogy/ No M S Oven (165)**	**Verbal M S Digipen (160)**
			Total 2230

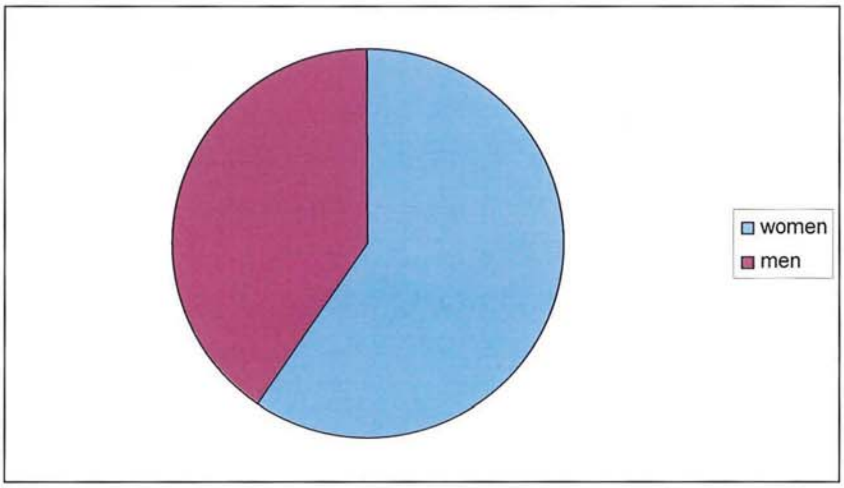
5.2.2 A Demographic Profile of the Respondents

In this section the responses of the participants are described by the variables of gender, occupation, education, age and nationality.

5.2.2.1 Respondents' Gender

59.4% of the respondents were women and 40.6% men. Figure 5.2-1 shows the distribution of gender among the participants to the experiment. It can be seen that women slightly outnumbered men.

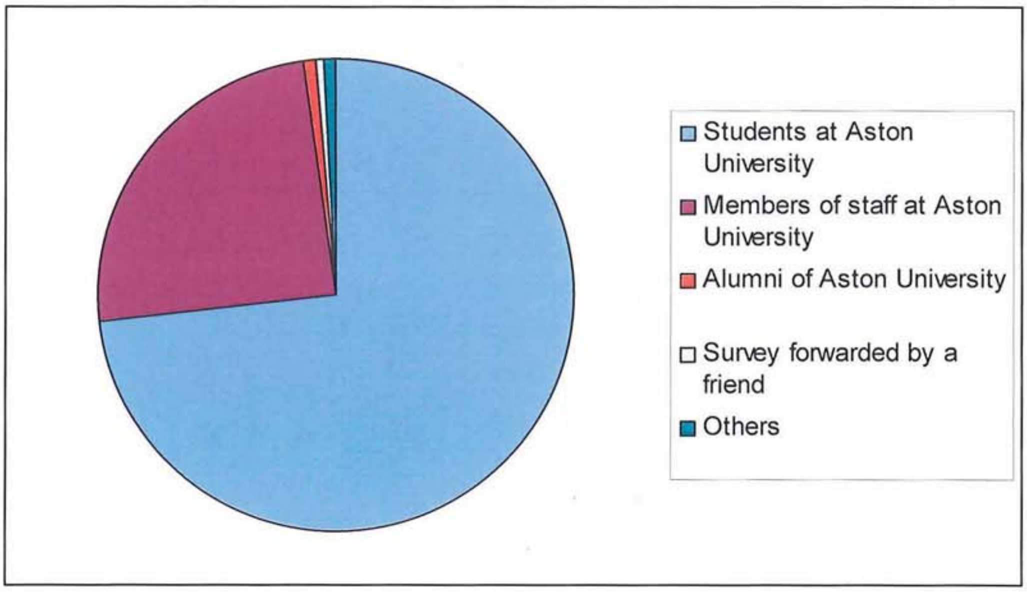
Figure 5.2-1 Pie Chart of Respondents' Gender



5.2.2.2 Respondents' Occupation (Method of Access to the Web Experiment)

73% of the respondents were students at Aston University and 24.8% were members of staff at Aston University. There were very few respondents that were neither students nor members of staff at Aston University (2.2%) hence no significant impact of these respondents on the experimental results is expected. These respondents were either alumni of Aston University (0.7%), were forwarded the survey by a friend (0.8%) or belonged to another category altogether (0.7%).

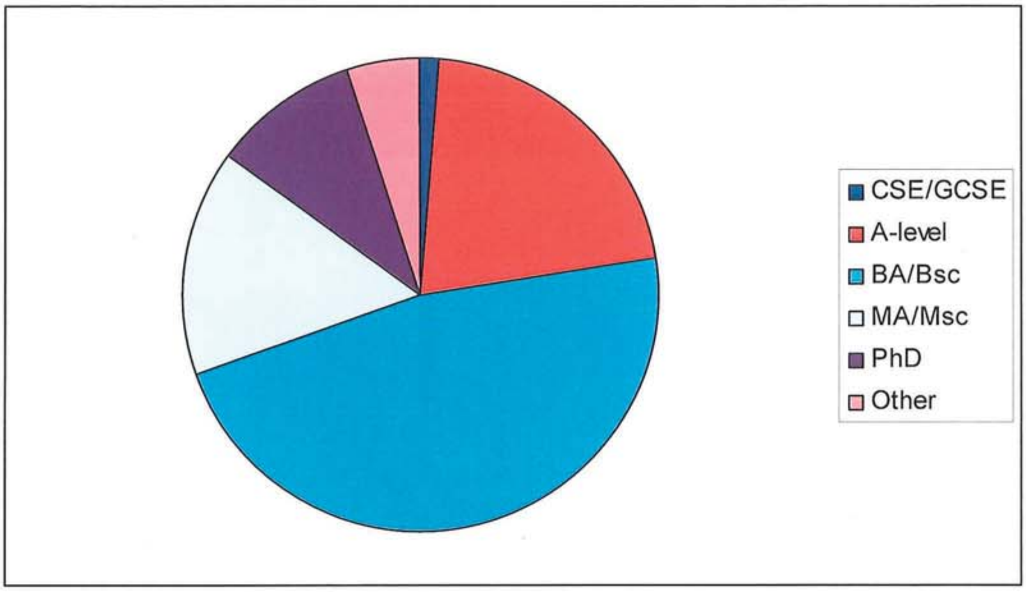
Figure 5.2-2 Pie Chart of Respondents' Occupation/ Method of Access to the Web-Experiment



5.2.2.3 Respondents' Education

The respondents were highly educated, with 46.4% holding a BA/ Bsc, 15.5% a MA/ Msc, 20.8% and 10% a Phd, 1.5% a GCSE and 4.8% another type of education. This is not a surprising finding considering that most participants were university students (undergraduate and postgraduate) and members of staff at university. This is consistent with the aim of the study which is to examine consumer responses to RNPs, as early adopters of complex innovative products tend to have a higher education and higher status than non-adopters (Adcock Hirschman and Goldstrucker 1977).

Figure 5.2-3 Pie Chart of Respondents' Education

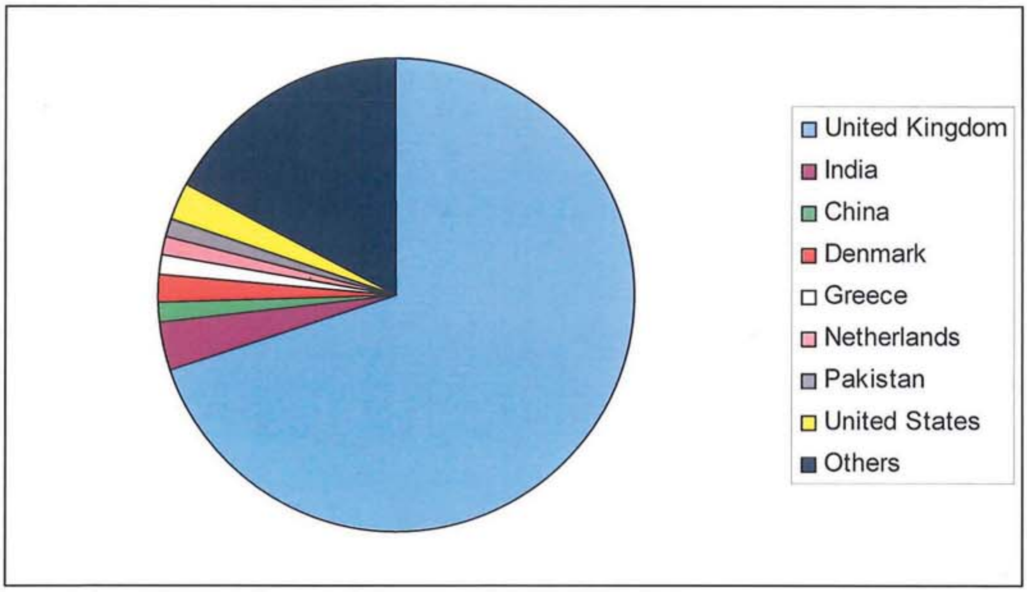


5.2.2.4 Respondents' Nationality

Most of the participants to the Web experiment were British (69.7%). The other participants were from a variety of countries, including India (3.4%), China (1.3%), Denmark (1.9%), Greece (1.4%), Netherlands (1.2%), Pakistan (1.5%), the United States (2.4%). Because there were very few members of each country apart from the United Kingdom, a comparison of the results per country was not deemed appropriate.

The spread in nationalities is not surprising. Most of the respondents were British, reflecting the majority of undergraduate students and staff. France, Germany and the Netherlands are countries which have exchange agreements with Aston University and this result is likely to reflect the participation of exchange students or of members of staff from these countries. China, Pakistan, India and Greece are also nationalities which are well represented among undergraduate students, members of staff and in particular among postgraduate students.

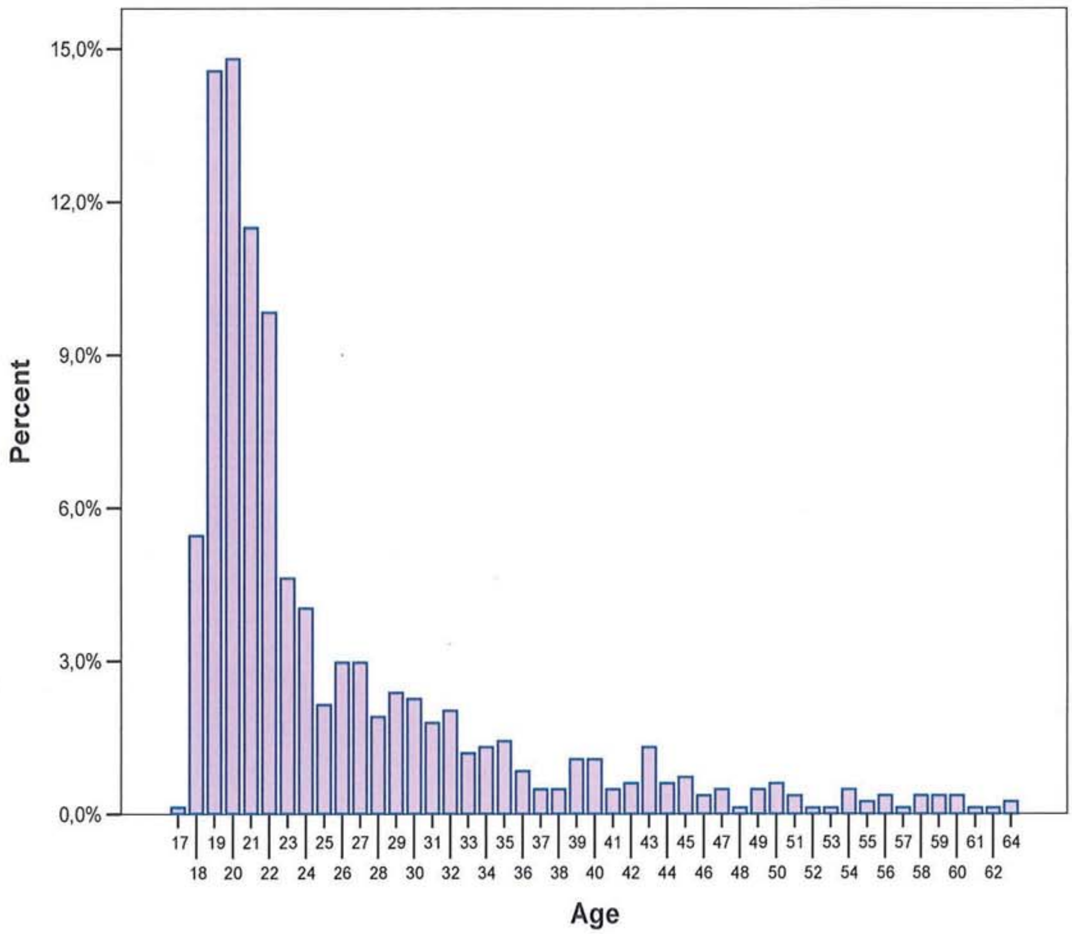
Figure 5.2-4 Pie Chart of Respondents' Nationality



5.2.2.5 Respondents' Age

The respondents were aged from 17 to 64 years old and 66.9% of the respondents were aged below 25. Figure 5.2-5 shows the distribution for respondents' age, measured in years. As can be seen in figure 5.2-5, the distribution is positively skewed with the frequent scores clustered at the lower end (skewness=1.887). The distribution is also leptokurtic, looking quite pointy with most of the ages concentrated between 18 to the late 20s (kurtosis=3.266). The relative asymmetry in the distribution is reflected in the difference between the median age (22) and the mean (25.77). The clustering of the scores at the lower end can easily be explained as the survey was primarily targeted to university students. This is consistent with the aim of the study as young, highly educated individuals are a key target for companies planning to introduce a new product in the marketplace.

Figure 5.2-5 Histogram of Respondents' Age



The characteristics of the sample are summarized in table 5.2-2.

TABLE 5.2-2 SAMPLE CHARACTERISTICS

Variables		**Counts**	**%**
Gender	Male	345	40.6
	Female	505	59.4
Occupation	Aston student	621	73
	Aston staff	211	24.8
	Aston alumni	6	0.7
	Forwarded by a friend	7	0.8
	Other	6	0.7
Education	CSE/ GCSE	13	1.5
	A level	177	20.8
	BA/ Bsc	396	46.4
	MA/ Msc	132	15.5
	PhD	85	10
	Other	50	4.8
Nationality	United Kingdom	598	69.7
	China	11	1.3
	Denmark	16	1.9
	Greece	12	1.4
	India	29	3.4
	Netherlands	10	1.2
	Pakistan	13	1.5
	United States	21	2.4
	Others	148	17.2
Age	17-25	574	66.9
	26-35	173	20.2
	36 +	111	12.9

5.2.3 Psychometric Properties of the Main Constructs

Existing measures were used to assess respondents' individual trait characteristics and responses to the stimuli. The following section reports the results of the analysis of the properties of these measures. The main purpose was to verify their properties for the present research, since all of the scales have previously been developed and have already been published in highly regarded journals. The procedure focused on examining the properties of the scales and on conducting additional analyses (i.e. exploratory factor analysis and social desirability bias testing).

5.2.3.1 Unidimensionality and Validity

The unidimensionality of a construct refers to the existence of a single trait or construct underlying a set of measures (Hattie 1985). For instance, a multi-item measure of attitude to the product should tap respondents' attitude toward the product only, and nothing else in a substantive manner. However, unidimensionality is only one of the indicators of a scale's validity and acceptable unidimensionality does not totally guarantee the validity of a given measure (Peter, 1981). Therefore, unidimensionality is a necessary but not sufficient condition to establish validity. Validity is defined as whether a multi-item measure of a construct actually measures the construct it intends to (Churchill, 1999). Ascertaining the validity of the measures used in the present study is essential.

Information on the validity of a scale can be obtained through a variety of methods, including the examination of the correlation of each item with *social desirability bias* (SDB) (Spector 1992). SDB is an individual trait which assesses whether respondents are likely to respond to measures in a 'socially desirable' manner, that is to say to make them look better by agreeing with favourable items about themselves (Spector 1992). If a measure is influenced by SDB, then by definition it cannot be unidimensional or valid.

Dimensionality and validity can also be examined by means of exploratory factor analysis (EFA) and internal consistency. Internal consistency analysis investigates whether the items from a scale have high intercorrelations with each other (DeVellis, 1991). Internal consistency is usually measured (within marketing research in particular) with coefficient alpha (Churchill 1979). Cronbach alpha assesses the reliability of the scale, or the extent to which independent but comparable measures of the same trait or construct of a given object agree (Churchill, 1979).

EFA however, taps more directly into the unidimensionality issue, by using the inter-item correlations to determine whether there is an underlying latent variable responsible for the pattern of correlations observed in the data (Sharma, 1996). By examining EFA results, a researcher can gain a picture of whether there is a single factor underlying the measure (i.e. unidimensional), or multiple factors (i.e. multidimensional).

5.2.3.2 Analysing Social Desirability Bias

The potential confounding of responses by social desirability response bias was assessed, as has been advocated in consumer research (Mick, 1996). Item properties that interfere with objectively identifying and reporting one's actual thoughts, feelings and behaviours detract from the validity of the item. Social desirability is regarded as such a threat as respondents may tend to endorse items of high social desirability and not endorse items of low social desirability regardless of whether the item describes their actual behaviour (Edwards, 1990). Strong correlations between social desirability bias and another variable are likely to indicate either self-deception about, or deliberate misrepresentation of, one's actual thoughts, feelings and behaviors (Borkenau and Ostendorf, 1989). Each item of the existing scales was examined for possible contamination by SDB. SDB was measured by a 10-item scale identified by Strahan and Gerbasi (1972) as a reliable short version of the 20-item Marlowe-Crowne original version. In order to detect the potential presence of SDB, each scale item was correlated with the SDB measure, with large and significant correlations taken as indications that the items were contaminated with SDB. Due to the large sample size, even very small correlations were likely to reach significance. In large samples (100+), very small correlations may be statistically significant. Thus, examining the correlation coefficients may be more appropriate than relying only on the significance level (Pallant, 2005, p.127).

According to the guidelines developed by Cohen (1988), for a small correlation the correlation coefficients range from 0.10 to 0.29; for a medium correlation from 0.30 to 0.49; and for a strong correlation from 0.50 to 1. Out of all the items used in the studies, no item reached a medium or strong correlation with SDB. Only three items reached a small correlation with SDB, and all three items belonged to the individual style of processing scale. To get an idea of how much variance each item shared with SDB, the coefficients of variance were calculated by squaring the correlation coefficients and multiplying them by 100 (Pallant, 2005, p. 127). The item "I like to picture how I could fix my apartment or a room if I could buy anything I wanted displayed a correlation coefficient of -0.134 and a coefficient of variance of 1.7%. The item "I like to daydream" showed a correlation coefficient of 0.150 and a coefficient of variance of 2.2%. The item "I seldom daydream" displayed a correlation coefficient of -0.110 and a coefficient of variance of 1.2%. These correlations can be characterized as weak, and therefore the researcher concludes that social desirability is unlikely to cause more than a very modest inflation of a few relationships and little or no inflation in most cases. Furthermore, these three items were subsequently deleted from the individual style of processing scale during the EFA. Therefore the SDB present in the scale was removed completely before the hypotheses testing stage.

5.2.3.3 Exploratory Factor Analysis and Internal Consistency

Following SDB analysis, each measure was analysed for internal consistency using Cronbach's alpha, and entered into an exploratory factor analysis. Since the scales being analysed were pre-existing, and thus had been subjected to significant amounts of prior analysis, a lower bound of 0.7 was used when evaluating internal consistency scores (Churchill, 1979; Nunnally, 1978). Each scale was also subjected to EFA separately, and purified as a result. Two main criteria were used when determining whether the items were appropriate for EFA. Firstly, to provide a statistical measure of item homogeneity, the Bartlett's test for sphericity was used. This check provides a statistical test for the presence of correlations amongst the variables (Hair et al., 2006). A significant Bartlett's test result suggests that the correlation matrix is not orthogonal (i.e. the variables are intercorrelated) (Sharma 1996). Given that the researcher is looking for clusters of variables that measure similar things, it should be obvious that some variables should correlate to have an appropriate dataset for factoring (Field, 2005). Therefore the Bartlett's test should be significant. However, this test is rather sensitive to sample size (Hair et al., 2006; Sharma 1996), and thus one should not use it solely to assess appropriateness of the data for EFA. As a result, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was also used. This index (ranging from 0 to 1) determines the extent to which variables are homogenous (Sharma 1996). A value of 0 indicates that the sum of partial correlations is large relative to the sum of correlations, indicating diffusion in the pattern of correlations (hence, factor analysis is likely to be inappropriate). A value close to 1 indicates that patterns of correlations are relatively compact and so factor analysis should yield distinct and reliable factors (Field, 2005). While there are no statistical tests for the KMO measure, it is generally considered that values above 0.5 imply that the data is appropriate for factor analysis (Hair et al., 2006; Sharma 1996). Furthermore, values between 0.6 and 0.7 are considered as mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (see Hutcheson and Sofroniou, 1999, p. 224-225 for more details). When examining the loadings of each item on the extracted factors, a minimal loading of 0.3 was used as the lower bound to indicate a significant factor loading, commonly considered a threshold level (Spector, 1992).

Following the individual EFAs, the constructs were split into two groups and each group was subjected to another EFA (with the same procedures as discussed above), to gain an indication of whether there was independence between the constructs. Group One consisted of the mediating variables: emotions (discouragement, scepticism and positive emotions). Group Two consisted of the final outcomes of product comprehension, attitude to the product and behavioural intent. Rather than randomly splitting the constructs, efforts were made to select groups of theoretically similar constructs (Baker and Sinkula, 1999).

The EFA procedure used in all factor analyses was principal axis factoring with an Oblimin oblique rotation. This type of analysis is preferred to structural equation modelling (SEM) when there are significant differences across segments of the data, because SEM estimated on aggregate samples, when there is an underlying structure in the data, may lead to seriously biased estimates (Bart et al. 2005). Therefore, and since the dataset has an underlying structure due to the experimental treatments, the measures are analysed via traditional principal axis factoring. The use of oblique rotation is in contrast to the original development process of many of the measures, where orthogonal rotations appeared to be used. An oblique factor rotation was considered conceptually superior here for a number of theoretical reasons. It is recognised that orthogonal rotations such as Varimax are often used in marketing. However, the popularity of orthogonal rotation methods may originate mainly from convenience (as Varimax is the default procedure within most statistical packages such as SPSS) and tradition. However, orthogonal rotations assume that the factors are uncorrelated (Sharma, 1996), which is an unlikely event when one is considering psychological variables. As Cattell (1978) states, "it makes sense for factors to be correlated rather than represented artificially in rigid orthogonality, because influences in the real world do get correlated" (p. 104). In the present case, there was no theoretical reason to suggest uncorrelated factors in any situation in which factor analysis was used, thus oblique rotations were implemented.

When an oblique rotation is conducted, the factor matrix is split into two matrices: the pattern matrix and the structure matrix. The pattern matrix contains the factor loadings and is comparable to the factor matrix that is interpreted in an orthogonal rotation. The structure matrix takes into account the relationship between factors. In fact, it is a product of the pattern matrix and the matrix containing the correlation coefficients between factors. The pattern matrix is preferable for interpretative reasons because it contains information about the *unique* contribution of a variable to a factor (Field, 2005). Therefore, the pattern matrices are reported in the EFAs which results are presented in the next sections.

5.2.4 Individual Scale Results

The following section provides the results of the development of the existing measures, where each measure is discussed individually. An iterative process of EFA and internal consistency analysis was used to eliminate any items which appeared to be detracting from the unidimensionality of the scale. Specific results are presented in the following subsections.

5.2.4.1 Discouragement

Discouragement was originally measured using a three-item scale developed by Murry and Dacin (1996) based on Plutchik's (1980) original set of adjectives. Cronbach's alpha was initially 0.872, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. In addition The KMO and Bartlett's tests were both indicative of an appropriate data set. EFA extracted one factor explaining 79.6% of the variance. Thus, all three items were retained.

Table 5.2-3 presents the EFA results.

TABLE 5.2-3 EFA RESULTS FOR DISCOURAGEMENT

Scale item	**Factor loading**
Puzzled	0.895
Discouraged	0.866
Bewildered	0.916

One factor extracted, rotation not required.
KMO = 0.725; Bartlett's Test = 3491.396; df: 3, $p = 0.000$

5.2.4.2 Scepticism

Scepticism was measured by means of a three-item scale (Holbrook and Batra, 1987). Cronbach's alpha was initially 0.898, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. The KMO and Bartlett's tests were both indicative of an appropriate data set. Additionally, EFA extracted one factor explaining 83.17% of the variance. Thus, all three items were retained.
Table 5.2-4 presents the EFA results.

TABLE 5.2-4 EFA RESULTS FOR SCEPTICISM

Scale item	**Factor loading**
Sceptical	0.879
Suspicious	0.942
Distrustful	0.913

One factor extracted, rotation not required.
KMO = 0.716; Bartlett's Test = 4417.599; df: 3, p = 0.000

5.2.4.3 Positive Emotions

Positive emotions were assessed with a four-item scale (Edell and Burke, 1987). Cronbach's alpha was initially 0.933, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. The KMO and Bartlett's tests were both indicative of an appropriate data set. Additionally, EFA extracted one factor explaining 83.18% of the variance. Thus, all four items were retained.

Table 5.2-5 presents the EFA results.

TABLE 5.2-5 EFA RESULTS FOR POSITIVE EMOTIONS

Scale item	Factor loading
Happy	0.937
Pleased	0.951
Contented	0.940
Proud	0.812

One factor extracted, rotation not required.
KMO = 0.830; Bartlett's Test = 8806.274; df: 6, $p = 0.000$

5.2.4.4 Product Comprehension

Product comprehension was measured by a six-item scale composed of two existing scales: a 2-item scale (Phillips, 2000) and a 4-item scale (Moreau, Lehmann and Markman, 2001). Cronbach's alpha was initially 0.911, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. The KMO and Bartlett's tests were both indicative of an appropriate data set. Additionally, EFA extracted one factor explaining 69.3% of the variance. Thus, all six items were retained.

Table 5.2-6 presents the EFA results.

TABLE 5.2-6 EFA RESULTS FOR PRODUCT COMPREHENSION

Scale item	Factor loading
I found the product description easy to understand	0.865
I found the product description straightforward	0.869
After reading the advert, I have a very strong understanding of how this product works	0.845
After reading the advert, I would be able to use the product	0.776
After reading the advert, I understand what the main features of the product are	0.849
After reading the advert, I understand what the main benefits of this product are	0.791

One factor extracted, rotation not required.
KMO = 0.820; Bartlett's Test = 10617.966; df: 15, $p = 0.000$

5.2.4.5 Attitude to the Product

The scale used to measure attitude to the product consists of four bi-polar adjectives (Holbrook and Batra, 1987). Cronbach's alpha was initially 0.972, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. The KMO and Bartlett's tests were both indicative of an appropriate data set. Additionally, EFA extracted one factor explaining 92.3% of the variance. Thus, all four items were retained.

Table 5.2-7 presents the EFA results.

TABLE 5.2-7 EFA RESULTS FOR ATTITUDE TO THE PRODUCT

Scale item	Factor loading
Good	0.958
Favorable	0.961
Like	0.959
Positive	0.965

One factor extracted, rotation not required.
KMO = 0.878; Bartlett's Test = 12503.620; df: 6, $p = 0.000$

5.2.4.6 Behavioural intent

Behavioural intent towards the product was measured using a four-item scale (Ait El Houssi, Morel and Hultink, 2005; Smith, 1991). Cronbach's alpha was initially 0.905, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. The KMO and Bartlett's tests were both indicative of an appropriate data set. Additionally, EFA extracted one factor explaining 77.8% of the variance. Thus, all four items were retained. Table 5.2-8 presents the EFA results.

TABLE 5.2-8 EFA RESULTS FOR BEHAVIOURAL INTENT

Scale item	Factor loading
This is a product I would like to try	0.906
I would like to have more information about this product	0.917
I would like to see a demonstration of this product	0.869
I would recommend this product to a friend	0.834

One factor extracted, rotation not required.
KMO = 0.817; Bartlett's Test = 6111.893; df: 6, $p = 0.000$

5.2.4.7 Individual Style of Processing

As discussed in section 4.9.1, although the present thesis did not develop formal hypotheses for the role of individual style of processing on consumer responses to RNPs, individual style of processing was measured in the Web-Experiment in order to control for respondents' verbal vs. visual style of processing. Individual style of processing was measured by 22 items. 11 items measured respondents' verbal tendency whereas 11 items measured respondents' visual tendency (Childers, Houston and Heckler, 1985). Cronbach's alpha on the original scale was high at 0.743, exceeding Nunnally's (1978) recommended threshold. Two EFAs were conducted, firstly for the visual processing scale and secondly for the verbal processing scale.

For the visual processing scale, the original Cronbach alpha was 0.737. EFA extracted three factors, explaining 54.6% of the common variance. The pattern matrix for the three-factor solution is presented in table 5.2-9.

TABLE 5.2-9 FIRST EFA RESULTS FOR VISUAL PROCESSING

Measurement Items	Factor Loadings		
	Factor 1	Factor 2	Factor 3
There are some special times in my life that I like to revive by mentally "picturing" just how everything looked	0.767	NS	NS
When I have forgotten something I frequently try to form a mental "picture" to remember it.	0.752	NS	NS
My thinking often consists of mental "pictures" or images.	0.687	NS	NS
I find it helps to think in terms of mental pictures when doing many things.	0.604	NS	NS
I like to picture how I could fix my apartment or a room if I could buy anything I wanted.	0.497	NS	NS
I like to daydream.	NS	0.848	NS
I seldom daydream.	NS	0.852	NS
I generally prefer to use a diagram rather than a written set of instructions.	NS	NS	0.740
When I'm trying to learn something new, I'd rather watch a demonstration than read how to do it.	NS	NS	0.702
I like to "doodle".		*(0.417)*	0.549
After I meet someone for the first time I can usually remember what they look like but not much about them.	NS	NS	*(0.314)*

NS = Non significant (<0.3 loading on any factor)
Note: Rotation converged in nine iterations.

KMO=0.772; Bartlett's Test=5249.086, df: 55, p=0.000

It can be seen that factor 1 captures the core of the visual processing construct, with the ability to use mental pictures and images in daily life to remember things, and organize activities. However, the item "I like to picture how I could fix my apartment or a room if I could buy anything I wanted" displayed a loading only slightly above the cut-off point of 0.45 and also loaded on factor 2. Therefore, the decision was made to delete this item. Factor 2 captures the tendency to "daydream" with two very similar items. The capacity to daydream is not relevant for the present study, and therefore the two items loading on factor 2 were deleted. Factor 3 captured the ability to extract more information from visual methods (i.e. a diagram or a demonstration) than from words. The item "I like to doodle" also loaded on this factor although there is no strong theoretical underpinning for this as the item seems to tap a separate dimension of visual processing. Thus, factor 3 was also deleted for the present study, as it measures a separate construct ("I generally prefer to use a diagram rather than a written set of instructions" and "When I am trying to learn something new, I'd rather watch a demonstration than read how to do it"). The item which did not load heavily on any factor was also deleted. The resulting four items were then re-analyzed using EFA, with a single factor explaining 58% of the variance extracted, and no problems evident. KMO and Bartlett's tests were all suggestive of the appropriateness of the data set, and loadings all high and significant. Cronbach's alpha for the reduced scale was 0.755. As a result, the 4 item scale was retained for future analysis. The results of the second EFA process are presented in Table 5.2-10.

TABLE 5.2-10 SECOND EFA RESULTS FOR VISUAL PROCESSING

Scale Item	Factor Loadings
My thinking often consists of mental "pictures" or images.	0.820
I find it helps to think in terms of mental pictures when doing many things.	0.807
When I have forgotten something I frequently try to form a mental "picture" to remember it.	0.755
There are some special times in my life that I like to revive by mentally "picturing" just how everything looked	0.652

One factor extracted, rotation not required.
KMO = 0.757; Bartlett's Test = 2163.173; df: 6, $p = 0.000$

The original Cronbach alpha for the verbal processing scale was 0.723. EFA extracted three factors, explaining 54% of the common variance. The pattern matrix for the three-factor solution is presented in table 5.2-11.

TABLE 5.2-11 FIRST EFA RESULTS FOR VERBAL PROCESSING

Measurement Items	Factor Loadings		
	Factor 1	Factor 2	Factor 3
I like learning new words.	0.930		
I enjoy learning new words.	0.934		
I like to think of synonyms for words.	0.591		
I spend very little time attempting to increase my vocabulary.	0.468	NS	NS
I prefer activities that don't require a lot of reading.	NS	NS	0.781
I do a lot of reading.			0.740
I enjoy doing work that requires the use of words	NS		0.508
I prefer to read instructions about how to do something rather than have someone show me.			0.470
I often make written notes to myself.			*(0.395)*
I can never seem to find the right word when I need it.		0.847	
I think I often use words in the wrong way.		0.837	

NS = Non significant (<0.3 loading on any factor)
Note: Rotation converged in eight iterations.

KMO=0.731; Bartlett's Test=6295.627, df: 55, p=0.000

Factor 1 appears to tap into respondents' interest in increasing their vocabulary, including learning new words and thinking of synonyms for words. Factor 2 taps into respondents' ability to master the language, including difficulties to find the appropriate word when needed and issues using words in the correct way. Factor 3 taps into respondents' interest in reading and doing work that requires the use of words. Factor 2 was deleted as respondents' difficulties to use words in a correct way did not appear to tap into the core of the verbal processing construct. The item "I often make written notes to myself" did not load significantly on any factor and was therefore deleted too. The choice between factor 1 and factor 3 was less straightforward as respondents' interest in learning new words and in reading are both theoretically sound to assess respondents' verbal processing ability. However, a reliability analysis conducted on the four-item scale extracted from factor 1 displayed a Cronbach alpha of 0.734, whereas a reliability analysis for the four-item scale extracted from factor 3 showed a Cronbach alpha of 0.566, which is below the threshold of 0.7 (Nunnally, 1978). The item-total statistics matrix revealed that deleting the item "I often make written notes to myself" would only increase Cronbach alpha to 0.605, which is still below the recommended threshold. Therefore, the four-item scale loading on factor 1 is both theoretically sound, unidimensional and reliable. It was thus retained for the next stage of the analysis.

The four items were then re-analyzed using EFA, with a single factor explaining 58.8% of the variance extracted, and no problems evident. KMO and Bartlett's tests were all suggestive of the appropriateness of the data set, and loadings all high and significant. Cronbach's alpha for the reduced scale was 0.734. The results of the second EFA process are presented in Table 5.2-12.

TABLE 5.2-12 SECOND EFA RESULTS FOR VERBAL PROCESSING

Scale Item	**Factor Loadings**
I like learning new words.	0.901
I enjoy learning new words.	0.900
I like to think of synonyms for words.	0.576
I spend very little time attempting to increase my vocabulary.	0.634

One factor extracted, rotation not required.
KMO = 0.649; Bartlett's Test = 3721.120; df: 6, $p = 0.000$

Subsequent to the separate EFA analyses of the visual processing scale and verbal processing scale, the two scales were subjected to an EFA together. The rationale behind this was to gain an indication of whether there was any cross-loading between the constructs, which would suggest that the items reflected a similar underlying factor, rather than distinct dimensions of individual style of processing. The results of the EFA presented in table 5.2-13 indicate that each item loaded satisfactorily on the allocated factor (visual vs. verbal). EFA extracted two factors, explaining 58.7% of the common variance. Therefore, the remaining eight-item scale for individual style of processing was retained for future analysis.

TABLE 5.2-13 EFA FOR VERBAL AND VISUAL PROCESSING

Measurement Items	Factor Loadings	
	Factor 1	Factor 2
I like learning new words.	0.901	NS
I enjoy learning new words.	0.899	NS
I like to think of synonyms for words.	0.574	NS
I spend very little time attempting to increase my vocabulary.	0.638	NS
My thinking often consists of mental "pictures" or images.	NS	0.827
I find it helps to think in terms of mental pictures when doing many things.	NS	0.807
When I have forgotten something I frequently try to form a mental "picture" to remember it.	NS	0.753
There are some special times in my life that I like to revive by mentally "picturing" just how everything looked	NS	0.644

NS = Non significant (<0.3 loading on any factor)
Note: Rotation converged in five iterations.

KMO=0.689; Bartlett's Test=5888.037, df: 28, p=0.000

Coefficient alpha (test of internal reliability), assumes the presence of a single dimension. When the scale is multidimensional, as is the case with the Style of Processing scale, coefficient alpha cannot be used to compute the reliability of the instrument. Total instrument reliability can be calculated by what is known as the Reliability of Linear Combinations (Nunnally, 1978, see details in Appendix 5). The formula returned a coefficient of 0.874, indicating a good reliability for the scale.

The inter-item correlation matrices for all the constructs are available in Appendix 6.

5.2.5 Group Analysis using EFA

Subsequent to the individual scale analyses using EFA which are detailed above, two groups of constructs were created and subjected to EFA in an attempt to gain an impression of the independence of the construct measures. Group One consisted of the mediating variables: emotions (discouragement, scepticism and positive emotions). Group Two consisted of the outcome measures: product comprehension, attitude to the product and behavioural intent. The following subsections detail the results of the EFA for each group.

5.2.5.1 Group One: Emotional Responses

The first group of constructs consisted of discouragement, scepticism and positive emotions. When subjected to an EFA, three factors were extracted, explaining 81.5%

of the total variance. KMO and Bartlett's tests both indicated the suitability of the data set for factor analysis. The results of the analysis are presented in Table 5.2-14. As can be seen from the results, all items loaded on their respective constructs. No problems were observed and as a result of this, all of the scales were retained in those operationalisations for further analysis.

TABLE 5.2-14 RESULTS FOR GROUP ONE EFA

Measurement Items	Factor Loadings		
	Scepticism	Positive emotions	Discouragement
Puzzled	NS	NS	0.905
Discouraged	NS	NS	0.803
Bewildered	NS	NS	0.922
Sceptical	0.833	NS	NS
Suspicious	0.946	NS	NS
Distrustful	0.918	NS	NS
Happy	NS	-0.909	NS
Pleased	NS	-0.916	NS
Contented	NS	-0.936	NS
Proud	NS	-0.853	NS

NS = Non significant (<0.3 loading on any factor)
Note: Rotation converged in six iterations.

KMO=0.867; Bartlett's Test=36282.417, df: 171, p=0.000

5.2.5.2 Group Two: Outcomes

The second group consisted of the outcome variables of product comprehension, attitude to the product and behavioural intent. When entered into EFA, three factors were extracted explaining 79.4% of the total variance in the data set. KMO and Bartlett's tests both indicated that the data sets were appropriate for factor analysis. The results of the EFA are presented in Table 5.2-15, showing that all items loaded on their respective construct. As a result, all three scales were considered suitable for further analysis.

TABLE 5.2-15 RESULTS FOR GROUP TWO EFA

Measurement Items	Factor Loadings		
	Attitude	Comprehension	Intent
I found the product description easy to understand	NS	0.854	NS
I found the product description straightforward	NS	0.844	NS
After reading the advert, I have a very strong understanding of how this product works	NS	0.833	NS
After reading the advert, I would be able to use the product	NS	0.793	NS
After reading the advert, I understand what the main features of the product are	NS	0.880	NS
After reading the advert, I understand what the main benefits of the product are	NS	0.750	NS
Good	0.951	NS	NS
Favorable	0.950	NS	NS
Like	0.926	NS	NS
Positive	0.941	NS	NS
This is a product I would like to try	NS	NS	0.681
I would like to have more information about this product	NS	NS	0.895
I would like to see a demonstration of this product	NS	NS	0.938
I would recommend this product to a friend	NS	NS	0.484

NS = Non significant (<0.3 loading on any factor)
Note: Rotation converged in six iterations.

KMO=0.906; Bartlett's Test=30635.518, df: 91, p=0.000

5.2.6 Descriptive Analysis of Individual Scales

Following the construction of the measures based on existing scales, it was also necessary to examine the characteristics of the final scales. This was useful to determine whether the measures were appropriate for further use in hypothesis testing. The descriptive analysis focused on the distribution of the measures, including a search for outliers and statistical testing of the distribution. Graphs were used to gain a picture of each measure's distribution, while the Kolgomorov-Smirnoff (KS) test was also used to assess the normality of the distribution.

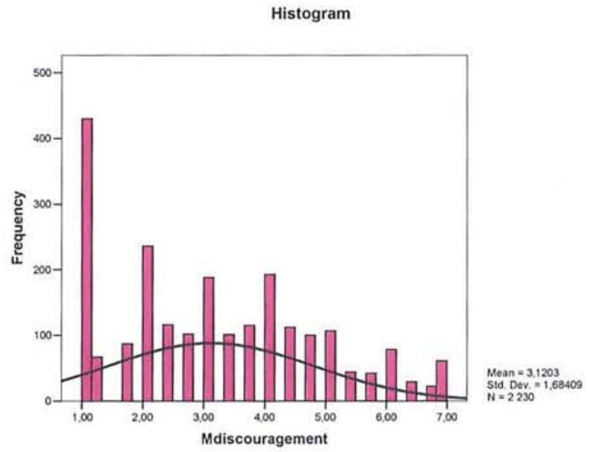
The KS statistic is a test of the hypothesis that the distribution differs from a normal distribution. A non-significant KS test indicates that the observed distribution approximates normality (Hair et al., 2006). However, for large samples (200 or more), it is more important to look at the value of the skewness and kurtosis statistics rather than examine the significance of the KS test (Field, 2005, p. 72) as the test is extremely sensitive to minor departures from normality (Sharma, 1996) and violating the assumption of normality is quite common in larger samples (Pallant, 2005, p.57).

Descriptives also provide some information concerning the distribution of scores on continuous variables (skewness and kurtosis). This information may be needed if these variables are to be used in parametric statistical techniques (t-tests, analysis of variance), which is the case in the present study. The skewness value provides an indication of the symmetry of the distribution. Kurtosis, on the other hand, provides information about the "peakedness" of the distribution. If the distribution is perfectly normal the values of the skewness and kurtosis would be zero (Pallant, 2005, p.51-52). Positive skewness values indicate positive skew (scores clustered to the left at the low values). Negative skewness values indicate a clustering of scores at the high end (right hand-side of a graph) (Pallant, 2005, p.51-52). Positive kurtosis values indicate that the distribution is rather peaked or "leptokurtic" (clustered in the center). Kurtosis values below 0 indicate a distribution that is relatively flat or "platykurtic" (too many cases in the extremes). Kurtosis can result in an underestimate of the variance but this risk is reduced with a large sample (200+ cases: see Tabachnick and Fidell, p. 75).

5.2.6.1 Discouragement

Figure 5.2-6 displays the frequency distribution of the consumer discouragement scale. As can be seen, a skew towards lower values is evident. A significant KS test result was returned (z=0.115, p=0.000). This is unfortunate, however it has been argued that the KS test is extremely sensitive to minor departures from normality in large samples (Sharma, 1996). Thus, it has been suggested that researchers should examine the kurtosis and skewness values of any distribution returning a significant test result. The discouragement variable returned values of 0.453 and -0.709 for skewness and kurtosis respectively. However, with reasonably large samples (more than 200 cases), skewness will not "make a substantive difference in the analysis" (Tabachnick and Fidell, 2001, p.75). Moreover, it has been argued that skewness and kurtosis below the threshold of 1.96 will not cause significant issues in the dataset (Field, 2005, p. 72). As the values returned are below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained without transformation for future analysis.

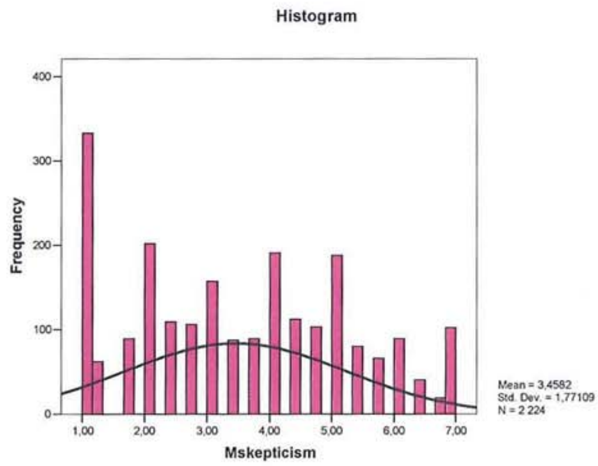
Figure 5.2-6 Histogram of Discouragement



5.2.6.2 Scepticism

Figure 5.2-7 displays the frequency distribution of the consumer scepticism scale. As can be seen, a skew towards lower values is evident. A significant KS test result was returned ($z=0.103$, $p=0.000$). The variable returned values of 0.234 and -0.991 for skewness and kurtosis respectively. As these values are below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained for future analysis.

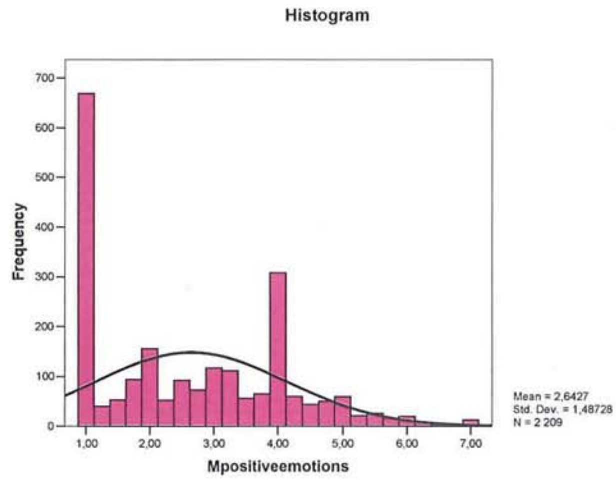
Figure 5.2-7 Histogram of Scepticism



5.2.6.3 Positive Emotions

Figure 5.2-8 displays the frequency distribution of the positive emotions scale. Again, a skew towards lower values is evident. A significant KS test result was returned (z=0.168, p=0.000). The variable returned values of 0.479 and -0.738 for skewness and kurtosis respectively. As these values are below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained for future analysis.

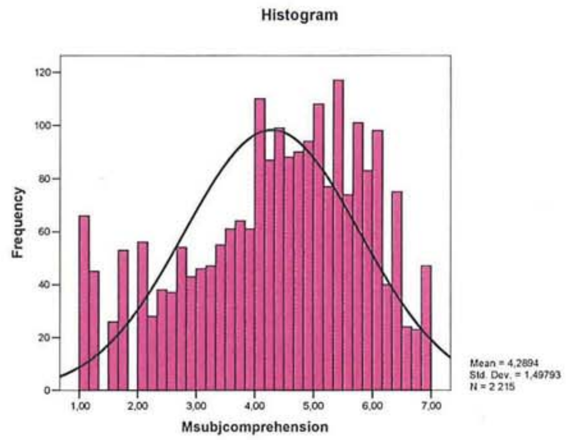
Figure 5.2-8 Histogram of Positive Emotions



5.2.6.4 Product Comprehension

Figure 5.2-9 displays the frequency distribution of the product comprehension scale. The distribution appeared to be close to normality, although some skew towards higher values was visible. A significant KS test result was returned (z=0.076, p=0.000). The variable returned values of -0.439 and -0.597 for skewness and kurtosis respectively. As these values are below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained for future analysis.

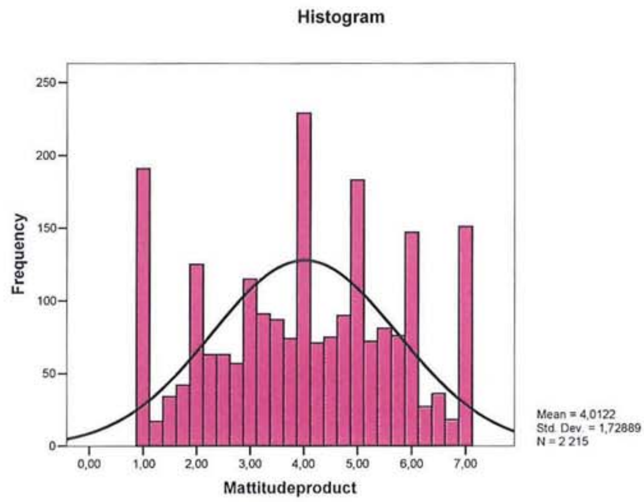
Figure 5.2-9 Histogram of Product Comprehension



5.2.6.5 Attitude to the Product

Figure 5.2-10 displays the frequency distribution of the attitude to the product scale. The distribution appeared to be close to normality, although some skew towards higher values was visible to some extent. A significant KS test result was returned ($z=0.073$, $p=0.000$). The variable returned values of -0.091 and -0.910 for skewness and kurtosis respectively. As these values were below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained for future analysis.

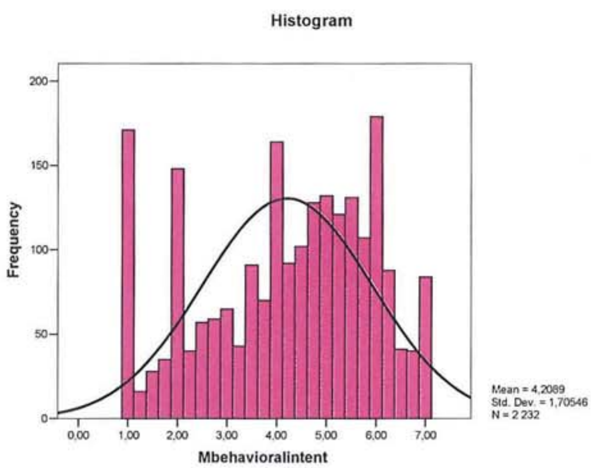
Figure 5.2-10 Histogram of Attitude to the Product



5.2.6.6 Behavioural Intent

Figure 5.2-11 displays the frequency distribution of the behavioural intent scale. The distribution appeared to be close to normality, although some skew towards higher values was visible. A significant KS test result was returned (z=0.095, p=0.000). The variable returned values of -0.366 and -0.898 for skewness and kurtosis respectively. As these values were below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained for future analysis.

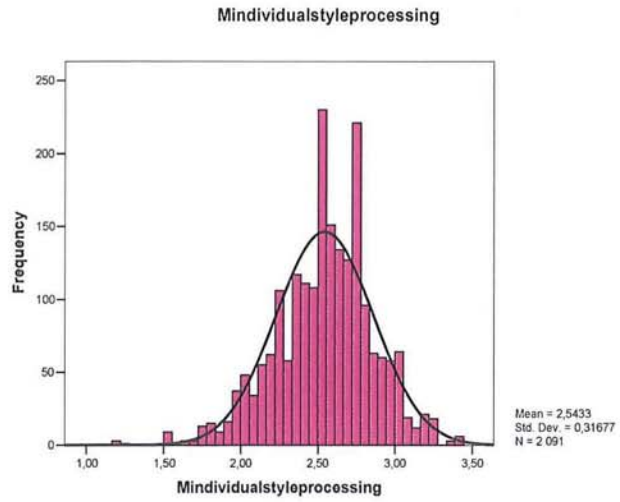
Figure 5.2-11 Histogram of Behavioural Intent



5.2.6.7 Individual Style of Processing

Figure 5.2-12 displays the frequency distribution of the individual style of processing scale. The distribution appeared to be close to normality, although some skew towards higher values was noticeable. A significant KS test result was returned (z=0.063, p=0.000). The variable returned values of -0.399 and 0.624 for skewness and kurtosis respectively. As these values were below the threshold of 1.96, it was considered that there were no serious concerns regarding the normality of the variable, and it was retained for future analysis.

Figure 5.2-12 Histogram of Individual Style of Processing



5.3 EXPERIMENT 2

5.3.1 Design and Sample

For the eye-tracking experiment, participants were divided into two groups: the respondents allocated to group 1 viewed a visual analogy for the video glasses and a visual mental simulation for the Digipen while the respondents of group 2 viewed a verbal analogy for the video glasses and a verbal mental simulation for the Digipen. The rationale for this design is detailed in Chapter 4, section 4.4.1 and therefore will not be reiterated here. The design is presented in Table 5.3-1.

TABLE 5.3-1 EXPERIMENTAL CELLS AND CELL SIZES

Group	Presentation format	Learning Strategy	Product	N
Group 1	Visual	Mental Simulation	Video Glasses	(9)
	Visual	Analogy	Digipen	(9)
Group 2	Verbal	Mental simulation	Video Glasses	(8)
	Verbal	Analogy	Digipen	(8)

The sample size for the eye-tracking experiment was seventeen participants, consistent with the expectations set in Chapter 4. This sample size is comparable to those used in previous eye tracking studies (Albert et al., 2005; Fleetwood and Byrne, 2006). The rationale for this sample size is presented in Chapter 4, Section 4.5.4. Participants had normal uncorrected vision or corrected vision via contact lenses.

5.3.2 A Demographic Profile of the Respondents

In this section the participants are described by the variables of gender, occupation, education, age and nationality.

Ten participants were male and seven were female. The age of the participants ranged from 23 to 30, with a mean of 26.05. Moreover, fifteen respondents were students (all postgraduate/ research) at Aston University (88.2%) and two respondents were members of staff (11.8%). With regards the respondents' education, fifteen respondents had an MA/Msc (88.2%) and two respondents were holders of a Phd (1.8%). As for the respondents' nationalities, five of the participants were British (29.4%) and twelve were non-British (70.6%). However, all the participants had been living in the United Kingdom for at least one year. The respondents were all from Western Europe and fluent in English.

5.3.3 Psychometric properties of the product comprehension construct

Product comprehension was measured by a six-item scale composed of two existing scales: a 2-item scale (Phillips, 2000) and a 4-item scale (Moreau, Lehmann and Markman, 2001). Cronbach's alpha was initially 0.908, higher than the threshold of 0.7 (Nunnally, 1978). The correlation matrix obtained from the factor analysis displayed several coefficients above 0.3. The KMO and Bartlett's tests were both indicative of an appropriate data set. Additionally, EFA extracted one factor explaining 68.2% of the variance. Thus, all six items were retained.
Table 5.3-2 presents the EFA results.

TABLE 5.3-2 EFA RESULTS FOR PRODUCT COMPREHENSION

Scale item	Factor loading
I found the product description easy to understand	0.901
I found the product description straightforward	0.822
After reading the advert, I have a very strong understanding of how this product works	0.856
After reading the advert, I would be able to use the product	0.793
After reading the advert, I understand what the main features of the product are	0.859
After reading the advert, I understand what the main benefits of this product are	0.729

One factor extracted, rotation not required.
KMO = 0.765; Bartlett's Test = 143.876; df: 15, $p = 0.000$

The other key variables measured in the eye-tracking experiment were the number of fixation and fixation duration to the message. However, these are physiological variables measured by the eye-tracker as opposed to multi-item measures. Therefore, EFA is not appropriate for these variables.

5.3.4 Descriptive Analysis of the constructs

The descriptive analysis focused on the distribution of the measures, including a search for outliers and statistical testing of the distribution. Graphs were used to gain a picture of each measure's distribution, while the Kolgomorov-Smirnoff (KS) test was also used to assess the normality of the distribution. The descriptive analysis included both the self-report measure (product comprehension) and the physiological measures (fixation duration to the message).

Figure 5.3-1 displays the frequency distribution of the product comprehension scale. The distribution appeared to be close to normality and a nonsignificant KS test result was returned (z=0.110, p=0.200). The variable returned values of 0.187 and -0.562 for skewness and kurtosis respectively, significantly below the threshold of 1.96. As a result, the variable was retained for future analysis.

Figure 5.3-1 Histogram of Product Comprehension

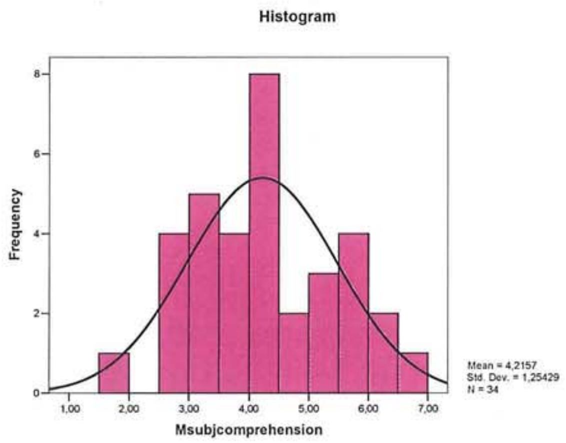
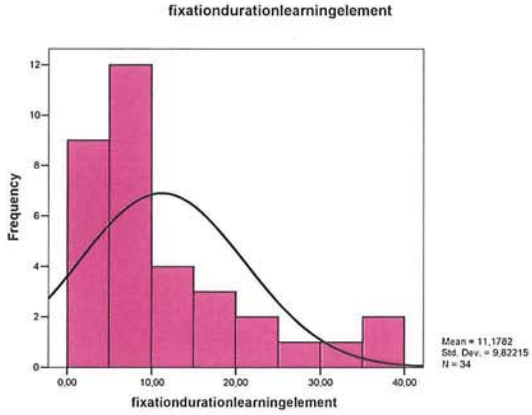


Figure 5.3-2 displays the frequency distribution for fixation duration to the message of the advertisement variable. A skew towards lower values was noticeable and a significant KS test result was returned (z=0.230, p=0.000). The variable returned

values of 1.482 and 1.475 for skewness and kurtosis respectively, below the threshold of 1.96. As a result, the variable was retained for future analysis.

Figure 5.3-2 Histogram of Fixation Duration to the Message



5.4 SUMMARY

This chapter provided a description of responses to the key variables of interest in study 1 and in study 2. The respondents were described according to gender, education, occupation, age and nationality. A number of previously-developed measures were also assessed in the chapter. The assessment process consisted of exploratory factor analyses, as well as item analysis and reliability. Each item was also assessed for its correlation with social desirability bias. In general, most of the measures performed adequately. Measures were also assessed for their discriminant validity, and no problems were noted. Descriptive analyses were conducted and focused on the distribution of the measures, including a search for outliers and statistical testing of the distribution. Graphs were used to gain a picture of each measure's distribution, while the Kolgomorov-Smirnoff (KS) test was also used to assess the normality of the distribution. Because most of the measures returned significant KS tests, the skewness and kurtosis statistics were examined. These statistics are more appropriate for large samples of 200 or more cases (Field, 2005, p. 72) as the KS test is extremely sensitive to minor departures from normality (Sharma, 1996). All the variables returned skewness and kurtosis values significantly below the upper threshold of 1.96 described in the literature (Field, 2005, p. 72). Therefore, the measures are deemed to be of sufficient quality to be put forward for further analysis and used in hypothesis testing applications, the focus of the following chapter.

CHAPTER SIX

RESEARCH FINDINGS

CONTENTS: The chapter presents the findings from the two experiments conducted as part of the research. Section 6.1 is an introduction to the chapter. Section 6.2 presents the overall tests of model significance for experiment 1. Section 6.3 tests hypotheses 1 to 12 related to the effect of learning strategy and presentation formats on consumer responses to RNPs. Section 6.4 tests hypotheses 13 to 16 related to the mediating role of emotional responses. Section 6.5 presents the results of the eye-tracking experiment and tests propositions 1 and 2. Finally, section 6.6 summarises the results.

6.1 INTRODUCTION

In chapter three, a set of hypotheses and propositions were developed about the effects of learning strategies and presentation formats used in marketing communications on consumer responses to RNPs. Two experimental studies were developed to test these empirically. In the present chapter, the analysis and results from the two studies are presented. The first experiment examines the effect of learning strategies and presentation formats on consumer responses to RNPs. The mediating role of emotions is examined. The role of the nature of a product in influencing consumer responses is also investigated. The study is a mixed design, specifically a 2 between-subjects (presentation format: words vs. pictures) x 3 within-subjects (learning strategy: mental simulation vs. analogy vs. no analogy/ no mental simulation) x 3 between-subjects (product type: utilitarian vs. hedonic vs. hybrid). The study tests the first conceptual model presented in chapter 3 (Section 3.1, Figure 3.1-1).

The second experiment examines the effect of learning strategies and presentation formats on consumers' comprehension for a RNP, along with the role of visual attention to the advertising message, and proceeds to test the second conceptual framework presented in chapter 3 (Section 3.1, Figure 3.1-2). The study combines data obtained from an eye-tracking experiment and self-report measures to establish whether an increase in attention to the advertising message is correlated with an increase in product comprehension. The two studies provide an integrated examination of the causal links between advertising variables and participants' responses to RNPs, namely product comprehension, attitude to the product and behavioural intent. Study 2 also adds to the understanding of consumer responses to RNPs by integrating conceptual responses with physiological reactions (visual attention patterns). The following sections report and analyze the two experiments.

6.2 OVERALL TESTS OF MODEL SIGNIFICANCE (STUDY 1)

Study 1 was based upon a mixed design with presentation format and product as the between-subjects variables and learning strategy as the within-subjects variable. The data was restructured to enable the researcher to perform repeated-measures analyses. The raw data output file included one line per experimental trial, resulting in a total of 2230 lines. The researcher first calculated the average performance for each dependent variable at each level of each condition. The data file was then reconfigured to show each participant's data on a single row. A variety of solutions exist to reconfigure data for a repeated-measures analysis (Lacroix and Giguere, 2006). For instance, researchers may make the computations and modifications "by hand" using spreadsheet software such as Excel, or they may write programs to accomplish the task in a more automatized fashion. However, these techniques are time-consuming and are somewhat prone to error. Therefore, the data file was formatted using the Restructure procedure in SPSS (Lacroix and Giguere, 2006). A unique identifier was created for each participant based on their passwords and email addresses. This identifier was used to restructure the data file such that the data for each participant appeared on a single row with each level of the within-subjects variable (learning strategy) appearing as a column header. This resulted in a total of 858 rows. The restructured dataset was thus appropriately refined to perform repeated-measures analyses.

Participants' product comprehension, attitude to the product and behavioural intent were primarily analyzed via a repeated-measures multivariate analysis of variance

(MANOVA) with learning strategy as the within-subjects variable and presentation format and product type as the between-subjects variables. There are several reasons for conducting a MANOVA instead of multiple ANOVAs as a preliminary analysis. First, multiple ANOVAs inflate the familywise error rate and thus increase the risk of Type 1 error (Field 2005). Furthermore, multivariate models account for the possibility that a composite, linear-vector combination of the dependent variables provides evidence of an overall group difference that may go undetected by examining each dependent variable separately (Hair et al. 1998), hence they are more powerful in the presence of multicollinearity among the dependent variables.

However, a controversy surrounds the power of MANOVA. Ramsey (1982) found that as the correlation between dependent variables increased, the power of MANOVA decreased. This would suggest that MANOVA would not be the most appropriate technique in the present study, as the dependent variables are expected to be correlated. In contrast, Stevens's (1980) investigation of the effect of dependent variable correlations on test power revealed that "the power with high intercorrelations is in most cases greater than that for moderate intercorrelations, and in some cases it is dramatically higher" (p. 736). This would suggest that a MANOVA would be appropriate for the present study. Therefore, both MANOVAs and multiple ANOVAs were conducted: a MANOVA as a preliminary analysis and univariate ANOVAs as a follow-up analysis to examine group differences and test the hypotheses developed in the conceptual model.

There are several test statistics a researcher can choose from to report for significance testing in MANOVA, including Pillai's trace, Wilk's Lambda, Hotelling's trace and Roy's greatest characteristic root. For the present study, Pillai's trace and Wilks' Lambda are reported, as they are the most robust in the case of unequal cell sizes, in addition to being the most widely reported in the literature (Hair et al. 1998). MANOVA is used as a preliminary test of the effects of experimental treatments on the three dependent variables, namely product comprehension, attitude to the product and behavioural intent. The results are presented in table 6.2-1.

The multivariate main effects of presentation format, learning strategy, and product type are significant, as are the interactive effects of presentation format with learning strategy (table 6.2-1). These results suggest that testing the interactions and causal linkages postulated by the conceptual framework are meaningful and further testing is justified.

Following the multivariate model, a step-down decomposition of the multivariate effects into univariate F-tests is performed (Hand and Taylor 1987; Koslowsky and Caspy 1991; Hair et al. 1998). The univariate main effects of learning strategy and product type remain significant on all three dependent variables. The univariate main effect of presentation format is only significant for one univariate model (product comprehension), while it was significant in the MANOVA. The interactive effects of presentation format with learning strategy were significant in the MANOVA and remain significant in the univariate models.

TABLE 6.2-1 EXPERIMENT 1: EFFECTS ON THE THREE DEPENDENT VARIABLES

	Multivariate Tests			Univariate F-Tests		
Effects	Pillai's Trace	Wilks' Lambda	F – Value	F-values		
				Product Comprehension	**Attitude to the product**	**Behavioural intent**
Presentation format (F)	0.227	0.773	56.863***	158.420***	2.571	0.003
Learning Strategy (S)	0.130	0.870	14.359***	41.584***	13.998***	8.489***
Product Type (P)	0.034	0.966	3.357***	5.024**	5.034**	7.141***
FxS	0.117	0.883	12.819***	38.293***	8.229***	4.510**

*** Significant at .005 level

*** Significant at .05 level*

6.3 TEST OF HYPOTHESES 1 TO 12

Hypotheses 1 to 12 are tested using repeated-measures ANOVAs with learning strategy as the within-subjects factor, presentation format as the between-subjects factors and product comprehension, attitude to the product and behavioural intent as the dependent variables. Following this analysis, ANOVAs with learning strategy and presentation format as the independent factors and product comprehension, attitude to the product and behavioural intent as the dependent variables are conducted for each of the three products: Digipen (Utilitarian), Video Glasses (Hedonic) and Intelligent Oven (Hybrid). To facilitate the identification of differences in the results obtained depending on the nature of the product, the results are organized per dependent variable: product comprehension (hypotheses 1, 4, 7 and 10), attitude to the product (hypotheses 2, 5, 8 and 11) and behavioural intent (hypotheses 3, 6, 9 and 12).

6.3.1 Product Comprehension (Hypotheses 1, 4, 7 and 10)

Hypothesis 1 suggests that when the learning strategy is a mental simulation a) the use of words will trigger higher levels of product comprehension than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of product comprehension than the use of words for hedonic products and c) the use of words will trigger similar levels of product comprehension as the use of pictures for hybrid products.

Hypothesis 4 suggests that when the learning strategy is an analogy the use of words will trigger higher levels of product comprehension than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.

Hypothesis 7 suggests that the use of verbal mental simulation will trigger higher levels of product comprehension than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.

Hypothesis 10 suggests that the use of visual mental simulation will trigger higher levels of product comprehension than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.

These hypotheses were tested using repeated-measures ANOVAs. A 3 within-subjects (learning strategy: mental simulation vs. analogy vs. no analogy/ no mental simulation) x 2 between-subjects (presentation format: visual vs. verbal) x 3 between-subjects (product type: utilitarian vs. hedonic vs. hybrid) repeated-measures ANOVA was first conducted with product comprehension as the dependent variable. Subsequently, 2 (presentation format) x 3 (learning strategy) between-subjects ANOVAs were conducted for each of the three products (intelligent oven, Digipen and video glasses).

6.3.1.1 Main Effects

6.3.1.1.1 Learning Strategy

There was a significant main effect of the learning strategy used in the advert on the participants' comprehension for the product advertised, $F(2, 1298)=33.696$, $p<0.001$, partial $\eta^2=0.049$. Overall, the mental simulation triggered a higher product comprehension than the analogy and the no analogy/ no mental simulation. Surprisingly, the no analogy/ no mental simulation created a higher product comprehension than the analogy ($M_{\text{mental simulation}}=4.60$ vs. $M_{\text{analogy}}=4.04$ vs. $M_{\text{no analogy/ no mental simulation}}=4.35$; $M_{\text{difference mental simulation vs. analogy}}=0.556$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.244$, $p<0.001$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.311$, $p<0.001$).

6.3.1.1.2 Presentation Format

The 3 x 2 x 3 repeated-measures ANOVA also revealed a significant main effect of presentation format, $F(1, 648)=170.799$, $p<0.001$, partial $\eta^2=0.209$, as the use of words yielded a significantly higher product comprehension than the use of pictures ($M_{\text{pictures}}=3.73$ vs. $M_{\text{words}}=4.75$; $M_{\text{difference}}= -1.016$, $p<0.001$). These results will be investigated further by examining interaction effects and by conducting analyses per product.

6.3.1.1.3 Product Type

The 3 x 2 x 3 repeated-measures ANOVA also revealed a significant main effect of product type, $F(2, 1298)=5.476$, $p<0.005$, partial $\eta^2=0.008$. Overall, the Digipen and the intelligent oven created a higher level of comprehension than the video glasses ($M_{.oven}=4.40$ vs. $M_{.Digipen}=4.39$ vs. $M_{.video\ glasses}=4.20$; $M_{.difference\ oven\ vs.\ Digipen}=0.009$, $p>0.05$; $M_{.difference\ oven\ vs.\ glasses}=0.203$, $p<0.001$; $M_{.difference\ Digipen\ vs.\ glasses}=0.194$, $p<0.001$).

6.3.1.2 Interaction effects: Presentation Format * Learning Strategy

The 3 x 2 x 3 repeated-measures ANOVA revealed a significant interaction effect between presentation format and learning strategy, $F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$. The pattern of effectiveness for presentation format did not significantly vary across learning strategies, as the use of words created a higher level of product comprehension than the use of pictures for the three learning strategies: mental simulation ($M_{.visual\ mental\ simulation}=4.33$ vs. $M_{.verbal\ mental\ simulation}=4.78$, $M_{.difference}= -0.452$, $p<0.001$, $F(1, 648)=18.573$, $p<0.001$), analogy ($M_{.visual\ analogy}=3.11$ vs. $M_{.verbal\ analogy}=4.68$, $M_{.difference}= -1.572$, $p<0.001$, $F(1, 648)=198.537$, $p<0.001$) and no analogy no mental simulation ($M_{.visual\ no\ analogy/\ no\ mental\ simulation}=3.75$ vs. $M_{.verbal\ no\ analogy/\ no\ mental\ simulation}=4.77$, $M_{.difference}= -1.023$, $p<0.001$, $F(1, 648)=81.824$, $p<0.001$).

However, consistent with the interaction effect, the pattern of product comprehension achieved for the learning strategies varied depending on the presentation format used. When the presentation format used pictures, the mental simulation triggered a significantly higher product comprehension than the analogy and than the no analogy/ no mental simulation. Furthermore, the no analogy/ no mental simulation created a significantly higher product comprehension than the analogy ($M_{.visual\ mental\ simulation}=4.33$ vs. $M_{.visual\ analogy}=3.11$ vs. $M_{.visual\ no\ analogy/\ no\ mental\ simulation}=3.75$; $M_{.difference\ mental\ simulation\ vs.\ analogy}=1.219$, $p<0.001$; $M_{.difference\ mental\ simulation\ vs.\ no}$

analogy/ no mental simulation=0.582, $p<0.001$; M.difference analogy vs. no analogy/ no mental simulation= -0.636, $p<0.001$, $F(2, 647)=73.140$, $p<0.001$). However, when the presentation format used words, there were no significant differences between mental simulation, analogy and the no analogy/ no mental simulation condition in product comprehension (M.verbal mental simulation=4.78 vs. M.verbal analogy=4.68 vs. M. verbal no analogy/no mental simulation=4.77, all p's>0.05, $F(2, 647)=0.764$, $p>0.05$).

The interaction effect of presentation format with learning strategy is illustrated in figure 6.3-1. The means for product comprehension for each combination of presentation format and learning strategy are also illustrated in figure 6.3-2.

Figure 6.3-1 Interaction Effect of Presentation Format and Learning Strategy for Product Comprehension

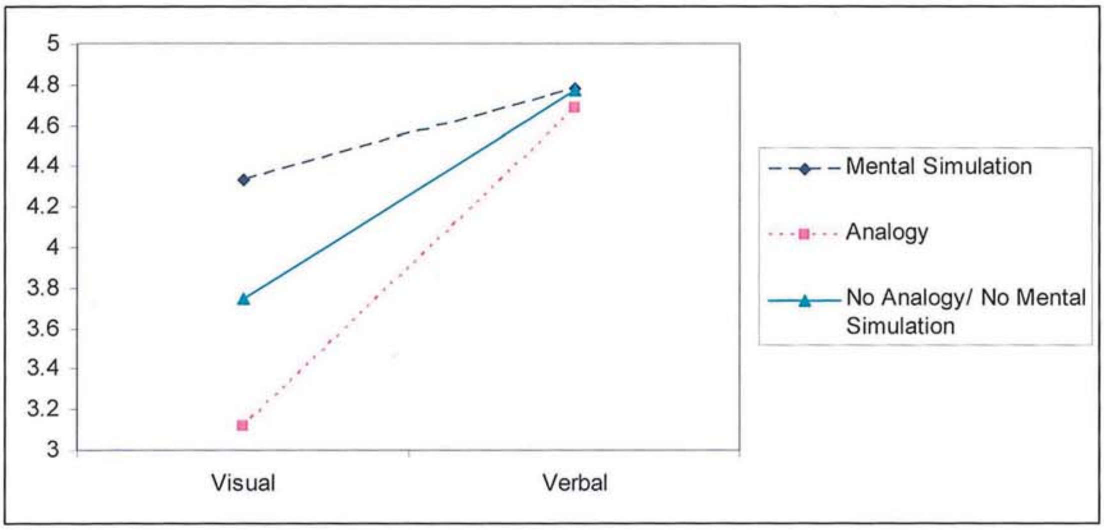
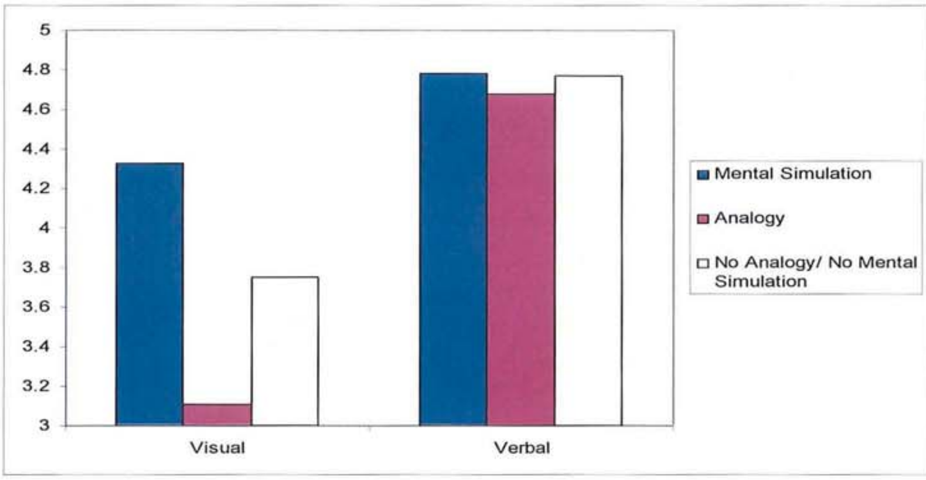


Figure 6.3-2 Product Comprehension for each Presentation Format/ Learning Strategy combination



6.3.1.3 Analysis per Product

As alternative presentation formats and learning strategies are nested within each product, and in order to fully test the hypotheses, 2 (presentation format) x 3 (learning strategy) between-subjects ANOVAs were conducted for each of the three products (intelligent oven, Digipen and video glasses).

For the Digipen (utilitarian product), the main effects of learning strategy [F(2, 715)=34.824, p<0.001, partial η^2=0.089] and presentation format [F(1, 715)=275.856, p<0.001, partial η^2=0.278] were significant. The interaction effect of learning strategy and presentation format [F(2, 715)=24.533, p<0.001, partial η^2=0.064] also reached significance.

For the video glasses (hedonic product), the main effects of learning strategy [F(2, 740)=24.271, p<0.001, partial η^2=0.062] and presentation format [F(1, 740)=21.464, p<0.001, partial η^2=0.028] were significant. The interaction effect of learning strategy and presentation format [F(2, 740)=21.516, p<0.001, partial η^2=0.055] also reached significance.

For the intelligent oven (hybrid product), the main effects of learning strategy [$F(2, 742)=10.014$, $p<0.001$, partial $\eta^2=0.026$] and presentation format [$F(1, 742)=70.333$, $p<0.001$, partial $\eta^2=0.087$] were significant. However, the interaction effect of learning strategy and presentation format was not significant [$F(2, 742)=0.941$, $p>0.05$, partial $\eta^2=0.003$].

For the Digipen (utilitarian), the use of words created a higher level of product comprehension than the use of pictures in the mental simulation condition ($M_{\text{visual mental simulation}}=4.39$ vs. $M_{\text{verbal mental simulation}}=5.08$; $M_{\text{difference}}= -0.688$, $p<0.001$, $F(1, 715)=16.960$, $p<0.001$), in the analogy condition ($M_{\text{visual analogy}}=3.01$ vs. $M_{\text{verbal analogy}}=5.21$; $M_{\text{difference}}= -2.198$, $p<0.001$, $F(1, 715)=169.515$, $p<0.001$) and in the no analogy/ no mental simulation condition ($M_{\text{visual no analogy/no mental simulation}}=2.69$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.76$; $M_{\text{difference}}= -2.069$, $p<0.001$, $F(1, 715)=131.291$, $p<0.001$). *Therefore,* ***hypothesis 1a*** *which predicted that when the learning strategy is a mental simulation, the use of words would trigger a higher product comprehension than the use of pictures for a utilitarian product is* ***supported. Hypothesis 4a*** *which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of product comprehension than the use of pictures for a utilitarian product is also* ***supported****.*

For the video glasses (hedonic), the use of words created a higher level of product comprehension than the use of pictures in the analogy condition ($M_{\text{visual analogy}}=3.00$ vs. $M_{\text{verbal analogy}}=4.38$; $M_{\text{difference}}= -1.381$, $p<0.001$, $F(1, 740)=79.034$, $p<0.001$). In the no analogy/ no mental simulation condition the use of words was only marginally superior to the use of pictures ($M_{\text{visual no analogy/ no mental simulation}}=4.33$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.56$; $M_{\text{difference}}= -0.233$, $p>0.05$, $F(1, 740)=1.619$, $p>0.05$). Finally, in the mental simulation condition, the use of pictures created a marginally higher product comprehension than words, although the difference did not reach significance ($M_{\text{visual mental simulation}}=4.44$ vs. $M_{\text{verbal mental simulation}}=4.28$; $M_{\text{difference}}=0.156$, $p>0.05$; $F(1, 740)=0.591$, $p>0.05$). *Therefore,* ***hypothesis 1b*** *which predicted that when the learning strategy is a mental simulation, the use of pictures* *would trigger higher levels of product comprehension than the use of words for a hedonic product is statistically* ***rejected****. Although the pattern of results is in the expected direction, the mean difference did not reach significance.* ***Hypothesis 4b*** *which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of product comprehension than the use of pictures for a hedonic product is* ***supported****.*

For the intelligent oven (hybrid product), the use of words yielded a higher product comprehension than the use of pictures in the mental simulation condition ($M_{\text{visual mental simulation}}=4.05$ vs. $M_{\text{verbal mental simulation}}=4.69$; $M_{\text{difference}}= -0.644$, $p<0.001$; $F(1, 742)=16.976$, $p<0.001$), in the analogy condition ($M_{\text{visual analogy}}=3.46$ vs. $M_{\text{verbal analogy}}= 4.39$; $M_{\text{difference}}= -0.927$, $p<0.001$, $F(1, 742)=22.799$, $p<0.001$) and in the no analogy/ no mental simulation condition ($M_{\text{visual no analogy/ no mental simulation}}=4.01$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.92$; $M_{\text{difference}}= -0.909$, $p<0.001$, $F(1, 742)=32.615$, $p<0.001$). *Hypothesis 1c predicted that when the learning strategy is a mental simulation, the use of words would trigger similar levels of product comprehension as the use of pictures for a hybrid product. Therefore,* ***hypothesis 1c*** *is* ***rejected*** *as the use of words triggered a significantly higher product comprehension than pictures in the mental simulation condition. Hypothesis 4c predicted that when the learning strategy is an analogy the use of words would trigger higher levels of product comprehension than the use of pictures for a hybrid product. Therefore,* ***hypothesis 4c*** *is* ***supported****.*

The means for product comprehension for each combination of learning strategy and presentation format are illustrated for each product in figures 6.3-3, 6.3-4 and 6.3-5. Furthermore, the cell means and standard deviations for product comprehension and for each product as a result of combinations of learning strategies and presentation formats are presented in table 6.3-1.

Figure 6.3-3 Product Comprehension for each presentation format/ learning strategy combination (Utilitarian Product: Digipen)

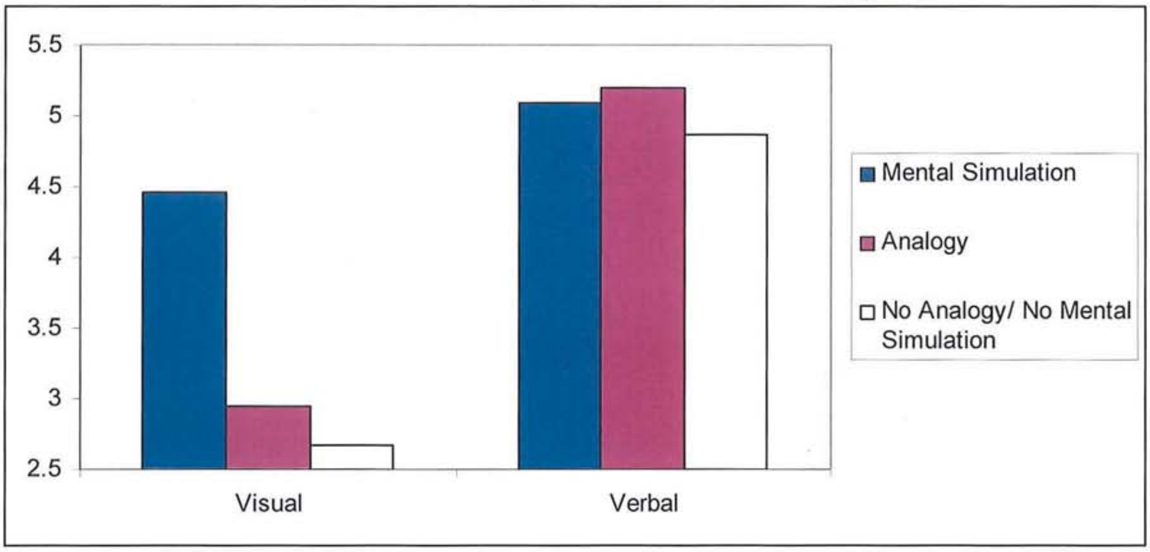


Figure 6.3-4 Product Comprehension for each presentation format/ learning strategy combination (Hedonic Product: Video glasses)

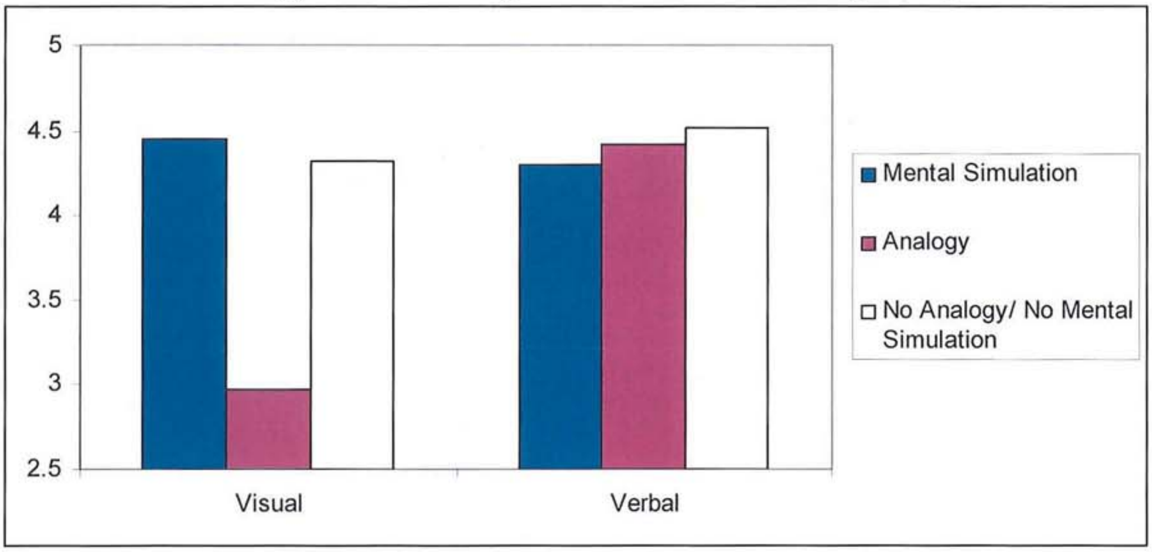


Figure 6.3-5 Product Comprehension for each presentation format/ learning strategy combination (Hybrid Product: Intelligent oven)

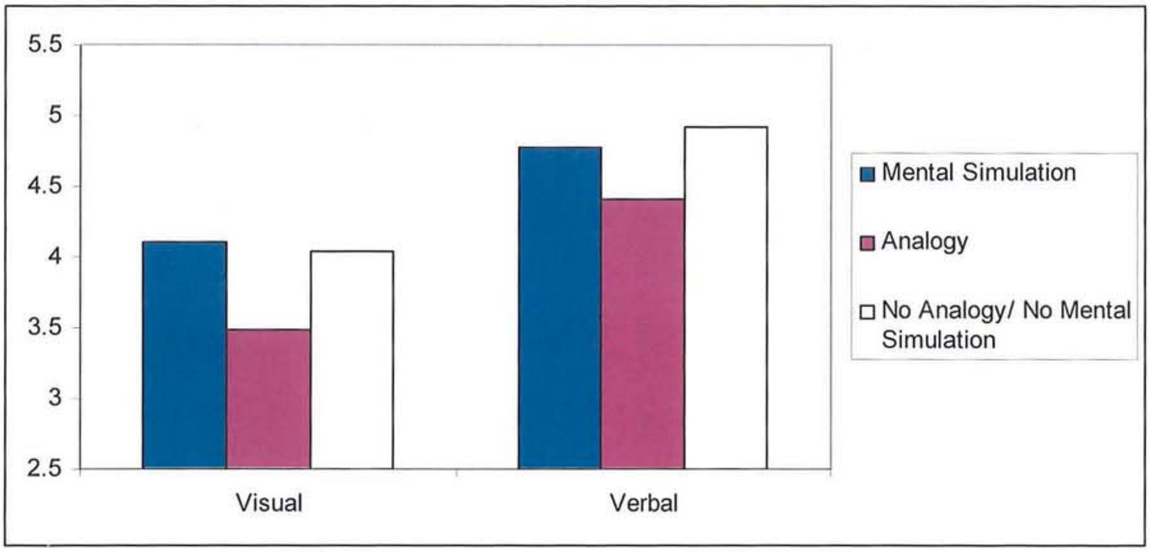


TABLE 6.3-1 PRODUCT COMPREHENSION FOR ALTERNATIVE PRESENTATION FORMATS AND LEARNING STRATEGIES

	Visual			Verbal		
	Mental Simulation	Analogy	No analogy/ no mental simulation	Mental Simulation	Analogy	No analogy/ no mental simulation
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Digipen (Utilitarian)	4.39 (1.54)	3.01 (1.72)	2.69 (1.30)	5.08 (1.05)	5.21 (1.15)	4.76 (1.17)
Video Glasses (Hedonic)	4.44 (1.33)	3.00 (1.35)	4.33 (1.57)	4.28 (1.40)	4.38 (1.21)	4.56 (1.48)
Intelligent Oven (Hybrid)	4.05 (1.46)	3.46 (1.50)	4.01 (1.43)	4.69 (1.12)	4.39 (1.30)	4.92 (1.13)

An analysis of mean differences was then conducted to examine the differences in product comprehension between alternative learning strategies when the presentation format is conveyed with words and when it is conveyed with pictures.

For the Digipen, when the product was conveyed using words the analogy triggered a higher product comprehension than the no analogy/ no mental simulation ($M_{\text{verbal mental simulation}}=5.08$ vs. $M_{\text{verbal analogy}}=5.21$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.76$; $M_{\text{difference mental simulation vs. analogy}}= -0.133$, $p>0.05$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.319$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=0.452$, $p<0.05$; $F(2, 715)=4.009$, $p<0.05$). *Therefore,* ***hypothesis 7a*** *which predicted that the use of verbal mental simulation would trigger higher levels of product comprehension than verbal analogy when the product is utilitarian is* ***rejected****, as there were no significant differences in product comprehension between verbal analogy and verbal mental simulation.*

For the Digipen, when the product was conveyed using pictures the mental simulation created a higher product comprehension than the analogy and than the no analogy/ no mental simulation ($M_{\text{visual mental simulation}}=4.39$ vs. $M_{\text{visual analogy}}=3.01$ vs. $M_{\text{no analogy/ no mental simulation}}=2.69$, $M_{\text{difference mental simulation vs. analogy}}=1.377$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=1.700$, $p<0.001$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=0.323$, $p>0.05$; $F(2, 715)=46.949$, $p<0.001$). *Therefore,* ***hypothesis 10a*** *which predicted that the use of visual mental simulation would trigger higher levels of product comprehension than visual analogy when the product is utilitarian is* ***supported****.*

For the video glasses, when the product was conveyed using words there were no significant differences between the three strategies ($M_{\text{verbal mental simulation}}=4.28$ vs. $M_{\text{verbal analogy}}=4.38$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.56$; $M_{\text{difference mental simulation vs. analogy}} = -0.096$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}= -0.274$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.178$, all p's$>0.05$; $F(2, 740)=1.256$, $p>0.05$). *Therefore,* ***hypothesis 7b*** *which predicted that the use of verbal* *mental simulation would trigger higher levels of product comprehension than verbal analogy when the product is hedonic is **rejected**, as there were no significant differences between verbal mental simulation and verbal analogy.*

For the video glasses, when the product was conveyed using pictures the mental simulation and the no analogy/ no mental simulation conditions created a higher level of product comprehension than the analogy ($M_{\text{visual mental simulation}}=4.44$ vs. $M_{\text{visual analogy}}=3.00$ vs. $M_{\text{visual no analogy/ no mental simulation}}=4.33$, $M_{\text{difference mental simulation vs. analogy}}=1.441$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.115$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=-1.326$, $p<0.001$; $F(2, 740)=39.004$, $p<0.001$). *Therefore, **hypothesis 10b** which predicted that the use of visual mental simulation would trigger higher levels of product comprehension than visual analogy when the product is hedonic is **supported**.*

For the intelligent oven, when the product was conveyed using words the no analogy/ no mental simulation created a higher product comprehension than the analogy. No other significant differences were noted among means ($M_{\text{verbal mental simulation}}=4.69$ vs. $M_{\text{verbal analogy}}=4.39$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.92$; $M_{\text{difference mental simulation vs. analogy}}=0.306$, $p>0.05$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}= -0.225$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=-0.531$, $p<0.005$, $F(2, 742)=5.143$, $p<0.01$). *Therefore, **hypothesis 7c** which predicted that the use of verbal mental simulation would trigger higher levels of product comprehension than verbal analogy when the product is hybrid is **rejected**. Although the expected pattern of results is observed, the mean difference did not reach significance.*

For the intelligent oven, when the product was conveyed using pictures the mental simulation and the no analogy/ no mental simulation created a significantly higher product comprehension than the analogy ($M_{\text{visual mental simulation}}=4.05$ vs. $M_{\text{visual analogy}}=3.46$ vs. $M_{\text{visual no analogy/ no mental simulation}}=4.01$; $M_{\text{difference mental simulation vs. analogy}}=0.588$, $p<0.005$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.040$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=-0.548$,

$p<0.05$; $F(2, 742)=5.832$, $p<0.005$). *Therefore,* ***hypothesis 10c*** *which predicted that the use of visual mental simulation would trigger higher levels of product comprehension than visual analogy when the product is hybrid is* ***supported****.*

6.3.2 Attitude to the Product (Hypotheses 2, 5, 8 and 11)

Hypothesis 2 suggests that when the learning strategy is a mental simulation a) the use of words will trigger higher levels of attitude to the product than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of attitude to the product than the use of words for hedonic products, c) the use of words will trigger similar levels of attitude to the product as the use of pictures for hybrid products.

Hypothesis 5 suggests that when the learning strategy is an analogy the use of words will trigger higher levels of attitude to the product than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.

Hypothesis 8 suggests that the use of verbal mental simulation will trigger higher levels of attitude to the product than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.

Hypothesis 11 suggests that the use of visual mental simulation will trigger higher levels of attitude to the product than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.

These hypotheses were tested using repeated-measures ANOVAs. A 3 within-subjects (learning strategy: mental simulation vs. analogy vs. no analogy/ no mental simulation) x 2 between-subjects (presentation format: visual vs. verbal) x 3 between-subjects (product type: utilitarian vs. hedonic vs. hybrid) repeated-measures ANOVA was first conducted with attitude to the product as the dependent variable. Subsequently, 2 (presentation format) x 3 (learning strategy) between-subjects ANOVAs were conducted for each of the three products (intelligent oven, Digipen and video glasses).

6.3.2.1 Main Effects

6.3.2.1.1 Learning Strategy

There was a significant main effect of the learning strategy used in the advert on the participants' attitude to the product advertised, $F(2, 1278)=12.680$, $p<0.001$, partial $\eta^2=0.019$. Overall, the mental simulation triggered a significantly higher attitude than the analogy and a marginally higher attitude than the no analogy/ no mental simulation. Surprisingly, the no analogy/ no mental simulation created a higher product attitude than the analogy ($M_{\text{mental simulation}}=4.24$ vs. $M_{\text{analogy}}=3.78$ vs. $M_{\text{no analogy/ no mental simulation}}=4.05$; $M_{\text{difference mental simulation vs. analogy}}=0.453$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.186$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.267$, $p<0.05$).

6.3.2.1.2 Presentation Format

There was also a significant main effect of presentation format, $F(1, 638)=5.154$, $p<0.05$, partial $\eta^2=0.008$, as the use of words created a higher product attitude than the use of pictures ($M_{\text{pictures}}=3.91$ vs. $M_{\text{words}}=4.11$; $M_{\text{difference}}= -0.204$, $p<0.05$). These results will be investigated further by examining interaction effects and by conducting analyses per product. It can be noted that the difference between the use of words and pictures for product attitude is greatly reduced compared to the effect found previously for product comprehension.

6.3.2.1.3 Product Type

There was a significant main effect of product type, $F (2, 1278) =21.623$, $p<0.001$, partial $\eta^2=0.033$. Overall, the Digipen received a higher attitude than the video glasses and the oven. The video glasses also created a higher level of attitude than the intelligent oven ($M_{\text{oven}}=3.74$ vs. $M_{\text{Digipen}}=4.33$ vs. $M_{\text{video glasses}}=4.01$; $M_{\text{difference oven vs. Digipen}}= -0.590$, $p<0.001$; $M_{\text{difference oven vs. glasses}}=-0.266$, $p<0.005$; $M_{\text{difference Digipen vs. glasses}}=0.324$, $p<0.001$).

6.3.2.2 Interaction effects: Presentation Format * Learning Strategy

As hypothesized, there was a significant interaction effect between presentation format and learning strategy, $F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$.

Contrary to the results encountered for product comprehension, the pattern for presentation format varied significantly across learning strategies. The use of words created a significantly higher level of product attitude than the use of pictures for only one learning strategy, the analogy ($M_{\text{visual analogy}}=3.43$ vs. $M_{\text{verbal analogy}}=4.04$, $M_{\text{difference}}= -0.615$, $p<0.001$, $F(1, 638)=19.858$, $p<0.001$). For the mental simulation strategy, the use of pictures yielded a product attitude which was marginally higher than the use of words ($M_{\text{visual mental simulation}}=4.30$ vs. $M_{\text{verbal mental simulation}}=4.19$, $M_{\text{difference}}= 0.103$, $p>0.05$, $F(1, 638)=0.543$, $p>0.05$). In the no analogy/ no mental simulation condition, there was no significant difference between the use of words and the use of pictures ($M_{\text{visual no analogy/ no mental simulation}}=3.99$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.09$, $M_{\text{difference}}= -0.099$, $p>0.05$, $F(1, 638)=0.514$, $p>0.05$).

Furthermore, the pattern of product attitude achieved across learning strategies varied depending on the presentation format used. When the presentation format used pictures, the mental simulation and the no analogy/ no mental simulation triggered a significantly higher product attitude than the analogy. The mental simulation was marginally superior to the no analogy/ no mental simulation ($M_{\text{visual mental simulation}}=4.30$ vs. $M_{\text{visual analogy}}=3.43$ vs. $M_{\text{visual no analogy/ no mental simulation}}=3.99$; $M_{\text{difference mental simulation vs. analogy}}=0.869$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.303$, $p=0.086$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.566$, $p<0.001$, $F(2, 637)=20.732$, $p<0.001$). However, when the presentation format used words, there were no significant differences between mental simulation, analogy and the no analogy/ no mental simulation condition in terms of product attitude ($M_{\text{verbal mental simulation}}=4.19$ vs. $M_{\text{verbal analogy}}=4.04$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.09$, all p's>0.05, $F(2, 637)=0.896$, $p>0.05$).

The interaction effect of presentation format with learning strategy is illustrated in figure 6.3-6. The means in terms of product attitude for each combination of presentation format and learning strategy are also illustrated in figure 6.3-7.

Figure 6.3-6 Interaction Effect of Presentation Format and Learning Strategy for Product Attitude

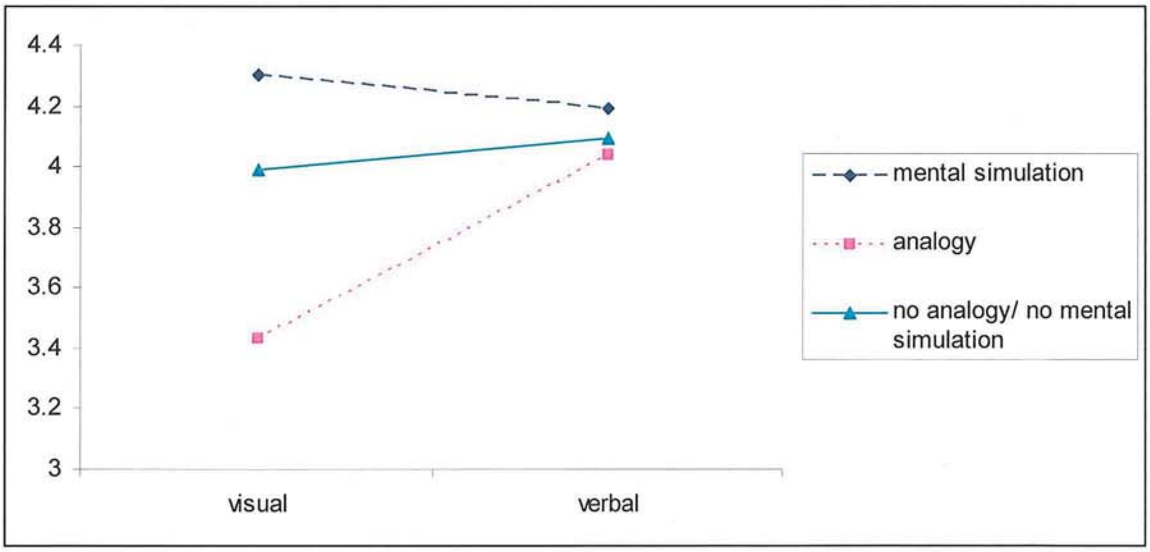
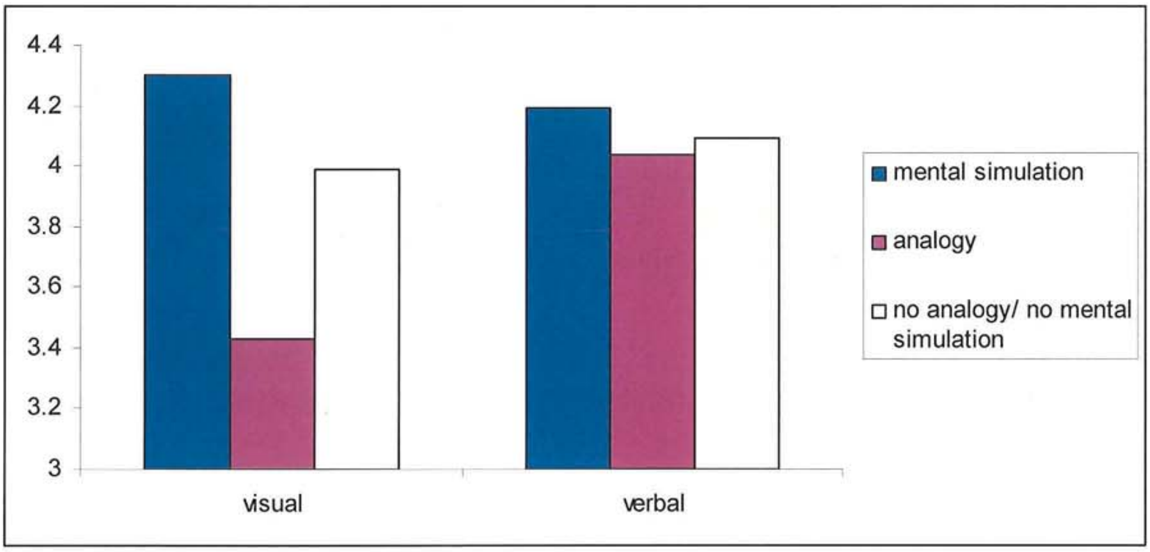


Figure 6.3-7 Product Attitude for each Presentation Format/ Learning Strategy combination



6.3.2.3 Analysis per product

As alternative presentation formats and learning strategies are nested within each product, a 3 (learning strategy) x 2 (presentation format) between-subjects ANOVA was performed for each of the three products (intelligent oven, Digipen and video glasses).

For the Digipen, the main effects of learning strategy [$F(2, 726)=13.899$, $p<0.001$, partial $\eta^2=0.037$] and presentation format [$F(1, 726)=40.318$, $p<0.001$, partial $\eta^2=0.053$] were significant. The interaction effect of learning strategy and presentation format [$F(2, 726)=4.002$, $p<0.05$, partial $\eta^2=0.011$] was also significant.

For the video glasses, the main effects of learning strategy [$F(2, 736)=8.382$, $p<0.001$, partial $\eta^2=0.022$] and presentation format [$F(1, 736)=21.424$, $p<0.001$, partial $\eta^2=0.028$] were significant. The interaction effect of learning strategy and presentation format [$F(2, 736)=13.676$, $p<0.001$, partial $\eta^2=0.036$] was also significant.

For the intelligent oven, the main effect of learning strategy [$F(2, 735)=11.178$, $p<0.001$, partial $\eta^2=0.030$] was significant while the main effect of presentation format was not [$F(1, 735)=0.649$, $p>0.05$, partial $\eta^2=0.001$]. The interaction effect of learning strategy and presentation format was not significant [$F(2, 735)=0.002$, $p>0.05$, partial $\eta^2=0.000$].

For the Digipen, the use of words created a higher level of product attitude than the use of pictures in the analogy condition ($M_{\text{visual analogy}}=3.58$ vs. $M_{\text{verbal analogy}}=4.77$; $M_{\text{difference}}= -1.194$, $p<0.001$, $F(1, 726)=32.053$, $p<0.001$) and in the no analogy/ no mental simulation condition ($M_{\text{visual no analogy/no mental simulation}}=3.48$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.27$; $M_{\text{difference}}= -0.786$, $p<0.001$, $F(1, 726)=12.452$, $p<0.001$). However, the difference was only marginal in the mental simulation condition ($M_{\text{visual mental simulation}}=4.48$ vs. $M_{\text{verbal mental simulation}}=4.84$; $M_{\text{difference}}= -0.362$, $p=0.077$, $F(1, 726)=3.127$, $p=0.077>0.05$). *Therefore, **hypothesis 2a** which predicted that when the learning strategy is a mental simulation the use of words would trigger higher levels of attitude to the product than the use of pictures for the utilitarian product was **marginally rejected**, as the pattern of results was as expected and the p-value was* *close to significance ($p=0.077$). **Hypothesis 5a** which predicted that when the learning strategy is an analogy the use of words will trigger higher levels of attitude to the product than the use of pictures for a utilitarian product was **supported**.*

For the video glasses, the use of pictures created a higher level of product attitude than the use of words in the mental simulation condition ($M_{\text{visual mental simulation}}=4.80$ vs. $M_{\text{verbal mental simulation}}=3.56$; $M_{\text{difference}}= 1.241$, $p<0.001$, $F(1, 736)=25.863$, $p<0.001$) and in the no analogy/ no mental simulation condition ($M_{\text{visual no analogy/ no mental simulation}}=4.66$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=3.91$; $M_{\text{difference}}= 0.750$, $p<0.001$, $F(1, 736)=11.968$, $p<0.001$). Finally, in the analogy condition, there was no significant difference between the use of words and the use of pictures ($M_{\text{visual analogy}}=3.61$ vs. $M_{\text{verbal analogy}}=3.87$; $M_{\text{difference}}=-0.259$, $p>0.05$; $F(1, 736)=1.992$, $p>0.05$). *Therefore, **hypothesis 2b** which predicted that when the learning strategy is a mental simulation, the use of pictures will trigger higher levels of attitude to the product than the use of words for a hedonic product is **supported**. **Hypothesis 5b** which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of attitude to the product than the use of pictures for a hedonic product is **rejected**, as the mean difference did not reach significance.*

For the intelligent oven, there was no significant difference in product attitude between the use of words and the use of pictures in the mental simulation condition ($M_{\text{visual mental simulation}}=3.65$ vs. $M_{\text{verbal mental simulation}}=3.74$; $M_{\text{difference}}= -0.095$, $p>0.05$; $F(1, 735)=0.215$, $p>0.05$), in the analogy condition ($M_{\text{visual analogy}}=3.19$ vs. $M_{\text{verbal analogy}}= 3.29$; $M_{\text{difference}}= -0.104$, $p>0.05$, $F(1, 735)=0.163$, $p>0.05$) and in the no analogy/ no mental simulation condition ($M_{\text{visual no analogy/ no mental simulation}}=3.97$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.08$; $M_{\text{difference}}= -0.115$, $p>0.05$, $F(1, 735)=0.302$, $p>0.05$). ***Hypothesis 2c** which predicted that when the learning strategy is a mental simulation, the use of words would trigger similar levels of attitude to the product as the use of pictures for a hybrid product is therefore **supported**. **Hypothesis 5c** which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of attitude to* *the product than the use of pictures for a hybrid product was* ***rejected*** *as the mean difference did not reach significance.*

The results in terms of attitude to the product for each combination of learning strategy and presentation format are illustrated for each product in figures 6.3-8, 6.3-9 and 6.3-10. Furthermore, the cell means and standard deviations for product attitude and for each product as a result of combinations of learning strategies and presentation formats appear in table 6.3-2.

Figure 6.3-8 Product Attitude for each presentation format/ learning strategy combination (Utilitarian product: Digipen)

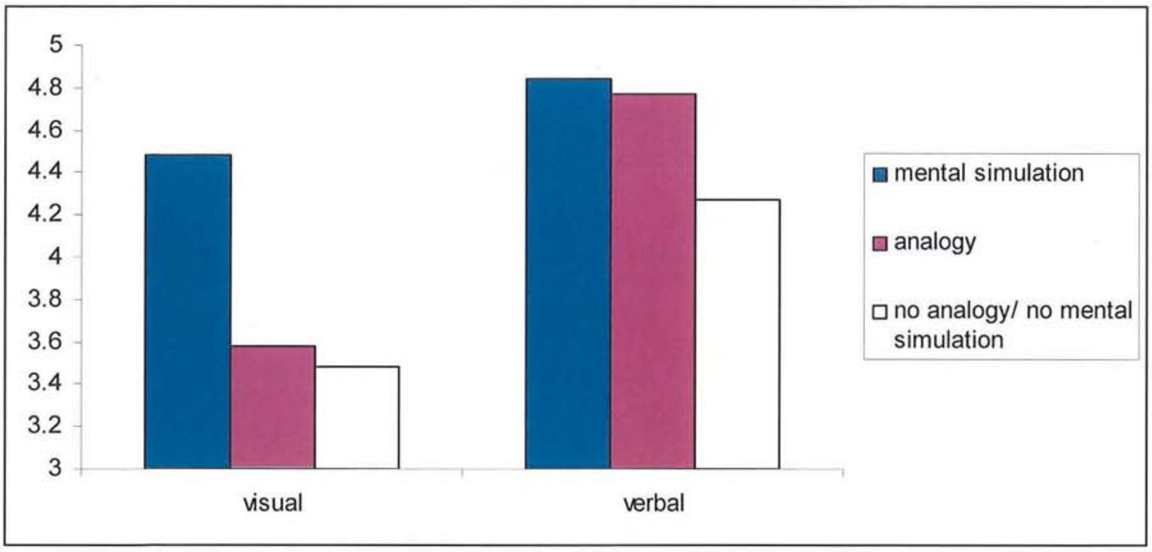


Figure 6.3-9 Product Attitude for each presentation format/ learning strategy combination (Hedonic Product: Video glasses)

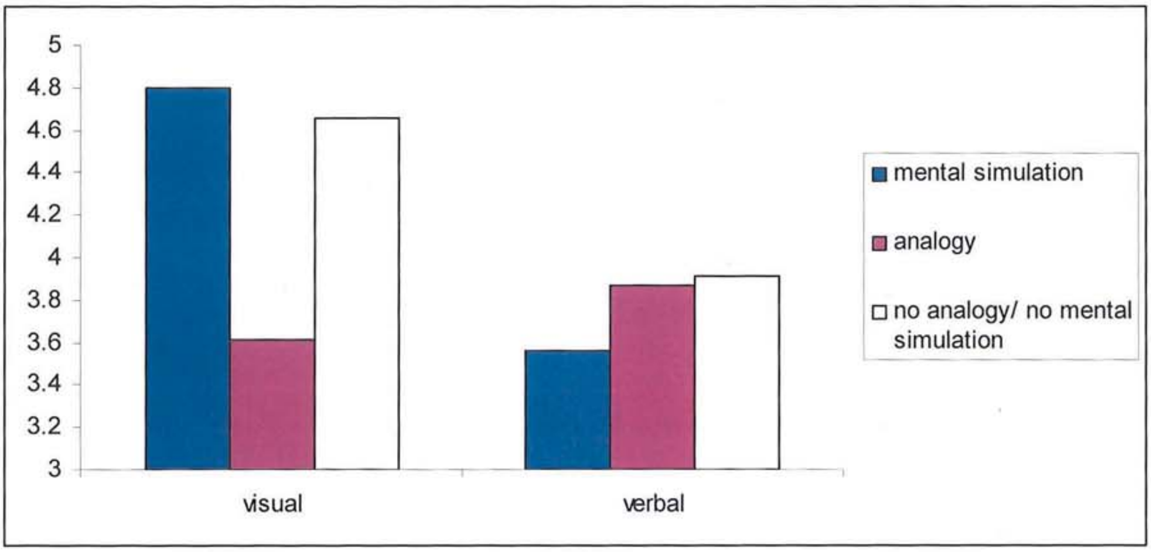


Figure 6.3-10 Product Attitude for each presentation format/ learning strategy combination (Hybrid Product: Intelligent oven)

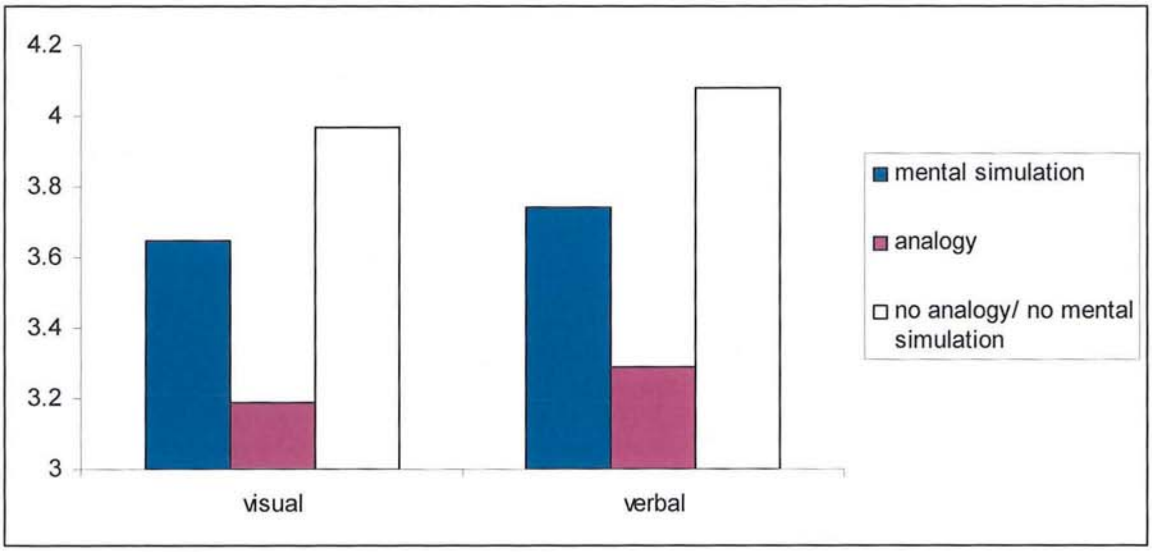


TABLE 6.3-2 PRODUCT ATTITUDE FOR ALTERNATIVE PRESENTATION FORMATS AND LEARNING STRATEGIES

	Visual			Verbal		
	Mental Simulation	**Analogy**	**No analogy/ no mental simulation**	**Mental Simulation**	**Analogy**	**No analogy/ no mental simulation**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Digipen (Utilitarian)	4.48 (1.66)	3.58 (1.75)	3.48 (1.40)	4.84 (1.74)	4.77 (1.58)	4.27 (1.60)
Video Glasses (Hedonic)	4.80 (1.53)	3.61 (1.49)	4.66 (1.63)	3.56 (1.68)	3.87 (1.60)	3.91 (1.81)
Intelligent Oven (Hybrid)	3.65 (1.56)	3.19 (1.60)	3.97 (1.64)	3.74 (1.63)	3.29 (1.93)	4.08 (1.85)

An analysis of mean differences was then conducted to examine the differences in attitude to the product between alternative learning strategies when the presentation format is conveyed with words and when it is conveyed with pictures.

For the Digipen, when the product was conveyed using words the mental simulation and the analogy triggered a higher product attitude than the no analogy/ no mental simulation ($M_{\text{verbal mental simulation}}=4.84$ vs. $M_{\text{verbal analogy}}=4.77$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.27$; $M_{\text{difference mental simulation vs. analogy}}= 0.068$, $p>0.05$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.573$, $p<0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=0.504$, $p<0.05$; $F(2, 726)=4.682$, $p<0.01$). *Therefore, **hypothesis 8a** which predicted that the use of verbal mental simulation would trigger higher levels of attitude to the product than verbal analogy when the product is utilitarian is **rejected**, as the mean difference did not reach significance.*

For the Digipen, when the product was conveyed using pictures the mental simulation created a higher product attitude than the analogy and than the no analogy/ no mental simulation ($M_{\text{visual mental simulation}}=4.48$ vs. $M_{\text{visual analogy}}=3.58$ vs. $M_{\text{no analogy/ no mental simulation}}=3.48$, $M_{\text{difference mental simulation vs. analogy}}=0.900$, $p<0.001$; $M_{\text{difference mental simulation vs no analogy/ no mental simulation}}=0.996$, $p<0.001$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=0.097$, $p>0.05$; $F(2, 726)=11.810$, $p<0.001$). *Therefore, **hypothesis 11a** which predicted that the use of visual mental simulation would trigger higher levels of attitude to the product than visual analogy when the product is utilitarian is **supported**.*

For the video glasses, when the product was conveyed using words there were no significant differences between the three strategies ($M_{\text{verbal mental simulation}}=3.56$ vs. $M_{\text{verbal analogy}}=3.87$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=3.91$; $M_{\text{difference mental simulation vs. analogy}} = -0.316$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}= -0.353$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.037$, all p's$>0.05$; $F(2, 736)=1.585$, $p>0.05$). *Therefore, **hypothesis 8b** which predicted that the use of verbal* *mental simulation would trigger higher levels of attitude to the product than verbal analogy when the product is hedonic is* ***rejected****, as the verbal analogy actually created a marginally higher attitude to the product than the verbal mental simulation.*

For the video glasses, when the product was conveyed using pictures the mental simulation and the no analogy/ no mental simulation conditions created a higher level of product attitude than the analogy (M.visual mental simulation=4.80 vs. M.visual analogy=3.61 vs. M.visual no analogy/ no mental simulation=4.66, M.difference mental simulation vs. analogy=1.184, $p<0.001$; M.difference mental simulation vs. no analogy/ no mental simulation=0.138, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation=-1.046, $p<0.001$; $F(2, 736)=18.074$, $p<0.001$). *Therefore,* ***hypothesis 11b*** *which predicted that the use of visual mental simulation would trigger higher levels of attitude to the product than visual analogy when the product is hedonic is* ***supported****.*

For the intelligent oven, when the product was conveyed using words the no analogy/ no mental simulation was superior to the analogy. The mental simulation was marginally superior to the analogy (M.verbal mental simulation=3.74 vs. M.verbal analogy=3.29 vs. M.verbal no analogy/ no mental simulation=4.08; M.difference mental simulation vs. analogy=0.449, $p>0.05$); M.difference mental simulation vs. no analogy/ no mental simulation= -0.322, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation= -0.779, $p=0.005$, $F(2, 735)=6.498$, $p<0.005$). *Therefore,* ***hypothesis 8c*** *which predicted that the use of verbal mental simulation would trigger higher levels of attitude to the product than verbal analogy when the product is hybrid is* ***rejected****, as the difference did not reach significance.*

For the intelligent oven, when the product was conveyed using pictures the no analogy/ no mental simulation created a significantly higher product attitude than the analogy; other mean differences were not significant although the mental simulation was marginally superior to the analogy (M.visual mental simulation=3.65 vs. M.visual analogy=3.19 vs. M.visual no analogy/ no mental simulation=3.97; M.difference mental simulation vs. analogy=0.458, $p=0.191$; M.difference mental simulation vs. no analogy/ no mental simulation= -0.322, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation= -0.779, $p=0.005$; F(2, 735)=4.896, p=0.008). *Therefore,* ***hypothesis 11c*** *which predicted that the use of visual mental simulation would trigger higher levels of attitude to the product than visual analogy when the product is hybrid is* ***rejected*** *because the mean difference did not reach significance.*

6.3.3 Behavioural Intent (Hypotheses 3, 6, 9 and 12)

Hypothesis 3 predicts that when the learning strategy is a mental simulation a) the use of words will trigger higher levels of behavioural intent than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of behavioural intent than the use of words for hedonic products, c) the use of words will trigger similar levels of behavioural intent as the use of pictures for hybrid products.

Hypothesis 6 predicts that when the learning strategy is an analogy the use of words will trigger higher levels of behavioural intent than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.

Hypothesis 9 predicts that the use of verbal mental simulation will trigger higher levels of behavioural intent than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.

Hypothesis 12 predicts that the use of visual mental simulation will trigger higher levels of behavioural intent than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.

These hypotheses were tested using repeated-measures ANOVAs. A 3 within-subjects (learning strategy: mental simulation vs. analogy vs. no analogy/ no mental simulation) x 2 between-subjects (presentation format: visual vs. verbal) x 3 between-subjects (product type: utilitarian vs. hedonic vs. hybrid) repeated-measures ANOVA was first conducted with behavioural intent as the dependent variable. Subsequently, 2 (presentation format) x 3 (learning strategy) between-subjects ANOVAs were conducted for each of the three products (intelligent oven, Digipen and video glasses)

6.3.3.1 Main effects

6.3.3.1.1 Learning Strategy

There was a significant main effect of the learning strategy used in the advert on the participants' behavioural intent for the products, $F(2, 1316)=6.605$, $p<0.001$, partial $\eta^2=0.010$. Overall, the mental simulation triggered a significantly higher intent than the analogy and a marginally higher intent than the no analogy/ no mental simulation ($M_{\text{mental simulation}}=4.36$ vs. $M_{\text{analogy}}=4.07$ vs. $M_{\text{no analogy/ no mental simulation}}=4.21$; $M_{\text{difference mental simulation vs. analogy}}=0.291$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.145$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.146$, $p>0.05$).

6.3.3.1.2 Presentation Format

The main effect of presentation format was not significant, $F(1, 657)=0.026$, $p>0.05$, partial $\eta^2=0.000$ ($M_{\text{pictures}}=4.20$ vs. $M_{\text{words}}=4.22$; $M_{\text{difference}}= -0.016$, $p>0.05$).

6.3.3.1.3 Product type

There was a significant main effect of product type, $F (2, 1316) =38.185$, $p<0.001$, partial $\eta^2=0.055$. Overall, the Digipen created a stronger behavioural intent than the video glasses and the oven ($M_{\text{oven}}=3.98$ vs. $M_{\text{Digipen}}=4.61$ vs. $M_{\text{video glasses}}=4.06$; $M_{\text{difference oven vs. Digipen}}= -0.626$, $p<0.001$; $M_{\text{difference oven vs. glasses}}= -0.075$, $p>0.05$; $M_{\text{difference Digipen vs. glasses}}=0.551$, $p<0.001$).

6.3.3.2 Interaction effect: Presentation Format * Learning Strategy

There was a significant interaction effect between presentation format and learning strategy, $F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$.

The pattern for presentation format varied significantly across learning strategies, as the use of words created a significantly higher level of behavioural intent than the use of pictures for only one learning strategy: analogy ($M_{\text{visual analogy}}=3.91$ vs. $M_{\text{verbal analogy}}=4.18$, $M_{\text{difference}}= -0.269$, $p<0.05$, $F(1, 657)=3.993$, $p<0.05$). For the mental simulation strategy, the use of pictures yielded a behavioural intent which was marginally higher than the use of words ($M_{\text{visual mental simulation}}=4.42$ vs. $M_{\text{verbal mental simulation}}=4.32$, $M_{\text{difference}}= 0.098$, $p>0.05$, $F(1, 657)=0.530$, $p>0.05$). In the no analogy/ no mental simulation condition, there was no significant difference between the use of words and the use of pictures ($M_{\text{visual no analogy/ no mental simulation}}=4.29$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.16$, $M_{\text{difference}}= 0.124$, $p>0.05$, $F(1, 657)=0.843$, $p>0.05$).

Furthermore, consistent with the interaction effect, the pattern of behavioural intent achieved for the learning strategies varied depending on the presentation format used. When the presentation format used pictures, the mental simulation and the no analogy/ no mental simulation triggered a significantly higher behavioural intent than the analogy ($M_{\text{visual mental simulation}}=4.42$ vs. $M_{\text{visual analogy}}=3.91$ vs. $M_{\text{visual no analogy/ no mental simulation}}=4.29$; $M_{\text{difference mental simulation vs. analogy}}=0.505$, $p<0.001$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.130$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}= -0.375$, $p<0.005$, $F(2, 656)=8.821$, $p<0.001$). However, when the presentation format used words, there were no significant differences between mental simulation, analogy and the no analogy/ no mental simulation condition in terms of behavioural intent ($M_{\text{verbal mental simulation}}=4.32$ vs. $M_{\text{verbal analogy}}=4.18$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.16$, all p's$>0.05$, $F(2, 656)=1.372$, $p>0.05$).

The interaction effect of presentation format with learning strategy is illustrated in figure 6.3-11. The means in terms of behavioural intent for each combination of presentation format and learning strategy are also illustrated using columns in figure 6.3-12.

Figure 6.3-11 Interaction Effect of Presentation Format and Learning Strategy for Behavioural Intent

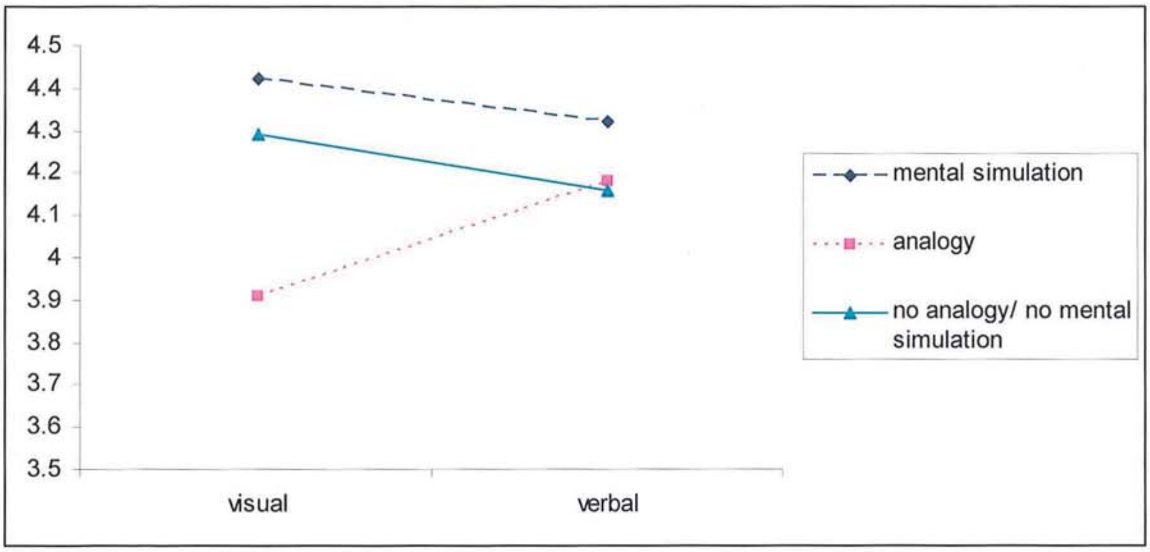
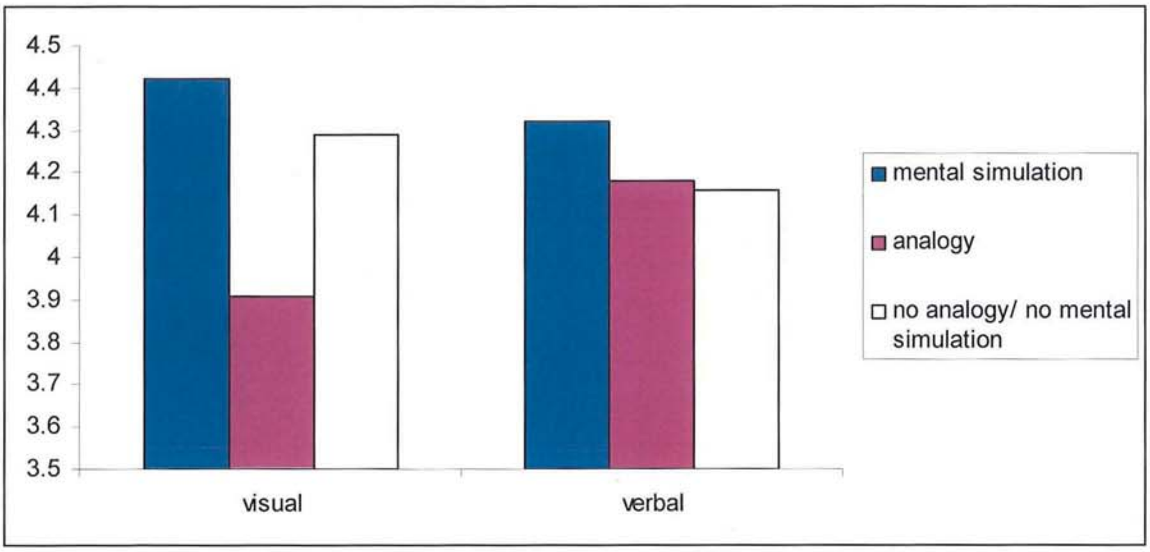


Figure 6.3-12 Behavioural Intent for each Presentation Format/ Learning Strategy Combination



6.3.3.3. Analysis per Product

As alternative presentation formats and learning strategies are nested within each product, a between-subjects ANOVA was conducted for each of the three products (intelligent oven, Digipen and video glasses).

For the Digipen, the main effects of learning strategy [$F(2, 724)=8.773$, $p<0.001$, partial $\eta^2=0.024$] and presentation format [$F(1, 724)=15.249$, $p<0.001$, partial $\eta^2=0.021$] were significant. The interaction effect of learning strategy and presentation format [$F(2, 724)=2.089$, $p>0.05$, partial $\eta^2=0.006$] was not significant.

For the video glasses, the main effect of learning strategy was not significant [$F(2, 750)=0.953$, $p>0.05$, partial $\eta^2=0.003$] while the main effect of presentation format did reach significance [$F(1, 750)=22.520$, $p<0.001$, partial $\eta^2=0.029$]. The interaction effect of learning strategy and presentation format [$F(2, 750)=8.001$, $p<0.001$, partial $\eta^2=0.021$] was significant.

For the intelligent oven, the main effect of learning strategy [$F(2, 740)=11.609$, $p<0.001$, partial $\eta^2=0.030$] was significant while the main effect of presentation format was not [$F(1, 740)=0.053$, $p>0.05$, partial $\eta^2=0.000$]. The interaction effect of learning strategy and presentation format was not significant [$F(2, 740)=0.461$, $p>0.05$, partial $\eta^2=0.001$].

For the Digipen (utilitarian product), the verbal presentation format created a higher level of behavioural intent than the visual presentation format in the mental simulation condition ($M_{\text{visual mental simulation}}=4.61$ vs. $M_{\text{verbal mental simulation}}=5.07$; $M_{\text{difference}}= -0.460$, $p<0.05$, $F(1, 724)=5.246$, $p<0.05$) and in the analogy condition ($M_{\text{visual analogy}}=4.15$ vs. $M_{\text{verbal analogy}}=4.92$; $M_{\text{difference}}= -0.779$, $p<0.001$, $F(1, 724)=14.480$, $p<0.001$). However, the difference was only marginal in the no analogy/ no mental simulation condition ($M_{\text{visual no analogy/ no mental simulation}}=4.14$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=4.31$; $M_{\text{difference}}= -0.169$, $p>0.05$, $F (1, 724)=0.596$, $p>0.05$). *Therefore, **hypothesis 3a** which predicted that when the learning strategy is a mental simulation the use of words would trigger higher levels of behavioural intent than the use of pictures for a utilitarian product is **supported**. **Hypothesis 6a** which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of behavioural intent than the use of pictures for utilitarian products is **supported**.*

For the video glasses (hedonic product), the visual presentation format created a higher level of behavioural intent than the verbal presentation format in the mental simulation condition ($M._{\text{visual mental simulation}}=4.63$ vs. $M._{\text{verbal mental simulation}}=3.47$; $M._{\text{difference}}= 1.169$, $p<0.001$, $F(1, 750)=23.045$, $p<0.001$) and in the no analogy/ no mental simulation condition ($M._{\text{visual no analogy/ no mental simulation}}=4.53$ vs. $M._{\text{verbal no analogy/ no mental simulation}}=3.89$; $M._{\text{difference}}= 0.642$, $p<0.005$, $F(1, 750)=8.653$, $p<0.005$). Finally, in the analogy condition, there was no significant difference between the use of words and the use of pictures ($M._{\text{visual analogy}}=4.00$ vs. $M._{\text{verbal analogy}}=4.03$; $M._{\text{difference}}=-0.027$, $p>0.05$; $F(1, 750)=0.020$, $p>0.05$). *Therefore,* ***hypothesis 3b*** *which predicted that when the learning strategy is a mental simulation the use of pictures would trigger higher levels of behavioural intent than the use of words for a hedonic product is* ***supported.*** ***Hypothesis 6b*** *which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of behavioural intent than the use of pictures for a hedonic product is* ***rejected,*** *as there were no significant differences in behavioural intent between the verbal analogy and the visual analogy.*

For the intelligent oven (hybrid product), there was no significant difference in behavioural intent between the verbal presentation format and the visual presentation format in the mental simulation condition ($M._{\text{visual mental simulation}}=3.92$ vs. $M._{\text{verbal mental simulation}}=4.04$; $M._{\text{difference}}= -0.116$, $p>0.05$; $F(1, 740)=0.331$, $p>0.05$), in the analogy condition ($M._{\text{visual analogy}}=3.58$ vs. $M._{\text{verbal analogy}}= 3.39$; $M._{\text{difference}}= 0.196$, $p>0.05$, $F(1, 740)=0.592$, $p>0.05$) and in the no analogy/ no mental simulation condition ($M._{\text{visual no analogy/ no mental simulation}}=4.28$ vs. $M._{\text{verbal no analogy/ no mental simulation}}=4.27$; $M._{\text{difference}}= 0.010$, $p=0.583$, $F(1, 740)=0.002$, $p>0.05$). *Therefore,* ***hypothesis 3c*** *which predicted that when the learning strategy is a mental simulation the use of words would trigger similar levels of behavioural intent as the use of pictures for a hybrid product is* ***supported.*** ***Hypothesis 6c*** *which predicted that when the learning strategy is an analogy the use of words would trigger higher levels of behavioural intent than the use of pictures for a hybrid product is* ***rejected,*** *as the pattern of results showed that the visual analogy triggered a marginally higher behavioural intent than the verbal analogy. The mean difference was not significant.*

The results for each combination of learning strategy and presentation format are illustrated for each product in figures 6.3-13, 6.3-14 and 6.3-15. Furthermore, the cell means and standard deviations for behavioural intent and for each product as a result of combinations of learning strategies and presentation formats appear in table 6.3-3.

Figure 6.3-13 Behavioural Intent for each presentation format/ learning strategy combination (Utilitarian product: Digipen)

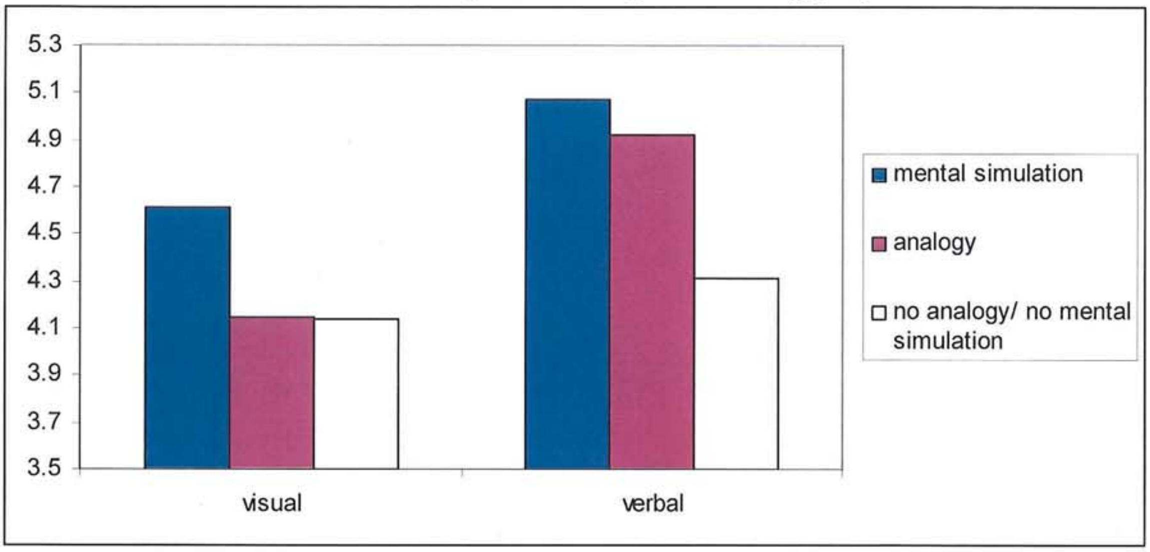


Figure 6.3-14 Behavioural Intent for each presentation format/ learning strategy combination (Hedonic product: Video glasses)

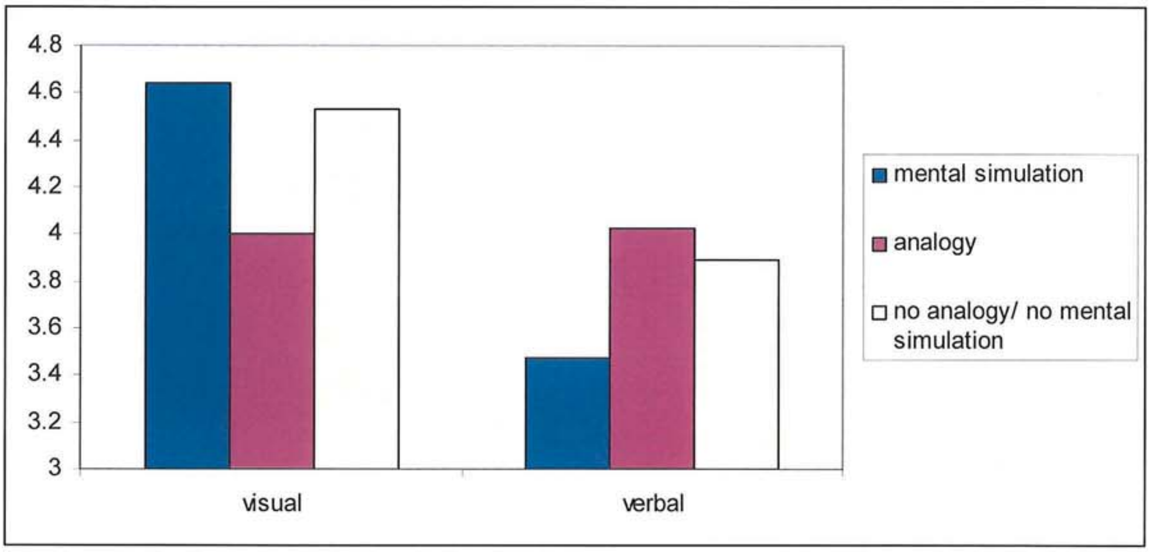


Figure 6.3-15 Behavioural intent for each presentation format/ learning strategy combination (Hybrid product: Intelligent oven)

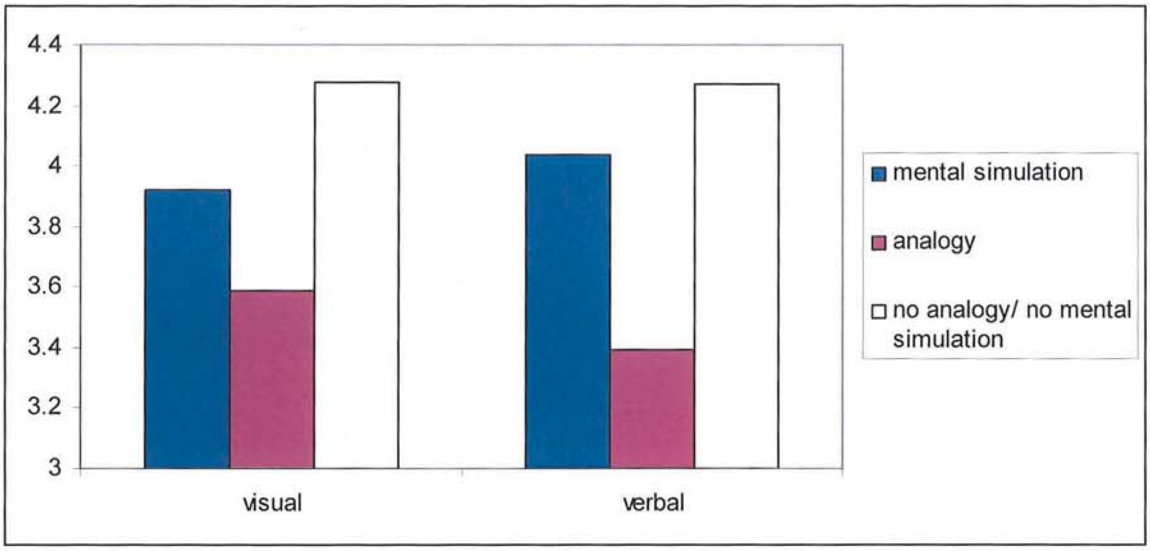


TABLE 6.3-3 BEHAVIOURAL INTENT FOR ALTERNATIVE PRESENTATION FORMATS AND LEARNING STRATEGIES

	Visual			Verbal		
	Mental Simulation	Analogy	No analogy/ no mental simulation	Mental Simulation	Analogy	No analogy/ no mental simulation
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Digipen (Utilitarian)	4.61 (1.59)	4.15 (1.69)	4.14 (1.52)	5.07 (1.53)	4.92 (1.65)	4.31 (1.59)
Video Glasses (Hedonic)	4.63 (1.56)	4.00 (1.53)	4.53 (1.80)	3.47 (1.64)	4.03 (1.62)	3.89 (1.79)
Intelligent Oven (Hybrid)	3.92 (1.68)	3.58 (1.47)	4.28 (1.58)	4.04 (1.74)	3.39 (1.77)	4.27 (1.77)

An analysis of mean differences was then conducted to examine the differences in behavioural intent between alternative learning strategies when the presentation format is conveyed with words and when it is conveyed with pictures.

For the Digipen, when the product was conveyed using words the mental simulation and the analogy triggered a higher behavioural intent than the no analogy/ no mental simulation. The mental simulation was marginally superior to the analogy ($M_{\text{verbal mental simulation}}=5.07$ vs. $M_{\text{verbal analogy}}=4.92$ vs. $M_{\text{verbal no analogy/no mental simulation}}=4.31$; $M_{\text{difference mental simulation vs. analogy}}= 0.148$, $p>0.05$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.766$, $p<0.001$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=0.618$, $p<0.01$; $F(2, 724)=8.359$, $p<0.001$). *Therefore, **hypothesis 9a** which predicted that the use of verbal mental simulation would trigger higher levels of behavioural intent than verbal analogy when the product is utilitarian is **rejected** as the difference did not reach significance. Although the pattern of results is in the expected direction, the mean difference did not reach significance.*

For the Digipen, when the product was conveyed using pictures there were no significant differences between the three strategies. The mental simulation was marginally superior to the other two strategies ($M_{\text{visual mental simulation}}=4.61$ vs. $M_{\text{visual analogy}}=4.15$ vs. $M_{\text{no analogy/ no mental simulation}}=4.14$, $M_{\text{difference mental simulation vs. analogy}}=0.468$, $p>0.05$; $M_{\text{difference mental simulation vs. no analogy/ no mental simulation}}=0.475$, $p>0.05$; $M_{\text{difference analogy vs. no analogy/ no mental simulation}}=0.007$, $p>0.05$; $F(2, 724)=3.029$, $p>0.05$). *Therefore, **hypothesis 12a** which predicted that the use of visual mental simulation would trigger higher levels of behavioural intent than visual analogy when the product is utilitarian is **rejected**. Although the pattern of results was in the expected direction, the difference did not reach significance.*

For the video glasses, when the product was conveyed using words the analogy created a higher behavioural intent than the mental simulation ($M_{\text{verbal mental simulation}}=3.47$ vs. $M_{\text{verbal analogy}}=4.03$ vs. $M_{\text{verbal no analogy/ no mental simulation}}=3.89$; $M_{\text{difference mental simulation vs. analogy}} = -0.565$, $p<0.05$; $M_{\text{difference mental simulation vs. no analogy/ no mental}}$

simulation= -0.422, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation= 0.143, $p>0.05$; $F(2, 750)=3.879$, $p<0.05$). *Therefore, **hypothesis 9b** which predicted that the use of verbal mental simulation would trigger higher levels of behavioural intent than verbal analogy when the product is hedonic is **rejected** as the verbal analogy created a significantly higher behavioural intent than the verbal mental simulation.*

For the video glasses, when the product was conveyed using pictures the mental simulation and the no analogy/ no mental simulation conditions created a higher level of behavioural intent than the analogy. The mental simulation was also marginally superior to the no analogy/ no mental simulation (M.visual mental simulation=4.63 vs. M.visual analogy=4.00 vs. M.visual no analogy/ no mental simulation=4.53, M.difference mental simulation vs. analogy=0.631, $p<0.05$; M.difference mental simulation vs. no analogy/ no mental simulation=0.104, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation= -0.526, $p<0.05$; $F(2, 750)=3.879$, $p<0.01$). *Therefore, **hypothesis 12b** which predicted that the use of visual mental simulation would trigger higher levels of behavioural intent than visual analogy when the product is hedonic is **supported**.*

For the intelligent oven, when the product was conveyed using words the no analogy/ no mental simulation and the mental simulation were superior to the analogy (M.verbal mental simulation=4.04 vs. M.verbal analogy=3.39 vs. M.verbal no analogy/ no mental simulation=4.27; M.difference mental simulation vs. analogy=0.647, $p<0.01$; M.difference mental simulation vs. no analogy/ no mental simulation= -0.237, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation= -0.884, $p<0.001$, $F(2, 740)=8.510$, $p<0.001$). *Therefore, **hypothesis 9c** which predicted that the use of verbal mental simulation would trigger higher levels of behavioural intent than verbal analogy when the product is hybrid is **supported.***

For the intelligent oven, when the product was conveyed using pictures the no analogy/ no mental simulation created a significantly higher behavioural intent than the analogy; other mean differences were not significant, although the mental simulation was marginally superior to the analogy (M.visual mental simulation=3.92 vs. M.visual analogy=3.58 vs. M.visual no analogy/ no mental simulation=4.28; M.difference mental simulation vs.

analogy=0.335, $p>0.05$; M.difference mental simulation vs. no analogy/ no mental simulation= -0.363, $p>0.05$; M.difference analogy vs. no analogy/ no mental simulation= -0.698, $p<0.05$; $F(2, 740)=4.059$, $p<0.05$). *Therefore,* ***hypothesis 12c*** *which predicted that the use of visual mental simulation would trigger higher levels of behavioural intent than visual analogy when the product is hybrid is* ***rejected.*** *The pattern of results was as expected but the mean difference did not reach significance. .*

6.3.4 Test for Individual Style of Processing

The role of individual style of processing was first examined as a moderator of consumer responses to the RNPs presented in the experiment. 3 (within-subjects: learning strategy) x 2 (between-subjects: presentation format) x 2 (between-subjects: individual style of processing) mixed design ANOVAs were conducted to test the moderating role of individual style of processing on product comprehension, attitude to the product and behavioural intent. However, subsequent tests showed no evidence to support a moderating role, which suggests that participants' responses to the RNPs presented cannot be attributed to individual differences in style of processing. Due to this lack of support, the detailed analyses related to the moderating role of individual style of processing are not presented in the present thesis. Instead, in order to test for potential confounding variation, analyses of covariance were run with individual style of processing as covariate. The effects of presentation format and learning strategy were the same when the analyses were conducted with and without the covariate (Appendix 7). Hence, participants' responses cannot be attributed to differences in individual style of processing.

6.4 TEST OF HYPOTHESES 13 TO 16

6.4.1 Mediating Effect of Discouragement, Scepticism and Positive Emotions on Product Comprehension (Hypothesis 13)

6.4.1.1 Mediating Effect of Discouragement on Product Comprehension (Hypothesis 13a)

Hypothesis 13a suggests that discouragement mediates the interaction effect of learning strategy and presentation format on product comprehension. To test this hypothesis, the correlation between discouragement and product comprehension was first verified for the mental simulation ($r= -0.571$, $p<0.001$), for the analogy ($r= -0.671$, $p<0.001$) and for the no analogy/ no mental simulation ($r= -0.636$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with product comprehension ($F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$) and then with discouragement as the dependent variable ($F(2, 1318)=31.753$, $p<0.001$, partial $\eta^2=0.046$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the comprehension measure (dependent).

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with discouragement as a covariate. Consistent with the requirements for mediation (Baron and Kenny, 1986), discouragement was a significant covariate for the mental simulation ($F(1, 623)=35.782$, $p<0.001$, partial $\eta^2=0.054$), for the analogy ($F(1, 623)=47.236$, $p<0.001$, partial $\eta^2=0.070$) and for the no analogy/ no mental simulation ($F(1, 623)=54.294$, $p<0.001$, partial $\eta^2=0.080$). Moreover, the interaction effect of learning strategy and presentation format on product comprehension showed a reduction in its effect size as evidenced by the reduction in partial eta squared, although the interaction effect remained significant ($F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$ vs. $F(2, 1246)=11.060$, $p<0.001$, partial $\eta^2=0.017$, without vs. with the covariate). There was an 81.9% reduction in the mean squares[1] (MS=49.206 vs. MS=8.885, without vs. with the covariate). *Thus, **hypothesis 13a** is **supported** as discouragement partially mediates the interaction effects of learning strategy and presentation format on product comprehension.*

[1] Although some authors have suggested reporting the percent reduction of ω^2 as an indicator of mediation, the researcher prefers to report the percent reduction of the MSs of the mediated effect. This is because in ANCOVA, changes of ω^2 also reflect changes in the MS error that are unrelated to the experimental factor of interest, e.g. mediation of other experimental or unobserved factors (see Pham and Muthukrishnan, 2002).

6.4.1.2 Mediating effect of scepticism on product comprehension (Hypothesis 13b)

Hypothesis 13b suggests that scepticism will mediate the interaction effects of learning strategy and presentation format on product comprehension. To test this hypothesis, the correlation between scepticism and product comprehension was first verified for the mental simulation ($r= -0.304$, $p<0.001$), for the analogy ($r= -0.289$, $p<0.001$) and for the no analogy/ no mental simulation ($r= -0.262$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with product comprehension ($F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$) and then with scepticism as the dependent variable ($F (2, 1308)=4.486$, $p<0.05$, partial $\eta^2=0.007$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the dependent measure.

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with scepticism as a covariate. Consistent with the requirements for mediation (Baron and Kenny, 1986), scepticism was a significant covariate for the mental simulation ($F(1, 619)=12.950$, $p<0.001$, partial $\eta^2=0.020$), for the analogy ($F(1, 619)=8.828$, $p<0.005$, partial $\eta^2=0.014$) and for the no analogy/ no mental simulation ($F(1, 619)=5.959$, $p<0.05$, partial $\eta^2=0.010$). Moreover, the interaction effect of learning strategy and presentation format on product comprehension showed a reduction in partial eta squared although the effect remained significant ($F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$ vs. $F(2, 1238)=29.806$, $p<0.001$, partial $\eta^2=0.046$, without vs. with the covariate). There was a 22.8% reduction in the mean squares ($MS=49.206$ vs. $MS=37.962$, without vs. with the covariate). *Therefore, **hypothesis 13b** is **supported** as scepticism partially mediates the effects of learning strategy and presentation format on product comprehension.*

6.4.1.3 Mediating effect of positive emotions on product comprehension (Hypothesis 13c)

Hypothesis 13c suggests that positive emotions mediate the interaction effect of learning strategy and presentation format on product comprehension. The correlation between positive emotions and product comprehension was first verified for the mental simulation ($r= 0.224$, $p<0.001$), for the analogy ($r= 0.302$, $p<0.001$) and for the no analogy/ no mental simulation ($r= 0.288$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with product comprehension ($F\ (2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$) and then with positive emotions as the dependent variable ($F\ (2, 1280)=2.862$, $p=0.058$, partial $\eta^2=0.004$). The interaction effect of the variables on the mediator was very close to significance ($p=0.058$).

An analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with positive emotions as a covariate. Positive emotions were a significant covariate for the mental simulation ($F(1, 605)=8.060$, $p<0.05$, partial $\eta^2=0.013$), but not for the analogy ($F(1, 605)=3.037$, $p>0.05$, partial $\eta^2=0.005$) and for the no analogy/ no mental simulation ($F(1, 605)=1.095$, $p>0.05$, partial $\eta^2=0.002$). Moreover, the interaction effect of learning strategy and presentation format on product comprehension did not show a reduction in partial eta squared and even showed a slight increase ($F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$ vs. $F(2, 1210)=35.904$, $p<0.001$, partial $\eta^2=0.056$, without vs. with the covariate). There was a 13.1% reduction in the mean squares (MS=49.206 vs. MS=42.751, without vs. with the covariate).

*Therefore, positive emotions do not mediate the effects of learning strategy and presentation format on product comprehension and **hypothesis 13c** is **rejected**.*

6.4.2 Mediating Effect of Discouragement, Scepticism and Positive Emotions on Attitude to the Product (Hypothesis 14)

6.4.2.1 Mediating Effect of Discouragement on Attitude to the Product (Hypothesis 14a)

Hypothesis 14a suggests that discouragement mediates the interaction effect of learning strategy and presentation format on attitude to the product. The correlation between discouragement and attitude to the product was first verified for the mental simulation ($r = -0.411$, $p<0.001$), for the analogy ($r = -0.497$, $p<0.001$) and for the no analogy/ no mental simulation ($r = -0.459$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with attitude to the product ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$) and then with discouragement as the dependent variable ($F(2, 1318)=31.753$, $p<0.001$, partial $\eta^2=0.046$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the attitudinal measure.

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with discouragement as a covariate. Consistent with the requirements for mediation (Baron and Kenny, 1986), discouragement was a significant covariate for the mental simulation ($F(1, 615)=13.914$, $p<0.001$, partial $\eta^2=0.022$), for the analogy ($F(1, 615)=12.252$, $p<0.001$, partial $\eta^2=0.020$) and for the no analogy/ no mental simulation ($F(1, 615)=22.395$, $p<0.001$, partial $\eta^2=0.035$). Moreover, the interaction effects of learning strategy and presentation format on attitude to the product became non-significant when the covariate was added to the model ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$ vs. $F(2, 1230)=0.097$, $p>0.05$, partial $\eta^2=0.000$, without vs. with the covariate). There was a 99.1% reduction in the mean squares (MS=21.349 vs. MS=0.174, without vs. with the covariate).

*Therefore, discouragement fully mediates the effects of learning strategy and presentation format on attitude to the product and **hypothesis 14a** is **supported**.*

6.4.2.2 Mediating Effect of Scepticism on Attitude to the Product (Hypothesis 14b)

Hypothesis 14b suggests that scepticism mediates the interaction effect of learning strategy and presentation format on attitude to the product. The correlation between scepticism and attitude to the product was first verified for the mental simulation ($r= -0.433$, $p<0.001$), for the analogy ($r= -0.437$, $p<0.001$) and for the no analogy/ no mental simulation ($r= -0.403$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with attitude to the product ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$) and then with scepticism as the dependent variable ($F(2, 1308)=4.486$, $p<0.05$, partial $\eta^2=0.007$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the attitudinal measure.

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with scepticism as a covariate. Consistent with the requirements for mediation (Baron and Kenny, 1986), scepticism was a significant covariate for the mental simulation ($F(1, 610)=28.580$, $p<0.001$, partial $\eta^2=0.045$), for the analogy ($F(1, 610)=13.912$, $p<0.001$, partial $\eta^2=0.022$) and for the no analogy/ no mental simulation ($F(1, 610)=19.615$, $p<0.001$, partial $\eta^2=0.031$). Moreover, the interaction effects of learning strategy and presentation format on attitude to the product showed a reduction in significance ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$ vs. $F(2, 1220)=5.631$, $p<0.005$, partial $\eta^2=0.009$, without vs. with the covariate). There was a 46.5% reduction in the mean squares ($MS=21.349$ vs. $MS=11.412$, without vs. with the covariate).
*Therefore, scepticism partially mediates the effects of learning strategy and presentation format on attitude to the product and **hypothesis 14b** is **supported**.*

6.4.2.3 Mediating Effect of Positive Emotions on Attitude to the Product (Hypothesis 14c)

Hypothesis 14c suggests that positive emotions mediate the interaction effect of learning strategy and presentation format on attitude to the product. The correlation between positive emotions and attitude to the product was first verified for the mental simulation ($r= 0.502$, $p<0.001$), for the analogy ($r= 0.467$, $p<0.001$) and for the no analogy/ no mental simulation ($r= 0.465$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with attitude to the product ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$) and then with positive emotions as the dependent variable ($F(2, 1280)=2.862$, $p=0.058$, partial $\eta^2=0.004$). Thus, the effect of the independent variables on the mediator is close to significance.

An analysis of covariance (ANCOVA) was then conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with positive emotions as a covariate. Positive emotions were a significant covariate for the mental simulation ($F(1, 598)=33.983$, $p<0.001$, partial $\eta^2=0.054$), for the analogy ($F(1, 598)=16.114$, $p<0.001$, partial $\eta^2=0.026$) and for the no analogy/ no mental simulation ($F(1, 598)=7.524$, $p<0.01$, partial $\eta^2=0.012$). Moreover, the interaction effect of learning strategy and presentation format on attitude to the product showed a reduction in significance ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$ vs. $F(2, 1196)=5.620$, $p<0.005$, partial $\eta^2=0.009$, without vs. with the covariate). There was a 51.9% reduction in the mean squares (MS=21.349 vs. MS=10.267, without vs. with the covariate).
Therefore, positive emotions partially mediate the effects of presentation format and learning strategy on attitude to the product and ***hypothesis 14c is marginally supported****. It should be noted that the interaction effects of learning strategy and presentation format on positive emotions were only close to significance.*

6.4.3 Mediating effect of discouragement, scepticism and positive emotions on Behavioural Intent (Hypothesis 15)

6.4.3.1 Mediating Effect of Discouragement on Behavioural Intent (Hypothesis 15a)

Hypothesis 15a suggests that discouragement mediates the interaction effect of learning strategy and presentation format on behavioural intent, the correlation between discouragement and behavioural intent was first verified for the mental simulation ($r= -0.213$, $p<0.001$), for the analogy ($r= -0.217$, $p<0.001$) and for the no analogy/ no mental simulation ($r= -0.192$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with behavioural intent ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$) and then with discouragement as the dependent variable ($F(2, 1318)=31.753$, $p<0.001$, partial $\eta^2=0.046$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the behavioural measure.

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with discouragement as a covariate. Discouragement was not a significant covariate for the mental simulation ($F(1, 630)=2.098$, $p>0.05$, partial $\eta^2=0.003$), for the analogy ($F(1, 630)=0.118$, $p>0.05$, partial $\eta^2=0.000$) and for the no analogy/ no mental simulation ($F(1, 630)=1.125$, $p>0.05$, partial $\eta^2=0.002$). The interaction effect of learning strategy and presentation format on behavioural intent became non-significant ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$ vs. $F(2, 1260)=0.365$, $p>0.05$, partial $\eta^2=0.001$, without vs. with the covariate). There was a 91.3% reduction in the mean squares ($MS=7.712$ vs. $MS=0.676$, without vs. with the covariate).
Therefore, discouragement does not mediate the effects of learning strategy and presentation format on behavioural intent. ***Hypothesis 15a*** *is* ***rejected.***

6.4.3.2 Mediating Effect of Scepticism on Behavioural Intent (Hypothesis 15b)

Hypothesis 15b suggests that scepticism mediates the interaction effect of learning strategy and presentation format on behavioural intent, the correlation between scepticism and behavioural intent was first verified for the mental simulation ($r= -0.234$, $p<0.001$), for the analogy ($r= -0.203$, $p<0.001$) and for the no analogy/ no mental simulation ($r= -0.121$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with behavioural intent ($F (2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$) and then with scepticism as the dependent variable ($F (2, 1308)=4.486$, $p<0.05$, partial $\eta^2=0.007$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the behavioural measure.

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with scepticism as a covariate. Scepticism was not a significant covariate for the mental simulation ($F(1, 626)=2.731$, $p>0.05$, partial $\eta^2=0.004$), for the analogy ($F(1, 626)=2.050$, $p>0.05$, partial $\eta^2=0.003$) and for the no analogy/ no mental simulation ($F(1, 626)=0.511$, $p>0.05$, partial $\eta^2=0.001$). The interaction effect of learning strategy and presentation format on behavioural intent became non-significant ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$ vs. $F(2, 1252)=1.972$, $p>0.05$, partial $\eta^2=0.003$, without vs. with the covariate). There was a 51.1% reduction in the mean squares (MS=7.712 vs. MS=3.766, without vs. with the covariate).
Therefore, scepticism does not mediate the effects of learning strategy and presentation format on behavioural intent. ***Hypothesis 15b*** *is* ***rejected****.*

6.4.3.3 Mediating effect of positive emotions on behavioural intent (Hypothesis 15c)

Hypothesis 15c suggests that positive emotions mediate the interaction effect of learning strategy and presentation format on behavioural intent, the correlation between positive emotions and behavioural intent was first verified for the mental simulation ($r= 0.407$, $p<0.001$), for the analogy ($r= 0.376$, $p<0.001$) and for the no analogy/ no mental simulation ($r= 0.378$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with behavioural intent ($F (2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$) and then with positive emotions as the dependent variable (F (2, 1280)=2.862, $p=0.058$, partial $\eta^2=0.004$). Thus, the effect of the independent variables on positive emotions is almost significant.

An analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with positive emotions as a covariate. Positive emotions were a significant covariate for the mental simulation ($F(1, 614)=21.733$, $p<0.001$, partial $\eta^2=0.034$), for the analogy ($F(1, 614)=6.333$, $p<0.05$, partial $\eta^2=0.010$) and for the no analogy/ no mental simulation ($F(1, 614)=5.251$, $p<0.05$, partial $\eta^2=0.008$). The interaction effect of learning strategy and presentation format on behavioural intent became non-significant ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$ vs. $F(2, 1228)=2.384$, $p>0.05$, partial $\eta^2=0.004$, without vs. with the covariate). There was a 47.3% reduction in the mean squares (MS=7.712 vs. MS=4.062, without vs. with the covariate).

Therefore, positive emotions fully mediate the effects of learning strategy and presentation format on behavioural intent and ***hypothesis 15c*** *is* ***marginally supported****. It should be noted that the effect of the independent variables on the mediator was close to significance (p=0.058).*

6.4.4 Mediating Effect of Product Comprehension and Attitude to the Product on Behavioural Intent (Hypothesis 16)

6.4.4.1 Mediating effect of product comprehension on behavioural intent (Hypothesis 16a)

Hypothesis 16a suggests that product comprehension mediates the main effects of learning strategy and presentation format on behavioural intent. The correlation between product comprehension and behavioural intent was first verified for the mental simulation ($r= 0.289$, $p<0.001$), for the analogy ($r= 0.266$, $p<0.001$) and for the no analogy/ no mental simulation ($r= 0.261$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with behavioural intent ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$) and then with product comprehension as the dependent variable ($F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the behavioural measure (dependent).

To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with product comprehension as a covariate. Consistent with the requirements for mediation (Baron and Kenny, 1986), product comprehension was a significant covariate for the mental simulation ($F(1, 621)=8.719$, $p<0.005$, partial $\eta^2=0.014$), for the analogy ($F(1, 621)=6.613$, $p<0.01$, partial $\eta^2=0.011$) and for the no analogy/ no mental simulation ($F(1, 621)=6.701$, $p<0.01$, partial $\eta^2=0.011$). Moreover, the interaction effect of learning strategy and presentation format on behavioural intent became non-significant ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$ vs. $F(2, 1242)=0.183$, $p>0.05$, partial $\eta^2=0.000$, without vs. with the covariate). There was a 95.6% reduction in the mean squares ($MS=7.712$ vs. $MS=0.339$, without vs. with the covariate).

Therefore, product comprehension fully mediates the effects of learning strategy and presentation format on behavioural intent. ***Hypothesis 16a*** *is* ***supported.***

6.4.4.2 Mediating effect of attitude to the product on behavioural intent (Hypothesis 16b)

Hypothesis 16b suggests that attitude to the product will mediate the interaction effect of learning strategy and presentation format on behavioural intent. The correlation between attitude to the product and behavioural intent was first verified for the mental simulation ($r= 0.728$, $p<0.001$), for the analogy ($r= 0.650$, $p<0.001$) and for the no analogy/ no mental simulation ($r= 0.696$, $p<0.001$).

A 2 (presentation format) x 3 (learning strategy) mixed design ANOVA was then conducted first with behavioural intent ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$) and then with attitude to the product as the dependent variable ($F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$) indicating a significant interaction between the two manipulated factors. Thus, the independent variables have significant effects on both the mediator and the behavioural measure.

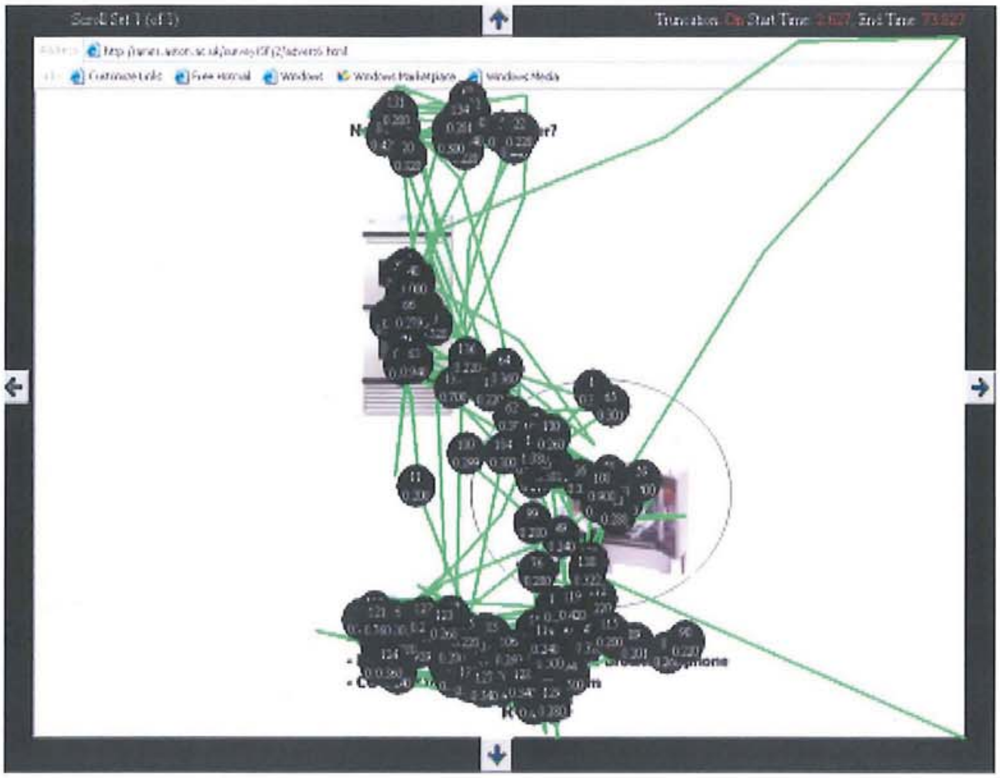
To satisfy the other criteria for mediation, an analysis of covariance (ANCOVA) was conducted for the 2 (within-subjects: presentation format) x 3 (between-subjects: learning strategy) mixed design with attitude to the product as a covariate. Consistent with the requirements for mediation (Baron and Kenny, 1986), attitude to the product was a significant covariate for the mental simulation ($F(1, 614)=136.591$, $p<0.001$, partial $\eta^2=0.182$), for the analogy ($F(1, 614)=95.268$, $p<0.001$, partial $\eta^2=0.134$) and for the no analogy/ no mental simulation ($F(1, 614)=125.853$, $p<0.001$, partial $\eta^2=0.170$). Moreover, the interaction effect of learning strategy and presentation format on behavioural intent became non-significant ($F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$ vs. $F(2, 1228)=0.122$, $p>0.005$, partial $\eta^2=0.000$, without vs. with the covariate). There was a 98.4% reduction in the mean squares (MS=7.712 vs. MS=0.118, without vs. with the covariate).

Therefore, attitude to the product fully mediates the effects of learning strategy and presentation format on behavioural intent. ***Hypothesis 16b*** *is* ***supported.***

6.5 EXPERIMENT 2

Experiment 2 examines the effect of learning strategies and presentation formats on comprehension for a RNP, along with the role of visual attention to the advertising message, and proceeds to test model 2 presented in the conceptual framework in chapter 3 (Section 3.1, figure 3.1-2). The study combines data obtained from an eye-tracking experiment and self-report measures to establish that an increase in attention to the advertising message is not necessarily correlated with an increase in product comprehension. Study 2 also adds to the understanding of consumer responses to RNPs by integrating conceptual responses with physiological reactions (visual attention patterns). An example of "scanpath", or pattern of eye fixations is presented in figure 6.6-1 as an illustration.

Figure 6.5-1 Example of a scanpath obtained with the eye-tracker



6.5.1 Test of propositions 1 and 2

The data was analyzed to assess the amount of time participants devoted to either the word-based or picture-based portions of the ads (fixation durations) by dividing the stimuli into different zones. The means and standard deviations of the fixation durations for each zone and per stimuli are presented in table 6.5-1. Table 6.5-2 displays the means and standard deviations obtained for product comprehension as a function of presentation format (visual vs. verbal) and learning strategy (mental simulation vs. analogy). Table 6.5-3 displays the correlations between the fixation durations paid to the message for each stimulus and product comprehension. In addition to showing the p-values obtained, Table 6.5-3 also displays the R-squared and variability percentages values. The interpretation of R-squared and variability percentages is useful for the present analysis. Due to the small sample size, the p-values obtained may not reach significance; however the examination of the variability percentages may reveal that strong correlations do exist between visual attention and product comprehension.

Proposition 1a suggests that for the visual mental simulation, an increase in visual attention to the message will not be correlated with an increase in product comprehension.

Proposition 1b predicts that for the visual analogy, an increase in visual attention to the message will not be correlated with an increase in product comprehension.

Proposition 2a predicts that for the verbal mental simulation, an increase in visual attention to the message will be correlated with an increase in product comprehension.

Proposition 2b predicts that for the verbal analogy, an increase in visual attention to the message will be correlated with an increase in product comprehension.

TABLE 6.5-1 MEANS AND STANDARD DEVIATIONS FOR THE FIXATION DURATIONS FOR EACH ZONE

	Visual Mental Simulation			**Visual Analogy**			**Verbal Mental Simulation**			**Verbal Analogy**		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Overall Stimulus	32.14	17.19	9	34.03	12.25	9	46.35	14.91	8	53.52	18.07	8
Headline	2.81	1.96	9	3.20	1.62	9	3.82	3.29	8	3.77	2.86	8
Picture Product		n.a			n.a		6.76	4.94	8	3.93	2.42	8
Message	19.67	11.89	9	14.88	7.64	9	26.66	7.27	8	29.76	4.60	8
Product Features	6.31	3.61	9	14.10	7.10	9	6.95	2.06	8	10.57	7.52	8
Brand	0.33	0.37	9	0.49	0.27	9	0.56	0.45	8	0.46	0.22	8

TABLE 6.5-2 MEANS AND STANDARD DEVIATIONS FOR PRODUCT COMPREHENSION

	Visual Mental Simulation			**Visual Analogy**			**Verbal Mental Simulation**			**Verbal Analogy**		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Product Comprehension	3.90	1.28	9	3.98	1.26	9	4.49	1.22	8	4.54	1.34	8

TABLE 6.5-3 CORRELATIONS BETWEEN PRODUCT COMPREHENSION AND FIXATION DURATIONS

	Visual Mental Simulation	**Visual Analogy**	**Verbal Mental Simulation**	**Verbal Analogy**
R	0.008	0.275	0.675	0.606
P	0.984	0.474	0.066	0.112
R-squared	0.000064	0.075	0.4556	0.3672
Variability Percentage	0.0064%	7.56%	45.56%	36.72%
N	9	9	8	8

As predicted in proposition 1a, in the visual mental simulation condition there was no correlation between fixation durations and product comprehension [r=0.008, n=9, p=0.984]. In addition, the fixation duration to the message of the advert accounts for only 0.0064% of the variability in product comprehension. ***Proposition 1a is supported.***

As predicted in proposition 1b, in the visual analogy condition there was no significant correlation between fixation durations and product comprehension [r=0.275, n=9, p=0.474]. In addition, the fixation duration to the message accounts for only 7.56% of the variability in product comprehension. ***Proposition 1b is supported.***

Proposition 2a predicted that there would be a significant correlation between attention to the message in the verbal mental simulation condition and product comprehension. However, there was no significant correlation between fixation durations and product comprehension [r=0.675, n=8, p=0.066]. Nevertheless, the p-value is close to significance and the r-value is above 0.5, suggesting a strong correlation. Moreover, it is useful to examine the R-square values and variability percentages due to the small sample size. The fixation duration to the message accounts for 45.56% of the variability in product comprehension, that is almost half of its variability.

Therefore, although the correlation between attention to the message and product comprehension did not reach significance due to the small sample size, the variability percentages do indicate a strong correlation between fixation duration and product comprehension. ***Evidence suggests that some support exists for proposition 2a,*** *even though the main correlation analysis did not show significant results.*

Proposition 2b predicted that there would be a significant correlation between attention to the message in the verbal analogy condition and product comprehension. However, there was no significant correlation between fixation durations and product comprehension [r=0.606, n=8, p=0.112]. Nevertheless, although the correlation did not reach significance in terms of the p-value, the r value is above 0.5, suggesting a strong correlation.

Moreover, it is particularly interesting to examine the R-square value and variability percentage because of the small sample size. The fixation duration to the message accounts for 36.72% of the variability in product comprehension. Therefore, although the correlation between attention to the message and product comprehension did not reach significance due to the small sample size, the variability percentage indicates a strong correlation between fixation duration and product comprehension. ***Evidence suggests that some support exists for proposition 2b*** *although the main correlation analysis does not reach significance.*

6.5.2 Additional Analysis

Although no specific propositions were explicitly formulated with regards the correlations between product comprehension and attention to the other elements of the stimuli (overall stimulus, first sentence, product features and brand), it is useful to examine potential correlations for these elements to enhance understanding of the connections between perceptual and conceptual analyses. This is particularly appropriate considering the lack of research in the domain of visual attention for RNPs. Correlations between attention and product comprehension may be uncovered and foster further research in this area.

Table 6.5-4 displays the correlations between product comprehension and the fixation durations for each zone of the stimuli (except the message) as a function of presentation format (visual vs. verbal) and learning strategy (mental simulation vs. analogy).

TABLE 6.5-4 CORRELATIONS BETWEEN PRODUCT COMPREHENSION AND FIXATION DURATIONS FOR EACH ZONE OF THE STIMULI

	Visual Mental Simulation				Visual Analogy			
	R	P	%	N	R	P	%	N
Overall Stimulus	-0.064	0.871	0.4	9	-0.350	0.355	12.25	9
Headline	-0.438	0.239	19.18	9	-0.467	0.205	21.80	9
Product Features	0.312	0.415	9.73	9	-0.403	0.283	16.24	9
Brand	-0.175	0.653	3.06	9	-0.241	0.532	5.8	9

	Verbal Mental Simulation				Verbal Analogy			
	R	P	%	N	R	P	%	N
Overall Stimulus	0.563	0.146	31.69	8	0.596	0.119	35.52	9
Headline	-0.122	0.773	29.05	8	0.476	0.233	22.65	9
Picture Product	0.684	0.061	46.78	8	0.878	0.004	77.08	9
Product Features	-0.213	0.613	4.53	8	-0.217	0.606	4.7	9
Brand	-0.143	0.7	2.04	8	-0.170	0.688	2.89	9

Examining the correlations between product comprehension and the fixation durations to each zone of the stimuli provides some exciting findings.

6.5.2.1 Correlations between Attention to the Overall Stimulus and Product Comprehension

First of all, in the visual conditions, there is a lack of correlation between attention to the overall stimulus and product comprehension for the visual mental simulation. The negative correlation between the fixation duration to the overall stimulus for the visual analogy can be characterized as medium sized according to the r-value, even though the correlation does not reach significance [$r=-0.350$, $n=9$, $p=0.355$]. These findings suggest that in the visual conditions, paying more attention to the overall stimulus does not enhance product comprehension. When the message is conveyed using a visual analogy, an increase in *attention to the overall advertisement may actually reflect confusion regarding the nature of the product advertised. However, it should be emphasized that these findings do not reach significance, due to the small sample size.*

On the opposite, in the verbal conditions, positive correlations between attention to the whole stimulus and product comprehension are observed. This is true in the verbal mental simulation condition [$r=0.563$, $n=8$, $p=0.146$] and in the verbal analogy condition for fixation duration [$r=0.596$, $n=8$, $p=0.119$]. The correlations are strong based on the r-values, however the results do not reach significance. The variability percentages are also high (range: 31.69% - 35.52%). *These findings suggest that when the message is conveyed using words, an increase in attention to the overall advertisement may indicate an increase in product comprehension.*

6.5.2.2 Correlations between Attention to the Headline and Product Comprehension

Similarly, when the product is conveyed using pictures, negative correlations between attention to the headline and product comprehension are observed. In the visual mental simulation condition, there was a negative correlation between fixation duration and product comprehension [$r= -0.438$, $n=9$, $p=0.239$]. In the visual analogy condition, there was a negative correlation between fixation duration and product comprehension [$r= -0.467$, $n=9$, $p=0.205$].

The variability percentages for attention to the headline in the visual conditions were rather high (Range: 19.18%-21.8%). *These findings indicate that when the product was conveyed using pictures, an increase in attention to the first sentence did not lead to enhanced comprehension and may reflect respondent's confusion. In an effort to understand the product, respondents may have increased their attention to the first sentence of the advert to try and extract meaning. However, the results do not reach significance.*

In the verbal conditions, a difference can be noticed between the verbal mental simulation and the verbal analogy. In the verbal mental simulation condition, there was a negative correlation between fixation duration and comprehension [$r= -0.122$, $n=8$, $p=0.773$]. The variability percentage was rather high (29.05%).

In the verbal analogy condition, there was a positive correlation between fixation duration and comprehension [$r= 0.476$, $n=8$, $p=0.233$]. The variability percentage was rather high (22.65%) even though the results do not reach significance. *These findings indicate that in the verbal mental simulation condition, an increase in attention to the first sentence may have reflected confusion, whereas in the verbal analogy condition it reflected product comprehension. An explanation for this finding may be that in the verbal mental simulation participants did not need to increase their attention to the first sentence of the advert to understand the product whereas this was needed for the verbal analogy.*

6.5.2.3 Correlations between Attention to the Picture of the Product (Verbal Conditions) and Product Comprehension

The picture of the product refers to the image of the product alone used only in the verbal conditions. Interestingly, there were positive correlations between attention to the picture of the product and product comprehension. For the verbal mental simulation condition, there was a strong positive correlation between fixation duration and comprehension as evidenced by the r-values [$r= 0.684$, $n=8$, $p=0.061$]. For the verbal analogy condition, there was a strong positive correlation between fixation duration and comprehension [$r= 0.878$, $n=8$, $p=0.004$]. The variability percentages were high (range: 46.78% - 77.08%). The results were significant for the verbal analogy and close to significance for the verbal mental simulation.

These findings suggest that an increase in attention to the picture of the product in the verbal conditions led to respondents' enhanced product comprehension. This contributes to the idea that visuals have meaning and contribute to the comprehension of the product.

6.5.2.4 Correlations between Attention to the Product Features and Product Comprehension

In the visual analogy condition and in the two verbal conditions, negative correlations between the amount of attention paid to the product features and product comprehension were observed.

For the visual analogy condition, there was a medium negative correlation between fixation duration to the product features and product comprehension [r= -0.403, n=9, p=0.283]. The variability percentage was 16.24%.

For the verbal mental simulation condition, there was a small negative correlation between fixation duration to the product features and product comprehension [r= -0.213, n=8, p=0.613]. The variability percentage was low at 4.53%. Similarly, for the verbal analogy condition, there was a small negative correlation between fixation duration to the product features and comprehension [r= -0.217, n=8, p=0.606]. The variability percentage was low at 4.7%. These results indicate that *in the visual analogy condition and in both verbal conditions, an increase in attention to the product features actually reflected respondents' confusion. However, it should be noted that the results did not reach significance.*

However, in the visual mental simulation condition, there was a medium positive correlation between fixation duration to the product features and product comprehension [r= 0.312, n=9, p=0.415]. The variability percentage was rather low however at 9.73% are the results did not reach significance. *Overall, evidence suggests that an increase in attention to the product features may reflect confusion about the nature of the product. Interestingly, this may either suggest that paying* *more attention to the product features reduces product comprehension, or that due to their confusion respondents tried to extract more information to the features by increasing their attention levels. For the visual mental simulation, participants may have actually been able to reduce their confusion by paying more attention to the product features.*

6.5.2.5 Correlations between Attention to the Brand Name and Product Comprehension

The correlations between attention to the brand element of the advert and product comprehension remained very small (range of variability percentages: 2.04% - 5.8%). This was to be expected as *the brand names chosen were unknown to the respondents and unlikely to enhance product comprehension* ('E-2000' and 'R-4000').

6.6 CHAPTER SUMMARY

This chapter has analysed and presented results from the two experimental studies that test the effect of presentation formats (words vs. pictures) and learning strategies (mental simulation vs. analogy vs. no analogy/ no mental simulation) used in marketing communications on consumer responses to RNPs.

The results of the first experiment suggest that the presentation format and learning strategy used jointly determine product comprehension, attitude to the product and behavioural intent for a RNP. The speculation that hedonic, utilitarian and hybrid products would follow different patterns was verified. Furthermore, emotional responses, namely discouragement, scepticism and positive emotions mediated the effects of learning strategy and presentation format on consumer responses to the RNP. Product comprehension and attitude to the product fully mediated the effects of the independent variables on behavioural intent.

The second experiment examined the effect of learning strategies and presentation formats on consumers' comprehension for a RNP, along with the role of visual attention to the advertising message. The propositions developed are supported as the results of the study suggest that an increase in attention to the advertising message is not necessarily correlated with an increase in product comprehension. When the message is conveyed using pictures, an increase in visual attention to the message may indicate an underlying confusion about the nature of the new product. Table 6.6-1 and 6.6-2 summarize the results of the testing of the hypotheses and propositions.

TABLE 6.6-1 SUMMARY OF HYPOTHESES TESTING (STUDY 1)

Number	Hypothesis	Result of Hypothesis Testing
1	When the learning strategy is a mental simulation a) the use of words will trigger higher levels of product comprehension than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of product comprehension than the use of words for hedonic products and c) the use of words will trigger similar levels of product comprehension as the use of pictures for hybrid products.	1a: Supported 1b: Rejected 1c: Rejected
2	When the learning strategy is a mental simulation a) the use of words will trigger higher levels of attitude to the product than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of attitude to the product than the use of words for hedonic products, c) the use of words will trigger similar levels of attitude to the product as the use of pictures for hybrid products.	2a: Rejected 2b: Supported 2c: Supported
3	When the learning strategy is a mental simulation a) the use of words will trigger higher levels of behavioural intent than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of behavioural intent than the use of words for hedonic products, c) the use of words will trigger similar levels of behavioural intent as the use of pictures for hybrid products.	3a: Supported 3b: Supported 3c:Supported
4	When the learning strategy is an analogy the use of words will trigger higher levels of product comprehension than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.	4a: Supported 4b: Supported 4c: Supported
5	When the learning strategy is an analogy the use of words will trigger higher levels of attitude to the product than the use of pictures for a) utilitarian products and b) hedonic products and c) hybrid products.	5a: Supported 5b: Rejected 5c: Rejected
6	When the learning strategy is an analogy the use of words will trigger higher levels of behavioural intent than the use of pictures for a) utilitarian	6a: Supported 6b: Rejected

	products, b) hedonic products and c) hybrid products.	6c: Rejected
7	The use of verbal mental simulation will trigger higher levels of product comprehension than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	7a: Rejected 7b: Rejected 7c: Rejected
8	The use of verbal mental simulation will trigger higher levels of attitude to the product than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	8a: Rejected 8b: Rejected 8c: Rejected
9	The use of verbal mental simulation will trigger higher levels of behavioural intent than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	9a: Rejected 9b: Rejected 9c: Supported
10	The use of visual mental simulation will trigger higher levels of product comprehension than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	10a: Supported 10b: Supported 10c: Supported
11	The use of visual mental simulation will trigger higher levels of attitude to the product than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	11a: Supported 11b: Supported 11c: Rejected
12	The use of visual mental simulation will trigger higher levels of behavioural intent than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	12a: Rejected 12b: Supported 12c: Rejected
13	a) Discouragement, b) scepticism and c) positive emotions will mediate the interaction effect of learning strategy and presentation format on product comprehension.	13a: Supported 13b: Supported 13c: Rejected
14	a) Discouragement, b) scepticism and c) positive emotions mediate the interaction effect of learning strategy and presentation format on attitude to the product.	14a: Supported 14b: Supported 14c: Marginally Supported
15	a) Discouragement, b) scepticism and c) positive emotions mediate the interaction effect of learning strategy and presentation format on behavioural intent.	15a: Rejected 15b: Rejected 15b: Marginally Supported

16	a) Product comprehension and b) attitude to the product will mediate the interaction effect of learning strategy and presentation format on behavioural intent.	16a: Supported 16b: Supported

TABLE 6.6-2 SUMMARY OF TESTING FOR THE PROPOSITIONS (STUDY 2)

Proposition 1a: For the visual mental simulation, an increase in visual attention to the message will not be correlated with an increase in product comprehension	Supported
Proposition 1b: For the visual analogy, an increase in visual attention to the message will not be correlated with an increase in product comprehension.	Supported
Proposition 2a: For the verbal mental simulation, an increase in visual attention to the message will be correlated with an increase in product comprehension.	Evidence of support (n.s)
Proposition 2b: For the verbal analogy, an increase in visual attention to the message will be correlated with an increase in product comprehension.	Evidence of support (n.s)

CHAPTER SEVEN

GENERAL DISCUSSION

CONTENTS: The chapter is a discussion of the main findings from the two experimental studies. Section 7.1 is an introduction to the chapter. Section 7.2 discusses the findings of the research organised in four areas: the role of presentation format per product type (Section 7.2.1), the role of learning strategy (Section 7.2.2), the mediating role of emotions (Section 7.2.3) and the role of visual attention (Section 7.2.4). Finally, Section 7.3 summarises the chapter.

7.1 INTRODUCTION

Consumers face difficulties to learn about complex novel products or RNPs (Roehm and Sternthal, 2001). These difficulties may affect consumer comprehension and evaluations of new products and ultimately their acceptance of the innovation. Consistent with this notion, two experimental studies have been presented. In the first study, consumer responses to alternative learning strategies (i.e mental simulation vs. analogy vs. no analogy/ no mental simulation) and presentation formats (i.e. words vs. pictures) for different types of products (i.e. hedonic vs. hybrid vs. utilitarian) were examined. The second study combined eye tracking measures and self-reports in an effort to examine whether individual attention processes used to comprehend new products presented with pictures were comparable to the strategies used to extract information from text or whether they were in line with the mechanisms traditionally related to scene perception. The following sections discuss the findings and link them with previous results in the literature and with the theories that underlie them.

7.2 MAIN FINDINGS

First and foremost, there is a need to exercise caution when drawing conclusions from rejected hypotheses. This is particularly relevant in the present study due to the high rejection rate of hypotheses. Specifically, when a hypothesized effect is not found by manipulating the independent variables in an experimental design, several possibilities may be considered:

- The theory underpinning the hypotheses is incorrect;
- Some confounding factors are not adequately controlled for (Churchill and Iacobucci, 2004).

In the present thesis, the latter is more likely due to the highly complex experimental design used. A wide range of variables were controlled for in the experimental procedure, including:

- Nature of the products: all products were perceived as low in familiarity and high in innovativeness (Chapter 4, Section 4.6);
- Nature of the analogies: all analogies were perceived as similarly easy to comprehend and were all distant-domain analogies as opposed to near domain analogies. Moreover, the analogies were all marketer-provided as opposed to consumer-provided (Chapter 4, Section 4.7);
- Similarity of the message conveyed via words vs. pictures: the validity of the visual vs. verbal manipulation was verified with a pre-test (Chapter 4, Section 4.7).
- Additional elements: Hypothetical brand names were used, the size of the elements and the ad layout were held constant across conditions (Chapter 4, Section 4.7).

However, despite these efforts some confounding factors may not have been adequately controlled for. In particular minor differences in layout can be found between visual mental simulations across the three products. These differences are difficult to avoid and are common in experiments studying the use of visuals in advertising (McQuarrie and Philips, 2005). Moreover, future research will examine the role of potential individual moderators that may explain strong individual differences and thus the lack of support for some of the hypotheses. These include consumer expertise (Park, Mothersbaugh and Feick, 1994) and exploratory consumer buying behaviour (Baumgartner and Steenkamp, 1996).

Table 7.2-1 presents a summary of the most effective combinations of learning strategies and presentation format to enhance each outcome (i.e. product comprehension, attitude to the product and behavioural intent), for each of the three products.

TABLE 7.2-1 SUMMARY OF THE MOST EFFECTIVE COMBINATIONS OF LEARNING STRATEGIES AND PRESENTATION FORMATS PER PRODUCT TYPE AND PER OUTCOME

	Digipen (utilitarian)	Intelligent oven (hybrid)	Video glasses (hedonic)
Product Comprehension	**Best strategies: Verbal mental simulation and verbal analogy.** The verbal analogy triggered a significantly higher comprehension than all other conditions. The verbal mental simulation created a significantly higher comprehension than all conditions except verbal no analogy/ no mental simulation (n.s.)	**Best strategies: Verbal mental simulation and verbal no analogy/ no mental simulation** The verbal no analogy/ no mental simulation triggered a significantly higher comprehension than all other conditions. The verbal mental simulation created a significantly higher comprehension than all conditions except verbal analogy (n.s.)	**Best strategies: Visual mental simulation, visual no analogy/ no mental simulation, all three verbal conditions.** These conditions all triggered a significantly higher product comprehension than the visual analogy
Attitude to the product	**Best strategies: Verbal mental simulation and verbal analogy followed by visual mental simulation** These strategies triggered a significantly higher product attitude than the other three conditions.	**Best strategies: Verbal and visual no analogy/ no mental simulations followed by verbal and visual mental simulations** Only the no analogy/ no mental simulation conditions triggered a significantly higher attitude than the analogies. The differences between mental simulations and analogies were marginal.	**Best strategies: Visual mental simulation and visual no analogy/ no mental simulation.** These strategies triggered a significantly higher product attitude than the other conditions.

Behavioural Intent	**Best strategies: Verbal mental simulation and verbal analogy** These strategies triggered a significantly higher behavioural intent than the other conditions.	**Best strategies: Verbal and visual no analogy/ no mental simulations followed by verbal and visual mental simulations** Only the no analogy/ no mental simulation conditions triggered a significantly higher intent than the analogies. The differences between mental simulations and analogies were marginal.	**Best strategies: Visual mental simulation and visual no analogy/ no mental simulation.** These strategies triggered a significantly higher behavioural intent than the other conditions.

The results suggest that for the utilitarian product (Digipen), the verbal mental simulation and the verbal analogy triggered the most positive responses. These results are in line with the expectation that words are more appropriate to enhance consumer responses for a RNP of a utilitarian nature (Johar and Sirgy, 1991). It can be noted however that visual mental simulation created an attitude to the product which was only marginally less positive than the verbal mental simulation and the verbal analogy. Moreover, the verbal mental simulation did not create significantly more positive responses than the verbal analogy, contrary to expectations.

For the hybrid product (intelligent oven), the verbal mental simulation and the verbal no analogy/ no mental simulation created the strongest product comprehension, contrary to expectations that no differences would be found between the use of words vs. pictures. This may be due to a greater focus placed on the nature of the process (i.e. utilitarian) as opposed to the outcome (i.e. hedonic) to reach product comprehension. As expected, the verbal mental simulation triggered a stronger product comprehension than the verbal analogy. The strategies that created the most positive product attitude and the strongest behavioural intent were the verbal and visual no analogy/ no mental simulations and the verbal and visual mental simulations. These results support the argument that words and pictures create similar levels of evaluations for a hybrid product. Furthermore, the negative results obtained not only by the visual analogy but also by the verbal analogy may indicate that the analogy of the hybrid product with a cook was unable to sell the benefits of the product.

For the hedonic product (Video Glasses), all conditions created a similar level of product comprehension, except the visual analogy for which product comprehension was significantly weaker. Visual mental simulation and visual no analogy/ no mental simulation triggered the most positive attitude to the product and the strongest behavioural intent. This is consistent with the argument that a congruity should be achieved between the nature of the product (i.e. hedonic) and the presentation used (i.e. visual) to enhance self-congruity and ultimately consumer responses to the product (Johar and Sirgy, 1991). Although words were as capable of enhancing product comprehension as the visual mental simulation, they were less effective to enhance evaluations, as measured by attitudinal and behavioural variables. The results also provide further support for the low responses expected when analogies were conveyed using visuals (Spiro et al., 1989; McQuarrie and Phillips, 2005). These results are discussed in more details in the following section.

7.2.1 Role of Presentation Format for each Product Type

The main effect of presentation format on product comprehension was highly significant $F(1, 648)=170.799$, $p<0.001$, partial $\eta^2=0.209$, suggesting that overall the use of words triggered a significantly higher product comprehension than the use of pictures. Consistent with this effect, the findings indicate that for the utilitarian (Digipen) and the hybrid (Intelligent oven) products, the use of words triggered a higher product comprehension than the use of pictures, both for mental simulations and analogies. This is contrary to the expectations set for the hybrid product that no significant differences would be found between the use of words vs. pictures. This finding may indicate that when a RNP requires the consumer to go through a utilitarian process but delivers a hedonic outcome, individuals may focus predominantly on the process dimension to reach an understanding of the product. This would explain why the patterns for product comprehension encountered for the two products with a utilitarian process are comparable. This finding adds a new dimension to a recent study on mental simulations and the evaluation of new products in the context of process vs. outcome-focused thoughts (Zhao, Hoeffler and Zauberman, 2008). Consumers focus mainly on the benefits when thinking of products with a low complexity (i.e. INPs) but focus both on the benefits and the outcomes when thinking about products with a high level of complexity (i.e. RNPs) (Mukherjee and Hoyer, 2001). This may be related to the learning complacency associated with prior knowledge which lowers individual motivation for information processing (Wood and Lynch, 2002). Accordingly, recent findings suggest that while consumers naturally focus more attention on the benefits than on the process of using a product for INPs, they focus equally on the process and the benefits for RNPs (Zhao, Hoeffler and Zauberman, 2008). The present study contributes to this body of literature and suggests that when trying to understand the product individuals may actually focus more attention on the process of using the product. Hence, individuals may reach a higher product comprehension when the product is presented using words than using pictures for RNPs using a utilitarian process, regardless of the nature of the benefits offered by the product (i.e. utilitarian vs. hedonic). This finding suggests that classifying products according to the nature of their process vs. outcomes, which has not been implemented in the marketing literature to date, has tremendous theoretical implications for consumer research on individual response to new products.

For the hedonic product (Video Glasses) the use of words triggered a higher level of product comprehension than the use of pictures for analogies (as hypothesized). However, there were no significant differences in the use of pictures vs. words for mental simulations, while the use of pictures was expected to create a stronger product comprehension than the use of words. This finding is nonetheless exciting, considering that for the utilitarian and the hybrid products the use of words was superior to the use of pictures for the mental simulation. Hence, the difference is minimized for the hedonic product, and the visual mental simulation even triggers a marginally stronger product comprehension than the verbal mental simulation. These results will be strengthened when using attitudinal and behavioural variables as the outcomes of interest.

The examination of the effects of visual vs. verbal analogies on product comprehension contributes to the literature on the processing of rhetorical works in advertising, which has focused to a large extent on persuasion and memory effects (Huhmann, 2008). Only recently has Huhmann (2008) developed a model of the processing effects of rhetorical works, which includes four processing outcomes:

orienting response, interpretation, memory and persuasion. Interpretation involves individual comprehension, although the model has not been developed in the context of response to new products and thus product comprehension. The present study also contributes to understanding how structural properties of rhetoric influence processing. Particularly noteworthy is that Huhmann's (2008) list of rhetorical figures developed after synthesizing several sources of advertising rhetoric (e.g. Huhmann, Mothersbaugh and Franke, 1999, 2002; Leech, 1966; Mothersbaugh, Huhmann and Franke, 2002; Nelson and Hitchon, 1999; Pandya, 1977; Tanaka, 1994) which intention was to be more exhaustive than the list put forward in McQuarrie and Mick's (1996) seminal work still fails to identify analogies as a rhetorical work, and more specifically as a destabilization trope.

The present research clearly acknowledges the classification of analogies as rhetorical figures, as analogies are a type of metaphor (Gentner, 1989) and identifies implications for the use of analogies in advertising for new products. The weak product comprehension derived from visual analogies across the three products is grounded in the theoretical precepts of experimental aesthetics and the resource-matching perspective. Experimental aesthetics research has consistently observed a non-monotonic function (i.e. an inverted U-shaped relationship or Wundt curve) between processing performance and structural properties (e.g. Berlyne, 1971, 1974; Wundt, 1874). Huhmann (2008) recently provided a satisfactory theoretical rationale for this effect i.e the resource-matching perspective (Anand and Sternthal, 1990). Specifically, the processing of rhetorical works will be optimized when one's available resources match resource demand. In the present study, as visual analogies were used to communicate the nature of novel and complex products for which individuals have limited existing cognitive resources, the stimulus' resource demand may have been greater than the individual's available resources. Consequently, respondents may have been overwhelmed, hence a detrimental effect on processing. Although headlines were used in the design of the stimuli in an attempt to facilitate the comprehension of the visual analogies in such a complex context, in line with the finding that ad headlines can ease interpretation of a complex visual metaphor (Phillips, 2000), product comprehension levels remained very low. This is consistent with the taxonomy of rhetorical figures, which identifies destabilization tropes as the figures which have the highest resource demand and the most open meaning

(Huhmann, 2008), thus placing a strong pressure on cognitive processing. Because resource demand motivates processing (Mothersbaugh, Huhmann and Franke, 2002), higher resource-demands rhetorical figures such as analogies are successfully interpreted up to the point where resource demand exceeds available resources. After this point interpretation will suffer, which was the case for visual analogies in experiment 1.

Interestingly, the differences between the use of words and pictures were significantly reduced for attitudinal responses. This is reflected in the main effect of presentation format with attitude to the product as the outcome $F(1, 638)=5.154$, $p<0.05$, partial $\eta^2=0.008$, which shows a decrease in partial eta squared compared to the effect of presentation format with product comprehension as the outcome $F(1, 648)=170.799$, $p<0.001$, partial $\eta^2=0.209$.

In the case of the utilitarian product (Digipen), for the mental simulation the use of words created a marginally more positive attitude to the product than pictures. For the analogy the superiority of words over pictures reached significance, as hypothesized. These findings suggest that visual mental simulations may be capable of enhancing attitude to the product to the same extent as verbal mental simulations, even when the product advertised is of a utilitarian nature.

For the hybrid product (Intelligent oven), as expected there were no significant differences between the use of words vs. pictures, both for mental simulations and analogies. This finding is consistent with the recent assertion that consumers focus equally on the process and the outcomes of product use when developing an attitude for a RNP and that the effects of process and outcome simulations on consumers' product evaluations do not differ when the product is a RNP (Zhao, Hoeffler and Zauberman, 2008). A consequence of these findings is that when evaluating a RNP with a utilitarian process but hedonic outcomes, such as the intelligent oven, individuals may focus equally on the utilitarian and the hedonic dimension of the product, which may explain why no differences in product attitudes are encountered between the use of words, associated with the utilitarian nature of product, and pictures, associated with the hedonic nature of the RNP.

As hypothesized, for the hedonic product (Video Glasses), the use of pictures triggered a significantly more positive product attitude than the use of words for the mental simulation whereas the use of words triggered a more positive attitude than pictures for the analogy. However the difference in product attitude between the visual and the verbal analogy was only marginal. These findings support the benefits of using pictures to convey RNPs of a hedonic nature, not only for mental simulations but also, contrary to expectations, for analogies as the difference in attitude to the product obtained for the visual analogy was not significantly more negative than the attitude obtained for the verbal analogy.

Interestingly, the main effect of presentation format, which was significant for product comprehension and attitude to the product, did not reach significance for behavioural intent: $F(1, 657)=0.026$, $p>0.05$, partial $\eta^2=0.000$. This suggests that regardless of the nature of the product and of the learning strategy used, there were no differences in behavioural intent after exposure to a message conveyed using words vs. pictures. However, an investigation per product does reflect significant mean differences.

As hypothesized, for the utilitarian product (Digipen), for the mental simulation and the analogy the use of words created a significantly stronger behavioural intent than pictures. This finding is consistent with the literature on functional congruity discussed in the conceptual framework (Johar and Sirgy, 1991). This result also supports the "dark side" of openness for consumer response (Ketelaar, Van Gisbergen and Beentjes, 2008). Open adverts which messages are conveyed primarily via pictures provide less guidance toward a specific interpretation. Because in the design of the adverts for experiment 1 the verbal copy explaining how the pictures related to the product was very limited in the visual conditions, the advertisements did not explicitly guide the respondents toward a specific interpretation, thus increasing the openness of the ads, hence a weaker behavioural intent when the product was conveyed using pictures than using words.

For the hybrid product (Intelligent Oven), there were no significant differences in behavioural intent in the use of words vs. pictures, both for the mental simulations and the analogies, which was also expected.

For the hedonic product (Video Glasses), the use of pictures triggered a stronger behavioural intent than the use of words for the mental simulation, as hypothesized. However, while the use of words was expected to lead to a stronger behavioural intent than the use of pictures for the analogy, no significant differences were found between visual and verbal analogies and the mean scores were almost identical. This finding, consistent with the results encountered for attitude to the hedonic product, provides support for the argument that although visual analogies created a weaker product comprehension than verbal analogies for the hedonic product, they are as capable of enhancing attitudes and behavioural intent for this type of product as their verbal counterpart.

These results can be related to the literature on openness in advertising, which showed contradictory results in the past. Recent findings suggest that consumer attitudes are more negative towards open ads than towards closed ads (Ketelaar, Van Gisbergen and Beentjes, 2008), consistent with Warlaumont (1995)'s findings. However, McQuarrie and Mick (1992, 1999, 2003) found positive effects of openness on attitudes. A plausible explanation for these contrasting results may be the differences in the manipulation of the experimental ads: the open ads that triggered negative effects provided little guidance on how to interpret the message, whereas the studies that showed a positive effect of openness on attitudes contained a headline that guided consumers toward the intended interpretation (Ketelaar, Van Gisbergen and Beentjes, 2008). The present study furthers the understanding of the effect of openness on attitudes when openness is triggered by visuals. Specifically, in experiment 1, differences in the effectiveness of open advertisements are not explained by variations in the design of the stimuli but by the nature of the product advertised: open advertisements with a prominent visual were more effective than closed advertisements with a message conveyed using text when the product advertised was more hedonic as opposed to utilitarian.

The superiority of pictures over words to enhance behavioural intent for a hedonic product conveyed using mental simulation is in support of the need for consumer behaviourists to engage with ad images (Scott, 1994). To a large extent, past research has used a simplistic understanding of images, as opposed to regarding them as complex artifacts richly endowed with multiple meanings. In a review of the accumulated expertise on visual persuasion in American society at the beginning of the 21st century, Malkewitz, Wright and Friestad report "our analysis suggests that practical expertise in applied everyday persuasion is not very well developed and we remain in a state of relative ignorance" (2003, 3, 7). The present research acknowledges that although consumer researchers have studied the human system with great care, little attention has been devoted to the ad as an artefact that is embedded in a complex system of signifying variables (Larsen, 2008). In line with McQuarrie and Mick's (1996, 1999, 2003) work on rhetorical figures, this research contributes to balance understanding of the human system with an understanding of the ad system and thus remedy the lack of understanding highlighted by Malkewitz, Wright and Friestad (2003). Specifically, the research establishes that visual images building a mental simulation scenario are a more powerful advertising tool than a scenario conveyed using words to enhance intent toward a RNP of a hedonic nature. Hence, the findings argue against copy theory, or the idea that pictures simply point to objects or experiences in the empirical world and are passively absorbed, a theory criticized by Scott (1994).

7.2.2 Role of Learning Strategy for each Product Type

The main effect of presentation format on product comprehension in experiment 1 was significant: $F(2, 1298)=33.696$, $p<0.001$, partial $\eta^2=0.049$. The interaction effect of learning strategy and presentation format was also significant: $F(2, 1296)=34.592$, $p<0.001$, partial $\eta^2=0.051$. A closer examination of the mean scores reveals different patterns for learning strategy across visual vs. verbal presentation formats. This finding is contrary to the expectation set in the hypotheses that mental simulations would trigger a stronger product comprehension than analogies regardless of the nature of the product or of the format used. The findings indicate that for the three products, the use of a mental simulation triggered a significantly stronger product comprehension than the use of an analogy in the visual conditions but not in the verbal conditions. In the verbal conditions the product comprehension obtained for mental simulations vs. analogies was very similar for the utilitarian product and for the hedonic product. For the hybrid product the verbal mental simulation created a marginally stronger product comprehension than the verbal analogy but the difference did not reach significance. Therefore, the pattern of results was consistent with the expectations set in the conceptual framework in the visual presentation formats, however no significant differences were noted for any of the three products for the verbal presentation formats.

This lack of significant differences in product comprehension across learning strategies conveyed using words is consistent with difficulties encountered in previous research to enhance product comprehension for RNPs using experimental procedures. For example, recent research has examined comprehension for RNPs conveyed using between-domain analogies which rely on the transfer of information between two systems which belong to fundamentally different conceptual domains and within-domain analogies which involve knowledge transfer of common surface attributes between concepts within highly similar domains (Gentner, 1989; Vosniadou, 1989). The results suggest that benefit comprehension was enhanced by a between-domain analogy, or 'true analogy' for only one of two products (Ait El Houssi, Morel and Hultink, 2004). The lack of superiority of the mental simulation condition over the analogy condition may also be related to the imagery power of analogies, which could have minimized differences in product comprehension. Paivio (1979) described poetic metaphors as bringing about mental imagery. Honeck, Riechmann and Hoffman (1975) observed in a pre-test that some metaphoric proverbs generated mental imagery. Gibbs and Bogdonovich (1999) exposed recipients to a poem with metaphors and concluded that comprehending the poem's metaphors involved the activation of mental imagery. The imagery power of analogies is also put forward in the literature on consumer responses to RNPs (Hoeffler, 2003). The imagery activated by verbal analogies may therefore explain the lack of significant differences in product comprehension between verbal mental simulations and verbal analogies, thus reducing the expected superiority of mental simulations over analogies.

Moreover, for the hybrid product (Intelligent Oven), the no analogy/ no mental simulation triggered a significantly stronger product comprehension than the analogy, both in visual and in verbal formats. For the utilitarian product (Digipen), the no analogy/ no mental simulation triggered a significantly weaker product comprehension than the mental simulation in the visual formats and a significantly weaker product comprehension than the analogy in the verbal formats. For the hedonic product (Video Glasses), the no analogy/ no mental simulation created a stronger level of product comprehension than the analogy in the visual formats.

Therefore, the results indicate that when exposed only to a visual of the product without any description of the product benefits, visual or verbal, respondents reported a stronger product comprehension than when exposed to a visual analogy, which is a surprising finding. This finding is consistent with research highlighting the risks related to analogical learning as analogies rely on inferences (Spiro et al., 1989) and with the classification of analogies as figures of rhetoric that can destabilize the reader (Huhmann, 2008; Gentner, 1989). As DeRosia (2008) states in his recent integration of ancient hypotheses and modern empirical evidence of the effects of rhetorical figures, the notion that some messages oblige respondents to make inferences during comprehension has been identified since Ancient Greece. According to Aristotle, "an agreeable style may be achieved by the following method: by stating half of a consideration so that the audience may understand the other half themselves" (Rhetoric to Alexander xxii. 35). Because analogies are rhetorical figures that go beyond the given information, they may cause comprehension failures. As the ancients described it, rhetorical figures can lead to ambiguity (Art of Rhetoric 3.5), obscurity (De Partitione Oratoria v. 19), a lack of clarity (Institutio Oratoria 8.3.15) and a lack of perspicuity (Institutio Oratoria 8.2.1).

Modern evidence also suggests that individuals sometimes fail to comprehend metaphors, and by extension analogies. Reinsch (1971) observed in an experiment that several metaphors used as stimuli were poorly comprehended. McQuarrie and Mick (1992; study 2) showed that participants had difficulties to understand one of two figurative ads. Mothersbaugh, Huhmann and Franke (2002) observed that ads with rhetorical figures were more difficult to understand than literal ads according to self-report measures of comprehension difficulty. Morgan and Reichert (1999) identified comprehension failures, mostly among individuals who rely heavily on analytic or left-brain processing. Roehm and Sternthal (2001) reported four studies with analogies demonstrating that respondents who lacked motivation or ability to devote cognitive effort while processing the ad were less likely to understand the analogy (see DeRosia, 2008 for a review). Conveying an analogy using visuals which by definition are prone to multiple interpretations (Huhmann, 2008) further increased the risks of comprehension failures, consistent with the finding in experiment 1 that product comprehension is weaker for visual analogies than for visual conditions without analogy or mental simulation for two of the three products. For the utilitarian product (Digipen) no significant differences were noted between the visual analogy and the visual no mental simulation/ no analogy, however this result is not explained by a superior performance of the visual analogy but by similarly low means obtained for product comprehension, which provides further support for the comprehension difficulties associated with visual analogies.

The main effect of learning strategy on attitude to the product also reached significance: $F(2, 1278)=12.680$, $p<0.001$, partial $\eta^2=0.019$. Consistent with the results for product comprehension, the interaction effect of learning strategy and presentation format on attitude to the product was also significant: $F(2, 1276)=8.247$, $p<0.001$, partial $\eta^2=0.013$, suggesting differences in the pattern of results for learning strategies across presentation formats.

For the utilitarian product (Digipen), in the visual conditions the mental simulation created a significantly more positive attitude to the product than the analogy, in line with expectations. However, no significant differences were noted in the verbal conditions and the mean scores were very similar. The no analogy/ no mental simulation condition obtained significantly more negative scores than the mental simulation.

For the hybrid product (Intelligent Oven), the mental simulations triggered a marginally more positive attitude to the product than the analogies, both in the visual and in the verbal conditions. It should also be noted that the no analogy/ no mental simulation triggered a significantly higher attitude to the product than the analogy, both in visual and verbal conditions. This finding is rather surprising, mostly in the verbal formats. As this result was only encountered for one product in the verbal conditions, an explanation may be that the specific analogy used to compare the intelligent oven with a cook was not successful to enhance attitudes and may have actually lowered attitudes compared to the no analogy/ no mental simulation condition. Importantly, understanding a product does not automatically lead to a more positive appreciation of the new product. Therefore, from a marketing perspective, analogies should not only explain the key benefits to consumers but should also sell the benefits as well (Ait El Houssi, Morel and Hultink, 2005). The cook analogy may not have been successful in this respect, regardless of the presentation format used to convey it.

For the hedonic product (Video Glasses), the mental simulation and the no analogy/ no mental simulation conditions triggered a significantly more positive product attitude than the analogy in the visual conditions. In the verbal formats however, no significant differences were noted between the three strategies. Consistent with the findings encountered for product comprehension, the results suffer from a lack of significance in the verbal conditions, providing further support of the imagery power of analogies (Gibbs and Bogdonovich, 1999).

The main effect of learning strategy on behavioural intent was significant: $F(2, 1316)=6.605$, $p<0.001$, partial $\eta^2=0.010$. The interaction effect of presentation format and learning strategy on behavioural intent also reached significance: $F(2, 1314)=3.667$, $p<0.05$, partial $\eta^2=0.006$.

For the utilitarian product (Digipen), in the visual conditions there were no significant differences in behavioural intent between the three strategies. The mental simulation created a marginally stronger behavioural intent than the other two strategies. In the verbal conditions, the mental simulation and the analogy triggered a significantly stronger behavioural intent than the no analogy/ no mental simulation. The mental simulation also triggered a marginally stronger behavioural intent than the analogy. It should be noted that the difficulties encountered to find significant differences between strategies are consistent with existing studies which found no significant differences in purchase intention for analogies, no analogies and analogies plus attributes (Ait El Houssi, Morel and Hultink, 2005), no significant differences in preferences for between-domain vs. within-domain analogies (Ait El Houssi, Morel and Hultink, 2004) and no differences in preferences for an explicit analogy vs. implicit analogy vs. literal similarity (Ait El Houssi, Morel and Hultink, 2005). These previous findings, along with the results of experiment 1 that show a lack of significance in the differences in behavioural intent between the mental simulation and the analogy for the utilitarian product support the difficulty for marketers to enhance behavioural intent for RNPs. However, the analogy and the mental simulation both created a statistically superior behavioural intent than the no analogy/ no mental simulation in the verbal conditions, which suggests that cognitive tools can indeed be effective to enhance behavioural intent compared to conditions that do not manipulate a cognitive tool for a utilitarian product.

For the hybrid product (Intelligent Oven), the mental simulation triggered a marginally stronger behavioural intent than the analogy in the visual conditions. This difference reached significance in the verbal conditions, as expected in the hypotheses. It should also be noted that the no analogy/ no mental simulation triggered a significantly stronger behavioural intent than the analogy, both in visual and verbal conditions, providing further support for the idea that the intelligent oven/ cook analogy was not successful to sell or dramatize the benefits of the product and thus motivate behavioural intent. Appropriate conveyors (i.e. analogies) should not only explain a new product's benefits but also create a positive impression in consumer's minds (Ait El Houssi, Morel and Hultink, 2005). This may improve the effectiveness of analogies as the findings for the intelligent oven suggest that analogies may sometimes be harmful for behavioural intent, even when conveyed using words.

For the hedonic product (Video Glasses), the mental simulation and the no analogy/ no mental simulation conditions triggered a significantly stronger behavioural intent than the analogy in the visual conditions, in line with the results for attitudes. In the verbal formats however, the analogy created a stronger behavioural intent than the mental simulation which is contrary to what was expected in the hypotheses. Two possibilities may be put forward to explain this surprising result. The first possibility is related to the low behavioural intent obtained for the verbal mental simulation, which suggests that the use of pictures is definitely more suited to convey the benefits of hedonic products with a mental simulation, as put forward in the conceptual model using self-congruity theory (Johar and Sirgy, 1991). The second possibility provides a rationale for the superior result of the analogy over the mental simulation: as opposed to the intelligent oven/ cook analogy, the video glasses/ cinema projection analogy may have been able to emphasize the benefits of the hedonic product when conveyed using words, at least to a greater extent than the verbal mental simulation.

The different patterns obtained for the hedonic product (Video Glasses), the hybrid product (Intelligent Oven) and the utilitarian product (Digipen) are consistent with recent findings in the marketing literature which suggest that products that meet consumers' utilitarian needs yield different reactions compared to products that fulfil consumers' hedonic needs (Chitturi, Raghunathan and Mahajan, 2008). Chitturi, Raghunathan and Mahajan (2008) show that the nature of the product triggers different post-consumption emotions (i.e. delight or dissatisfaction for hedonic benefits vs. satisfaction or anger for utilitarian benefits). The present study adds to this recent body of research and proposes that the nature of the product also affects consumer responses to alternative presentation formats in advertising.

The current research also has relevance to the recent work on convergence in the electronic sector (Gill, 2008). This research suggests that the nature of the product (i.e. utilitarian vs. hedonic) and the congruence between an added functionality and the base product affect consumer evaluations. Specifically, an asymmetric additivity effect indicates that convergent products with a utilitarian base gain more from an incongruent addition than from a congruent one. For example, a PDA (utilitarian base) would gain more from the addition of internet access (hedonic functionality) than from the addition of a GPS system (utilitarian functionality). However, convergent products with a hedonic base gain more from a congruent addition. For example, a portable MP3 player (hedonic base) would benefit more from the addition of video capability (hedonic functionality) than from the addition of a GPS system (utilitarian functionality). Overall, regardless of the nature of the base, convergent products gain more from a hedonic addition than from a utilitarian one. The present research also examines hedonic and utilitarian products which have received little investigation in the marketing literature on high-tech products. The present study suggests an alternative method to distinguish between utilitarian and hedonic aspects of a new product. As opposed to base vs. addition, which can be used solely for incremental convergent products that build on existing functionalities (Gill, 2008), more innovative new products (RNPs) can be categorised according to the hedonic vs. utilitarian nature of the a) process required to use them and b) outcomes obtained from product use, a distinction which has never been suggested in the marketing literature. Adequate advertising methods to communicate the benefits of hedonic, utilitarian and hybrid products were identified.

7.2.3 The Role of Emotions

Table 7.2-2 presents the results of the mediation analyses. Scepticism and discouragement partially mediate the interaction effects of learning strategy and presentation format on product comprehension. Discouragement fully mediates the effect on attitude to the product while scepticism and positive emotions partially mediate the effect on this outcome variable. Positive emotions partially mediate the effects on behavioural intent. However, it should be noted that one of the equations part of the mediation analyses for positive emotions was only marginally significant ($p=0.058$). Moreover, product comprehension and attitude to the product fully mediate the effects of presentation formats and learning strategies on behavioural intent. The results are discussed in the following section.

TABLE 7.2-2 SUMMARY OF THE RESULTS OF THE MEDIATION ANALYSES

	Product Comprehension	Attitude to the product	Behavioural Intent
Discouragement	Partial mediation	Full mediation	No mediation
Scepticism	Partial mediation	Partial mediation	No mediation
Positive emotions	No mediation	Partial mediation	Partial mediation
Product Comprehension	n.a.	n.a.	Full mediation
Attitude to the product	n.a.	n.a.	Full mediation

Researchers have recently acknowledged that consumer evaluations of innovations trigger emotional responses that should be considered in the development of product launch strategies (Wood and Moreau, 2006; Castano, Sujan, Kacker and Sujan, 2008). The present study has identified an important gap and examines whether positively and negatively-valenced emotions mediate the effects of presentation formats and learning strategies used in marketing communications for RNPs on consumers' comprehension of the product, attitude to the product and behavioural intent. Experiment 1 confirms that discouragement and scepticism mediate the effects of presentation formats and learning strategies on both product comprehension and attitude to the product. Positive emotions mediate the effect on attitude to the product. Interestingly, positive emotions also mediate the effect of the independent variables on behavioural intent, while discouragement and scepticism do not. In line with recent findings (Castano, Sujan, Kacker and Sujan, 2008) which suggest that adoption decisions are driven by feelings of anxiety and optimism, the present study demonstrates that adding emotions to models of consumer adoption of RNPs can contribute to a more thorough understanding of adoption decisions. These findings are consistent with Mick and Fournier's (1998) argument that technology may trigger both positive and negative feelings. Consistent with Kulwivat et al. (2007)'s recent call for conceptual models incorporating a wide variety of affective reactions consumers may experience when developing their reactions to complex innovative products, experiment 1 examined the mediating role of three key consumer emotions. This allows for a more comprehensive understanding of consumer emotional responses, while selecting a small set of emotions in light of the review of the literature in an effort to keep the model as parsimonious as possible.

Furthermore, while previous research has focused on the role of emotional responses on consumer evaluation of new products, the present research also demonstrates that specific emotions (i.e. discouragement and scepticism) act as mediators for consumer cognitive responses (i.e. product comprehension). Therefore, experiment 1 fills in a gap in existing literature by identifying discouragement and scepticism as emotional responses that take place directly as a result of the learning process, consistent with the view of emotions arise from goal-based behaviours (Mukhopadhyay and Venkataramani Johar, 2007) and with regulatory-focus theory in social psychology (Higgins, 1987). Emotions are mechanisms that communicate important information relative to expected progress toward goal achievement (Bagozzi, Gopinath and Nyer, 1999). Therefore, they are likely to arise when product comprehension is either reached or impeded while learning for a complex new product. However, the present research highlights that not all affective responses will mediate the effect of marketing communications on product comprehension. Specifically, scepticism and discouragement arise directly from the learning process, whereas positive emotions may not be triggered by the learning process as they do not mediate product comprehension. Contrarily, positive emotions may arise as a result of the intrinsic content of the stimuli, i.e. the learning strategies and presentation formats manipulated in the experiment. In the specific case of consumer responses to RNPs, recent research has demonstrated empirically that mental simulation in advertising shapes consumer emotions including anxiety and optimism (Castano, Sujan, Kacker and Sujan, 2008). A recent study manipulating mental simulation for a target product also found that participants displayed higher evaluations for the product, and that this persuasion effect occurred through the generation of positive affect (Escalas, 2004). Similarly, analogies can trigger positive emotions (Gregan-Paxton et al., 2002), in line with self-schema theory (Meyers-Levy and Tybout, 1989; Perracchio and Tybout, 1996) and the pleasure-of-the text standpoint (McQuarrie and Mick, 1996; 1999). Therefore, an explanation for the mediating role of positive emotions for attitude to the product but not for product comprehension may be that positive emotions arise from the intrinsic content of the advertisement, and not from the learning process itself. Contrarily, scepticism and discouragement affect both cognitive responses and attitudes and may therefore arise directly from the learning process and colour product evaluations.

Furthermore, contrary to what was expected, only positive emotions mediated the effect of presentation formats and learning strategies on behavioural intent, whereas the results of the mediation tests were non significant for discouragement and scepticism. It should be noted that some caution is required in the interpretation of these findings as the effect of the independent variables on positive emotions was only close to significance ($p=0.058$) in the mediation test with behavioural intent as the individual outcome.

The finding that positive emotions are a mediator for behavioural intent but discouragement and scepticism are not is consistent with the argument that discouragement and scepticism may arise directly from the learning efforts and thus will not influence behavioural intentions directly but only through their impact on comprehension and attitudes. However, positive emotions that arise as a result of the intrinsic nature of the stimuli manipulation have a direct mediating role on both attitudinal and behavioural responses towards the innovation. These findings highlight a gap in the literature and the need to examine whether emotional responses for new products arise from the material manipulated in the experimental procedure or from the learning efforts. The results of experiment 1 suggest that emotional responses arising from the learning efforts such as discouragement or scepticism may act as latent variables affecting cognitive and attitudinal responses which may have an indirect effect on intent. By contrast, emotions arising as a result of the stimuli manipulated (i.e. analogies and mental simulations), namely positive emotions, may have a direct impact on both attitudinal and behavioural individual responses but not on product comprehension.

The results of experiment 1 also support the argument that product comprehension and attitude to the product both mediate the effects of learning strategy and presentation format on behavioural intent. This is consistent with the view of comprehension as a prerequisite to behaviour under the central or systematic processing route (Ratneshwar and Chaiken, 1991). This finding also contributes to the current debate on comprehension-as-mediator as it appears that when using measures of product comprehension as opposed to memory measures, deep comprehension levels are associated with strong and positive post-exposure intentions toward the product. The results of experiment 1 are consistent with recent findings indicating that benefit comprehension has a positive effect on product preferences for a RNP (Ait El Houssi. Morel and Hultink, 2005). Furthermore, the mediating role of product comprehension for behavioural intent is central to the present thesis. The empirical confirmation that product comprehension mediates behavioural responses is in support of calls for research aimed at enhancing consumer comprehension of RNPs (Ait El Houssi, Morel and Hultink, 2005; Roehm and Sternthal, 2001), as this variable acts as a latent explanatory variable for behavioural responses. Furthermore, the results of experiment 1 are also in support of the mediating role of attitudinal responses in the relationship between antecedents (i.e. presentation format and learning strategy) and behavioural outcome, consistent with self-generated validity theory (Feldman and Lynch 1988).

7.2.4 The Role of Visual Attention

There were several reasons for adding the eye-tracking experiment to the main experiment, which provide a strong rationale for the use of this technique.

First, research suggests that eye movements are diagnostic of underlying cognitive processes. Therefore, using eye movements to understand learning processes provides the ability to make real-time inferences from eye movements to cognition. Eye tracking experiments help make inverse inferences and discriminate the state of the cognitive processing from observed patterns of eye movements (Feng, 2003), thus providing a "window to the mind" (Pieters, Wedel and Zhang, 2007). Therefore, an eye-tracking experiment is used to further the understanding of the links between conceptual and perceptual analyses when processing information for RNPs. This is consistent with Wedel and Pieters (2007)' recent call for more research applying eye tracking measures to make inverse inferences about fundamental communication processes.

Second, measuring visual attention for visual vs. verbal claims may contribute to enhancing the understanding of processing strategies for "open" advertisements. A recent stream of literature has identified visuals as powerful sources of meaning and persuasion in advertising (McQuarrie and Phillips, 2005). Based on this definition of visuals in advertising as communication artifacts, a question is whether attention processes for complex advertising visuals are in line with those outlined in research on scene perception or whether they are different for rhetorical figures. On the one hand, the literature on scene perception suggests that attention to pictures relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). This stream of research suggests that no correlation should exist between attention to the pictorial element of the stimulus and product comprehension. On the other hand, the literature on visual rhetoric suggests that people process advertising images in a conscious and deliberative manner which is thought to consume cognitive resources, to be intentional and controllable (Johar, Maheswaran and Peracchio, 2006). Therefore, if visual rhetoric is like writing with pictures (Scott and Vargas, 2008), the processing of complex images may be similar to attention strategies used to extract information from text. Hence, a sustained cognitive effort and consequently an increase in attention may be required to reach comprehension, thus suggesting a correlation between attention and comprehension. In light of the different perspectives offered by the literature on scene perception and by the literature on visual rhetoric, the study of visual attention for complex visuals in advertising appears to be a fruitful area of research.

Third, the eye tracking experiment may have strong managerial implications that significantly contribute to the present thesis, consistent with recent efforts to investigate the implications of visual representations for decision-making (Lurie and Mason, 2007). Due to the overcrowded information environment (Wedel and Pieters, 2007), uncovering whether visuals may be capable of conveying product benefits more quickly than text may have tremendous managerial implications.

Table 7.2-3 presents a summary of the variability percentages that provide support for the propositions presented in the conceptual model as the variability percentages are higher for the verbal conditions than for the visual conditions, suggesting a correlation between visual attention to the message and product comprehension only when the message is conveyed using words. Due to the small sample size, variability percentages are preferred to p-values. The implications of these findings for research on visual attention are discussed in the following section.

TABLE 7.2-3 SUMMARY OF THE VARIABILITY PERCENTAGES BETWEEN VISUAL ATTENTION TO THE MESSAGE AND PRODUCT COMPREHENSION FOR EACH CONDITION

	Variability percentage visual attention to the message/ product comprehension
Visual Mental Simulation	0.006%
Visual Analogy	7.56%
Verbal Mental Simulation	**45.56%**
Verbal Analogy	**36.72%**

The present research highlights the importance of visual attention when studying consumer behaviour (echoing Wedel and Pieters, 2007; Brasel and Gips, 2008). The moment-to-moment attention information that eye trackers provide offers an important tool to study visual attention in the context of advertising for RNPs. The difference in visual patterns between a message conveyed via words vs. via pictures shows how changes in stimuli affect attentional processes.

Specifically, experiment 2 offered a preliminary exploration of the role of visual attention, and in particular the correlation between the amount of visual attention allocated to an advertising message and product comprehension. Even though the p-values suffer from a lack of significance due to the small sample size, the results indicate that, in line with the physiology of reading (Rayner, 1998), there is reason to believe that a correlation exists between visual attention and product comprehension when the message is conveyed using words. However, the results indicate that, as expected in the propositions set in the conceptual framework, no correlation can be found between visual attention and product comprehension when the message is presented via pictures. These results are in line with Wedel and Pieters' (2007) recent call for more research applying eye tracking measures to make inverse inferences about fundamental communication processes. Previous eye tracking research has often been descriptive, for instance by relating perceptual aspects of the stimulus, namely size, colour or position of the brand, text and pictorial directly to measures of visual attention. However, much more can be gained from using eye-tracking measures as indicators of the latent measures of interest (Wedel and Pieters, 2007), as indicated by the different visual attention processes at stake to extract information about a novel, complex product from words vs. pictures. Drawing on the inverse inference model (Feng, 2003), indicators of unobservable cognitive processes may be derived from observed eye movements (Pieters, Wedel and Zhang, 2007).

This call for research has stimulated recent interest in the study of visual attention (Brasel and Gips, 2008). In line with these recent findings, the present research shows that drastically changing the stimuli presented alters a viewer's visual attention patterns. While early advertising research showed that the amount of time spent looking at the screen affects brand memory (Thorson, Friestad and Zhoa 1987), the present research introduced a condition as the amount of time spent looking at the message only affects product comprehension if the message is presenting with words. This finding is also consistent with recent efforts to use eye-tracking techniques to consider not only how attention affects memory and recognition but also how it affects more complex outcomes. Recognition is a highly relevant advertising outcome (Singh, Rothschild and Churchill, 1988). However, eye-tracking can also be implemented to investigate more complex dimensions of advertising effectiveness such as attitudinal and behavioural outcomes (Brasel and Gips, 2008; Wedel and Pieters, 2007), but also comprehension for new product concepts which has been the object of very little attention in the visual marketing literature. As visuals have taken up an ever-increasing part of print ads (Pollay, 1985), it is essential to examine how changes in presentation format affect the basic search patterns of consumers and not assume that older models of visual attention, such as the AIDA model, apply unchanged. This is particularly relevant as there is reason to believe that younger consumers are significantly more visual than older age groups (Ramsey and Deeter-Schmelz, 2008). This supports the trend in the industry of utilizing more visual aids marketed toward younger consumers, hence the need to further the understanding of individual responses and attention processing strategies for visual elements.

Particularly noteworthy is that little research has examined whether visual information is processed in the same manner as verbal information or whether it is processed differently (Sojka and Giese, 2001). The present research suggests that a detailed processing strategy may be used to decipher a verbal message, hence a correlation between visual attention and product comprehension, obtained through an effortful process. This is consistent with the argument that processing information conveyed using numbers or text is inherently effortful because it involves rule-based reasoning. In rule-based reasoning, data are abstracted into values that are given meaning through formal rules and deliberative analysis (Sloman, 1996). In contrast, a more generalized, holistic processing strategy may be implemented to decipher a visual message, hence a lack of correlation between attention and comprehension. This holistic strategy is consistent with the use of the associative system, in which meaning is ascribed through gestalt and automatic processes (Sloman, 1996). The format of the stimulus therefore appears to drive the visual attention strategy used, consistent with bottom-up models of attention (Wolfe, 1998).

The finding that an increase in attention may predict an increase in product comprehension through an effortful processing strategy is also in line with the finding that the text element in an advertisement best captures attention in direct proportion with its surface size (Pieters and Wedel, 2004). Similarly, a holistic processing strategy for pictures is consistent with the finding that the pictorial element in an advertisement captures attention independent of its size (Pieters and Wedel, 2004). Along with Pieters and Wedel (2004), the present research contributes to knowledge in the domain of visual attention as "remarkably little is known about the extent to which viewers look at the picture versus the text" (Rayner et al., 2001). The AC-TEA model developed by Pieters and Wedel (2004) describes bottom-up (stimulus) and top-down (person and process) mechanisms of visual attention to advertising. It also differentiates two forms of attention capture by ad elements, one being independent (baseline) and the other dependent (incremental) on its size. Furthermore, it distinguishes two forms of attention transfer from one ad element to the others, one being independent (endogenous) and the other dependent (exogenous) on its size. In relation with this model of attention, the present research focuses on bottom-up factors of the stimulus. However the size of the element is controlled for and hence the focus is not on the effect of size but solely on the presentation format for the message. Furthermore, the present research adds a key contribution to this model by relating measures of attention to self-reports (Wedel and Pieters, 2007) i.e. product comprehension. As size is controlled, the study also focused on baseline, as opposed to incremental, attention processes. The finding that there is reason to believe that an increase in attention to the message conveyed using text may be correlated with an increase in product comprehension can be related to the finding that text captures attention in direct proportion to its surface size: comprehension can be gained only through focal attentive processes which are voluntary, serial, slow and effortful (Loftus, 1983; Rayner, 1998; Reichle et al., 1998). Contrarily, scene, or picture perception relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). Therefore, although the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth, 1998), text needs more eye fixations to be comprehended. This fundamental difference between scene and text perception provides a compelling explanation for the findings of experiment 2.

Importantly, the findings of experiment 2 also contribute to enhancing the understanding of attention processes for rhetorical figures. A recent stream of

literature has identified visuals as powerful sources of meaning and persuasion in advertising (McQuarrie and Phillips, 2008). Based on this definition of visuals in advertising as communication artifacts, and on recent efforts to understand how individuals "read pictures" (Wang and Peracchio, 2008), a question is whether attention processes for complex advertising visuals are in line with those outlined in articles on scene perception or whether they are different for rhetorical figures. Only very recently have consumer researchers started to investigate the effect of "open adverts" on visual attention using eye-tracking techniques (Ketelaar, Van Gisbergen and Beentjes, 2008). The results of three experiments that manipulated openness using low vs. moderate verbal-guidance conditions and low vs. moderate visual-guidance conditions show that openness does not influence consumers' attention toward ads. The results of these experiments do not support the notion that open ads hold attention better than closed ones (Peracchio and Meyers Levy, 1994; Phillips and McQuarrie, 2004) but strengthen the finding of McQuarrie and Mick (1992) that openness has no beneficial or detrimental effect on consumer attention towards ads.
However, a more essential issue is not whether more 'open' ads that convey the ad message using visuals capture more attention than closed ads, but what mechanisms are used to process the message for open vs. closed ads. If processing of complex visuals such as visual analogy and visual mental simulation differs from the processing of familiar scenes, processing may be similar to the strategies used for reading text and thus may necessitate a sustained cognitive effort, and thus an increase in attention to reach comprehension. The finding in experiment 2 show a lack of correlation between visual attention and product comprehension when the message is conveyed using visuals, which suggests that the attention mechanisms used to process complex visual artifacts are consistent with a) the literature on scene perception, as the findings suggest that meaning is not gained through sustained attention when the message is conveyed via pictures (Henderson and Hollingworth, 1998) and with b) the literature on visual rhetorics, as an increase in attention may actually indicate confusion, likely caused by the complexity of the visual and the high resource demands placed on individual processing (Huhmann, 2008).

The present research is also in line with recent efforts to investigate the implications of visual representations for decision-making (Lurie and Mason, 2007). Managers and consumers alike have to deal with an ever-increasing amount of information, likely to result in information-overload. The issue of information overload has recently been addressed both in the context of visualization tools (Lurie and Mason, 2007) and visual attention processes (Wedel and Pieters, 2007). The present research draws from these perspectives to examine visual attention patterns for visualization tools in advertising. The results of experiment 2 show a lack of correlation between visual attention to the message conveyed via pictures and product comprehension. This finding suggests that, provided the visual stimuli is appropriately designed to convey the core benefits of the new product, individuals may reach product comprehension without going through an effortful visual processing strategy. This is a particularly exciting possibility in light of the overcrowded information environment (Wedel and Pieters, 2007): when the conditions that trigger positive individual responses for new products are satisfied (i.e. visual mental simulation for a hedonic product), visuals may be capable to convey product benefits more quickly than text, and may thus be preferable to compete in an overcrowded informational landscape. However, great care must be given to identify the situations in which visuals can improve consumer responses and the cases in which they may actually hinder learning. This is in line with recent research on information visualization (Lurie and Mason, 2007) which highlights the need to approach the problem-solving capabilities offered by visual representations with care. Visualization tools offer the promise to facilitate the processing of more information without overloading the individual (Tegarden, 1999). However, visuals are a mixed blessing: although they have the potential to improve efficiency, offer new insights and increase consumer satisfaction, they may also bias decisions and increase the salience of less diagnostic information (Lurie and Mason, 2007). This argument is consistent with the differential effects of visuals obtained in the present research: while visual mental simulation enhanced attitudinal and behavioural responses for the hedonic product, visual analogies consistently triggered poor responses for all products. This finding suggests that caution should be exercised when using visual representations as visuals cannot be combined with any learning strategy, particularly when the product concept conveyed is novel.

7.3 CHAPTER SUMMARY

The findings suggest that learning strategies and presentation formats have significant effects on consumer responses to RNPs, not only in terms of product comprehension but also of attitudinal and behavioural responses. Furthermore, the research has introduced an essential classification for RNPs according to the nature of the process required to use the product and to the nature of the outcomes offered by the product (i.e. utilitarian vs. hedonic), inspired by the distinction between process and outcome focus for mental simulations (Escalas and Luce, 2003; 2004). The findings show that the classification is central to examining consumer responses to RNPs as consumer responses to the stimuli presented, and in particular to different presentation formats (i.e. message conveyed via words vs. via pictures) are dependent on the nature of the product (utilitarian vs. hedonic vs. hybrid). The mediating role of discouragement and scepticism on the interaction effects of presentation format and learning strategy on the one hand and product comprehension and attitude on the other hand support the argument that specific emotions arise as part of the learning process for a complex new product (Wood and Moreau, 2006). The mediating role of positive emotions on attitude to the product and behavioural intent suggests that positive emotions arise as a result of the intrinsic nature of the stimuli, namely learning strategy and presentation format as they do not affect product comprehension. The full mediation of product comprehension on the relationship between learning strategy and presentation format on the one hand and behavioural intent on the other hand supports calls for more research aimed at enhancing consumer comprehension of RNPs (Ait El Houssi, Morel and Hultink, 2005; Roehm and Sternthal, 2001). As expected, attitude to the product was also a significant mediator. Overall, the findings support the argument that the inclusion of emotional responses in innovation frameworks can enhance the understanding of consumer responses to new products (Wood and Moreau, 2006; Kulviwat et al., 2007). Finally, the results of experiment 2 suggest that a correlation between visual attention to the message and product comprehension may exist only when the message is conveyed using words. The moment-to-moment attention information provided by the eye-tracking system (Wedel and Pieters, 2007; Brasel and Gips, 2008) made it possible to study how changes in stimuli characteristics affect visual search processes, with implications for literature on visual attention (Wedel and Pieters, 2007), rhetorical works in advertising (McQuarrie and Phillips, 2008) and visualization tools (Lurie and Mason, 2007). The next chapter discusses the contribution and the implications of the study, its limitations and directions for future research.

CHAPTER EIGHT

CONCLUSIONS

CONTENTS: Section 8.1 presents a summary of the results. Section 8.2 relates the results to the research questions. Section 8.3 discusses the contributions of the research while section 8.4 presents the implications of the research. Finally, the limitations of the study are identified (Section 8.5) and avenues for future research (Section 8.6) are suggested.

8.1 SUMMARY OF THE RESULTS

In order to conclude on the findings of the research, it is useful to remind the reader of how the hypotheses turned out. Tables 8.1-1 and 8.1-2 below summarize the results of the two experiments and state whether the hypotheses/ propositions were supported or rejected.

TABLE 8.1-1 SUMMARY OF HYPOTHESES TESTING (STUDY 1)

Number	Hypothesis	Result of Hypothesis Testing
1	When the learning strategy is a mental simulation a) the use of words will trigger higher levels of product comprehension than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of product comprehension than the use of words for hedonic products and c) the use of words will trigger similar levels of product comprehension as the use of pictures for hybrid products.	1a: Supported 1b: Rejected 1c: Rejected
2	When the learning strategy is a mental simulation a) the use of words will trigger higher levels of attitude to the product than the use of pictures for utilitarian products whereas b) the use of pictures will trigger higher levels of attitude to the product than the use of words for hedonic products, c) the use of words will trigger similar levels of attitude to the product as the use of pictures for hybrid products.	2a: Rejected 2b: Supported 2c: Supported
3	When the learning strategy is a mental simulation a) the use of words will trigger higher levels of behavioural intent than the use of pictures for utilitarian products whereas b) the use of pictures	3a: Supported 3b: Supported

	will trigger higher levels of behavioural intent than the use of words for hedonic products, c) the use of words will trigger similar levels of behavioural intent as the use of pictures for hybrid products.	3c:Supported
4	When the learning strategy is an analogy the use of words will trigger higher levels of product comprehension than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.	4a: Supported 4b: Supported 4c: Supported
5	When the learning strategy is an analogy the use of words will trigger higher levels of attitude to the product than the use of pictures for a) utilitarian products and b) hedonic products and c) hybrid products.	5a: Supported 5b: Rejected 5c: Rejected
6	When the learning strategy is an analogy the use of words will trigger higher levels of behavioural intent than the use of pictures for a) utilitarian products, b) hedonic products and c) hybrid products.	6a: Supported 6b: Rejected 6c: Rejected
7	The use of verbal mental simulation will trigger higher levels of product comprehension than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	7a: Rejected 7b: Rejected 7c: Rejected
8	The use of verbal mental simulation will trigger higher levels of attitude to the product than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	8a: Rejected 8b: Rejected 8c: Rejected
9	The use of verbal mental simulation will trigger higher levels of behavioural intent than verbal analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	9a: Rejected 9b: Rejected 9c: Supported
10	The use of visual mental simulation will trigger higher levels of product comprehension than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	10a: Supported 10b: Supported 10c: Supported
11	The use of visual mental simulation will trigger higher levels of attitude to the product than visual analogy when the product is a) utilitarian, b) hedonic and c) hybrid.	11a: Supported 11b: Supported 11c: Rejected
12	The use of visual mental simulation will trigger higher levels of behavioural intent than visual analogy when the product is a) utilitarian, b)	12a: Rejected 12b: Supported

	hedonic and c) hybrid.	12c: Rejected
13	a) Discouragement, b) scepticism and c) positive emotions will mediate the interaction effect of learning strategy and presentation format on product comprehension.	13a: Supported 13b: Supported 13c: Rejected
14	a) Discouragement, b) scepticism and c) positive emotions mediate the interaction effect of learning strategy and presentation format on attitude to the product.	14a: Supported 14b: Supported 14c: Marginally Supported
15	a) Discouragement, b) scepticism and c) positive emotions mediate the interaction effect of learning strategy and presentation format on behavioural intent.	15a: Rejected 15b: Rejected 15b: Marginally Supported
16	a) Product comprehension and b) attitude to the product will mediate the interaction effect of learning strategy and presentation format on behavioural intent.	16a: Supported 16b: Supported

TABLE 8.1-2 SUMMARY OF TESTING FOR THE PROPOSITIONS (STUDY 2)

Proposition 1a: For the visual mental simulation, an increase in visual attention to the message will not be correlated with an increase in product comprehension	Supported
Proposition 1b: For the visual analogy, an increase in visual attention to the message will not be correlated with an increase in product comprehension.	Supported
Proposition 2a: For the verbal mental simulation, an increase in visual attention to the message will be correlated with an increase in product comprehension.	Evidence of support (n.s)
Proposition 2b: For the verbal analogy, an increase in visual attention to the message will be correlated with an increase in product comprehension.	Evidence of support (n.s)

The following section revisits the research objectives and relates them to the above results.

8.2 RESEARCH OBJECTIVES REVISITED

The first objective of the research was:

1. To identify the role of alternative presentation formats (i.e. words vs. pictures) and learning strategies (i.e. mental simulations and analogies) on consumer responses to RNPs (i.e. product comprehension, attitude to the product and behavioural intent);

In order to achieve this goal, two stimuli elements were manipulated in experiment 1, namely presentation format (i.e. words vs. pictures) and learning strategy (i.e. mental simulations vs. analogies vs. no analogies/ no mental simulations). The comparisons of learning strategies and presentation formats yielded significant differences with respect to the respondents' attitudes and behavioural intentions. Because the results were highly dependent on the nature of the RNP (i.e. utilitarian vs. hedonic vs. hybrid), as expected in the hypotheses, they are discussed further in research objective 2.

2. To present a new conceptualisation of RNPs based on the nature of the product (i.e. utilitarian vs. hedonic vs. hybrid-utilitarian process and hedonic outcome) and examine whether individual responses to stimuli for RNPs are affected by the nature of the new product;

The conceptualisation of RNPs according to the nature of the process and outcomes of product use was discussed in the conceptual framework of the research and identified three types of products, namely utilitarian, hedonic and hybrid. The hypotheses predicted that individual responses to the products would vary according to the nature of the product, which was verified in experiment 1.

For product comprehension, words triggered a higher response than pictures for the utilitarian product (Digipen) and for the hybrid product (Intelligent Oven). This result was contrary to expectations for the hybrid product and suggests that individual product comprehension as a response to alternative presentation formats operates according to similar mechanisms for products with a utilitarian process, regardless of the nature of the outcomes. For the hedonic product (Video Glasses), product comprehension for alternative presentation formats differed according to the learning strategy activated, as the use of words was preferable for analogies but not for mental simulations. The marginal superiority of the use of pictures over the use of words for the mental simulation points to a key departure considering that the use of words consistently triggered a higher product comprehension than pictures for the other two products.

The superiority of mental simulations over analogies in enhancing product comprehension received strong support across all three products when the learning strategies were conveyed using pictures, however the results show a lack of support when the strategies were conveyed using words. Verbal mental simulations and verbal analogies created similar levels of product comprehension across the three products.

For attitude to the product, the use of words triggered a more positive product attitude than the use of pictures for the utilitarian product, although the difference was only significant for the analogy and not for the mental simulation. For the hybrid product, no significant differences were encountered between the use of words vs. pictures, as predicted in the hypotheses. For the hedonic product, the use of pictures was superior to words for the mental simulation, although no significant differences were found for the analogy.

The superiority of mental simulations over analogies in enhancing product attitudes was not supported for any of the three products when the strategies were conveyed using words. When the strategies were conveyed using pictures, mental simulations did trigger a more positive attitude to the products than analogies, although the difference did not reach significance for the hybrid product.

When behavioural intent was used as the outcome variable, the use of words triggered a stronger behavioural intent than the use of pictures for the utilitarian product. The superiority of verbal mental simulation over visual mental simulation, which was not significant with attitude as an outcome, reached significance. For the hybrid product, no significant differences were encountered between the use of words vs. pictures, as predicted in the hypotheses. For the hedonic product, the use of pictures was superior to words for the mental simulation, although no significant differences were found for the analogy.

The superiority of mental simulations over analogies in enhancing behavioural intent when the strategies were conveyed using words was supported only for the hybrid product. This indicates a departure compared to the results for attitude to the product which showed a lack of support for the hypotheses across the three products. When the strategies were conveyed using pictures, mental simulations triggered a higher behavioural intent than analogies, although the difference only reached significance for the hedonic product. Overall, the results of experiment 1 indicate that the effectiveness of alternative combinations of learning strategies and presentation formats in enhancing individual responses for RNPs greatly vary depending on the nature of the product (utilitarian vs. hedonic vs. hybrid).

3. To determine whether specific positive and negative emotional responses mediate the relationship between stimuli characteristics and individual outcomes;

In order to achieve this objective, the feelings of discouragement, scepticism and positive emotions experienced by respondents as a response to the stimuli presented were examined in experiment 1. The results indicate strong support for the mediating role of emotional responses, as discouragement and scepticism partially mediated the interaction effects of presentation formats and learning strategies on product comprehension. Discouragement, scepticism and positive emotions mediated the interaction effects of presentation formats and learning strategies on attitude to the product. This mediation was full for discouragement and partial for scepticism and positive emotions. Positive emotions also partially mediated the interaction effects of learning strategies and presentation formats on behavioural intent. However, the results for positive emotions should be interpreted with prudence because one of the mediating relationships was only close to significance ($p=0.058$). The findings support recent research which states that consumer evaluations of innovations trigger emotional responses that must be considered in the development of product launch strategies (Wood and Moreau, 2006; Castano, Sujan, Kacker and Sujan, 2008). Furthermore, product comprehension and attitude to the product fully mediated the effects of learning strategies and presentation formats on behavioural intent. This finding provides further support for the need to enhance consumers' product comprehension in the context of RNP adoption (Ait El Houssi, Morel and Hultink, 2005, 2008; Roehm and Sternthal, 2003).

4. To investigate the links between the perceptual strategies used by individuals to process messages conveyed using words vs. using pictures and individual comprehension for a new product.

In order to attain this objective, experiment 2 combined an eye-tracking experiment with individual self-report measures assessing product comprehension. This study offered a preliminary exploration of the role of visual attention in learning, and in particular of the correlation between the amount of visual attention allocated to an advertising message and individual product comprehension. Even though the p-values suffer from a lack of significance due to the small sample size, the results suggest that a correlation may exist between visual attention and product comprehension when the message is conveyed using words. However, the results indicate that, as expected in the propositions set in the conceptual framework, no correlation can be found between visual attention and product comprehension when the message is presented via pictures. The finding that an increase in attention to the message conveyed using text may be correlated with an increase in product comprehension is consistent with the physiology of reading literature (Rayner, 1998): comprehension can be gained only through focal attentive processes which are voluntary, serial, slow and effortful (Loftus, 1983; Rayner, 1998; Reichle et al., 1998). Contrarily, scene, or picture perception relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). Therefore, although the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth, 1998), text needs more eye fixations to be comprehended. This fundamental difference between scene and text perception provides a compelling explanation for the findings of experiment 2.

8.3 RESEARCH CONTRIBUTIONS

"The question, 'What constitutes a knowledge contribution?' has a simple and straightforward answer that is less than simple or straightforward to accomplish" (David Glen Mick, in Ladik and Stewart, 2008).

This citation illustrates a common issue in academic research, which is the difficulty to clearly identify a strong incremental contribution. Specifically, researchers need to express how their research contribution adds to what is already known or how it significantly extends prior work (Ladik and Stewart, 2008). A recent article by Ladik and Stewart (2008) collected the insights of past and present editors of major journals in marketing to help clarify what a contribution is. In summary, "the contribution concept represents an outcome-based measure in which the knowledge generated from the [research] is compared with the extant knowledge contained within the literature stream" (Michael Dorsch). In other words, a contribution is made when a manuscript clearly adds, embellishes or creates something beyond what is already known (Ladik and Stewart, 2008). Four common themes emerged in relation to what that the eighteen editors sampled consider being a 'contribution': clarifying the target audience, the subjective nature of a contribution, the importance of passion for the research topic and the element of surprise. Three of these themes are addressed in the next section. Because common theme three, "passion for the research topic" is difficult to assess, it will not be discussed per se. However, the researcher hopes that passion for the research will show in the discussion of the other three themes!

8.3.1 Clarifying the Target Audience

"To me, the first step toward a contribution is to think very carefully about the audience to whom you wish to make the contribution. Is it other academics? Is it practitioners? Thinking carefully about the intended audience and the nature of the audience is crucial. For example, an academic audience is generally interested in a theoretical advance, whereas practitioners want actionable implications. (Richard Lutz, in Ladik and Stewart, 2008)".

The above citation by Richard Lutz illustrates the need to clearly identify the target audience of a research study and to identify whether the audience exposed to the research has learned something new and whether prior beliefs on the topic have been changed (Ladik and Stewart, 2008). The present study has two main target audiences: academic researchers and practitioners. The implications for these two key target audiences are thoroughly discussed in sections 8.4.1 and 8.4.2. Therefore, the present section will not repeat these implications.

8.3.2 Contribution Subjectivity

"The notion of a 'contribution to knowledge' is an elusive one. Ask ten editors and expect ten different answers" (Richard Lutz, in Ladik and Stewart, 2008).

The above citation illustrates one of the more challenging aspects in the review process, which is the subjective nature involved in determining what makes a contribution (Ladik and Stewart, 2008). The contribution of the present research will be addressed by answering how the study extends existing knowledge and how it relates to other research efforts in the literature.

The present research first contributes to learning theories in cognitive and consumer psychology. Both analogies and mental simulations have been identified as appropriate cognitive strategies to help individuals deal with uncertain environments and develop new knowledge (Gregan-Paxton and Roedder John, 1997; Taylor et al., 1998). Analogies rely on a model of internal knowledge transfer which focuses on the transfer of knowledge from one domain (the base) to another (the target), as a function of the correspondence between the two (Gentner, 1989). The analogical learning paradigm provides an understanding of knowledge transfer not only between a new stimulus and the existing knowledge used to organize it in memory, but also between a new stimulus and the knowledge used to learn about it (Gregan-Paxton and Roedder John, 1997), thus providing a broader perspective on the knowledge-transfer issue than the categorization theory. Mental simulation is another cognitive tool that may help individuals gain new knowledge. Mental simulation, defined as the imitative representation of some event or series of events (Taylor and Schneider, 1989), involves the cognitive construction of hypothetical scenarios. The role of mental simulation as a cognitive tool to evaluate products is well established in the literature (Phillips, 1996; Shiv and Huber, 2000). Moreover, mental simulation may be an appropriate cognitive process to help consumers learn about new product benefits

(Sujan et al., 1997), which is particularly relevant in the context of consumer learning for RNPs. A comprehensive review of the literature on consumer responses to RNPs was conducted. The results of this literature search indicate that previous research has examined both the effect of analogies (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau, 2003; Hoeffler, 2003; Roehm and Sternthal, 2001; Ait El Houssi, Morel and Hultink, 2005) and mental simulations (Castano, Sujan, Kacker and Sujan, 2008; Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007; Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007) on responses to RNPs. However, to a large extent analogies and mental simulations have been studied in different streams of research with little overlap. The sole exception encountered during the literature search was Hoeffler's (2003) study on the measurement of preferences for RNPs, which was not conducted in the context of marketing communications but using market research techniques inciting potential consumers to elaborate on the sources of uncertainty that characterize the new products. Hence, the extant literature on new products has not formerly examined the differential effects of mental simulations and analogies on consumer responses in an experimental setting. The present study therefore contributes to this stream of literature by identifying in which conditions mental simulations are more effective strategies than analogies.

Moreover, the ability of nonverbal, pictorial stimuli to drive individuals to imagine themselves in a situation has been widely acknowledged in consumer research (Babin and Burns, 1997). However, previous research on mental simulations for RNPs has focused solely on the use of text containing instructions to imagine (Castano, Sujan, Kacker and Sujan, 2008; Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007; Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007). Pictures present visual images in an appropriate modality for internalization as the basis for personal imagery (Rossiter and Percy, 1980). A picture superiority effect ensues as visual information tends to be remembered over verbal information because pictures activate a visual as well as verbal encoding process (the dual-coding hypothesis; Paivio, 1986). Most studies also support the picture superiority effect on brand attitudes (Edell and Staelin, 1983; Mitchell, 1986; Mitchell and Olson, 1981; Rossiter and Percy, 1978, 1980). Therefore, mental simulation conveyed using a visual scenario may enhance consumers' ability to vicariously experience the consequences of product use to a greater extent than a verbal description. Hence, the comparison of visual vs. verbal mental simulation strategies in the context of consumer responses to RNPs extends the existing knowledge in this literature area by identifying in which conditions mental simulations should be conveyed with words vs. with pictures. Specifically, the results suggest that for utilitarian products mental simulations should be conveyed using words, for hedonic products using pictures, and for hybrid products using either words or pictures.

Contrary to visual mental simulations, the use of visual analogies has received little attention in consumer research. Researchers in marketing have started to investigate the processes of internal knowledge transfer that consumers engage in when learning about a new, unfamiliar product based on work in cognitive psychology on analogical reasoning (Gentner and Gentner, 1983; Holyoak, Gentner, and Kokinov 2001; Vosniadou 1989). However, despite this explicit use of analogies, little research has acknowledged that analogies are rhetorical figures (Delbaere and Smith, 2007) and can thus be powerful tools for persuasive communication when conveyed either verbally or visually. The present research brings together two different streams of research: analogical learning for RNPs (Gregan-Paxton, Hibbard, Brunel and Azar 2002; Gregan-Paxton and Moreau 2003; Moreau, Lehman and Markman 2001; Moreau, Markman and Lehmann 2001, Roehm and Sternthal 2001) and the use of figures of rhetoric in advertising (McQuarrie and Mick, 1992, 1996, 1999, 2003). Considering that visual figures have recently been conceptualized as sources of meaning and persuasion in advertising operating through indirect persuasion (McQuarrie and Phillips, 2005), the present research closed a gap in the literature by comparing analogies for RNPs presented alternatively in words and in pictures. The findings suggest that, due to their highly implicit nature, visual analogies are not the most appropriate combination of learning strategy and presentation format to convey the benefits of RNPs regardless of their nature.

Recent research in marketing has identified the need to distinguish between hedonic and utilitarian products in the context of convergence in the high-tech electronics sector, whereby disparate functionalities are added to existing base products (Gill, 2008). RNPs can also be conceptualized as offering predominantly utilitarian or hedonic benefits. Based on the congruity theory (Johar and Sirgy, 1991), advertising effectiveness will be enhanced if a congruity is achieved between the nature of the product and the advertising appeal. Specifically, hedonic appeals are more effective than utilitarian appeals when the product is perceived to be more hedonic. Conversely, utilitarian appeals are more effective than hedonic appeals when the product is perceived to be utilitarian (Johar and Sirgy, 1991). Drawing on the idea that pictures have a more hedonic nature than words (Hirschman and Solomon, 1984; Hirschman, 1986), the present research contributes to this stream of literature by establishing which combinations of learning strategies and presentation formats are best to enhance individual outcomes. Moreover, the present research identifies a third category of RNPs: hybrid products characterised by a utilitarian process but hedonic outcomes. The present research clearly highlights that consumer responses to this product type differ from responses to hedonic and utilitarian RNPs.

Only recently have researchers acknowledged that consumer evaluations of innovations result in emotional responses that must be considered in the development of product launch strategies (Wood and Moreau, 2006; Castano, Sujan, Kacker and Sujan, 2008), following Mick and Fournier's (1998) call for more research appraising the role of emotions as a mediator in consumer responses to technological products. The present study draws together the literature on regulatory focus in social psychology (Higgins, 1987), transportation theory (Green and Brock, 2000), self-schema theory (Meyers-Levy and Tybout, 1989; Perracchio and Tybout, 1996) and indirect persuasion (McQuarrie and Phillips, 2005) and builds a key contribution by establishing that positively and negatively valenced emotions mediate the effect of learning strategies and presentation formats on consumer comprehension, attitude and intent toward the new product.

Past studies on analogical learning for RNPs have examined the effect on memory outcomes, namely the recall of attributes (Gregan-Paxton et al., 2002; Gregan-Paxton and Moreau, 2003) and features (Gregan-Paxton and Moreau, 2003), on attitudinal variables, namely product judgments (Gregan-Paxton et al., 2002), evaluations (Roehm and Sternthal, 2001), preferences (Ait El Houssi, Morel and Hultink, 2005) and purchase interest (Hoeffler, 2003) and on comprehension, namely the transfer of shared relational information and attribute transfer from the base to the target (Gregan-Paxton and Moreau, 2003), base associations (Roehm and Sternthal, 2001) and benefit comprehension (Ait El Houssi, Morel and Hultink, 2005). However, previous research on consumer responses to mental simulations for RNPs has focused solely on the effect on attitudinal and behavioural variables, such as product evaluation (Dahl and Hoeffler, 2004; Zhao, Hoeffler and Dahl, 2007), preferences (Hoeffler, 2003; Zhao, Hoeffler and Zauberman, 2007), choice (Zhao, Hoeffler and Zauberman, 2007), purchase interest (Hoeffler, 2003) and behavioural intentions (Castano, Sujan, Kacker and Sujan, 2008). The present study thus extended previous work by examining the effect of mental simulations and analogies on a wider range of outcomes, i.e. product comprehension, attitude to the product and behavioural intent.

The research is also the first to provide empirical support for the notion that product comprehension and attitude to the product mediate the effects of presentation format and learning strategies on behavioural intent. This relationship may not always be observed with incremental products because consumers do not need to fully comprehend the nature of the product to develop a positive attitude towards it. However, because RNPs are by definition complex, high-involvement products, consumers will develop positive attitudes and behavioural intent for the product provided they comprehend and learn about product-relevant information (Bettman, 1979; Ait El Houssi, Morel and Hultink, 2005).

The research also contributes to the literature on visual attention. Wedel and Pieters (2007) have recently called for more research applying eye tracking measures to make inverse inferences about fundamental communication processes. Previous eye tracking research has often been descriptive, for instance by relating perceptual aspects of the stimulus, namely size, colour or position of the brand, text and pictorial directly to measures of visual attention. However, much more can be gained from using eye-tracking measures as indicators of the latent measures of interest, such as product comprehension (Wedel and Pieters, 2007). Contrary to the accepted wisdom inspired by hierarchical models such as AIDA and its successors (Starch, 1923) that attention is a mere precondition, a gate through which information enters on its ways to higher-order cognitive processes of more interest, academic research has shown that visual attention is a key coordinating mechanism that helps maintain information processing and other goals over time (LaBerge, 1995). Drawing on the inverse inference model (Feng, 2003), key indicators of unobservable cognitive processes may be derived from observed eye movements, thus providing a 'window to the mind' (Pieters, Wedel and Zhang, 2007). Extant research on RNPs has not examined the role of visual attention in consumer responses to the product. The present research suggests that an increase in visual attention to the message is correlated with an increase in product comprehension only when the message is conveyed using words. These results obtained by combining self-reports and physiological measurements (i.e. eye tracking technique) thus contribute to the understanding of the dynamics that link conceptual analysis during which consumers integrate information from the stimulus with their existing knowledge (Pieters and Warlop, 1999) and perceptual analyses during which individuals integrate textual and pictorial information using visual attention (Rayner et al., 2001).

8.3.3 Surprise

"When viewing what is a contribution or not, the most significant contributions create what I call the 'wow, that's really neat' response" (James Stock, in Ladik and Stewart, 2008).

The present research showed some surprising results which enhance the significance and the originality of the contribution of the present thesis. In particular, three key surprising findings are worth mentioning here.

First and foremost, the results suggest that visual analogies are not only less effective in communicating the benefits of a RNP than visual mental simulations, they are also less effective than the use of a simple visual of the product, without mental simulation of analogy. For the hybrid product, the no analogy/ no mental simulation triggered a significantly higher product comprehension than the analogy, both in visual and in verbal formats. For the hedonic product, the no analogy/ no mental simulation created a higher level of product comprehension than the analogy in the visual formats. Therefore, the results indicate that when exposed only to a visual of the product without any descriptive of the product benefits, visual or verbal, respondents reported a higher product comprehension that when exposed to a visual analogy, which is a surprising finding. This finding may be related with research on knowledge acquisition highlighting the risks related to analogical learning as analogies rely on inferences (Spiro et al., 1989). Previous research also suggests that individuals sometimes fail to comprehend metaphors, and by extension analogies. Reinsch (1971) observed in an experiment that several metaphors used as stimuli were poorly comprehended. McQuarrie and Mick (1992; study 2) showed that participants had difficulties to understand one of two figurative ads. Mothersbaugh, Huhmann and Franke (2002) observed that ads with rhetorical figures were more difficult to understand than literal ads according to self-report measures of comprehension difficulty. Morgan and Reichert (1999) identified comprehension failures, mostly among individuals who rely heavily on analytic or left-brain processing. Roehm and Sternthal (2001) reported four studies with analogies demonstrating that respondents who lacked motivation or ability to devote cognitive effort while processing the ad were less likely to understand the analogy (see DeRosia, 2008 for a review). Conveying an analogy using visuals which by definition are prone to multiple interpretations (Huhmann, 2008) further increased the risks of comprehension failures, which thus provides a theoretical explanation for the finding in experiment 1 that product comprehension was lower for visual analogies than for visual conditions without analogy or mental simulation for two of the three products.

Second, the effectiveness of visual no analogy/ no mental simulation strategies in enhancing attitude and intent for the hedonic and for the hybrid product and product comprehension for the hedonic product is a surprising finding. This finding may be explained by the inclusion of verbal attributes which, combined with a picture of the product, helped clarify its benefits. However, there is a need for future research to examine what processes activated learning and evaluations for a stimulus which did not activate mental simulation or analogical learning.

Third, the findings of experiment 1 suggest that discouragement and scepticism mediate the interaction effects of presentation formats and learning strategies on both product comprehension and attitude to the product. Positive emotions only mediate the effect on attitude to the product and behavioural intent. Therefore, the present research highlights that not all affective responses will mediate the effect of marketing communications on product comprehension, which is an unexpected finding. Specifically, scepticism and discouragement are likely to arise directly from the learning process, whereas positive emotions may not be triggered by the learning process as they do not mediate product comprehension. Positive emotions may arise as a result of the intrinsic content of the stimuli, i.e. the learning strategies and presentation formats manipulated in the experiment. In the specific case of consumer responses to RNPs, a recent study manipulating mental simulation for a target product also found that participants displayed higher evaluations for the product, and that this persuasion effect occurred through the generation of positive affect (Escalas, 2004). Similarly, analogies can trigger positive emotions (Gregan-Paxton et al., 2002), in line with self-schema theory (Meyers-Levy and Tybout, 1989; Perracchio and Tybout, 1996) and the pleasure-of-the text standpoint (McQuarrie and Mick, 1996; 1999). Therefore, an explanation for the mediating role of positive emotions for attitude to the product but not for product comprehension may be that such feelings arise from the intrinsic content of the advertisement. Contrarily, scepticism and discouragement affect both cognitive responses and attitudes and may therefore arise directly from the learning process and colour product evaluations. Furthermore, contrary to what was expected, only positive emotions mediated the interaction effect of presentation formats and learning strategies on behavioural intent, whereas the results of the mediation tests were non significant for discouragement and scepticism. Again, this is consistent with the argument that discouragement and scepticism arise from the learning efforts and will not influence behavioural intentions directly but only through their impact on comprehension and attitudes. However, positive emotions that arise as a result of the intrinsic nature of the stimuli manipulation have a mediating role on both attitudinal and behavioural responses towards the innovation. These findings identify a gap in the literature and the need to examine the origins of emotional responses for new products as emotions may arise from the material manipulated in the experimental procedure but may also be derived from the learning efforts. The results of experiment 1 suggest that emotions derived from the learning process will act as latent variables affecting cognitive and attitudinal responses which may have an indirect effect on intent, whereas emotions that arise from the ad content will act as latent variables in the relationship between ad content on the one hand and attitudinal and behavioural responses on the other hand.

Overall, the key contributions of the research are summarised in the following points:

- The present research establishes which combinations of learning strategies and presentation formats are most effective to enhance product comprehension, attitude to the product and behavioural intent depending on the nature of the product (see Table 8.3-1). This is a key contribution, as the existing literature on consumer responses to RNPs did not compare the differential effects of mental simulations vs. analogies in an experimental setting. Moreover, existing research on RNPs only studied the effects of learning strategies conveyed using words and the present research is the first to examine the effects of learning strategies for RNPs presented using pictorials.

TABLE 8.3-1 SUMMARY OF THE MOST EFFECTIVE COMBINATIONS OF LEARNING STRATEGIES AND PRESENTATION FORMATS PER PRODUCT TYPE AND PER OUTCOME

	Digipen (utilitarian)	Intelligent oven (hybrid)	Video glasses (hedonic)
Product Comprehension	**Best strategies: Verbal mental simulation and verbal analogy.**	**Best strategies: Verbal mental simulation and verbal no analogy/ no mental simulation**	**Best strategies: Visual mental simulation, visual no analogy/ no mental simulation, all three verbal conditions.**
	The verbal analogy triggered a significantly higher comprehension than all other conditions. The verbal mental simulation created a significantly higher comprehension than all conditions except verbal no analogy/ no mental simulation (n.s.)	The verbal no analogy/ no mental simulation triggered a significantly higher comprehension than all other conditions. The verbal mental simulation created a significantly higher comprehension than all conditions except verbal analogy (n.s.)	These conditions all triggered a significantly higher product comprehension than the visual analogy
Attitude to the product	**Best strategies: Verbal mental simulation and verbal analogy followed by visual mental simulation**	**Best strategies: Verbal and visual no analogy/ no mental simulations followed by verbal and visual mental simulations**	**Best strategies: Visual mental simulation and visual no analogy/ no mental simulation.**
	These strategies triggered a significantly higher product attitude than the other three	Only the no analogy/ no mental simulation conditions triggered a significantly higher	These strategies triggered a significantly higher product attitude than the other conditions.

	conditions.	attitude than the analogies. The differences between mental simulations and analogies were marginal.	
Behavioural Intent	**Best strategies: Verbal mental simulation and verbal analogy** These strategies triggered a significantly higher behavioural intent than the other conditions.	**Best strategies: Verbal and visual no analogy/ no mental simulations followed by verbal and visual mental simulations** Only the no analogy/ no mental simulation conditions triggered a significantly higher intent than the analogies. The differences between mental simulations and analogies were marginal.	**Best strategies: Visual mental simulation and visual no analogy/ no mental simulation.** These strategies triggered a significantly higher behavioural intent than the other conditions.

- The research introduces a new classification for RNPs: utilitarian vs. hedonic vs. hybrid products. Although previous research has examined the effects of process vs. outcome-focused mental simulations for new products, no research to date has acknowledged that RNPs can be classified according to the nature their process vs. outcomes. This classification is important, because the research showed that consumer responses to stimuli presenting RNPs greatly depend on the nature of the product.

- The research suggests that, due to their highly implicit nature, visual analogies are not the most effective combination of learning strategy and presentation format to convey the benefits of RNPs regardless of the nature of the product. A surprising finding was that for two of the three products, product comprehension was weaker for visual analogies than for visual conditions presenting only a picture of the product, which is most probably due to the high degree of implicitness that characterises the combination of a rhetorical figure (i.e. analogy) with pictorials.

- The research highlights that emotional responses may arise as a result of the learning efforts made by the individual to learn about a complex RNP, but may also arise as a result of the content of the stimuli. Specifically, scepticism and discouragement mediate the interaction effects of learning strategies and presentation formats on product comprehension and attitudes and may therefore be derived from the learning efforts. Furthermore, contrary to what was expected, only positive emotions mediated the interaction effects of presentation formats and learning strategies on behavioural intent, whereas the results of the mediation tests were not significant for discouragement and scepticism. Thus, positive emotions may not occur as a result of the learning efforts as they do not mediate the effects on product comprehension. Positive emotions may arise as a result of the intrinsic content of the stimuli, i.e. the learning strategies and presentation formats manipulated in the experiment.

- The research provides empirical support for the notion that product comprehension and attitude to the product mediate the effects of presentation format and learning strategies on behavioural intent.

- Extant research on RNPs has not examined the role of visual attention in consumer responses to the product. The present research suggests that an increase in visual attention to the message is correlated with an increase in product comprehension only when the message is conveyed using words. This suggests that when the message is conveyed using pictures, an increase in attention to the message may actually reflect confusion.

- A methodological contribution of the research also lies in the innovative combination of physiological measures collected with an eye-tracker and self-report measures in an effort to draw inverse inferences and enhance the understanding of the links between perceptual and conceptual processes during individual learning processes for a new product.

8.4 IMPLICATIONS

8.4.1 Implications for Academic Researchers

This study has several implications for academic researchers, related to the contributions of the research highlighted above. First, the use of visual stimuli has implications for the debate on the effectiveness of words vs. pictures, seldom applied in a NPD context. Visualization tools offer the promise to facilitate the processing of new information without overloading the decision-maker (Tegarden, 1999) and may lead to a faster understanding of novel information when used in the right conditions. However, the present research demonstrates that visual tools are a mixed blessing: they may at times lead to negative outcomes, as some visual ways of conveying information (i.e. visual analogy) may actually accentuate biases in decision-making (Lurie and Mason, 2007).

Second, the diverse findings obtained in experiment 1 shed new light on the importance ascribed to the nature of the new product in the choice of a stimulus to enhance learning. Using the expectancy value model, previous research investigating utilitarian products, that is, products that fulfill utilitarian or functional needs, have demonstrated that objective claims, as opposed to subjective claims, yield higher purchase intentions (Darley and Smith, 1993), generate more positive expected values and are more credible (Ford, Smith and Swasy, 1990; Holbrook, 1978). In contrast, a hedonic product has the ability to provide feelings or hedonic pleasure. Research indicates that subjective claims may be more effective than objective claims for hedonic products (Park and Young, 1986). This is consistent with this study's findings.

Third, the classification of RNPs into three categories i.e. utilitarian vs. hedonic vs. hybrid has key implications for academic researchers. Because the results of experiment 1 indicate that the effectiveness of communication strategies are dependent on the nature of the product, further research on consumer learning for RNPs should take into account this classification in experimental settings.

Fourth, this research also represents the first empirical effort to identify discouragement, scepticism and positive emotions as important constructs in consumer learning for RNPs. Only recently have scholars recognized the need to add emotional responses to innovation frameworks (Wood and Moreau, 2006; Kulviwat et al., 2007). Integrating emotions into adoption of innovations models is likely to lead to substantial improvements in the prediction of consumer responses to innovations, as evidenced by the E^3 model of emotional influence (Wood and Moreau, 2006) and the Consumer Acceptance of Technology model (Kulviwat et al., 2007). The E^3 model of emotional influence (Wood and Moreau, 2006) acknowledges that the learning process is potentially emotion-generating, independent of the net benefits of the product. The model is divided into five key steps: Complexity expectations, (dis)confirmed expectations, experienced emotions, innovation evaluation and usage diffusion. The model provides a description of how emotions are created in the early use of complex products and how they may influence product evaluations beyond diffusion's traditional focus on net benefits. The Consumer Acceptance of Technology model (Kulviwat et al., 2007) also contributes to the understanding of the role of emotions in the acceptance of innovations by merging two previously unrelated models: TAM (Technology Acceptance Model) and PAD (Pleasure, Arousal and Dominance paradigm of affect). The resulting model was successful in explaining over 50% of the variance in consumer adoption intentions, a considerable increase compared to TAM, thus suggesting that substantial progress in the prediction of technology adoption decisions is possible by integrating affect and cognition. The present research contributes to this effort by identifying three key emotional mediators in the conceptual framework developed: discouragement, scepticism and positive emotions. The research also suggests that emotions can be occur directly from the learning efforts, in line with Wood and Moreau's (2006) findings but can also arise as a result of the intrinsic content of the ad, and the learning strategies and presentation formats manipulated.

Finally, this study illustrates how visual attention can contribute to the understanding of the links between conceptual and perceptual analyses when learning for a RNP. Drawing on the physiology of reading literature (Rayner, 1998), inverse inferences were made to discriminate the state of higher-order cognitive processing from observed patterns of eye movements (Feng, 2003). The results suggest that when the product information is conveyed using words, an increase in attention to the advertising message reflects enhanced comprehension for the RNP. However, when the information is conveyed using pictures, an increase in attention reflects underlying confusion towards the nature of the product. Importantly, this finding does not imply that pictures are an ineffective means of conveying product information, but rather that consumers are likely to understand the nature of the product quickly or not at all. This study adds evidence to a growing body of literature which shows that eye movements reflect higher order cognitive processes (Wedel, Pieters and Zhang, 2007). The research also demonstrates that the link between attention and comprehension is not always straightforward as an increase in attention may actually indicate confusion as opposed to comprehension.

8.4.2 Managerial Implications

This research provides valuable information that product managers may want to consider in the development and marketing of RNPs. Visualization tools have the potential to offer managers ways to gain new insights, to make product concepts more accessible (Lurie and Mason, 2007), and to increase comprehension for complex high-tech products. Nonetheless, using a picture of a complex new product is not enough as RNPs possess benefits that might not be apparent from an inspection of a product's surface attributes (Roehm et al., 2001). To enhance attitudinal and behavioural responses, visuals that encourage mental simulation by building a visual scenario of the product in use can be implemented in advertising and concept testing as a surrogate for product demonstration or product trial. As the results of the research show, this strategy will be most effective when the product is of a hedonic nature.

The research findings also suggest that from a managerial standpoint one needs to be cautious when developing marketing communication strategies for RNPs. Research has shown that consumers systematically undervalue innovations whereas firms overvalue their innovation relative to what an objective analysis would suggest (Gourville, 2005). This is consistent with the present study's findings, which show that helping consumers to reach a high level of comprehension for a RNP may prove a daunting task, as comprehension levels may be very low if the strategy used is not appropriate (i.e. visual analogies). Appreciation of the challenge faced in conveying the benefits of RNPs to consumers and an understanding of the strategies best suited to the communication of such benefits can help NPD managers in their efforts to bring successful new products to the market.

Recent research on product convergence in the electronics sector has developed a new classification of products according to the nature of the base product (utilitarian vs. hedonic) and the congruity between the base and the added functionality (Gill, 2008). This classification has provided a framework for marketers in the consumer electronics, computer and communications industry to understand when added functionalities are likely to be more successful i.e. congruent functionalities for hedonic products and incongruent functionalities for utilitarian products (Gill, 2008). The present research extends this work to help marketers understand the importance of classifying RNPs according to the nature of their process vs. outcomes offered. This distinction is particularly relevant for marketers intending to launch RNPs, as opposed to incremental innovations on the marketplace, because research has shown that while individuals focus mainly on the outcomes of the product when evaluating an incrementally new product, they focus equally on the process and the outcomes for a RNP (Zhao Hoeffler, Zauberman, 2008).

This process vs. outcome distinction has key implications for marketers because the results of experiment 1 show that words are more effective than pictures to enhance product comprehension when the product is of a hybrid nature. Because of the hedonic outcomes of such products, marketers may have wrongly inferred that their benefits (which are the outcomes of product use) should be communicated to consumers in a similar manner as for hedonic products, via a pictorial presentation format. However, the results of experiment 1 suggest that verbal mental simulation and verbal no analogy/ no mental simulation would be the most effective strategies to enhance product comprehension for a hybrid product. This has significant implications for marketers because many RNPs require consumers to go through a complex utilitarian process for product use due to their high-tech characteristics but deliver hedonic outcomes. An example of such hybrid products is Tivo (i.e. Digital Video Recorders). Both Tivo and DVD players entered the U.S. market in the late 1990s. By early 2005, 80 million DVD players had been sold compared with only 3 million TiVo units, although TiVo spent over $500 million on marketing. Both products were highly innovative, but whereas the DVD was a direct replacement for the VCR, TiVo required a huge change in behaviour because it completely altered people's television viewing habits (Gourville, 2005). Also noteworthy in this example is that both products offer hedonic, entertainment outcomes, however the Tivo necessitates a complex functional process which places a heavy learning burden on consumers. A key difficulty which explains Tivo's struggle to enter the marketplace may be consumers' lack of understanding of the process needed to obtain the hedonic outcomes. The results of experiment 1 suggest that the benefits of Tivo should have been conveyed using words, as the important issue with Tivo was the lack of comprehension of the product benefits. This finding may be counterintuitive as marketers may have associated the hedonic benefits of the product with marketing communications conveyed with visual scenarios. Because it is difficult to explain the complexities of the Tivo in a 30-second commercial(http://media.wiley.com/product_data/excerpt/36/07645692/0764569236.pdf,accessed 20/ 11/ 2008), it is essential for managers to understand which tools are most appropriate to quickly activate learning. In light of these difficulties, verbal analogies have been used frequently to explain the nature of the Tivo in internet blogs:

"TiVo works as your robotic television manager, constantly scanning upcoming show listings to separate your favourites from the trash". (http://media.wiley.com/product_data/excerpt/36/07645692/0764569236.pdf, 3/10/04).

Using a TV without a Tivo is like using a microcomputer without an internet connection (http://www.hutteman.com/weblog/2003/04/19-71.html, accessed on 20/ 11/ 2008).

To put it simply, TiVo is like a VCR on steroids (http://www.galttech.com/research/tivo/what_is_tivo_dvr.php, accessed on 20 / 11/ 2008).

TV without TiVo is like email without a spam filter (http://garrickvanburen.com/archive/asks-should-we-buy-a-hd-tivo, accessed on 20/ 11/ 2008).

Tivo acts like a search engine" (http://dvr.about.com/od/tivo/a/tivo1.htm, accessed on 20/ 11/ 2008).

Tivo acts like a brainy VCR (http://www.patentstorm.us/patents/7275254.html, accessed on 20/ 11/ 2008).

Additionally, Tivo commercials have also used analogies. In one TV spot for Tivo, a group of men gather around a barbecue grill, all wearing antennas, and one proclaims that TiVo is "like an entire video store connected right to your TV." (http://www.nytimes.com/2007/05/03/business/media/03adco.html?_r=1&pagewanted=2, accessed on 20/ 11/ 2008).

However, the results of the present research suggest that verbal analogies may not be the most effective strategy to enhance product comprehension for hybrid RNPs such as Tivo. Verbal mental simulations, such as the scenario presented below, may be a more effective strategic tool.

"Your friends take their seats, the show begins, and, a few minutes later, the pizza man rings the doorbell. Who misses the show to fetch the pizza? With TiVo, nobody misses anything. A press of the TiVo remote's pause button freezes the screen, flicker-free, until you return, pizza in hand" (http://media.wiley.com/product_data/excerpt/36/07645692/0764569236.pdf, accessed 20/ 11/ 2008).

Verbal descriptions presenting the benefits of the product without stimulating analogical learning or mental simulation are also likely to enhance product comprehension for such products (http://media.wiley.com/product_data/excerpt/36/07645692/0764569236.pdf, accessed 20/ 11/ 2008).

Similarly, several RNPs are of a hedonic nature, because not only the benefits offered by the product are hedonic, but the process of use is hedonic and experiential in itself. A recent example of such product is the ZCam 3-D camera, the first consumer video camera that can capture video with depth information and arguably the first real challenger to Nintendo's Wiimote: "with its 3D capture abilities it will allow [the consumer] to play Wii-style without using any controls whatsoever" (http://gizmodo.com/gadgets/zcam-depth-camera-could-be-wii-challenger/zcam-3d-camera-is-like-wii-without-wiimote-and-minority-report-without-gloves-334426.php, accessed on 20/ 11/ 2008). This product has been described using verbal analogies: "ZCam 3D Camera Is Like Wii Without Wiimote and Minority Report Without Gloves" (http://gizmodo.com/gadgets/zcam-depth-camera-could-be-wii-challenger/zcam-3d-camera-is-like-wii-without-wiimote-and-minority-report-without-gloves-334426.php, accessed on 20/ 11/ 2008). However, the results of experiment 1 suggest that although verbal analogies may be appropriate to enhance comprehension for a RNP of a hedonic nature, the use of visual mental simulation or of visuals alone are likely to create higher attitude and intent for the product. Examples of videos showing the product in use (http://gizmodo.com/gadgets/zcam-depth-camera-could-be-wii-challenger/zcam-3d-camera-is-like-wii-without-wiimote-and-minority-report-without-gloves-334426.php, accessed on 20/ 11/ 2008) for the ZCam 3D Camera could form the basis for future visually-oriented communications strategies.

Finally, marketers may wish to convey RNPs of a utilitarian nature via verbal mental simulations and verbal analogies. Recent examples of utilitarian RNPs are "smart products", devices which biometrically identify users. According to the results of the present research, these purely utilitarian products should be conveyed using verbal mental simulations or verbal analogies. This is consistent with previous research which found that conveying a smart pen using a verbal analogy (i.e. the smart pen is like a fingerprint) triggered a superior benefit comprehension compared to a verbal literal similarity (i.e. the smart pen is like a ballpoint) (Ait El Houssi, Morel and Hultink, 2005). The present research suggests that verbal mental simulations are also powerful strategies to enhance responses to such new products:

"Picture a key-fob sized electronic credit or debit card that can be used only after the authorized user biometrically verifies his or her identification using fingerprint authentication at the time of the transaction. Again, imagine a key-fob sized RFID security access device that requires the authorized user to biometrically identify himself or herself using fingerprint authentication at the time of entrance. Now imagine these in the same biometric device, a device that cannot be used by anyone

but the user who "owns" the device. Why? Because unauthorized users cannot provide the biometric authentication needed to use it" (http://ideinc.com/privaris.html, accessed on 20/ 11/ 2008).

Overall, the findings suggest that practitioners may not have been using optimal marketing communications strategy to convey the benefits of RNPs, and the present research suggests strategies that may enhance consumer responses to RNPs depending on the nature of the product (utilitarian vs. hedonic vs. hybrid).

Furthermore, the research has key managerial implications regarding the use of visual analogies, as the results consistently demonstrate that visual analogies are often inappropriate to convey the benefits of RNPs. This may come as a surprise for marketers who are accustomed to design communications for products that belong to well-known categories as opposed to RNPs. Garnier is an example of company which regularly uses visual rhetorics, and in particular visual analogies in advertising to convey the benefits of its products. For example, Garnier Skin Natural Pure Deep Pore Wash, a skin care product targeted against black heads, has been visually compared to a bottle opener. In the same vein, Garnier Pure A, a moisturizer that also tackles skin imperfections, has been implicitly compared to a dry erase board (http://www.visit4info.com/brand/Garnier-Range/1437, accessed on 20/ 11/ 2008). Such visual analogies are successful because consumers already have significant existing knowledge structures for the product category, and are therefore able to draw the appropriate inferences from the visual analogies i.e. Garnier Pure A is like a dry erase board because it erases skin imperfections. By contrast, consumers have very limited knowledge structures for RNPs and a great burden is placed on consumers to learn the product. Marketers should therefore consider using visual analogies for incrementally new products but not for RNPs as the implicitness of the analogical rhetorical device (McQuarrie and Phillips, 2005) combined with pictorials which are by definition open to multiple interpretations is unable to convey the benefits of such novel products.

Moreover, the results of experiment 2 also have implications for advertisers. Bearing in mind that study 2 has assessed visual attention and product comprehension in highly controlled conditions and with a small sample, general recommendations for print-ad execution in the context of RNPs should be formulated with great caution. Rather, ad strategy implications should be derived from empirical generalizations drawn from a larger number of studies involving more widely varying measures and conditions. Keeping these reservations in mind, the preliminary findings suggest a lack of correlation between visual attention to the advertising message and product comprehension when the message is conveyed using visuals. Therefore, in conditions when pictures are as capable as words of enhancing product comprehension, i.e. visual mental simulation for hedonic products, they may be able to convey product benefits more rapidly than verbal strategies. This possibility is consistent with the literature on reading and scene perception: comprehension from text can only be gained through focal attentive processes which are voluntary, serial, slow and effortful (Loftus, 1983; Rayner, 1998; Reichle et al., 1998). Contrarily, scene, or picture perception relies on peripheral and pre-attentive processes that are automatic, parallel, fast and less effortful (Loftus, 1983; Ohman, Flykt and Esteves, 2001). Therefore, the gist of a scene can often be comprehended in a few glances (Henderson and Hollingworth, 1998), whereas text needs more eye fixations to be comprehended. Print media have become cluttered with advertisements: many magazines have half of their pages or more carrying advertisements (Batra et al.1996, Ha and Litman, 1997). It has become very difficult to attract consumers' attention in these cluttered media landscape (Wedel and Pieters, 2000). Due to this highly competitive environment, consumers' attention span is very limited (Pieters, Warlop and Wedel, 2001) and advertisers strive for strategies that convey the benefits of new products quickly and effectively. The findings of the present research might stimulate marketers to convey RNPs of a hedonic nature such as the video glasses or the new ZD 3D camera using visual mental simulations that may be as capable of enhancing product comprehension as verbal strategies, may enhance attitude and intent to a greater extent than alternative strategies (experiment 1) while facilitating a less effortful processing than verbal strategies (experiment 2).

8.5 LIMITATIONS

The thesis produces exciting findings in the domain of consumer responses to RNPs, yet the research is not without limitations and results must be interpreted with prudence. The first limitation is inherent in experimental studies and mainly relates to generalisation of the findings beyond study sample. Differences related to consumer demographics may exist, although given the large sample size in experiment 1 this limitation is not as severe as it could be in a different research context. However, the study of consumer responses according to their demographic profiles is an interesting topic for further research and this area is discussed in the next section (Section 8.6).

Moreover, a limitation of experiment 1 may be that the stimuli used did not consist only of words or only of pictures. Specifically, the verbally-dominant stimuli contained a picture of the product and the visually-dominant stimuli contained a short list of product attributes. This decision was made to increase external validity as real-world advertisements are seldom purely visual or purely verbal. In addition, this choice is consistent with previous research on visual vs. verbal elements in advertising (McQuarrie and Phillips, 2005).

In addition, recent research suggests that the inclusion of attribute information may have a disruptive impact on consumers' benefit comprehension for RNPs (Ait El Houssi, Morel and Hultink, 2008). This finding has been related to the availability of cognitive resources theory (Roehm and Sternthal, 2001), as combining attribute information with an analogy distracts attention away from the analogy, thereby leaving less cognitive resources available. Although these findings emerged after the study was conducted, they suggest retrospectively that the inclusion of attribute information in the stimuli may partially explain the lack of effectiveness of analogies, and in particular of visual analogies in enhancing product comprehension. This is also consistent with the finding that visual attention to the product features and product comprehension were negatively correlated for three out of four conditions, namely verbal analogy, verbal mental simulation and visual analogy (See Chapter 6, Section 6.5.2.4).

Furthermore, although great care was applied to maintaining high levels of both internal and external validity in experiment 1, the choice of web experimentation, which deprives the research of control over participants' actions, may have increased external validity of the study at a certain cost of internal validity.

In addition, although the present research measures the differential effects of alternative learning strategies and presentation formats on behavioural intent, the research does not assess the effects on purchase intent. The rationale for this choice is that for innovative products such as RNPs, consumers have difficulties projecting beyond concept testing in an actual buying situation (Duke, 1994; Urban, Weinberg and Hauser, 1996). This is also supported by recent findings which indicate that consumers are less likely to express purchase intentions for RNPs than for INPs (Alexander, Lynch and Wang, 2008). Hence, behavioural intent is preferred to actual purchase intent, as for RNPs consumers' intent to see a demonstration of the product, try the product, have more information about the product and recommend it via WOM are the first steps that can lead to actual behaviour. This is consistent with previous research on consumer responses to RNPs which did not examine purchase intent but investigated product preference (Ait El Houssi, Morel and Hultink, 2005), recall (Gregan-Paxton and Moreau, 2003), product judgment (Gregan-Paxton et al., 2002), and behavioural intentions (Castano et al., 2008).

It is also necessary to reflect on the choice of a complex web-based experiment as this method has several limitations. Specifically, a mixed subjects design has the advantages of both between and within subject designs. The main disadvantage of between-subjects design is that because different samples are used, they are less sensitive than some other approaches and require a large number of subjects. The disadvantage of within-subject designs however, is that such designs introduce a nuisance variable that is not present in a between-subjects study, namely the order of the conditions. To reduce the nuisance introduced by the order in which the conditions are tested, the presentation order of the learning strategies was varied as presented in Table 4.3-1. Furthermore, exposure to all treatments may be cumbersome for participants (Keppel and Wickens, 2004). Due to respondent fatigue, some of the stimuli included in the design were not repeated as many times as others. In order to counter this limitation, future research may require respondents to view only two adverts, possibly by combining advert 1 and advert 2, advert 1 and 3 and advert 2 and 3. This design would enable researchers to reduce respondent fatigue and drop-out rates. Alternatively future experiments may use full factorial between-subjects designs which are easy to design, easy to analyse and require the smallest number of statistical assumptions (Keppel and Wickens, 2004).

In addition, the use of a web-experiment also has limitations. The use of a web-experiment ensures that respondents view the stimuli in more naturalistic conditions (i.e. at home or at work) than a laboratory experiment. However, this method of administration may lower the internal validity of the experiment as respondents participate to the experiment in different conditions, are based in different locations and can complete the experiment in their own time. In the future, laboratory experiments may be conducted to enhance the internal validity of the experimental procedure.

Additionally, experiment 2 has limitations, related primarily to the small sample size used. However, existing eye-tracking research in experimental psychology has used similar sample sizes (Albert et al., 2005; Fleetwood and Byrne, 2006). Moreover, the design was not a full factorial design but was deemed appropriate due to the nature of the study which purpose was to examine the plausibility of a set of propositions as opposed to testing hypotheses.

8.6 DIRECTIONS FOR FUTURE RESEARCH

Given the aforementioned limitations, future research should explore the same learning strategies and presentation formats using different demographic samples of consumers. For instance, future research may investigate differences between men and women in processing strategies for alternative types of stimuli. In this domain, the selectivity hypothesis argues that men and women adhere to alternative gender roles: men are guided by self, agentic goals while women pursue other, communal concerns (Meyers-Levy, 1988). Significant gender differences also exist in terms of advertising processing: men use a schema-based strategy whereas women use a detailed processing strategy (Meyers-Levy and Maheswaran, 1991) and engage in more comprehensive (Carsky and Zuckerman, 1991) and elaborate (Meyers-Levy, 1989; Meyers-Levy and Sternthal, 1991) processing. Particularly noteworthy for the study of RNPs is the finding that under lower risk conditions, females show equally favourable responses to objective and subjective claims. With higher risk conditions however, women prefer objective claims to subjective claims whereas men do not (Darley and Smith, 1995). Because RNPs are by definition high-risk, high-uncertainty products (Hoeffler, 2003), women are therefore likely to prefer more objective claims i.e. verbal presentation formats to subjective claims i.e. visual presentation formats whereas men may not have significantly different responses for these alternative formats. Future research may also examine sample differences in terms of age. Recent findings indicate that younger subjects (19-21) may be significantly more visually-oriented than other age groups (Ramsey and Deeter-Schmelz, 2008). This finding supports the trend in industry of utilizing more visual aids marketed toward younger consumers, and hence would be a pertinent moderating variable for future research.

Furthermore, in light of the recent findings that point to the disruptive impact of attribute information on the effects of analogies on consumers' benefit comprehension for RNPs (Ait El Houssi, Morel and Hultink, 2008), more experiments could be conducted that do not include attribute information. In addition, such experiments could be conducted as laboratory experiments in order to increase the internal validity of the research. An additional possibility to improve the effectiveness of visual analogies would be to conduct an experiment that investigates the additive effect of visual analogies i.e. text description of the product benefits vs. text description of the product benefits plus visual analogy. In this situation, the visual analogy would be given more contextual information, likely to reduce the cognitive load placed on individuals and thus enhance the positive effect of visual analogies. Importantly, the verbal anchoring used should focus on the benefits of the product as opposed to the attributes of the product (Ait El Houssi, Morel and Hultink, 2008).

Visual analogies which cannot be comprehended by consumers are not liked by consumers (McQuarrie and Mick, 1992; 1999). Therefore, advertisers wishing to use visual analogies to convey the benefits of RNPs should make the analogy sufficiently intriguing to induce pleasure in solving the puzzle presented in the ad, but simple enough so that it can be comprehended (Phillips, 2003). Verbal anchoring (Barthes, 1977) can make visual analogies easier to comprehend because the explicit verbal cues provide a link to stored knowledge in memory and reduce the amount of elaboration needed to finalise the inference (Alba and Hutchinson, 1987). The verbal anchoring may thus increase comprehension while the visual analogy will provide pleasure. Particularly noteworthy is that the verbal anchoring should not fully explain the visual analogy as previous experimental results indicate that fully explaining a visual metaphor in literal words increases comprehension but decreases the pleasure consumers get from the visual metaphor (Phillips, 2000). Therefore, an exciting direction for further research would be to examine the effectiveness of visual analogies anchored with non-literal descriptions of the product benefits in communications for RNPs.

In addition, future research may attempt to identify moderators in conceptual model 1. The present research found that individual style of processing was not a moderator in the model and used the construct as a covariate. This is consistent with previous findings showing that processing style was not a significant covariate in an investigation of modality (telesales with verbal information vs. face-to-face presentation with visual and verbal information) vs. offering effects (product vs. service) on recall, attitudes and intention (Szymanski, 2001). However, Szymanski's (2001) study did not conduct factor analysis on the style of processing scale, nor did it investigate the psychometric properties of the scale (Ramsey and Deeter-Schmelz, 2008). The present research used a rigorously developed shortened version of the scale, however its predictive ability remained limited. Future research may thus measure alternative personality traits such as need for cognition and need for affect (Haugtvedt, Petty and Cacioppo, 1992) in addition to style of processing because individuals with different processing style personality traits tend to prefer to process different types of information (Giese et al., 1999). Specifically, thinkers (high need for cognition/ Low need for affect) prefer to process verbal information whereas Feelers (low need for cognition/ high need for affect) prefer processing visual information. Moreover, Combiners (High need for cognition/ High need for affect) prefer processing verbal information compared to feelers but prefer processing visual information compared to thinkers (Sojka and Giese, 2001).

Future studies may also measure consumers' ability to understand metaphorical language (Just and Carpenter, 1992). Although preference for visual vs. verbal information may help researchers predict responses to visual vs. verbal format and to mental simulations, individual capacity to process metaphors and thus analogies is not acknowledged by the construct. Individuals who have a high capacity to access multiple interpretations may automatically access analogical meaning whereas individuals with a lower capacity may have a restrained comprehension (Dimofte and Yalch, 2005). Differences in working memory capacity may thus provide a more compelling explanation of individual differences in metaphor/ analogy comprehension than individual style of processing and should be the focus of future research.

Moreover, consumer confusion proneness may act as a significant moderator in the conceptual framework developed. Recent research has identified three dimensions of consumer confusion proneness (Walsh, Hennig-Thurau and Mitchell, 2007; Mitchell, Walsh and Yamin, 2005). Similarity confusion proneness occurs when a consumer is easily confused by a set of stimuli because they are very similar to each other (Walsh and Mitchell, 2005). Overload confusion may take place when consumers receive more information than can be processed in short-term memory (Mowen, 1995). Consumers prone to overload confusion face difficulties when confronted with more product information and alternatives than they can process in order to get to know, to compare and to understand alternatives (Walsh, Hennig-Thurau and Mitchell, 2007). Finally, the third dimension of consumer confusion proneness is ambiguity confusion proneness, which refers to consumers' tolerance for processing unclear, misleading or ambiguous products, product-related information or advertisements (Walsh, Hennig-Thurau and Mitchell, 2007). This third type of consumer confusion proneness is relevant to the present research, and can be related to the study of stimulus and product complexity (Berlyne, 1960) and to the concept of cognitive unclarity (Cox, 1967) which suggests that consumers perceive unclarity when they feel uncomfortable from information ambiguity. In the present research, some of the respondents may have been more prone to ambiguity confusion than others, and therefore may have reported more negative responses to the most ambiguous stimulus (i.e. visual analogy) due to this underlying personality trait. A fruitful avenue for future research may be to measure respondents' ambiguity confusion proneness and examine the predictive ability of the construct in explaining consumer responses to alternative presentation formats, with some formats more prone to personal interpretation (McQuarrie and Phillips, 2005).

Moreover, additional eye-tracking experiments should be conducted with larger samples and full-factorial designs in order to generalise the findings of the present research and test formal hypotheses. Future experiments could also examine correlations between visual attention to the message and attitudinal and behavioural outcomes, so as to examine whether the findings for product comprehension extend to evaluations and intent. Such research efforts would be in line with Wedel and Pieters' (2007) recent call for more research applying eye tracking measures to make inverse inferences about fundamental communication processes. Due to the differences in processing strategies between men and women as women use a detailed processing strategy (Meyers-Levy and Maheswaran, 1991) and engage in more comprehensive (Carsky and Zuckerman, 1991) processing whereas men use a more schema-based strategy, eye-tracking would also be a powerful tool to examine whether gender differences also exist in the perceptual processing of advertising stimuli.

In addition, future research should consider the use of open-ended questions to assess product comprehension. For instance, respondents may be asked to describe the product as they would to their grandmother/ grandfather (Gregan-Paxton et al., 2002). This will provide additional insights into the nature of consumers' product knowledge post-exposure to advertising for a RNP and will pinpoint any misconceptions about the nature of the product. Importantly, the present research measured product comprehension using closed-ended as opposed to open-ended questions because the focus was on consumer bewilderment as opposed to consumer miscomprehension. Consumer bewilderment can be assessed using closed-ended questions, which examine whether one is able or unable to interpret a stimulus (Huhmann, 2008). Miscomprehension is another form of failed interpretation, which occurs when one generates a meaning but not the intended one, and can be measured using open-ended questions. Unlike bewilderment, miscomprehension may not affect evaluations because the individual may not realize that he/she has miscomprehended the message. Moreover, unlike bewilderment, miscomprehension may not generate discouragement or scepticism, emotions which were key constructs in study 1. Hence, the measurement of comprehension using closed-ended questions was preferred to measurement using open-ended questions. However, because miscomprehension can go unnoticed and ultimately decrease persuasion if individuals realise their miscomprehension, future research should examine the effects of alternative presentation formats and learning strategies on comprehension using open-ended questions, as differences may occur between what people actually know and what they think they know (Brucks, 1985; Alba and Hutchinson, 2000; Park, Mothersbaugh and Feick, 1994).

In addition to addressing the limitations of the current thesis, future research should extend the findings of this research. Recent research efforts suggest that attention is not guided solely by the perceptual salience of the advertising stimuli (Pieters and Wedel, 2007). Consumers' goals not only control higher-order cognitive processes, they can also have systematic effects on patterns of visual attention to ads, consistent with the Yarbus (1967) implication. Attention is thus determined bottom-up by the salience of ad objects and top-down by their informativeness to consumer goals. Further research may therefore examine the effect of setting consumer goals, such as learning new information about the product advertised, on attention patterns. Evaluation goals (Hilton and Darley, 1991) can be distinguished from learning goals (Dweck and Leggett, 1988). Because evaluation goals involve judging a target on a specific dimension whereas learning goals involve acquiring knowledge about a target and storing it for later use, evaluation goals could be used to examine changes in correlations between attention and attitudinal/ behavioural responses, whereas learning goals could activated to assess changes in correlations between attention and product comprehension.

An additional opportunity for future research lies in a better understanding of how consumers use different visual images to learn about and form preferences for a new product. Specifically, consumers can use images of the self versus images of other consumers, i.e. self-related vs. others-related visualization. Previous findings indicate that the use of others-related visualisation produces more positive evaluations for a RNP than the use of self-related visualisation (Dahl and Hoeffler, 2004). This finding is explained by the substantial behavioural change required to obtain the benefits of RNPs (Lehmann, 1997). Because RNPs are like nothing consumers have experienced before, self-related visual images, which draw on personal previous experiences only have limited use for learning and evaluation. Thus, the learning requirements of RNPs may reduce the potential advantages of self-related visualization for these products. Consumers who form images of themselves using the RNP need to use their largely irrelevant prior experiences with existing products as the focal point, which may not enhance product attitudes. For example, consumers faced with a new product such as the digital pen may have trouble visualizing how the product would fit into their daily working habits and consequently may reject the product. These difficulties in incorporating the new product into one's existing lifestyle may trigger uncertainties regarding the costs of product use (Hoeffler, 2003).

However, an alternative explanation may exist for the superiority of others-related visualisation as opposed to self-related visualisation in Dahl and Hoeffler's (2004) experiment. The RNP presented in the stimuli was the IBM TransNote - a new mobile personal computer with a digital notepad that enables handwritten ideas to be captured and transferred to a digital computer file. This concept is similar to the Digipen presented in this research, and can therefore be classified as a utilitarian product. Therefore, the self-related visualisation tool may have been unsuccessful to convey the benefits of the product because for utilitarian products audience persuasion is achieved through functional congruity as opposed to self-congruity (Johar and Sirgy, 1991). Functional congruity is defined as the match between the performance-related product attributes and the criteria used to evaluate the actual performance characteristics of the product. The greater the congruity between the consumer's utilitarian beliefs about the attributes of the product and between the referent beliefs, the greater the persuasion (Miniard and Cohen 1983; Myers 1976; Oliver and Bearden 1985; Punj and Stewart 1983; Shimp and Kavas 1984). Contrarily, self-congruity is defined as the match between the product's attributes and the consumer's self-concept (Sirgy 1982; Varvoglis and Sirgy 1984). The self-concept involves four different types of self-images: (1) an actual self-image, (2) an ideal self image, (3) a social self-image, and (4) an ideal social self-image. An actual self-image is an image an individual has of him or herself. An ideal self-image is an image one aspires to have. A social self-image involves beliefs about how one is viewed by others, and the ideal social self-image is the imagined image one aspires others to have of him or herself (Johar and Sirgy, 1991).Therefore, the effectiveness of self-related mental simulations for RNPs is likely to be moderated by the nature of the new product, as self-related mental simulations may be more effective for a RNP of a hedonic nature than for a RNP of a utilitarian nature. For example, conveying the benefits of 3D video glasses using self-related mental simulation may activate congruent images for consumers who think of themselves as innovative, trendy or tech-savvy, thus increasing the satisfaction of self-congruity needs. If the individual aspires to these personality characteristics, congruity may be achieved with the ideal self-image, thus satisfying self-esteem needs. Therefore, an intriguing opportunity for future research lies in examining experimentally whether the nature of the RNP (i.e. hedonic vs. utilitarian) moderates the effect of self-related vs. others-related mental simulations on evaluations for a RNP.

Furthermore, another area which would be worthy of further investigation would be to examine the differential effects of process vs. outcome mental simulation for RNPs of hedonic vs. utilitarian vs. hybrid nature, while taking into account the time frame of reference i.e. near future vs. distant future. Drawing on theories that address intertemporal choice (e.g., Trope and Liberman, 2003; Wright and Weitz, 1977), recent findings empirically demonstrate that for a RNP (i.e. automatic car), process-focused mental simulation triggers higher behavioural intentions when the time frame is near whereas outcome-focused mental simulation yields higher behavioural intentions when the time frame is distant (Castano et al., 2008). However, another recent study which did not incorporate time frame as part of the experiment found no significant differences in evaluations after exposure to process vs. outcome mental simulation for a RNP (Zhao, Hoeffler and Zauberman, 2008). These different findings are likely to be due to the lack of time frame specification in the latter study, which should therefore be incorporated into future research efforts. However, Castano et al.'s (2008) experiment did not consider the role of the nature of the RNP in affecting evaluations. The present research showed that different strategies are suited to different types of products. In the same vein, responses to process vs. outcome mental simulation with a near vs. distant future time frame are likely to be affected by the nature of the product. When the time frame is distant, a focus on the outcomes of product use is likely to consistently trigger more positive product evaluations across the three products. However, for a near time frame, focusing on the process of product use may yield more positive responses for utilitarian and hybrid products whereas outcome-focused mental simulations may be preferred for hedonic products. Utilitarian and hybrid products require consumers to go through a utilitarian process to use the product. In a near time frame, consumers will mainly benefit from "how-to" uncertainties about how to use the product (Castano et al., 2008) because a utilitarian process is particularly daunting and likely to necessitate a great behavioural change. Successfully managing and reducing the uncertainties related to product use is likely to improve product evaluations for such RNPs. However, hedonic products do not require users to go through a utilitarian process, as the process for products such as the video glasses or the ZD 3D camera is hedonic in itself. Therefore, as individuals are likely to have limited uncertainties regarding the process of use, an outcome-focused mental simulation may yield more positive evaluations. Overall, this area would be a fruitful avenue for future research.

Future research should also examine potential strategies to improve the effectiveness of analogies as a learning and persuasive tool for new product concepts. An intriguing possibility would be to replace 'rational' analogies by experiential analogies (Goode, Dahl and Moreau, 2008). For example, Microsoft has compared playing the Xbox 360 to participating in a city-wide water balloon fight and Alfa Romeo has compared driving a sports car to a first kiss. Past research in analogical learning has focused exclusively on the transfer of objective knowledge in the context of functional comparisons (Gregan-Paxton 2001; Gregan-Paxton and Moreau 2003; Hoeffler 2003; Roehm and Sternthal 2001). However, this stream of research has ignored consumers' ability to transfer unique, personally-experienced emotional information and the persuasive impact of such emotional transfer on new product evaluations. The success of the experiential analogical transfer is likely to depend on consumers' base preference, i.e. is the consumers' first kiss associated with positive emotions? This research would be consistent with the need to move beyond the identification of factors that affect analogy comprehension to identify the factors that affect an analogy's persuasiveness (Ait El Houssi, Morel and Hultink, 2005; Perrott, Gentner, and Bodenhausen 2005). Moreover, because emotions are central to the experience of using a RNP of a hedonic nature, experiential analogies are likely to significantly enhance product attitudes compared to functional analogies by motivating individuals to consider their own subjective experience as a basis for understanding the emotions that may be experienced when using the new product.

Another issue that requires some consideration in the future concerns the use of multiple analogies, which may help consumers build a more complete understanding of a complex, multi-faceted product. As opposed to mental simulations which generate open-ended thinking about the benefits of the product, analogies may activate inferences that are specifically linked to the properties of the base (Hoeffler, 2003). Hence, analogical processing highlights some target attributes at the expense of others and therefore the content of the representation depends on the identity of the base, and is more likely to contain corresponding features than non-corresponding features (Gregan-Paxton et al., 2002). Analogical inferences are therefore likely to convey only a partial view of the target product.

Einhorn and Hogarth (1987) argue that using several metaphors can help decision-making when individuals generate a single metaphor and extend it to an extensive causal chain. Each metaphor or analogy illustrates another factor and another way of thinking, hence the possibility for individuals to build a more comprehensive picture of the issue at stake by combining all the pieces of information acquired through metaphorical thinking. In the same vein, the value of multiple models for analogical learning is tackled by Spiro et al. (1989) in the context of the advanced knowledge acquisition theory. One of the main shortcomings of analogies is that single analogies involve a single mapping between a base and a target. If analogies can provide a preliminary understanding of complex concepts, they can hinder the acquisition of deeper knowledge by reducing the understanding of the target to the aspects present in the base. Analogies thus often result in oversimplified knowledge. To date, academics have only focused on the use of single analogies to explain RNP concepts (El Houssi et al., 2005; Gregan-Paxton et al., 2002). However, Spiro et al. (1989) stress the numerous liabilities of single analogies and Gregan-Paxton et al (2002) also demonstrate experimentally that a single analogy elicits more base-related thoughts than a no-analogy condition, thus pointing to a reduction in the scope of thinking, as the analogical core is what individuals retain of the product.

Multiple analogies may vitiate the effects of single analogies by helping individuals build a more complete understanding of a complex concept and a more even-handed consideration of the relevant dimensions of the product (Spiro et al., 1989). The various analogies are integrated into a composite image that has selective instantiations of the correct and useful information found in each analogy but suppresses the inappropriate information. The supplementation technique may be used so that aspects of the target domain that are missed by earlier analogies are covered by a supplementary analogy. Therefore this stream of research suggests that multiple analogies may be a solution to the reductive bias induced by the use of single analogies to convey complex concepts.

However, another stream of research indicates that the analogy presented first may benefit from a primacy effect which will thus offset the impact of later alternatives. In particular, Koehler (1991) considers reasons why a primacy effect often occurs when individuals are presented with different explanations of a single issue, as the arguments generated first are given more weight and thus create bias. The primacy effect is related to the idea of confidence; the confidence held in an initial hypothesis is not easily undone by alternative hypotheses. Subsequently considered alternatives are at a disadvantage, because considering how the focal hypothesis may be true has made its aspects the major characteristic used to define the problem (Koehler, 1991). This phenomenon can be related to the concept of *"mental sets"* or *"fixedness"* found in theories of problem solving. Researchers in this area have noticed that individuals often become trapped in one way of viewing a problem or in one mode of thinking based on an initial hypothesis, which sometimes prevents the discovery of a solution (Glucksberg and Weisberg, 1966; Luchins, 1942). Similarly, recent research showed that the initial analogy continues to drive intention even when additional analogies are introduced (Bolton, 2003). After a schema has been designed in support of an initial analogy, it may be difficult to undo this schema entirely and then objectively consider an alternative analogy. Anecdotal evidence also suggests that initial analogies can interfere with the acceptance of new analogies (Holyoak and Thagard, 1995). Moreover, individuals may respond to multiple analogies by favouring the analogy that best fits their personal goals (Spellman and Holyoak, 1995).

The issue of multiple sets of thinking has been investigated in the context of advertising for RNPs (Moreau, Markman and Lehmann, 2001). The authors demonstrate in an experimental setting that when given two consecutive and plausible category labels, consumers rely primarily on the first label when categorizing and making inferences about the performance of a new product. However, in a second experiment the authors show that this primacy effect is somewhat offset when respondents are given two consecutive and plausible category labels along with explicit mappings from each category. In this situation, consumers rely on both the first and second labels when categorizing a really new product and when inferring the performance of a really new product.

However, the research conducted by Moreau, Markman and Lehmann (2001) focuses on categorization-based knowledge transfer. As the authors put it: "the recent interest in analogical based knowledge transfer (e.g., Gregan-Paxton and Roedder John 1997) and its growing applications to the marketing area suggest that future research needs to be done to more clearly distinguish categorization-based knowledge transfer from analogical knowledge transfer". This suggests that future research should examine consumer responses to multiple sources in an analogical learning setting. It can be argued that the base and the target used by Moreau, Markman and Lehmann (2001) share strong surface similarities (in particular the traditional camera and the digital camera). In an analogical transfer context, these would be classified as near-domain analogies (Halpern, 1989). This could have hindered the learning process of the respondents as respondents (1) may have focused on surface similarities to categorize the RNP as opposed to focusing on the functions of the product and (2) may not have had sufficient knowledge about the base to build a comprehensive understanding of the really new product, as scanners and traditional cameras may not have been familiar enough to the participants. Future research efforts should concentrate on individual learning strategies from multiple, far-domain analogies for RNPs presented in the same page and with explicit mappings to limit the occurrence of primacy effects.

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APPENDIX 1 Introduction to the Web-survey written in html

<html>

<head>

<title>intro page and time for questions

</title>

</head>

<body>

<p>
Thank you for agreeing to participate in this study. Participation in this research is voluntary and you are free to withdraw at any time.

<p>
In the first part of the questionnaire, you will be asked to answer demographic and personality questions. In the second part of the questionnaire, you will view three advertisements. After each advertisement, you will be asked to answer a short questionnaire which will examine your reactions to the advert. The questionnaire takes approximately 20 minutes to complete.

<p>
ETHICAL GUIDELINES:

Please note that this research is principally for a PhD and may lead to publications. Your answers are completely confidential and cannot be traced back to you personally.

The confidentiality of personal information of all volunteers involved in this investigation will be preserved in the following ways:

1/ Details that would allow you to be identified will not be published, or made available, to anybody not involved in the research. The researchers will not retain data which will enable them to link your email address with your participant number.

2/ Your identity will not be stored on computer but in written form. This information will be kept for six weeks.

<p>
Your email address is needed in order to contact you by email to inform you about the results of the prize draw. The prizes are: 2 Ipods NANO 4GB (value: 129£ each) and 3 Ipods shuffle (value: 55£ each)

<p>
The prize draw entry details will be kept separate from the questionnaire you will fill in during the study. The data will be related to your participant number, not to your name.

If you do not wish to participate in the prize draw, we will not retain your email address.

If you need any further information, please don't hesitate to contact the main researcher at: feierspi@aston.ac.uk.

<p>
Please Click to begin.

<p>

<p>Please click to begin</body>

</body>
</html>

APPENDIX 2 Links to the Web-Experiments

http://amirs.aston.ac.uk/survey/SF/1/intro.html

http://amirs.aston.ac.uk/survey/SF/2/intro.html

http://amirs.aston.ac.uk/survey/SF/3/intro.html

http://amirs.aston.ac.uk/survey/SF/4/intro.html

http://amirs.aston.ac.uk/survey/SF/5/intro.html

http://amirs.aston.ac.uk/survey/SF/6/intro.html

[Accessed 17/04/08].

APPENDIX 3 Introduction to the Web-Experiment

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Please Click to begin.

APPENDIX 4 Step-by-step guide to using the eye-tracker

Calibration of the MHT (Magnetic Head Tracker)

Start eye-tracker interface (E5 win)

Start MHT

Click on MHT Pan/ Tilt Calibration

Measure the distance from the MHT to the eye-tracking camera and enter the distance in the system

Focus the camera on the MHT using the remote control

Then: an assistant will place the sensor of the MHT exactly between the camera and the MHT. Focus the camera on the sensor and save the position on "center".

Place the sensor of the MHT six inches to the right. Focus the camera on the sensor and save the position on "right" Follow the same procedure for "left", "up" and "down".

Save this configuration.

Eye calibration

Focus the eye-tracking camera on the eye of the respondent using the remote control

Modify the illumination threshold to get the best view of the eye possible.

Fit the headband with the sensor on the respondent's forehead.

Read MHT set-up

In MHT, click on sensor-to-eye offset. Measure the distance from the eye of the respondent to the sensor of the MHT (i.e. 1 inch).

Enter the distance in inches in the system.

Modify the thresholds for the pupil and corneal reflection.

During this procedure:

- Both lights (CR and pupil) should be green (as opposed to red) and be as stable as possible
- The camera should always stay focused on the eye.
- Pan/Tilt tracking should be on Auto so that the camera follows the eye.

Then:

Open the calibration screen (i.e. white background with nine numbers placed at all angles of the screen)

Ask the respondent to look at point 1, and then click on "save target point". Follow the same procedure for points 2 to 9.

Click on "Test target points"

Ask the respondent to look at each number to check that the calibration was successful. If the cross that shows the POR (Point of Regard) is out of focus, start again the calibration (for all the numbers or only some of them).

Start recording data.

APPENDIX 5 Calculation of total instrument reliability for Style of Processing

Coefficient alpha (test of internal reliability), assumes the presence of a single dimension. If the instrument is multidimensional, as is the case with SOP, coefficient alpha cannot be used to compute the reliability of the instrument. Total instrument reliability can be calculated by what is known as the Reliability of Linear Combinations (Nunnally, 1978). The equation developed by Nunnally to compute total instrument reliability is reproduced in equation 1, which is an extension of the coefficient alpha relationship into multiple domain situation.

Equation 1 is equation (7-11) in Nunnally (1978, p. 248).

$$r_{yy} = 1 - \frac{\sum \sigma_i^2 - \sum r - ii\sigma_i^2}{\sigma_y^2}$$

where
σ_1^2 = variance of variable i
r_{ii} = reliability of variable i
σ_y^2 = variance of the linear combinations

With σ^2=VAR(X) + VAR(Y) + 2COV(X, Y)

Substituting in equation 1 :

R= 1- [(10.162-7.564)/20.742]=0.874

The table below presents the method of calculating total instrument reliability of SOP.

	Coefficient alpha	Variance	Alpha x Variance
Verbal Processing	0.734	5.111	3.751
Visual Processing	0.755	5.051	3.813
	Σ	**10.162**	**7.564**

Note : Variance of the linear combinations=20.742

APPENDIX 6 Inter-Item Correlations Matrices for the Constructs

Table 1 Inter-Item Correlations for Discouragement

	Puzzled	Discouraged	Bewildered	Cronbach's Alpha
Puzzled	1			0.872
Discouraged	0.637	1		
Bewildered	0.755	0.690	1	

Table 2 Inter-Item Correlations for Skepticism

	Skeptical	Suspicious	Distrustful	Cronbach's Alpha
Skeptical	1			0.898
Suspicious	0.746	1		
Distrustful	0.669	0.824	1	

Table 3 Inter-Item Correlations for Positive Emotions

	Happy	Pleased	Contented	Proud	Cronbach's Alpha
Happy	1				0.933
Pleased	0.908	1			
Contented	0.846	0.873	1		
Proud	0.643	0.667	0.696	1	

Table 4 Inter-Item Correlations for Product Comprehension

	Easy to understand	Straightforward	How the product works	Use the product	Features	Benefits	Cronbach's Alpha
Easy to Understand	1						0.911
Straightforward	0.909	1					
How the product works	0.629	0.652	1				
Use the product	0.536	0.547	0.746	1			
Features	0.655	0.651	0.621	0.574	1		
Benefits	0.571	0.558	0.579	0.511	0.744	1	

Table 5 Inter-Item Correlations for Attitude to the Product

	Good	Favourable	Like	Positive	Cronbach's Alpha
Good	1				0.972
Favourable	0.902	1			
Like	0.885	0.888	1		
Positive	0.895	0.905	0.913	1	

Table 6 Inter-Item Correlations for Behavioural Intent

	Trial	Information	Demonstration	Recommend	Cronbach's Alpha
Trial	1				0.905
Information	0.782	1			
Demonstration	0.691	0.783	1		
Recommend	0.714	0.655	0.590	1	

Table 7 Inter-Item Correlations for the Original Visual Processing Scale

	VIS1	VIS2	VIS3	VIS4	VIS5	VIS6	VIS7	VIS8	VIS9	VIS 10	VIS 11	Cronbach's Alpha
VIS1	1											0.737
VIS2	0.332	1										
VIS3	0.375	0.504	1									
VIS4	0.386	0.458	0.569	1								
VIS5	0.317	0.208	0.279	0.242	1							
VIS6	0.233	0.163	0.232	0.197	0.262	1						
VIS7	0.221	0.090	0.120	0.112	0.178	0.620	1					
VIS8	0.100	0.192	0.341	0.425	0.131	0.102	0.057	1				
VIS9	0.029	0.108	0.223	0.266	0.093	0.053	-0.011	0.340	1			
VIS10	0.078	0.139	0.229	0.295	0.125	0.298	0.165	0.267	0.127	1		
VIS11	0.095	0.227	0.170	0.231	0.074	0.069	-0.002	0.166	0.137	0.118	1	

Table 8 Inter-Item Correlations for the Original Verbal Processing Scale

	VER 1	VER 2	VER 3	VER 4	VER 5	VER 6	VER 7	VER 8	VER 9	VER 10	VER 11	Cronbach's Alpha
VER1	1											0.723
VER2	0.859	1										
VER3	0.362	0.346	1									
VER4	0.397	0.407	0.253	1								
VER5	0.163	0.157	0.077	0.310	1							
VER6	0.236	0.235	0.187	0.314	0.505	1						
VER7	0.343	0.342	0.251	0.310	0.345	0.336	1					
VER8	0.144	0.113	0.066	0.047	0.188	0.147	0.190	1				
VER9	0.099	0.082	0.117	0.084	0.110	0.157	0.202	0.034	1			
VER10	0.104	0.090	0.107	0.216	0.154	0.116	0.177	0.046	0.039	1		
VER11	0.100	0.101	0.092	0.188	0.235	0.159	0.154	0.051	0.044	0.464	1	

Table 9 Inter-Item Correlations for the Reduced Visual Processing Scale

	Thinking consists of mental pictures	It helps to think in terms of mental pictures	When I have forgotten I try to form a mental picture	Revive special times in my life	Cronbach's Alpha
Thinking consists of mental pictures	1				0.755
It helps to think in terms of mental pictures	0.577	1			
When I have forgotten I try to form a mental picture	0.502	0.454	1		
Revive special times in my life	0.365	0.382	0.334	1	

Table 10 Inter-Item Correlations for the Reduced Verbal Processing Scale

	Like Learning New Words	Enjoy Learning New Words	Synonyms	Vocabulary	Cronbach's Alpha
Like Learning New Words	1				0.734
Enjoy Learning New Words	0.857	1			
Synonyms	0.352	0.335	1		
Vocabulary	0.390	0.401	0.256	1	

APPENDIX 7

TABLE 1: ANALYSES OF LEARNING STRATEGY AND PRESENTATION FORMAT PER PRODUCT WITHOUT INDIVIDUAL STYLE OF PROCESSING AS A COVARIATE (EXPERIMENT 1)

	Intelligent Oven			Digipen			Video Glasses		
Product	F	p	η^2	F	p	η^2	F	p	η^2
Comprehension									
Presentation Format	70.333	0.000	0.087	275.856	0.000	0.278	21.464	0.000	0.028
Learning Strategy	10.014	0.000	0.026	34.824	0.000	0.089	24.271	0.000	0.062
P * S	0.941	0.391	0.003	24.533	0.000	0.064	21.516	0.000	0.055
Attitude to the Product									
Presentation Format	0.649	0.421	0.001	40.318	0.000	0.053	21.424	0.000	0.028
Learning Strategy	11.178	0.000	0.030	13.899	0.000	0.037	8.382	0.000	0.022
P*S	0.002	0.998	0.000	4.002	0.019	0.011	13.676	0.000	0.036
Behavioural Intent									
Presentation Format	0.053	0.817	0.000	15.249	0.000	0.021	22.520	0.000	0.025
Learning Strategy	11.609	0.000	0.030	8.773	0.000	0.024	0.953	0.386	0.003
P*S	0.461	0.631	0.001	2.089	0.125	0.006	8.001	0.000	0.021

TABLE 2: ANALYSES OF LEARNING STRATEGY AND PRESENTATION FORMAT PER PRODUCT WITH INDIVIDUAL STYLE OF PROCESSING AS A COVARIATE (EXPERIMENT 1)

	Intelligent Oven			Digipen			Video Glasses		
Product	F	p	η^2	F	p	η^2	F	p	η^2
Comprehension									
Presentation Format	66.685	0.000	0.089	243.342	0.000	0.270	18.883	0.000	0.027
Learning Strategy	10.319	0.000	0.029	29.354	0.000	0.082	19.286	0.000	0.054
P * S	0.773	0.462	0.002	23.978	0.000	0.068	19.804	0.000	0.055
Attitude to the Product									
Presentation Format	1.043	0.307	0.002	38.591	0.000	0.055	21.012	0.000	0.030
Learning Strategy	11.350	0.000	0.033	12.148	0.000	0.035	6.816	0.001	0.020
P*S	0.011	0.989	0.000	3.872	0.021	0.011	12.084	0.000	0.035
Behavioural Intent									
Presentation Format	0.003	0.955	0.000	14.901	0.000	0.022	19.975	0.000	0.028
Learning Strategy	12.634	0.000	0.036	8.122	0.000	0.024	1.741	0.176	0.005
P*S	0.559	0.572	0.002	2.862	0.058	0.008	7.248	0.001	0.021