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The effective use of augmented reality in advertising communications

Garnet Cluny Henry Jensen
12360636

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

11 November 2013

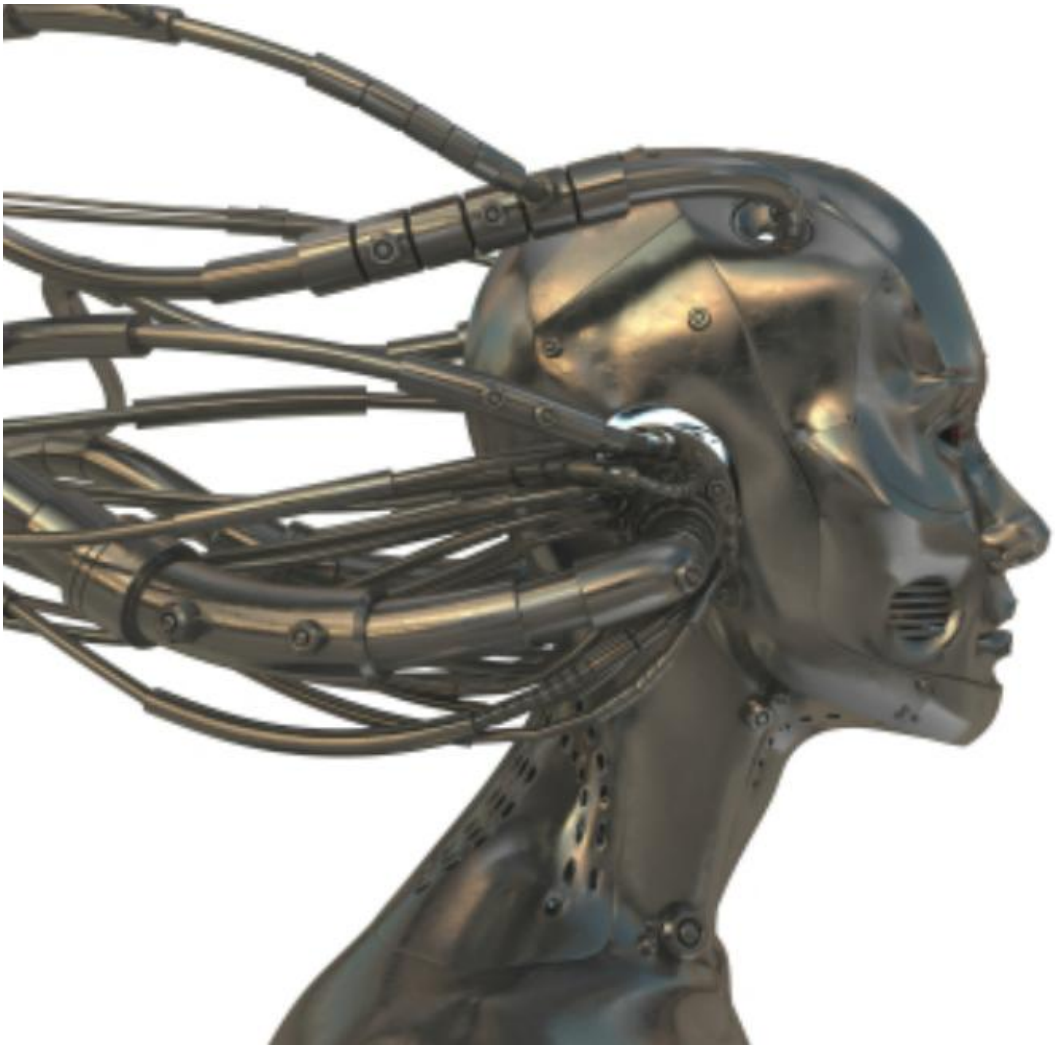
Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research

Name: **Garnet Cluny Henry Jensen**

Signature: _____ Date: **11 November 2013**

The Effective Use of Augmented Reality in Advertising Communications



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Abstract

Augmented Reality is a relatively new advertising medium, which up until now has only seen limited commercial success. The applications and value thereof, as an effective marketing communications tool has not been understood or quantified in the context of an industry which is currently going through profound changes. To this end, this research attempts to answer some of the critical questions facing practitioners and academics within this field. Using audience engagement as a measure of efficacy, independent test groups were subject to various types of Augmented Reality as well as more traditional, media advertisements. Through the experiments, the impacts of contextual relevance, media integration and message style on Augmented Reality advertising, were tested. The findings strongly support contextual relevance as a key characteristic for a successful Augmented Reality advertising implementation. In addition, it was found that this medium also had a significant impact on the audience's visual and emotive levels of engagement with the subject matter. It was also found through the testing and analysis that the most receptive population group for Augmented Reality advertising are young female Millennials.

Keywords

Augmented; Reality; Advertising

Acknowledgements

This research would no doubt have not been possible without the support and inspiration of first and foremost, my wife, Danielle. I would also like to thank "my boys"; Giovanni and Luca for their patience, affection and inspiration over this time. In addition, without the help of Granny Lizzy and Granny Mizzo, Nonno and Grumps, the focus required for this herculean effort would not have been possible. And last but not least, to Dr. Clive Corder for his helpful input, direction and interesting recollections.

Contents

1 Problem Definition

The advertising industry is currently in a state of flux, experiencing a period of unprecedented change and challenge to its methods, business models and industry structures; primarily as a result of the advent of new media (Pfeiffer & Zinnbauer, 2010). To exasperate this situation, analysts forecast that Augmented Reality (abbreviated as "AR" henceforth) will become a major disruptive technology and media type for marketers (Fenn, 2010), maturing to mainstream commercialisation within 5 years and generating revenues in the billions of dollars (Reuters, 2012). Some also believe that AR's impact will not be incremental in nature but herald a significant evolutionary step for advertising media (Trend One, 2010). Augmented reality should therefore be a serious strategic consideration for advertising professionals and academia. It is thus the purpose of this thesis to attempt to understand and quantify effective adoption and implementation of this technology in the context of advertising communications.

Three key trends are relevant to gain a greater understanding of the subject under discussion.

1. The emergence and challenges of AR as a commercially viable advertising media;
2. The increasingly fragmented and complex marketing media landscape; and
3. The growing trend of advertising audience fragmentation and behavioural shifts

1.1 Emergence and Challenges of Augmented Reality

Augmented reality has been around for a number of years, but until recently, has primarily been the domain of university labs and high technology military applications (Geroimenko, 2012). However, the advent and growing popularity of the smart phone has progressed this technology in terms of access, cost, operation and quality of experience, to the point of commercial viability (Jones, 2010). Amongst its numerous possible uses, advertising has been identified as a key application (Nguyen, 2011). Some have foreseen it to be a significant evolutionary step in advertising media (Trend One, 2010), which is expected to play a defining role in the future of marketing communications where the audience's real world environment is seamlessly integrated with digital content and advertising (Sarner, Gassman, & Frank, 2012). As a result, AR's potential has not gone unnoticed, with major industry, and technology organisations investing significant research and development into the development of devices and related systems (Sarner et al.,, 2012). The much hyped and imminent commercial release of Google's Glass product, being a AR enabled eyewear device, is surely set to accelerate the mainstream adoption and commercialisation of Augmented Reality (Riknas, 2012).

However, the last five years have only seen a handful of organisations adopting AR and integrating it as a media component within their marketing campaigns. These early adoptions have had limited reach and appeal, and have met with varying degrees of success, but more often with failure. As a result the advertising industry, for the most part, remains sceptical about the technology and its applications (Szymczyk, 2011). AR therefore still represents a niche, and to some degree, an experimental advertising format. The considerations and factors which equate to a successful implementation therefore remain largely undefined by industry and academia (Bulearca & Tamarjan, 2010).

1.2 The Media Revolution

Recent years have seen an acceleration of media platform fragmentation and proliferation within the advertising industry (Wyner, 2006). The array of channels available to advertising professionals in deciding their marketing mix, has exponentially grown from primarily being print based at the turn of the 20th century, to a multitude of content rich and diverse mediums. While the previous century was dominated by mass media, such as radio, cinema and television, the turn of the century heralded the rise of highly interactive online channels such as web, mobile and social media (Noll, 2007). With each passing year, new media has seen significant growth in market share relative to their traditional counterparts. For example, in , online based advertising growth has exceeded that of any other advertising media since 2005, and almost consistently in double digits. Today, it comes a close second to broadcast television in advertising revenues (Price Waterhouse Coopers, 2013). However, this rapid rise and conquest of new media has by no means relegated traditional media platforms, such as print, television and radio, as inconsequential. In fact, without these, the efficacy of new media is substantially diminished, lost in the sea of information and communication (Jenkins, 2006).

This new "media ecosystem" (Dovey, 2008) is thus driving the need for marketers to increasingly consider the mix, coordination and integration of their communications (Calder & Malthouse, 2005). In support of this, it is widely noted that a successful campaign is driven by a multitude of communications channels, both traditional and new. A skilled marketer will understand the value of well coordinated communications across multiple channels with consumer context and timing as key considerations (Pfeiffer et al., 2010).

1.3 The Audience Revolution

The advent and rise of new media has also lead to traditional types commanding smaller audiences and fewer resources (Kotler & Keller, 2012). It has heralded a paradigm change within the advertising and media related industries, such as print and television, from a "Mass Media" focus to "Masses of Media" (McPartlin, 2011), and challenged a number of fundamental assumptions of well established industries and profitable business models. No longer can marketers use blunt, persuasive and unidirectional or "one-to-many" communication practices, but now have to create channels that are engaging, integrated and which build customer relationships through ongoing interaction. This is essentially the rise of the "many-to-many" communications paradigm within marketing (Hoffman & Novak, 2006).

Further to this, the power balance in managing brand image and perception has swung largely in favour of the consumer, with online social networks amplifying word-of-mouth communications, and substantially limiting organisations' control. The power and increased importance of the individual in this new communication paradigm is also manifest in the concept of co-creation, in which individuals participate with organisations to design and implement marketing communications, creating shared value and greater consumer buy-in (Kozinets, de Valck, Wojnick, & Wilner, 2010).

Given the situation, it is no doubt that marketers are still to some extent grappling to understand how to effectively leverage, manage and monetise these complex and highly interactive new media platforms and their audiences (Retail Prophet, 2011), with a number of major brands experiencing recent catastrophic online marketing failures (Kirkland, 2011).

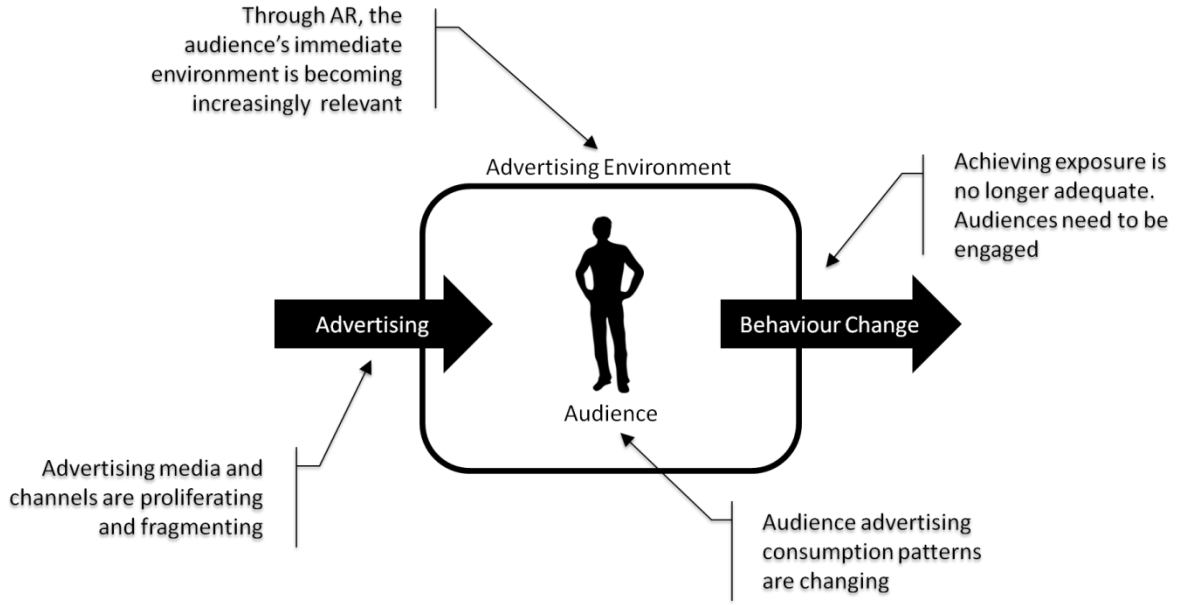
A key challenge to the traditional advertising industry model is the construct of audience "exposure", which to a large degree was the dominant currency of the media and advertising industry (Napoli, 2011). This challenge is not only in terms of the significant shifts in audience numbers from traditional to new media, but also whether "exposure" is a relevant and meaningful measure of the efficacy (and value for money) of advertising media types and specific channels (Napoli, 2011). This has lead academics and professionals to seek new measures to understand how effectively they have "engaged" their audience and changed their attitudes and behaviours. As a result, industry bodies such as the Advertising Research Foundation and audience research organisations, have sought to understand, rationalise and quantify this concept (Plummer, et al., 2007). To this end, it is imperative to understand how AR media interacts and performs against this construct of "Advertising Engagement".

1.4 Objectives and Scope

From the preceding discussion it should be clear that the established norms and constructs for the advertising industry are in a general state of change accompanied by a significant degree of uncertainty (Romanuik & Gugel, 2010). This is even more the case for Augmented Reality based advertising, which for the most part is an immature and not well understood medium (van Krevelen & Poelman, 2010). To this end, the objective of this research is to explore key facets of Augmented Reality as an advertising medium, so as to gain a better insight into its nature and characteristics. In line with the research title, ultimately this thesis seeks to facilitate a better understanding and application of Augmented Reality advertising in industry and academia.

The scope and focus of this research can be better contextualised by considering key points raised thus far in context of a basic advertising system and diagrammatically represented in Figure 1 below.

Figure 1 – The problem definition in context of the basic advertising model



(Adapted from Ball-Rokeach & DeFleur, 1976)

Drawing on these key points, and with the objective to cover relevant aspects across the system, the scope of the research in context of Augmented Reality advertising as the medium, will focus on:

- the effect of content styles in relation to the medium
- the interaction with other media types
- the relation with the audience's environment
- the manner and degree of resulting audience engagement

These topics are explored in detail, both theoretically and practically, in the chapters to follow.

2 Literature Review

In seeking to address the research question at hand, five main areas of academic knowledge have been identified, studied and applied to this thesis. These are:

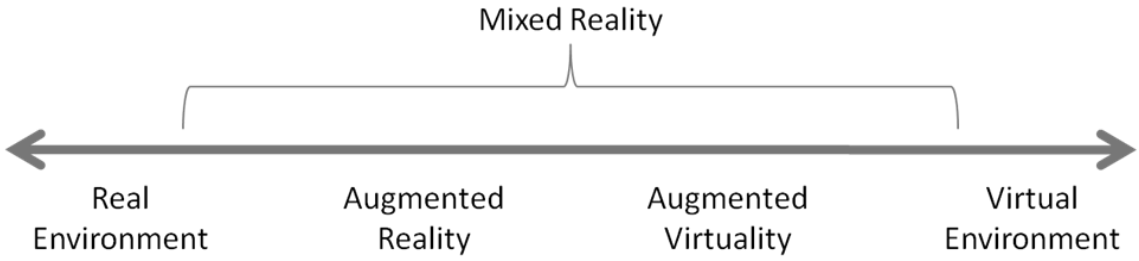
- Augmented Reality as a technology and advertising media
- The evolution of the media landscape
- The construct of advertising engagement
- Integrated marketing communications
- The advertising value transaction

These are discussed individually as well as in relation with one another in the sections to follow.

2.1 Defining Augmented Reality

A fundamental understanding of Augmented Reality is key, in order to be able to relate the concept to other academic theories discussed. It is useful to contextualise AR as a construct, through the use of Reality-Virtuality Continuum which defines the nature of our perceived environment on a linear scale, framed by the real world on one end and a completely virtual environment the other (Milgram, Takemura, Utsumi, & Kishino, 2007). In transitioning from real to virtual, an observer will experience a "mixed reality", firstly as an "Augmented Reality" and further along as an "Augmented Virtuality", as virtual elements become more dominant. This can also be interpreted as a transition from an entirely real to completely artificially generated environment. This continuum is shown in Figure 2 below.

Figure 2 – The Reality-Virtuality Continuum



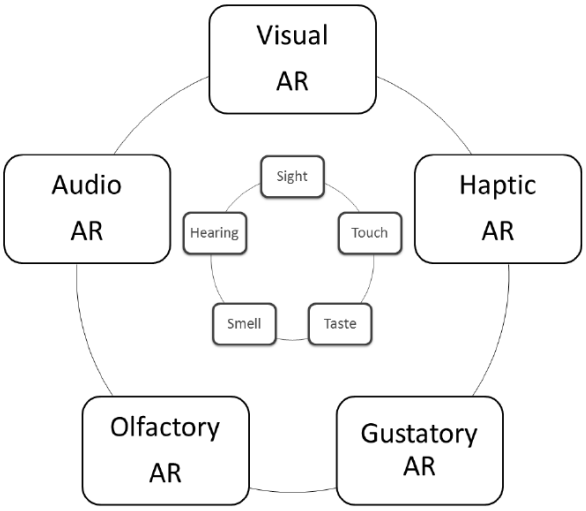
(Milgram et al, 2007)

As Augmented Reality has become an increasing focus for academics, so has the understanding and definition evolved. Geroimenko (2012) in his study of Augmented Reality went to some lengths to explore and refine a definition to arrive at the following:

"Augmented reality is a real-time device mediated perception of a real-world environment that is closely or seamlessly integrated with computer generated sensory objects".

While being concise and for the most part accurate, a criticism of this definition is its bias towards visual based AR systems which makes use of 3D computer video processing to create the AR experience. While this is a common and popular form of AR it constrains the definition.

Figure 3 – Multi-sensory AR permeations



(Geroimenko, 2012)

As Geroimenko (2012) also points out; a user's augmented experience can extend beyond the visual sensory dimension to cover hearing, smell, touch and taste sensory experiences. This is illustrated in Figure 3 on the left.

With this in mind we can revise Geroimenko's (2012) definition through substituting "computer generated sensory objects" with "artificially generated sensory inputs". A proposed revision to the definition would thus read as follows:

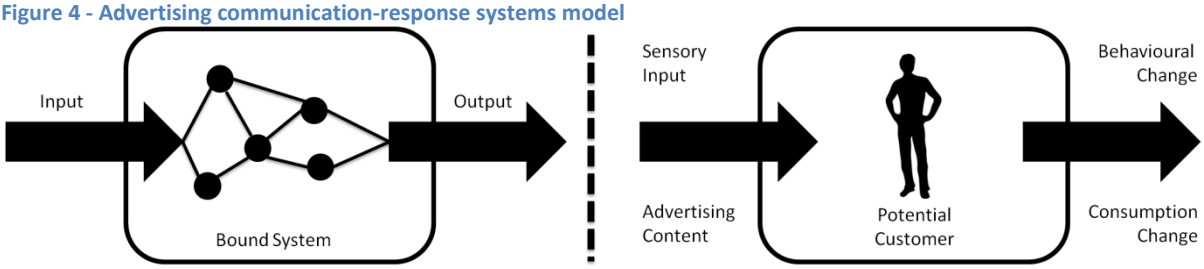
"Augmented reality is a real-time device mediated perception of a real-world environment that is closely or seamlessly integrated with artificially generated sensory inputs*".*

2.2 Augmented Reality Systems Analysis

Using this definition we can begin to analyse the nature of AR through the application of Systems Theory. This advocates a holistic understanding of a system through examination of the relations and interactions of elements therein (Braziller, 1968).

At a very simplistic level, a bounded system receives inputs and transforms these into an output through activities and interactions performed by the various elements within the system (Braziller, 1968). This can be related to the basic advertising communication and response models (Kotler et al., 2012, pp. 256-257), in which advertising content is provided as input to an audience of potential customers, with the output, hopefully being a change in consumption behaviour in favour of the advertiser. These systems are illustrated side-by-side in **Error! Reference source not found.**.

Figure 4 - Advertising communication-response systems model

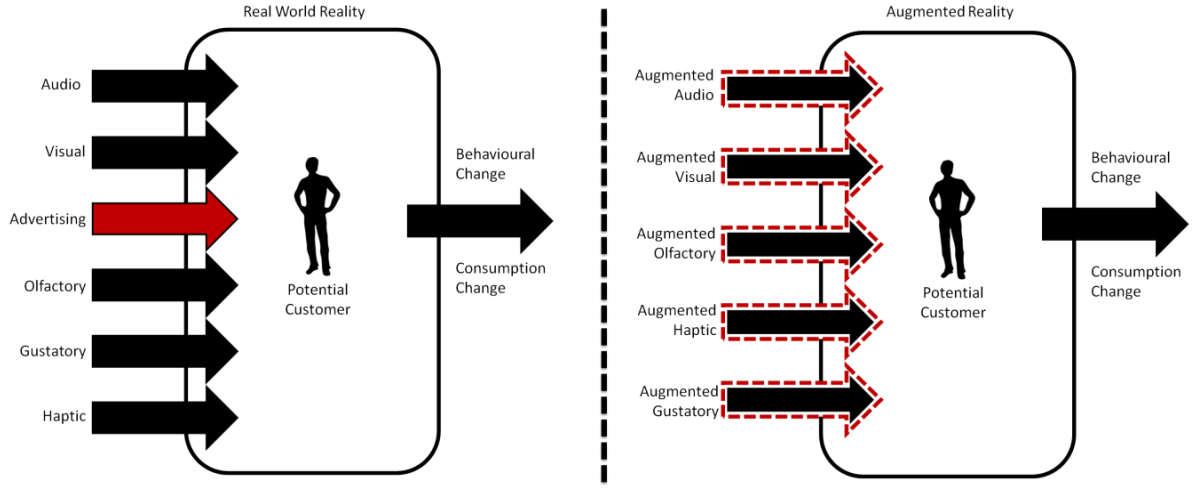


Adapted from Ball-Rokeach & DeFleur (1976)

Applying this to Augmented Reality, we can unpack the essential elements of an AR advertising system. However, before examining the internal system mechanics, it is prudent to first focus on the inputs and outputs as this informs the internal analysis.

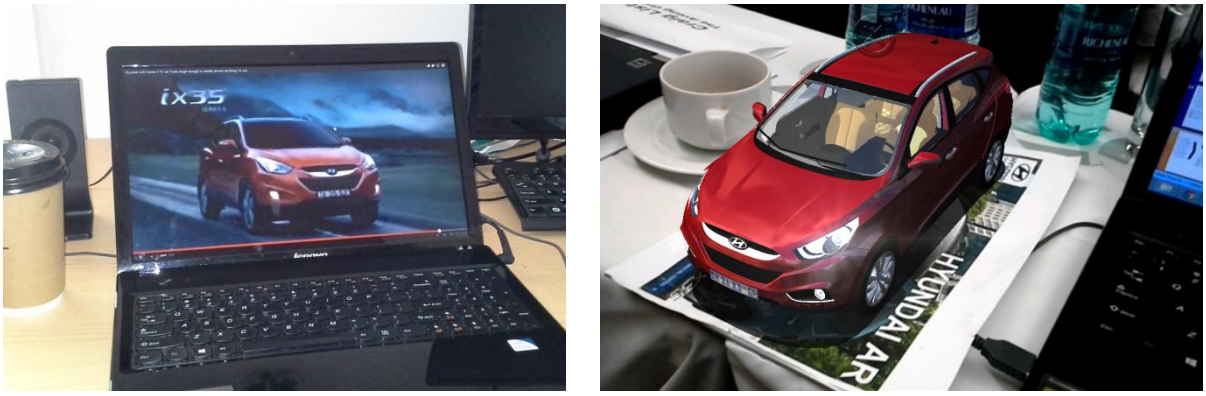
The objective or system output for AR versus non-AR based advertising remains the same, being a behavioural consumption change in the audience (Kotler et al., 2012, pp. 253-265). However, from an input perspective, the differences are key. Advertising content, in theory, can be delivered through any of the 5 senses, although visual and audio are no doubt dominant formats. In general, non-AR based advertising can be viewed as a focused input stream, distinct from the surrounding sensory environment. In contrast, AR based advertising content is "*closely or seamlessly integrated*" (Geroimenko, 2012) with its environment. These concepts are shown systematically in Figure 5 below:

Figure 5 - Conventional advertising sensory input versus Augmented Reality integrated sensory input



In order to better relate this abstract concept of sensory integration, a video based advertisement is shown in Figure 6 juxtaposed to a similar AR advert.

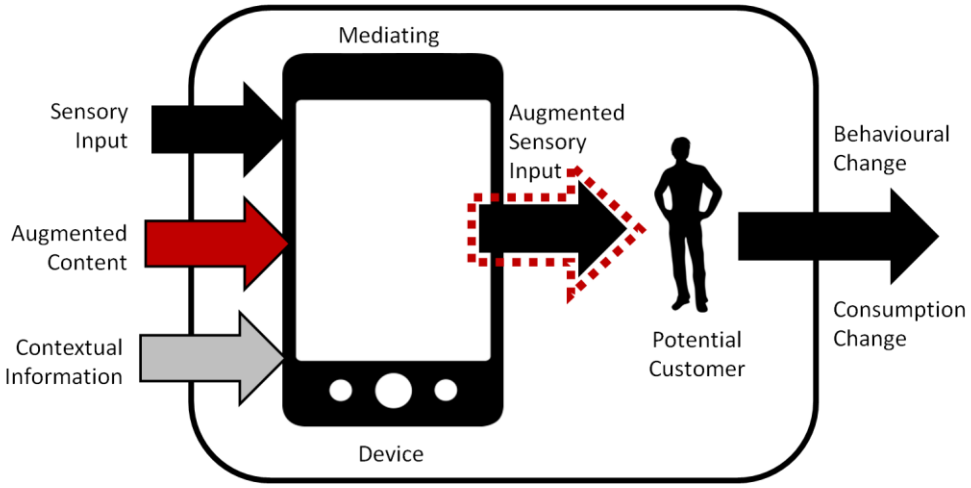
Figure 6 – Relating the abstract concept of sensory versus non-sensory integration



Building on this we can now begin to unpack the elements, activities and interactions within the system. Returning to the definition, it is clear that there are two distinct elements, being the audience as well as the mediating device. While the role of the audience remains largely unchanged, the mediating device is the differentiator and key enabler of the AR system (Nguyen, 2011).

As inputs, the mediating device accepts three possible information streams: the real world sensory inputs, the Augmented Reality content and other non-sensory based contextual information (Kealy & Scott-Young, 2006). The latter information group is in some instances important for the relational processing (discussed a little later), and can for example include informational streams such as GPS location, climate data or traffic information, amongst others (Jones, 2010). Combining these elements and information flows, the AR advertising system has further evolved and is shown in Figure 7.

Figure 7 – Revised AR systems model with key actors and granular inputs

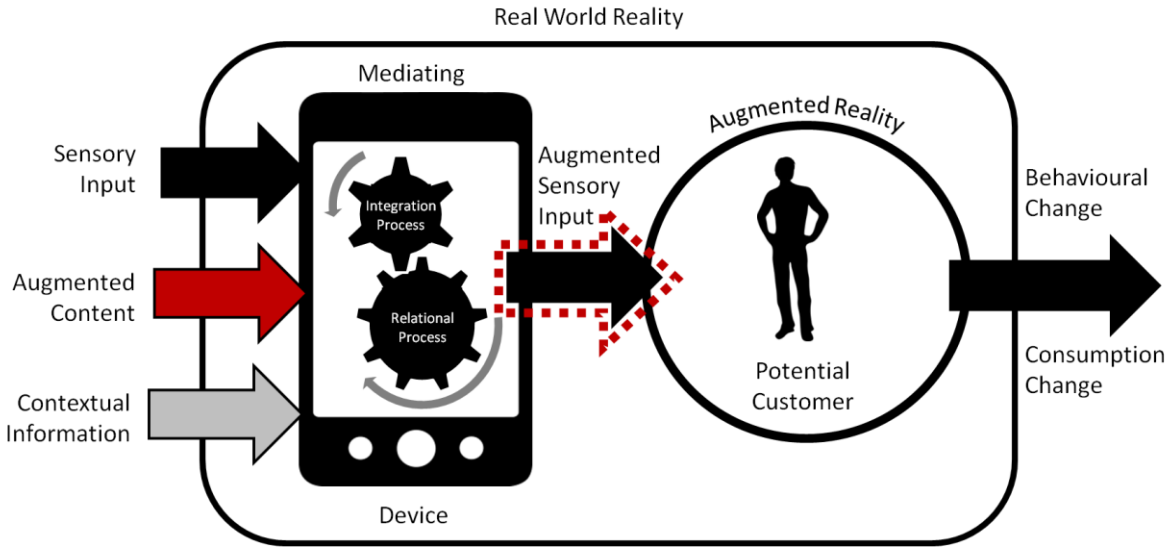


An important activity of the mediating device, is the transformation of its inputs into the augmented sensory output which is then consumed by the audience. This transformation activity comprises two important processes:

- **Relational Processing:** This is the logic which relates the real world sensory data with the augmented content, in some cases using the contextual information to achieve this. For example by making use of GPS data, direction and finder based AR applications can relate the position and direction of the user with other relevant location information (Jaeyoung & Heesung, 2011).
- **Sensory Integration Processing:** This is the process of combining the real world sensory input with the augmented content in a seamless manner. Expanding on the previous example, the camera video feed from the smart phone finder app is overlaid with direction and position information and visually displayed for the user (Jaeyoung et el., 2011).

Integrating these processes, our systems based model has now evolved to look as follows:

Figure 8 – Revised AR systems model with integration processes and AR sub-system



Important to note with the system illustrated above, is that a distinction is made between the real world reality as a system, and the Augmented Reality of the user as a sub-system there-of. This model will be a key basis upon which subsequent concepts and theories will be built.

2.3 Augmented Reality in Practice

Having defined AR at a fundamental level it is important to relate this abstract construct to practical implementations under development and in use today. This will also help the reader gain a more tangible understanding thereof and relate to it to other concepts discussed.

Based on the discussion thus far, an appreciation for the broad scope as well as the multitude of possible applications of Augmented Reality should be clear, especially in the context of all five senses. Therefore for practical purposes this study will give focus to visual based AR systems, since these are (van Krevelen & Poelman, 2010):

- technologically and commercially the most viable, currently; and
- the most pervasive form of AR used in advertising currently.

However before limiting the scope, it is worth briefly exploring Augmented Reality in these other sensory dimensions. If we were to apply our definition of AR to audio, we find that auditory based AR, although not termed as such, already exists. A simple example of this, is the voice prompts given by audio capable GPS navigation devices or even a context aware audio guide for a museum visitor (Elodie & Bourgeon-Renault, 2012). One could even argue that playback of recorded music and voice could be seen as such, whereby the users natural audio sensory input is augmented with artificially generated sounds through the use of a mediating device, in this case any common place audio system such as a CD player or iPod.

There have been a number of attempts to produce haptic AR systems. Common examples of these include amongst many, motion enhanced cinema seating and force feedback in popular gaming controllers. Medical, engineering and scientific training and simulation applications of Haptic AR technologies have also seen significant research focus (Luciano, Banerjee, Florea, & Dawe, 2005). However the degree to which these augment the users haptic experience are particularly limited and have met limited widespread commercial success. An effective form and mode of haptic AR is still technologically challenging and very much an evolving science field (van Krevelenet al., 2010).

The remaining two dimensions are still to some extent a pioneering field (van Krevelenet al., 2010). There have been some interesting commercial developments of digital olfactory devices by companies such as Scentair, Aromajet and Scent Communication. However, no viable commercial gustatory AR system was found in searches conducted by the researcher. Furthermore very limited academic knowledge appears to exist on the subject matter. Gustatory AR therefore appears to be

the least developed or viable of the sensory dimensions (Takuji, Shinya, Takashi, Tomohiro, & Michitaka, 2011).

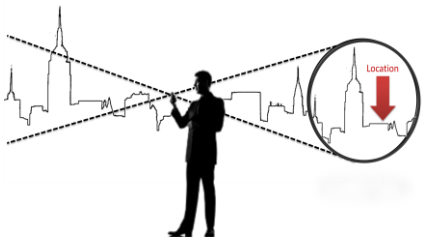
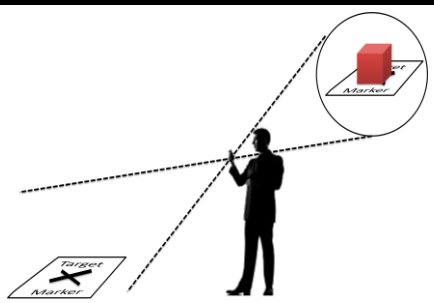
Returning to the domain of visual AR; the number of possible implementations are vast, and can include applications such as industrial design, equipment maintenance, medical procedures and, educational aides (van Krevelen et al., 2010). However to-date the most prevalent commercial applications have been in the field of marketing and advertising (Nguyen, 2011).

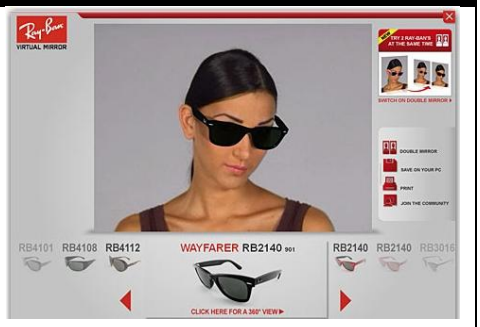
The advent of smart phones has been a significant catalyst for visual based Augmented Reality advertising. The combination of a built in video camera, GPS, gyro, compass and sufficiently powerful CPU and GPU, has allowed for the proliferation of AR applications available to users (Hughs, 2012). The mode of operation of these AR systems involve the user viewing their surrounding environment through their smart phone display upon which an Augmented Reality view of their environment is rendered. The most popular commercial examples available today are (van Krevelen et al., 2010):

1. Navigation and Finder Aides
2. Virtual Product Try-Outs
3. Augmented Print Media

These are briefly explained, conceptually illustrated, and include real world examples given below (Nguyen, 2011):

Table 1 – Common visual AR advertising applications

Navigation and Finder Aides		
The user searches for specified points of interest (such as nearby restaurants) by scanning the surrounding environment with their device.		 (source: www.nokia.com)
Augmented Print Media		
The user targets their device at a pre-determined marker (such as a print advertisement) which activates and renders the augmented content relative to the marker.		 (source: www.technabob.com)

Virtual Product Try-Outs		
The user targets their device at the product application feature (such as someone's face). This activates and renders the augmented content onto the feature.		 (source: www.mediamarlin.nl)

The important distinction between these three types are the inputs as well as relational and integration processing performed by each variant of the technology. While the virtual product try-out and augmented print media use a similar mode of processing being marker based, the navigation and finder apps applies a marker less mode of operation (Nguyen, 2011). The inputs as well as relational and integration processing for each type is summarised in the table below

Table 2 – Visual AR modes of operation using the AR systems model

	Inputs		Relational Processing	Integration Processing
Navigation and Finder Aides	Sensory	Video feed	The user's location and orientation (usually obtained via GPS and compass sensors) are related to a database of subscribed nearby points of interest (POI).	The POIs that are determined to lie in the field of view of the video feed are overlaid with 2 dimensional markers indicating the direction and distance of the points of interest.
	Augmented	Nearby points of interest		
	Context	Location & orientation		
Virtual Product Try-Outs	Sensory	Video feed	The relevant product application feature is recognised using a specialised algorithm which computes its 3D position and orientation. A 3D model of the Augmented Reality product is position relative to the feature.	The 3D product model is rendered into the video feed so as to appear correctly applied to the feature concerned.
	Augmented	3D product model		
	Context	None		
Augmented Print Media	Sensory	Video feed	The video feed is analysed to detect any of the 2D marker images, contained in the marker DB. The 3D feature model is positioned and orientated relative to the position and orientation of the relevant marker	The 3D feature model is rendered into the video feed so as to appear seamlessly integrated into the visual scene relative to the marker(s).
	Augmented	3D feature model		
	Context	Marker database		

While the smart phone has been instrumental in enabling the technology it can be rather cumbersome and limited in its ability to render a visual based AR experience (Sang Min, Suk Chang, & Gu Ji, 2013). Firms such as Google have been working on the next generation of wearable devices which are set to take the technology to the next level. An important advancement in this new class of device is the fact that it is always-on as well as allowing hands free operation (Ghubril & Prentice, 2013). An image of the newly release Google Glass product is illustrated in Figure 9.

Figure 9 – The new Google Glass(es)

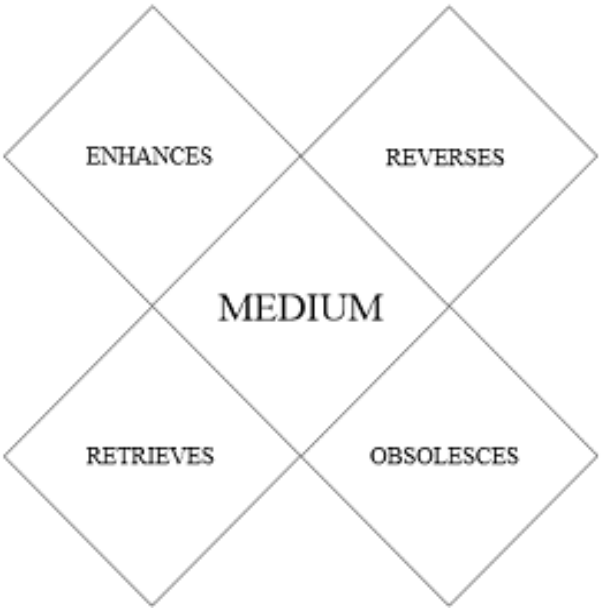
(source: www.talkandroid.com)

2.4 Evolution of Media

In order to better project the impact of Augmented Reality as a new media type, we need to understand how the media landscape has evolved thus far. By studying the successive introduction and evolution of established media types, we can gain a better understanding of the variables which helped drive their successes and shortcomings, in the media landscape (Noll, 2007).

To perform this analysis we will draw from one of the great technological deterministic thinkers, Marshal McLuhan, and specifically his theories on media. A central principle advocated by him, was that of the "medium as the message" (Mcluhan, 1967) which emphasised the role played by the media as opposed to the content, in shaping our usage and behaviours. An important model which came out of this thinking was that of the Tetrad of Media Effects which examines four scenarios in respect of media and its impact. (McLuhan & McLuhan, 1988). These are summarised below in Table 3:

Figure 10 - McLuhan's Tetrad of Media Effects



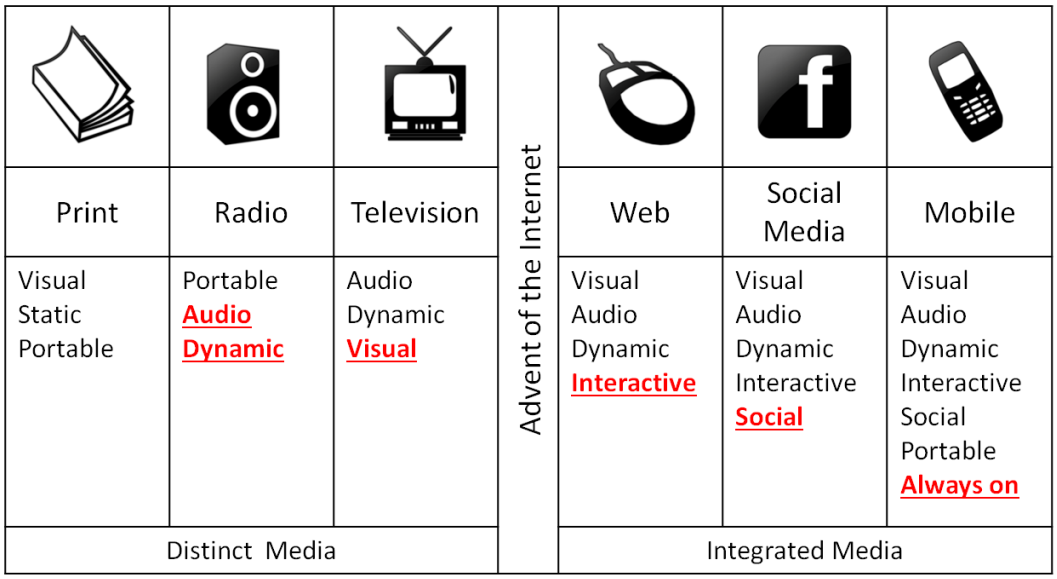
(McLuhan et al., 1988)

Table 3 – Summary of McLuhan's Tetrad of Media Effects

Tetrad Quadrant	Description
Enhances	The media must enhance some aspect of the manner in which content is communicated.
Retrieves	The media would likely revive a media or format of communication perhaps deprecated by other media in the past.
Obsoletes	As a result of the media's introduction, other media types may be completely superseded, or play a less prominent role in the media landscape.
Reverses	If the media is taken to the extreme, it assumes a different form with different characteristics.

If we were to apply this model retrospectively, examining the media landscape evolution, it can facilitate our understanding of the factors which allowed various platforms to attain a measure of success and their impact on their predecessors. The analysis focused on the "enhance" and "retrieve" scenarios in attempt to describe how the different media evolved relative to its predecessors. This analysis is summarised in Figure 11.

Figure 11 – Historic media analysis using the Tetrad



From the figure, the reader should notice certain trends emerging as we chronologically progress through the various media types. The following observation should be noted:

- **Each new media has at least one key differentiating characteristic (highlighted in red).** This is intuitive, as audiences would not adopt the medium if it did offer any distinct value over and above that which was already established. Put another way, and to use the marketing analogy, this unique characteristic would be termed the proverbial "order winner" (Kotler et al., 2012). From a tetrad perspective this is the “enhancing” function of the media.
- **Integrated media inherit key characteristics from their predecessors.** Prior to the advent of the internet each media type represented a distinct platform with a distinct set of characteristics and audience value offering. However following this, each new media tended to incorporated all the key characteristics of the preceding mediums. This is the “retrieves” action referred to in the tetrad and represents the proverbial "order qualifying" characteristics of the medium (Kotler et al., 2012).

These observations have important implications for Augmented Reality, assuming it would be the next major media platform. Applying these, we can infer what key attributes or characteristics a successful AR implementation would constitute. This exercise is detailed in Table 4 using the tetrad as an analysis framework.

Table 4 – Tetrad analysis of Augmented Reality

Tetrad Action	Action Target	Action Description
Enhances	The relevance of content to the users surrounding environment and context	AR users should be able to experience their surrounding environment in a new information and content rich manner. Their sensory experience of their environment should be augmented relative to the nature and composition of their surrounds as well as the context and preferences of the user (Jones, 2010).
Retrieves	Proximity and context based communication and social interaction as well as print and display media	Social media has allowed people to connect and interact regardless of their location. This has however adversely impacted social interaction at a local and community level. AR should have a counteracting influence on this trend, as the ability to search for, display and interact with people in their immediate proximity should become easier and more rewarding (McKay, 2012).

		Print and display media, from periodicals through to billboards, are also expected to benefit from the proliferation of AR, as important markers and triggers for augmented content (Jensen, 2011).
Obsoletes	At this early stage in AR's development this is quite difficult to foresee.	
Reverses	Into a virtual reality experience	Taken to the extreme, a user's Augmented Reality experience can become so dominated by virtual content that their experience traverses milligram's continuum to become a completely virtual experience. In this situation the user's environment will no longer be relevant (Milgram et al., 2007)..

Using these insights we can extend our media evolution model to include Augmented Reality and its relevant characteristics. This is shown in Figure 12 below.

Figure 12 – Historic media analysis with the added media type of AR

			Advent of the Internet				
Print	Radio	Television		Web	Social Media	Mobile	AR
Visual Static Portable	Portable **Audio** **Dynamic**	Audio Dynamic **Visual**		Visual Audio Dynamic **Interactive**	Visual Audio Dynamic Interactive **Social**	Visual Audio Dynamic Interactive Social **Portable** **Always on**	**Visual** Audio Dynamic Interactive **Social** Portable Always On **Contextual**
Distinct Media				Integrated Media			

As per the figure, with specific reference to the last column, AR media would first and foremost differentiate itself by being contextually relevant to its audience. Where the term "contextually relevant" can be qualified as being the audience's (Wang, 2006):

- Surrounding environment, in terms of any number of variables including composition, location, proximity, weather, etc.
- Personal context, in terms of amongst others their demographics, preferences, relationships, etc.

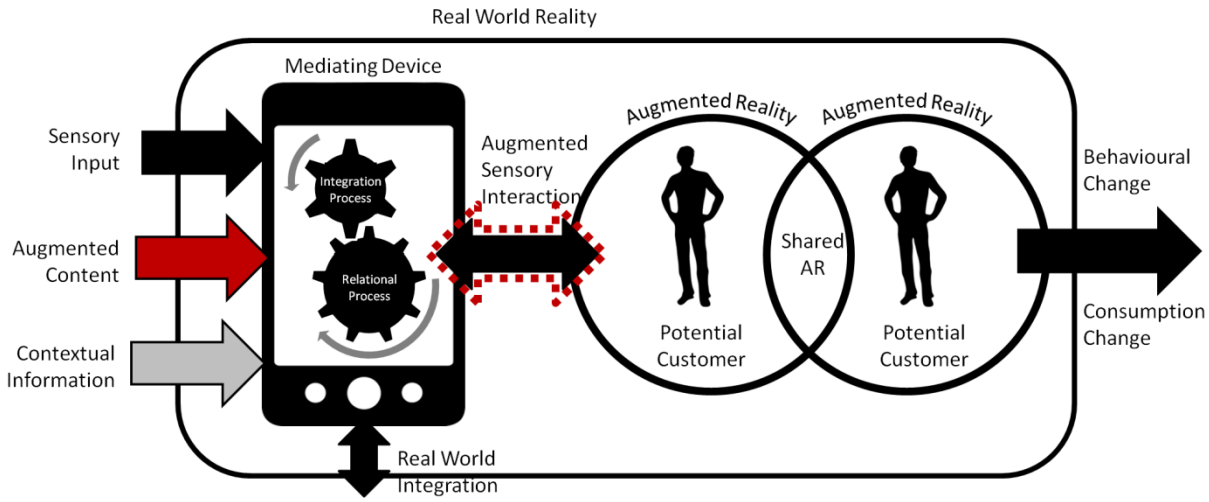
Secondly, it would need to inherit all the attributes of its media predecessors. However, most prominent of these would be AR's ability to facilitate social interaction in line with the "retrieve" action identified in the tetrad analysis. It can therefore be argued that the visual and social aspects of AR should feature more prominently.

Building on this analysis we can re-evaluate our earlier definition and systems model so as to derive a more insightful understanding of the key characteristics which would constitute a more engaging and successful AR implementation. This concept of a "better Augmented Reality" is analogous to the popular perception of the transition of the web, from a largely static "web 1.0" to the content rich, interactive and social "web 2.0". To this end, this improved AR experience will be termed as "AR 2.0", which is defined below as:

"Augmented reality 2.0, is the real-time device mediate, perception and interaction with the real-world environment that is closely or seamlessly integrated with artificially generated sensory inputs which are contextually relevant and socially integrated"

Representing this in the systems model format and building on from our previous model, we arrive at the system represented in Figure 13.

Figure 13 – "AR 2.0" systems model



The following important changes to the model should be noted:

- In line with the tetrad analysis, an interactive augmented sensory experience is an essential order qualifier. It is also an important precursor for contextual relevance.
- Over and above the sensory inputs, integration between the mediating device and the user's real world environment will allow a user's AR interactions to affect change in their real world environment. This will considerably enhance the contextual relevance of the AR experience.

- Users should be able to relate to, and interact with others in close proximity using Augmented Reality, as well as share their AR experience and thus connect at a social level through Augmented Reality.

This revised definition and model will represent our target Augmented Reality implementation blue print. A number of the hypotheses discussed in Chapter 4 will be derived from this.

An insightful exercise which can now be undertaken based upon the target model, is to measure current AR advertising implementations against the defined ideal. This is especially important considering the limited successes and appeal AR has had in the marketing space. Table 5 very broadly and generally summarises this comparison (van Krevelen et al., 2010).

Table 5 – Assessment of current AR advertising applications against the "AR 2.0" model

Attribute	Extent	Description
Visual	✓	In general most commercial AR implementations have been visual in nature
Audio	~	Few AR applications have implemented any kind of audio based augmentation
Dynamic	✓	Most applications do offer some level of dynamism to the visualisations
Interactive	~	Limited interactivity
Social	✘	Few applications have implemented any kind of social element. Those that have, have done so to a limited extent, none the less having obtained good success out of this. This attribute is therefore generally lacking
Portable	✓	Smart phones have allowed some level of portability to current AR applications, however their ergonomics are cumbersome with the user having to correctly orientate the device often with both hands limiting operability of the application. Wearable AR devices, once commercially available, should solve this.
Always On	✘	While mobile devices allowed for an "always on" and connected experience with respects to messaging and voice communications, it by no means achieved this for Augmented Reality applications. In order to access AR content users currently need to download the specific application and launch it. This represents a major barrier in the AR user experience
Contextual	✘	While finder apps and navigation aides are by their nature contextually relevant, they lack some of the other key characteristics, especially with respects to dynamic and interactive video and audio.

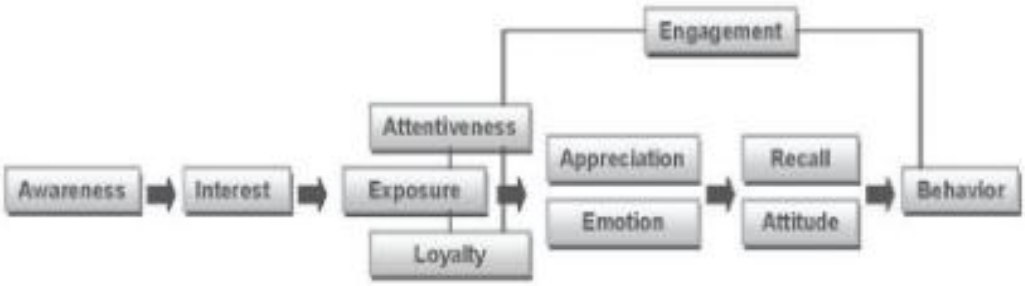
2.5 Media Engagement

The construct of "audience engagement" has been around for some time, however it has not received significant attention until recently, as a result of the changes in the industry and the challenges to the "exposure" model (Napoli, 2011). Engagement is an important construct for advertisers in that it has been shown that there is a strong correlation between levels of engagement, advertising receptivity and likelihood of purchase (Kilger & Romer, 2007) and is considered a good proxy for advertising efficiency (Wang, 2006). Eubank (2006) noted that engagement can be viewed from an advertising, brand and media perspective. Kilger et al (2007) and Napoli (2011), also observed that engagement levels have been demonstrated to vary across different media types and is therefore an important construct for this study.

A universal definition and measure of engagement however has not been agreed upon and is currently under debate within industry and academia. The Advertising Research Foundation have a number of publications dealing with the subject and have defined engagement as "Turning on a prospective consumer to a brand idea enhanced by the surrounding context" (ARF, 2006), but qualify the statement saying "it is simply too early to be fixed in our approach" (ARF, 2006). What is interesting to note with respects to this definition, is the clear reference to "context" being an enhancing factor, and which is ratified in Wang's (2006) research into advertising engagement. This of course should raise questions around the impact of the contextual nature of AR advertising on audience engagement.

According to Napoli (2011), audience engagement occurs only once the stages of awareness, interest and exposure have been traversed and begins at the point of audience attentiveness and loyalty, through the stages of appreciation and emotion, attitude and recall, and finally ending in a behavioural change. This is illustrated in Figure 14 below:

Figure 14 – Napoli (2011)'s engagement model



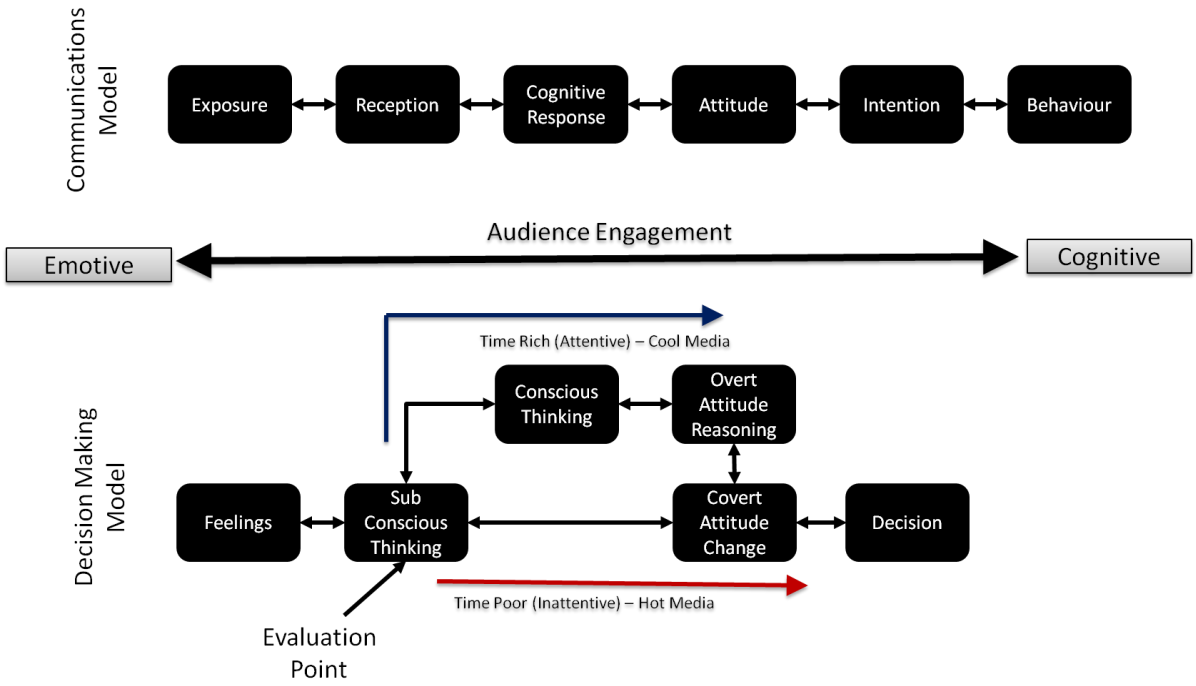
In contrast, in Plummer's et al, (2007) discourse on engagement, they recognise two concepts commonly associated with engagement, being cognitive engagement and emotive engagement, but argue that emotive engagement has by far the largest impact and therefore is the only true representation and measure of the construct. Wang (2006) separates the two concepts into engagement and involvement, representing the emotional and cognitive aspects of the advertising communication, respectively.

However the purpose of this study is not resolve this debate but rather apply a reasonable understanding of the construct to Augmented Reality based advertising. To this end and for the purposes of this study we will define "Audience Engagement" as having two primary dimensions:

- An emotional or subconscious aspect closely correlated to measures of attitude particularly with respects to the brands involved.
- A cognitive or rational aspect that is closely correlated to the level of attention and processing given to the advertisement by the audience.

We can better contextualise these by relating them to a more universal advertising communications model such as that given by Kotler et al, (2012, p. 254). To do this we need to relate it to a model of decision making such as that given by Plummer et al (2007) and based on work by Damasio (2000). This is shown in Figure 15 below.

Figure 15 – Proposed decision making-communications model for audience engagement



By using the decision making model we can clearly see that emotive engagement is more prevalent in the early and "time poor" stages of the communications model, but transitions to a more cognitive mode in the latter stages.

This brings us to the question; where in the communications model would AR be most effective? It will help us to also understand the role of AR in an integrated communications strategy and the marketing mix. In line with this, Siltanen & Aikala, (2012) advocated that AR is more effective when integrated with other media types. It is also widely accepted that certain media types, especially mass media types, are more effective at raising the call to action or driving emotive engagement as opposed to new media (McMains & Morrisey, 2009). In research by Pfeiffer (2010), it was found that different media perform better at various stages of the "advertising funnel" i.e. communication process, with traditional media, such as television, showing significant efficiency at driving the early stages, but online media performing far better at converting the lead to a sale, or the latter stages of the funnel.

This line of thinking can be related to AR advertising media by revisiting McLuhan's media theories, this time his theory of "hot" and "cool" media (Mcluhan, 1964). Very briefly and simplistically, this theory differentiates the two media "temperatures" by defining cool media as requiring significant levels of cognitive engagement as opposed to hot media. Hot media would therefore operate best in the emotive engagement space, and cool, as a cognitive engagement medium. Examples of hot media include television and radio while print is generally considered to be "cool." Augmented Reality, by deduction, and based on the definition given, would almost certainly be a cool media type, like most of its new media counterparts.

2.6 The Audience -Advertising Transaction

The discussion thus far has dealt primarily with maximising efficacy of the AR advertising engagement. However a key challenge for advertisers is getting their prospective audience to view the advert in the first place, as seldom do audiences actively seek to consume advertising. One way to solve this problem is to bundle the advert with other content, to attract and compel the audience to consume both concurrently (Pradeep, 2010). This is the central principle of the well established ad supported content model, which had worked well in conjunction with mass media, in part due to its linear and unidirectional nature, but is being challenged in its application to new media (Macnamara, 2010). As a new media type, Augmented Reality advertising is not immune to these challenges and as a result has struggled to achieve mass commercial appeal (Szymczyk, 2011).

To solve this problem, it needs to be understood how the audience makes a decision to consume content and/or advertising. Referring back to the decision communication model in Figure 15, the audience reaches a point where a subconscious choice is made, whether or not to continue with the media consumption. Essentially the audience evaluates the value gained by actively or cognitively engaging with the content and advertisement (Pradeep, 2010). At its core, this choice is a value based transaction where the audience weighs up the cost of consuming the advert (usually time as per the "time rich" dimension of the decision model) versus the value gained by viewing the associated content (Pradeep, 2010).

We can articulate this symbiotic relationship in a more logical manner using Schramm's (1965) communication theory of fractional selection, which defines an audience's propensity to view a specific piece of content as a function of reward and effort associated with the act of consumption. This is show in Figure 16, where an abbreviated form is given which will be used in subsequent explanations:

Figure 16 - Schramm's (1965) fractional selection theory

$$\frac{\text{Expectation of Reward}}{\text{Effort Required}} = \text{Frequency of Consumption} \rangle \frac{\text{Reward}}{\text{Effort}} = \text{Frequency}$$

By expanding this equation we can describe an audience's propensity to consume ad supported content. This is done by extrapolating the reward and effort variables into their respective content and advertising components. This derivation is shown in the formula in Figure 17 below:

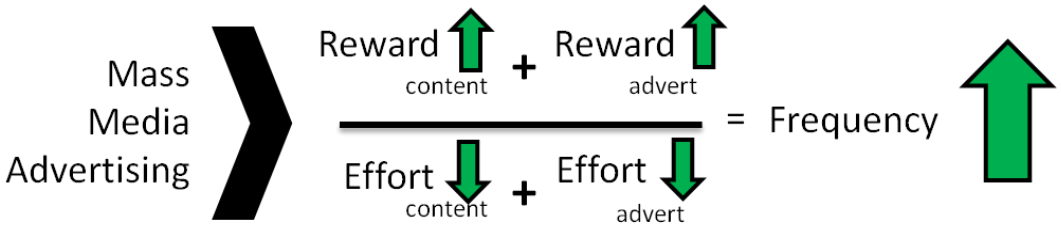
Figure 17 - Fractional selection theory applied to the ad support content model

$$\text{Advertising Supported Content} \rangle \frac{\text{Reward}_{\text{content}} + \text{Reward}_{\text{advert}}}{\text{Effort}_{\text{content}} + \text{Effort}_{\text{advert}}} = \text{Frequency}$$

Using this we can begin to understand the audience dynamics of ad supported content. More specifically, it would be relevant in the context of this study to compare mass media versus new media. Examining mass media, the equation can be simplified by the following observations. Firstly the effort required in consuming the advertising component is relatively small when compared with that of the content consumption. To illustrate this, consider a standard length television feature of 50 minutes in length, which is punctuated by two, three minute ad breaks. The six minutes of advertising relative to the 50 minute feature is relatively negligible. Furthermore, advertising in mass

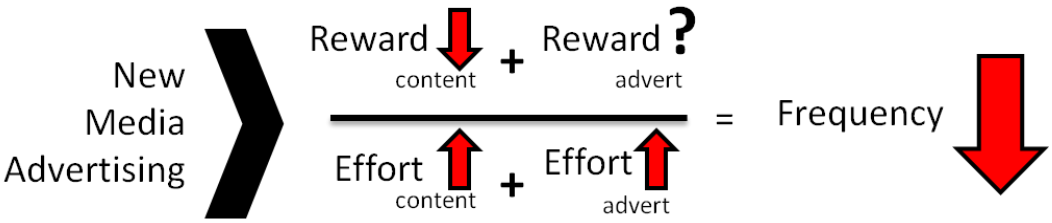
media channels is a fairly mature discipline and advertisements have become increasingly engaging, allowing the reward component of advertising to play a material role in the equation (Frank, 2013). An excellent example of this are the Super Bowl ads which run over the Super Bowl final in the USA and are considered one of the highlights of the programming (Beltrone, 2013). In addition because mass media tends to be "hot" in nature the effort required to consume the content is minimised (Mcluhan, 1964). The resulting equation for the ad support content model for mass media is thus very effective in that it minimises the denominator and maximises the numerator. This is shown, in Figure 18 below.

Figure 18 – Fractional selection theory applied to the mass media ad support content model



However for new media the ad supported content model looks significantly less attractive. This is as a result of the tendency for content consumption in new media to be in smaller quanta and therefore the effort required to consume the advert is significant relative to the content. For example a 30 second pre-screened video advert viewed prior to a 5 minute content clip on YouTube is far more significant than the mass media example given earlier. In addition, in part due to the interactive nature of new media, the effort required to consume the content is usually greater than mass media. Thus the equation for ad support new media model is as follows:

Figure 19 - Fractional selection theory applied to the new media ad support content model



Extending this to AR based advertising, as we understand it (based upon examples given in Chapter 2.3), the model rationalises down to a state, which in essence "breaks" the ad supported content model due to the fact that, in general, AR advertising is not supported by content. In essence the content components fall away resulting in the equation shown in Figure 20.

Figure 20 - Fractional selection theory applied to the Augmented Reality advertising model

This resulting equation gives some insight into why AR advertising has failed to achieve significant successes in the market (Tsirulnik, 2010). Therefore in order to make AR advertising a viable medium, marketing practitioners have three choices:

1. Bundle AR advertising with other content
2. Maximise the reward component of the advert
3. Minimise the effort required to consume the advert

The merits of bundling content such as audio, video and text are questionable, in that there would be no clear benefit of doing so versus conveying these in another medium such as web. Instead it would likely be more productive to focus on points two and three.

2.6.1 Maximising the Reward

There are a number of ways in which the advertising reward component of the equation can be maximised. As a first and obvious recourse, the quality of the advertising content will significantly impact the value judgement of the audience and correspondingly their propensity to consume the advert. (Wang, 2006).

We can also draw on the Uses and Gratification Theory (Katz, Blumler, & Gurevitch, 1973) to better understand how audiences are rewarded by advertising content. Applying these theories, to advertising, O'Donohoe (1994) found that audiences would actively seek to consume for one of seven categorical reasons, being:

- Marketing uses
- Structuring time
- Enjoyment
- Scanning the environment
- Social interaction
- Self affirmation

While AR would likely be able to employ any of these use cases, it would be prudent to focus on those to which its key characteristics would be best suited. In Chapter 2.5, AR's contextual, social and visual attributes where identified as key differentiators. To this end, scanning and social applications would possibly best fit AR as a technology. It could also be further ventured that the enjoyment category, and specifically gaming, would be a particularly well suited application.

Finally the contextual relevance of the advertising can also play a significant role in maximising the reward component. Wang (2006) demonstrated that contextually targeted ad placements can be significantly more effective. It is important at this point to recall in Chapter 2.5 that contextual relevance had two components. The first is relevance to the audience's surrounding environment, for example, location based services. Secondly, the relevance of the advertising to the audience's personal context in terms of their interests, needs, likes, etc. This has become increasingly important practice especially with new media, where online advertisers profile their users in this manner, in order to better target their advertising (Wang, 2006)

2.6.2 Minimising the Effort

The task of minimising the effort required to consume AR advertising is another important aspect of improving audience's experience of AR advertising. Some of challenges faced in this respect are that (Ghubril & Prentice, 2013):

- AR experiences currently tend only to be effective on high end devices
- Data and time costs incurred to download and synch app and associated data are significant
- Lack of standardization leads to poor performance and low interoperability
- Cumbersome interfaces and devices significantly degrade AR experiences

Addressing this issue can only be practically achieved through technological advances such as development of AR specific devices like Google Glass. This unfortunately is for the most part out of the practitioners control and is therefore a matter of waiting for the technology to further mature.

2.7 In Summary

The literature review has dealt with four main themes, that being the nature of Augmented Reality as an advertising medium as well as the more general themes of advertising engagement, integrated communications and the advertising value transaction. Through the analysis of these, four important dimensions to the Augmented Reality advertising paradigm have been identified and can be summarised as:

- Matching and differentiating media characteristics
- Integrated versus pure-play marketing media mixes
- Cognitive versus emotive advertising communications
- Uses and gratification for advertising audiences

Returning to the main research question of what constitutes an effective Augmented Reality advertising application, based on the literature study in the previous chapter, we can broadly hypothesis that such an application of AR advertising would be characterised as:

- Being contextually relevant to the audience's environment as well as the context of the individual.
- Facilitating social search, display and interaction with other AR users within their environment.
- More effective when supported by other media types and specifically mass media as part of an integrated campaign
- Better suited to communicate cognitive, as opposed to emotive; ideas, messages and information
- Best employed in the role of scanning, social and enjoyment based advertising use cases

Thus the overarching hypothesis being that: Augmented Reality based advertising which applies the above listed "best practices" will be more engaging for audiences and therefore more effective in creating the behavioural and consumption changes in favour of the advertiser.

3 Research Hypothesis

The literature review of the preceding chapter represents a fairly broad area of study. Given the resource constraints and availability, only a subset of the theory will be practically tested as part of this research. To this end the following three hypotheses were prioritised and will be examined:

1. A **contextually relevant** AR advertisement will be more engaging than the same AR based advert but without the context (as discuss in Chapters 2.2, 2.4 and 2.6). Therefore:
    - H_0: Contextual relevance of the AR advertising will make no difference in terms of audience engagement.
    - H_1: Contextually relevant AR advertising will result in a more engaged audience than non-contextual AR advertising.
2. An audience will engage better with an AR advertisement if it is **integrated** with traditional media as opposed to on its own (as discuss in Chapter 2.5). Therefore:
    - H_0: AR advertising integrated with traditional media will have no effect on audience engagement as opposed to AR advertising on its own.
    - H_1: AR advertising integrated with traditional media will be more engaging than the AR advert alone.
3. AR Advertising with an informational **message style** will generate more engagement than AR employed to drive an emotive agenda (as discuss in Chapter 2.5). Therefore:
    - H_1: Informational based AR advertising will be no more engaging than emotive based AR advertising.
    - H_0: Informational based AR advertising will be more engaging than emotive based AR advertising.

These propositions will be tested as part of the research conducted and is detailed in the chapter to follow.

4 Research Methodology

4.1 Research Approach

From a philosophical perspective, an interpretive approach would theoretically have been the most appropriate given that the study deals with the complex social phenomena of how audiences interact and react to differing forms of advertising. For this reason, as well as the perceived limited academic body of knowledge in the field of Augmented Reality advertising, an exploratory qualitative design was considered. However, after careful assessment of the merits and feasibility thereof, it was decided against this, primarily due to the lack of availability of experts within this field, for the envisaged expert interview format. (Saunders & Lewis, 2012, p. 110). In addition other forms of interpretive design would also not have been feasible due to the available population sample having had limited, and in many cases no exposure to AR advertising, and thus insufficient social phenomena had been established upon which a study could be based.

Therefore, from a pragmatic perspective, a critical realist philosophy was better suited to the study. A deductive causal approach was chosen, which was supported by a significant amount of research and methods available for measuring various aspects of advertising audience engagement. When considering the choice between a survey and experimental strategy, only the latter would meet the needs of the research due the low level of general knowledge with respects to AR advertising, as already noted.

4.2 Research Design

In order to test the defined hypotheses, a fractional factorial design (Saunders et al., 2012) was chosen. In line with this design, multiple experimental groups were exposed to different experimental treatments, with a pre and post test to measure any change resulting from the exposure. Based on the three hypotheses, three logically separate experiments were identified, and are elaborated upon below.

1) **Contextual Engagement Test**: The objective of this experiment was to first assess whether the contextual relevance of an AR advertisement had significant impact on the level of audience engagement. Participants were split into two groups:
    - Group A: were exposed to an AR advert in an appropriate contextually relevant environment.

- Group B: were exposed to an AR advert in an environment with no contextual relevance to the advert.

2) **Integrated Communications Engagement Test:** This experiment attempted to measure the extent to which audience engagement was impacted through the integration of AR advertising with other media types. Participants were divided into three groups:
   - Group C: were exposed to a related traditional media advertisement before being exposed to the AR advert.
   - Group D: were only exposed to the AR advertisement.
   - Group E: were exposed to the traditional media advertising only.
3) **Message Style Engagement Test:** This experiment attempted to measure the extent to which AR advertising was effective at driving audience engagement through the use of informative or emotive content. Participants were divided into four groups:
   - Group F: were exposed to an emotive AR advertisement dealing with a particular subject.
   - Group G: were only exposed to the informative AR advertisement on the same subject.
   - Group H: were exposed to an emotive non-AR advertisement while keeping the subject matter constant.
   - Group I: were only exposed to a non-AR informative advertisement on the same subject matter.

4.3 Design Rationalisation

Based upon the above experimental design, 9 different experimental groups would be required in order to test all the hypotheses given. However through further analysis these were rationalised down to 6 groups while still achieving the same outcome. The process of rationalisation involved identifying common attributes across the various experiments and groups.

As a baseline, the advertising media were informational, non-contextual and un-integrated in nature. From this baseline each variable was adjusted in line with the requirements of the 6 rationalised experimental groups. The results of this process are detailed in the table below.

Table 6 - Rationalised experimental test groups and their characteristics

#	Experiment	AR	Informational	Emotive	Contextual	Non-Contextual	Integrated	Un- Integrated
1	Informative AR	✓	✓			✓		✓
2	Integrated Video & AR	✓	✓	✓		✓	✓	
3	Enhanced Video		✓			✓		✓
4	Contextual AR	✓	✓		✓			✓
5	Emotive AR	✓		✓		✓		✓
6	Informative Web		✓			✓		✓

4.4 Experiment Execution

Having defined the experiments and associated groups, it is important to align the theory with the practical implementation thereof. To this end, three important aspects of the experimental execution need to be explored, being:

- Population and sample
- General experimental design
- Experimental variables and measurement

These are addressed in the sections below, following which the detailed designs of each experiment are elaborated upon.

4.4.1 Population and Sampling

The population for the experiments under consideration was defined as any person who adheres to the following broad parameters:

1. They must be a member of the general advertising audience.
2. They should be able to consume Augmented Reality advertising.

Theoretically speaking this effectively represents the general population at hand. However from a more pragmatic perspective we can narrow the scope based on the second parameter. In practice, in order to consume Augmented Reality advertising, population members would need access to the necessary mediating device, which currently effectively equates to a smart phone device. While the increasing proliferation of smart phones is a major trend, even in developing economies (Arthur, 2012), those who currently own such a device would more likely be innovators and early adopters of

Augmented Reality technology as well. Therefore a third parameter was included to refine the population scope, being:

3. They should have access to a smart phone device

Given this defined population, only non-probabilistic sampling was feasible. Kilger et al (2007) found that demographic variables where statistically significant in analysing audience engagement in the context of media, where correlations where observed between engagement, media types, as well as participant's age and gender. Therefore quota sampling aligned to especially the third parameter, with respects to age and gender, was required to account for this effect.

At this point it is key to note that the sampling approach had to be tempered to recognise the resource constraints under which these experiments could be performed. It was originally planned for a sample size of 30 respondents per defined experimental group, however only 20 per group proved to be manageable.

4.4.2 General Experimental Design

As discussed earlier, the general format of each experiment was a pre test followed by the advertising exposure and then completed with a post test. This structure is commonplace in measuring the efficacy of the advertising content. However in this case it needed to be optimised in order to be able to better infer impacts of the media from the results. Eubank (2006) noted that engagement can occur at an advertising content, brand and media level. Andrews & Durvasula, (1991) also noted that careful consideration needed to be made in the experimental design, in order to minimise the risk of biases being introduced through the choice of content and brand. These considerations included:

- **Media Portability:** Differing content, quality and styles can impact engagement scores across media (Kilger et al., 2007). While not entirely possible due to the nature and format of each media type, it was imperative that the content and brand dimensions were kept as constant as possible throughout the experiments.
- **Content Neutrality**: The incorrect choice of advertising subject matter could distort and even invalidate the results if the brand or content evoked extreme reactions in the participants. The choice of brand was especially important, as by its purpose, audiences attach specific emotions and associations to it (Calder et al., 2008).
- **Familiarity:** It was key to balance the level of familiarity the audience would have with the choice of subject matter. On the one end of the spectrum, audiences should be sufficiently

versed in the subject, to understand the advertising. On the other, and in line with research by Lazcniak, Kempf, & Meuhling (1999), audiences should not have high predisposed levels of subject knowledge as this will reduce the engagement response significantly.

- **Level of Detail:** In order to effectively test the audience engagement, there had be sufficient detail with respect to the content and subject matter to allow for testing, especially with respects to cognitive engagement.

Therefore based upon these considerations, the subject matter chosen for use in the various experiments was a passenger motor vehicle, and more specifically, the Hyundai iX35 sports utility vehicle, which is show in the illustration below.

Figure 21 – The subject matter chosen for the advertising experiments being the Hyundai iX35

In justifying this choice in context of the given content biases; the following comments can be made with respects to each:

- **Media Portability:** A broad range of media with similar content was readily available for the vehicle across different media and formats and could be repurposed in the experiments, for which permission was obtained. In addition, where it was required, creation of matching content for specific media was possible due to the availability of specific resources and skills.
- **Content Neutrality**: In a 2013 motor vehicle brand survey, Hyundai was place 43rd up from 52nd of the 100 brands surveyed (Gagnier, 2013). Based upon this, the brand was deemed to be sufficiently neutral for the purposes of the experiments.

- **Familiarity:** The iX35 is a widely available and popular passenger vehicle which has been available in South Africa since 2010. When conducting the experiments only a handful of participants needed to be show an image of the vehicle, as most were sufficiently familiar with it.
- **Level of Detail:** This was the key consideration which informed the choice of subject matter as being a motor vehicle. The number of details and features around the iX35, and any car for that fact, which could be tested, made it well suited to the purpose.

In addition to the content considerations, there were a few additional biases which needed evaluation in order to sufficiently mitigate these from occurring. The results of this evaluation exercise are detailed in the table below.

Table 7 – Experimental bias identification and mitigation

Bias	Description and Mitigation
Learning	Due to the fact that the pre and post questionnaires were identical in respect to measuring the various aspects of engagement, it was important to counteract any learning biases. To this end participants were only informed that there would be "another test" following the advertising exposure with no indication that it would contain the same question set. A second measure was put in place whereby the advertising exposure and post test were delayed by approximately 10 days following the pre-test, to minimise the effects of the short term recall of the participants.
Apathy	Another challenge was to mitigate the effects of audience apathy as this could have serious impacts, especially with respects to measuring engagement. Fortunately this was in part mitigated by the nature of the research, with a number of participants verbally indicating their enjoyment of the test, relative to other research surveys they had performed. In addition, it was found that audiences were more likely to fill in a paper based questionnaire, which was also generally quicker to complete than similar electronic based formats. Thus paper based questionnaires were used throughout.
Time bias	In line with the possible content bias noted across different formats, it was important to take into consideration the period of exposure to the advertising for the various experiments. Exposures were therefore limited to no more than 5 minutes across all formats, media and experiments. This was also important from the point of view that the exposure experience needed to simulate real world advertising consumption patterns where audiences seldom spend more than a few minutes engaging in an advertisement.

4.4.3 Experimental Variables

By its nature a causal design seeks to establish a relationship between two or more variables. Based upon the hypotheses presented in Chapter 3, the dependent and independent variables involved could be identified. Firstly, the three independent variables were:

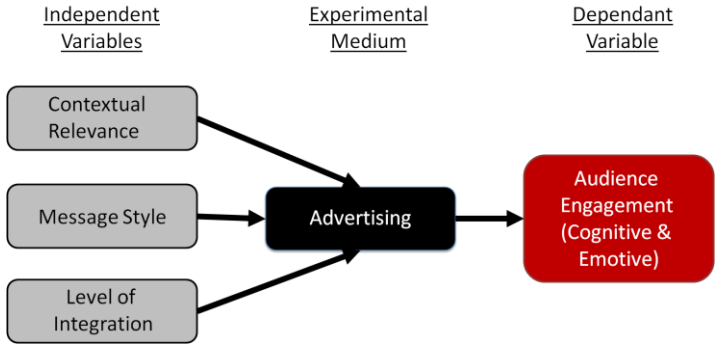
- **Contextual Relevance:** This was defined as the degree to which the advertising is related and relevant to its context, both from an environment perspective as well as the audience's context. This was defined and explored in Chapter 2.4.
- **Message Style:** This is the degree to which the advertising content has been stylised to communicate an emotively charged message on the one end of the scale or an informational message, the other.
- **Level of Integration:** This variable defines the level of integration across different media for a particular advertising campaign as discussed in Chapter 2.5. A single advertisement applied to one media type in isolation can be considered to be completely un-integrated. The level of integration increases as more media and formats of advertising are cohesively combined.

Each of these independent variables seeks to drive a single dependant variable which is given as "audience engagement". As per the literature review in Chapter 2.5, there are two main dimensions that required examination, being:

- **Emotive Engagement:** This construct is primarily measured by assessing the changes in the participant's attitudes and opinions with respects to the advertised subject matter (Lucas & Britte, 2012).
- **Cognitive Engagement:** Levels of recall and recognition of informational and visual artefacts within the content shown, are the main impacts which result from varying level of cognitive engagement (Lucas et al, 2012). Some academics refer to this as the rational level of attention (Heath, 2007).

These variables are illustrated in context of one another in Figure 22.

Figure 22 – Independent and dependant variables



4.4.4 Experimental Measurement

The main objective of the experiments was to measure the participant's level of engagement. There has been a recent renewal of interest in the subject, and as a result a number of advanced methods such as eye tracking, facial analysis and neural activity monitoring, have been developed to test these levels (Alio, Ibrahim, Pickton, & Bassford, 2009). However due to resource limitations, the experimental measurements were constrained to the more traditional questionnaire based testing.

A three step process was required in order to practically measure the outcome of each test:

1) Participants completed a pre test questionnaire.
2) They were then exposed to their assigned advertisement treatment.
3) A post test questionnaire was completed.

As noted, a decision was taken to keep the pre and post test questionnaires almost identical, only differing superficially, in their respective first sections. For the pre-test, the first section dealt with recording the basic demographics of the participant as was required for data analysis purposes. In addition, the participant's adherence to the defined population with respects to their access to a smart phone or tablet device was assessed as well. This first section is shown in Figure 23.

Figure 23 – Demographic and metadata section of the pre-questionnaire

What is your age?		15 to 24		25 to 34		35 to 44		45 to 54
		55 to 64		65 to 74		75+		
What is your gender?		Male		Female				
Do you own or have recently driven an ix35?		Yes		No				
What mobile devices do you own and or use?		Feature Phone 		Smart Phone 		Tablet 		

The first section in the post questionnaire attempted to measure the participant's engagement levels by posing direct questions around their perceived levels of engagement. While not as effective as more indirect methods (Lucas etal., 2012), and lacking the ability to assess the change in engagement levels, it was included in the hopes that it may support insights gained from the indirect engagement assessments data. Five questions were posed to the participant, based partly on Tripathi, Vilakshan (2009)'s engagement dimensions as well as direct questions around the participants emotive and cognitive levels. This section is shown in the figure below.

Figure 24 - Direct engagement assessment questions of the post-questionnaire

The core of the test was however contained in three subsequent sections kept constant across both tests. They dealt with indirect measures of engagement. As previously indicated, two types of measures were assessed, being:

- **Emotive Engagement:** In order to assess the changes in the participant's attitudes and opinion, a 7 point semantic differential scale was implemented to allow participants to score paired opposite emotive adjectives regarding the subject matter. (Lucas et al., 2012). There were 15 paired opposites examining various judgemental aspects of the vehicle. A sample of the scale used, is shown in the figure below.

Figure 25 – Emotive engagement 7 point semantic differential measurement scale sample

- **Cognitive Engagement:** in testing the levels of recall and recognition at an informational as well as visual level, two respective sections were created in the questionnaire to address this need. From an information perspective, 10 questions dealing with specific facts common to all the media and experiments were posed to the participants who had 4 possible options to choose from when answering. An excerpt of this is shown below.

Figure 26 – Cognitive informational engagement 4 option question sample

Question	JK	Answer JK	LM	Answer LM	NP	Answer NP	QR	Answer QR
What is the starting price for the base model?		R269K		R283K		R290K		R299K

Similarly for visual recognition and recall, 6 questions were presented with 4 different images for the participant to select as their answer. An excerpt of this section is also shown below

Figure 27 - Cognitive visual engagement 4 option question sample

JK	Answer JK	LM	Answer LM	NP	Answer NP	QR	Answer QR
Which start engine button belongs to the Hyundai iX35 ?							
							

Please refer to the annexure for a full copy of each of the pre and post questionnaires.

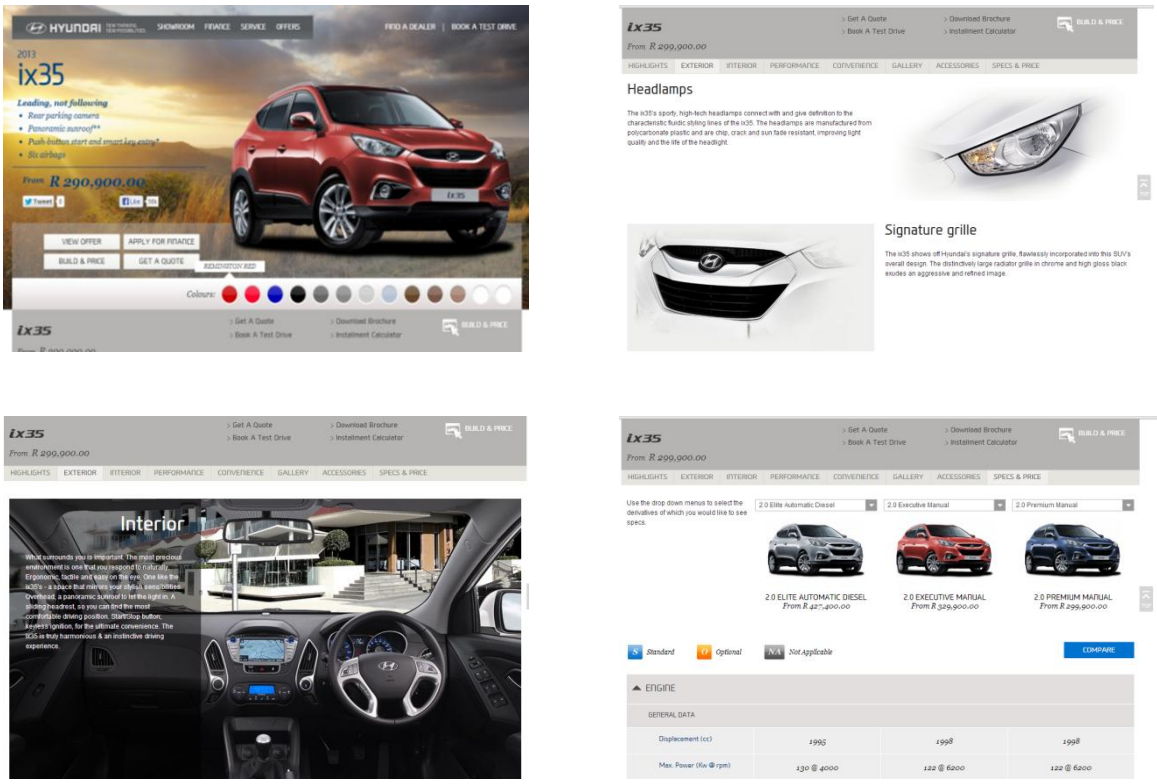
4.5 Detailed Experimental Design

As already defined, 6 different advertising experiments were required in order to test the given hypotheses. In design and execution of these, each of the identified independent variables was manipulated in order to meet the requirements of each experiment. This is detailed in the sub-sections below.

4.5.1 Informative Web

The iX35 website represented the informative, non-contextual and un-integrated advertising media baseline from which the other media and formats were derived. Participants exposed to this media were instructed to browse the website for as long they wanted to, as long as they covered all the content and did not exceed 5 minutes. They were also instructed not to follow any links. Shown below in Figure 28 are key frames from the website illustrating the nature and content therein.

Figure 28 – Key frames from the web page which served as the informative non-AR medium



4.5.2 Informative AR

Based on the website an Augmented Reality app was built to mirror the content thereof, in an AR experience. The application primarily used the target marker based AR format but also included a gyro triggered browser AR experience as well, covering 2 of the 3 AR implementation types discussed in Chapter 2.3. Once the app was launched and the landing page displayed, the user could explore three main functions, being:

- **Explore Exterior**: By aiming the tablet device at the defined target marker, participants could explore various aspects of the exterior of the vehicle through a number of functions. They could rotate the vehicle through touch gestures or by moving the target marker. They could also open and close the doors, change the vehicle colour and add optional extra's such as a nudge bar, side steps, etc. In addition, a feature browser allowed users to tap highlighted exterior features such as the side folding mirrors, displaying a detailed description thereof.
- **Explore Interior**: Using the gyro browser, users could explore the interior of the vehicle by orientating the tablet device around the virtual vehicle creating a perception of the user being inside the vehicle. Similarly to the exterior experience, users could browse key highlighted features in the vehicle interior such as the rear parking camera and air bags.

- **Review Specifications**: Again using the target marker AR method, participants could review the vehicle specification which included the engine, performance and convenience features. This was achieved by rendering a graphic based 3D bar chart of the relevant information.

The landing pages as well as these three main functions are illustrated in the screen grabs below.

Figure 29 - Key frames from the informative AR application

4.5.3 Contextual AR

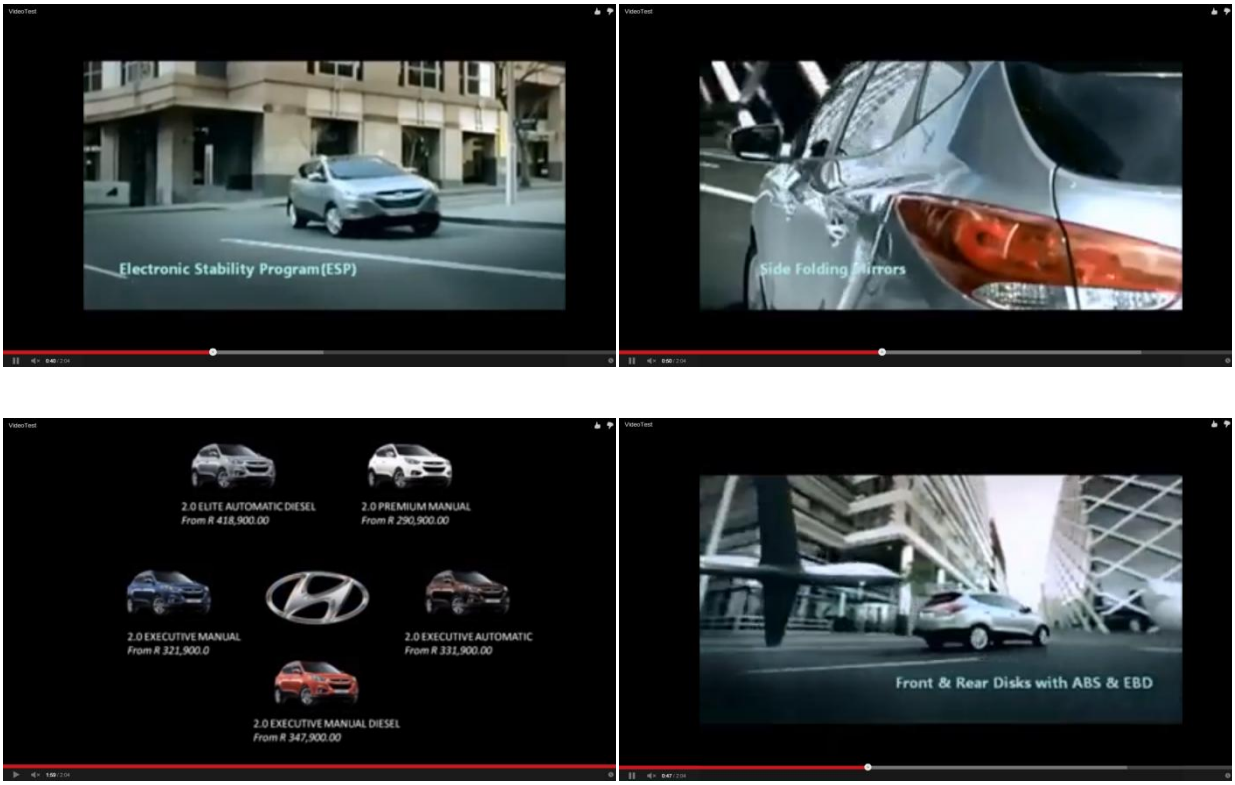
Based on the "Informative AR" the Augmented Reality app was enhanced to make the experience more contextually relevant to the audience. Again, marker based AR technology was used however as opposed to a flat A4 marker, a cube marker was created and placed in a contextually relevant environment for a motor vehicle. This app had the same three functions however the interior exploration mode was enhanced. As opposed to displaying the generic "cloudy sky" background used in the informative AR app, the background was rendered using the video feed creating the perception of the virtual vehicle being part of the surrounding environment. Screen grabs of this contextually relevant AR experience are show in Figure 30 below.

Figure 30 - Key frames from the contextually relevant AR application

4.5.4 Emotive Video

In order to address the requirements of the message style test, emotive elements had to be introduced into the experiments. To achieve this for the non-AR format experiments, video was chosen as the preferred format as it has been shown to be better at driving an emotive message with its audience than most other media (Wedel, Teixera, & Pieters, 2012). The video was carefully selected so as to align with the content presented in the web advertisement while infusing emotive elements which it achieved through sweeping panorama's and street scene's of New York coupled with a sleek jet powered aircraft following the vehicle through its journey. The video was augmented to ensure most of the factual information and visual imagery contained on the website as well as all aspects of the pre and post tests were covered. The final video was approximately two and a half minutes in length which participants were only allowed to view once before taking the post test. Scenes from the video are illustrated below.

Figure 31 - Key frames from the emotive enhanced video advertisement



4.5.5 Emotive AR

One of the biggest challengers was transferring these emotive elements into a workable AR format. Aligned to the hypothesis that AR was not well suited to deliver an emotive styled message, the limitations and format of the technology only allowed this to be achieved to a limited manner. For example, in the exterior exploration mode, as opposed to having the vehicle in isolation, the setting was enhanced to create a city street scene look and feel in line with the video. The jet aircraft seen in the video was also added as a dynamic element of the AR experience. In addition, the interior exploration mode was enhanced, where the informative AR app only rendered a plain cloudy sky, the vehicle exterior was rendered as a city street scene to try and match the aesthetics of the video and therefore hopefully capture the emotive elements thereof. In addition, the sound track from the emotive video advert was integrated into the application as it has been shown that advertising soundtracks play a significant role in driving emotional engagement (Morris & Boone, 1998). Key scenes from the “Emotive AR App” are shown in Figure 32.

Figure 32 - Key frames from the emotive AR advertisement

4.5.6 Integrated Video & AR

Finally in order to test the integrated media hypothesis, the informative AR app was combined with the same video used in the emotive advertising test, but without any of the additional informational augmentations. This was then shown to participants before they were exposed to the informative AR experience. Scenes for the unmodified video are show below. Comparing these to the modified video, the reader will notice the additional information prompts are not present besides those in the original video. Scenes for the informative AR apps are not displayed in Figure 33 but can be view in Figure 29.

Figure 33 - Key frames from the integrated video and AR advertisement

4.6 Limitations

While reasonable steps were taken to mitigate any biases as well as ensure that the independent variables were manipulated appropriately there were certain aspects which could not addressed and therefore need to be acknowledged and kept in mind when reviewing the experimental results and analysis in the subsequent chapters. The aspects include:

- While measures were put in place to minimize general product knowledge and involvement biases as identified by Lazcniak et al., (1999) this was not assessed adequately at an individual level. Some level of involvement was assessed through the 3rd question in the demographic section on the pre-questionnaire. The effects of this variable therefore cannot be adequately accounted for in the results analysis.
- While every effort was made to ensure that the emotive AR advertisement closely match key characteristics of the emotive video, those could not be fully achieved to the extent that the video could. The emotive elements were therefore limited in the emotive AR application; and therefore needs to be factored into the analysis if applicable.
- The sample method called for a quota sampling across age and gender. This was achieved to some extent; however, there was a factor of convenience in the sampling due especially to time limitations. The demographic results will be discussed in Chapter 5.2.

5 Results

This chapter will present the results and quantitative analysis of the experiments conducted as prescribed in Chapter 4. Commentary, interpretation and insights thereof, will be provided in the Chapter 0.

5.1 Terminology

For formatting and display purposes certain abbreviations and acronyms have been used. The six experimental groups were abbreviated to the following acronyms.

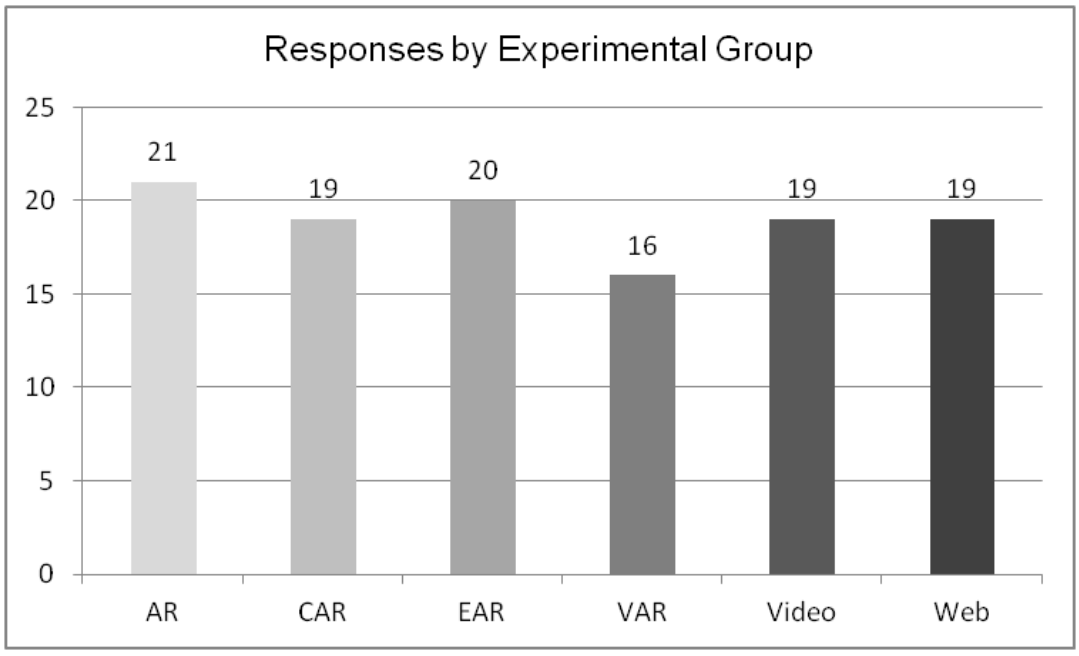
Table 8 – Acronyms used for the various experiments and groups

Experiment	Informative AR	Integrated Video & AR	Enhanced Video	Contextual AR	Emotive AR	Informative Web
Acronym	AR	VAR	Video	CAR	EAR	Web

5.2 Results Overview

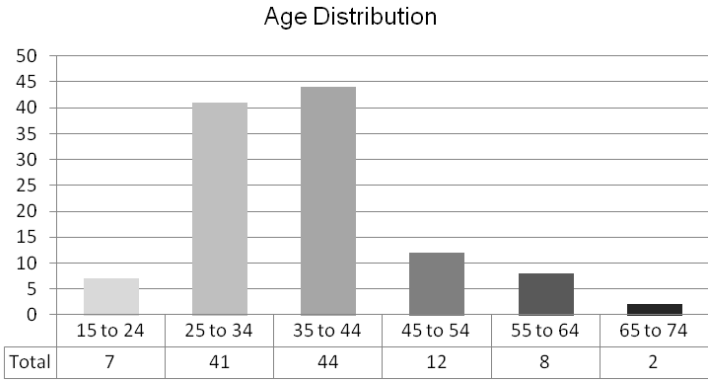
In summary 114 experiments were conducted, each comprising a pre and post questionnaire, equating to a total of 228 questionnaires. This in effect equated to 8 322 data points available for analysis against the given hypotheses. The breakdown of experiments conducted per experimental group is shown in Figure 34:

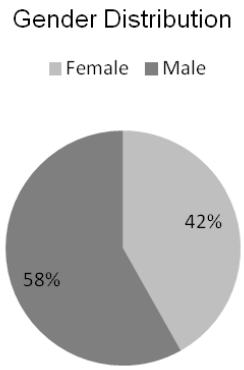
Figure 34 – Responses by experimental group bar chart



The distribution of age and gender amongst the participants is shown in Figure 35.

Figure 35 – Demographic distribution graphs for age and gender





While slightly skewed in favour of male versus female respondents, the gender demographic results were considered satisfactory. The age distribution of participants was concentrated around the 25 to 34 range. This was as a result of the convenience limitation noted in Chapter 4.6. While it would have been more desirable to have higher numbers in especially the 15 to 24 range the results were considered satisfactory in that the age spread obtained, roughly aligned with the smart phone requirement in the sample defined in Chapter 4.4.1 against data obtained through Google (2013).

5.3 Approach and Processing

The statistical analysis of the results was structured to align to the three areas of engagement tested within the questionnaires: informative, visual and emotive. In order to perform the relevant statistical analysis, the data needed to be transformed into a workable and meaningful structure and format. As per the hypothesis given and experimental method, our primary concern is with the change or delta between the pre and post test scores. To this end the data was:

1. Compared against the answer template, for the visual and informational sections, with a correct result given a score of one and an incorrect result assigned a value of zero.
2. The results were summed for each of the three sections, for both the pre as well as post questionnaires.
3. The difference or delta between the pre and post tests were then calculated as an integer value, with a positive result indicating an improved level of engagement.
4. In addition to the delta scores for each section, an overall engagement delta score was calculated by normalising scores from each of the three sections and giving each a weighting of 1/3 and a result range between zero and one.

These delta scores in conjunction with the experimental group assignments then formed the basis for the statistical analysis at both an individual section as well as overall level. The statistical analysis comprised a two step process:

1. A descriptive analysis was performed, which included parametric testing.
2. Based upon the outcome of the parametric test, changes in means were tested for statistical significance in accordance with the given hypothesis using the appropriate statistical test.

In performing the statistical analysis, a significance of 95% was applied across all tests.

5.4 Descriptive Analysis: Normalised Overall Engagement

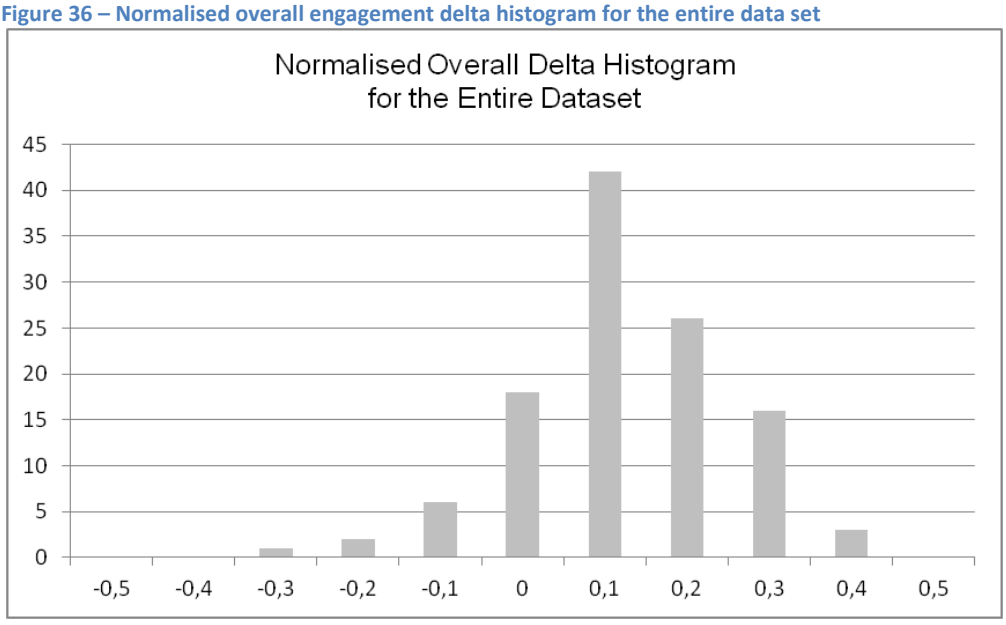
Firstly the entire normalised overall engagement data set was statistically analysed at a descriptive level to create context for the subsequent analysis of the individual experimental groups. This included the Shapiro-Wilk parametric test. The result of the analyses are shown in Table 9.

Table 9 – Descriptive statistics for the normalised overall engagement scores

Descriptive Statistics					Shapiro-Wilk Test	
Mean	0,073847	Range	0,7		W	0,984037
Standard Error	0,011857	Maximum	0,359259		p-value	0,194252
Median	0,057407	Minimum	-0,34074		alpha	0,05
Std Deviation	0,126599	Sum	8,418519		Parametric	yes
Sample Variance	0,016027	Count	114			
Kurtosis	0,536438	Skewness	-0,31687			

These are better visualised in the histogram shown in Figure 36.

Figure 36 – Normalised overall engagement delta histogram for the entire data set



Descriptive analytics were then performed on the data set at an experimental group level, the results of which are shown in the table below.

Table 10 - Descriptive statistics for the normalised overall engagement scores for each test group

Descriptive Statistics	AR	CAR	EAR	VAR	Video	Web
Mean	0,038977	0,120078	0,096852	0,059028	0,076023	0,052242
Standard Error	0,022869	0,024481	0,029289	0,037285	0,027563	0,033237
Median	0,037037	0,162963	0,07963	0,05	0,059259	0,051852
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0,1048	0,106712	0,130986	0,149142	0,120143	0,144876
Sample Variance	0,010983	0,011387	0,017157	0,022243	0,014434	0,020989
Kurtosis	0,230265	0,568087	-0,27537	1,084147	0,467365	1,717592
Skewness	-0,23708	-0,92076	0,178578	-0,00478	-0,34046	-0,75304
Range	0,433333	0,4	0,503704	0,625926	0,496296	0,614815
Maximum	0,222222	0,251852	0,355556	0,359259	0,303704	0,274074
Minimum	-0,21111	-0,14815	-0,14815	-0,26667	-0,19259	-0,34074
Sum	0,818519	2,281481	1,937037	0,944444	1,444444	0,992593
Count	21	19	20	16	19	19
Shapiro-Wilk Test	**AR**	**CAR**	**EAR**	**VAR**	**Video**	**Web**
W	0,968285	0,927065	0,968043	0,933093	0,978671	0,919871
p-value	0,694837	0,120203	0,689446	0,15876	0,905181	0,08626
alpha	0,05	0,05	0,05	0,05	0,05	0,05
normal	yes	yes	yes	yes	yes	yes

The results of the Shapiro-Wilk test for the normalised overall engagement test for each experimental group yielded a normalised score for each. This will allow for parametric testing against the relevant hypothesis. The results of the group based descriptive analytics are also illustrated in the box plot and bar chart in Figure 37 and Figure 38.

Figure 37 – Overall normalised engagement delta box plot by experimental group

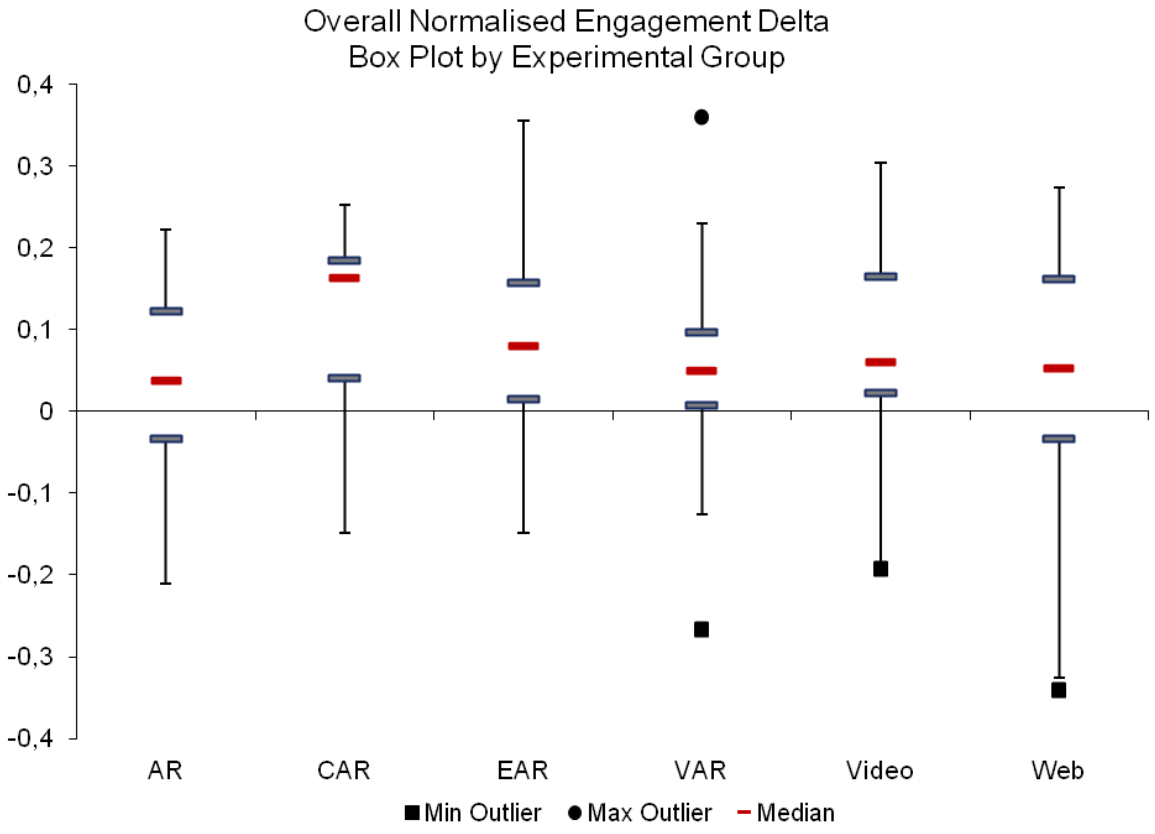
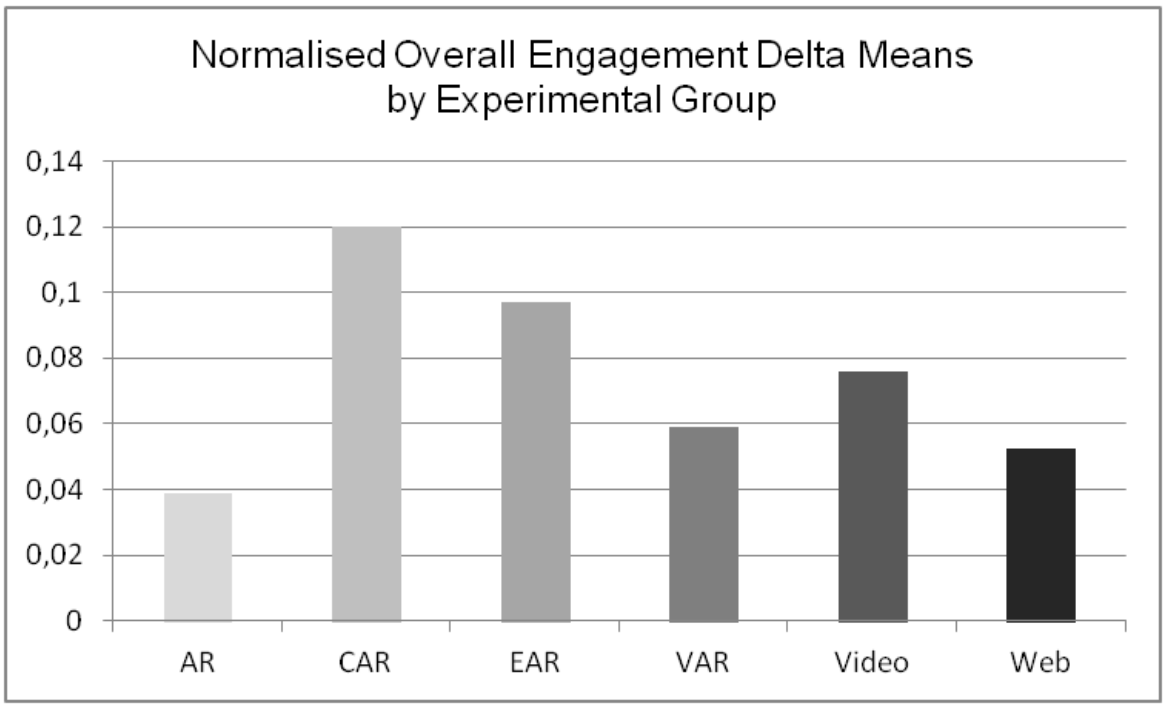


Figure 38 – Normalised overall engagement delta means by experimental group



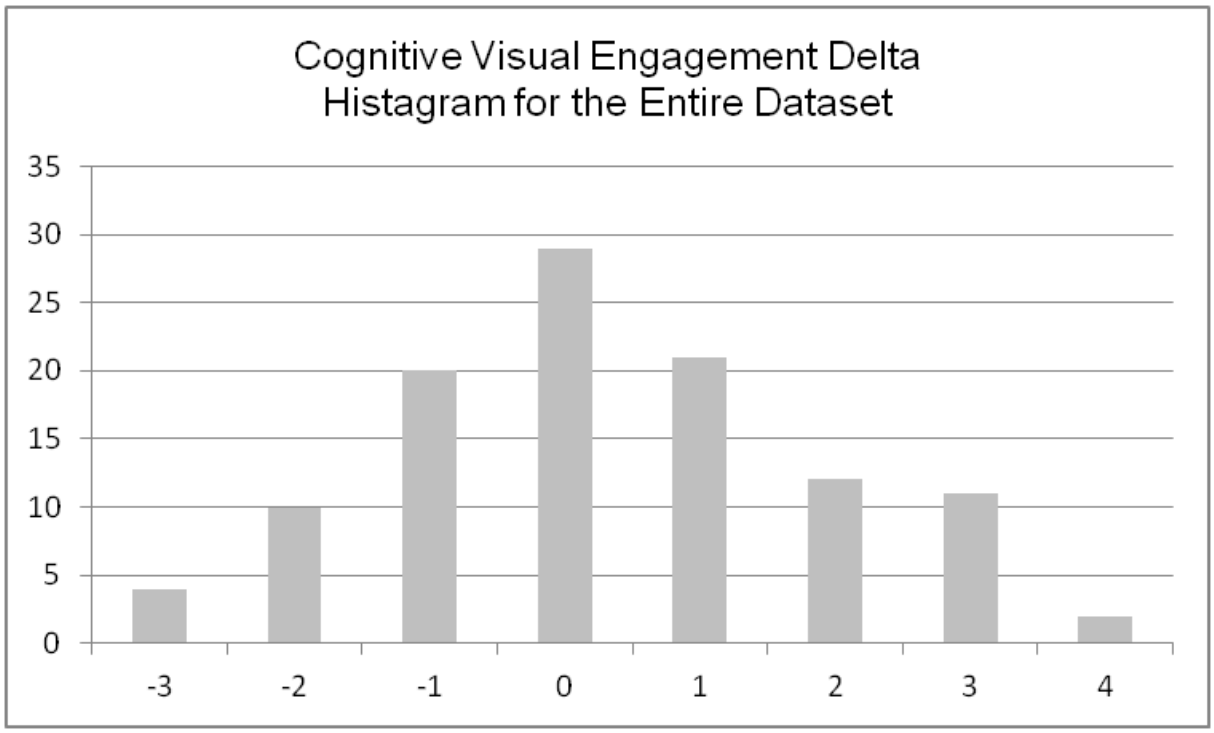
5.5 Descriptive Analysis: Cognitive Visual Engagement

Following analysis at an overall engagement level, descriptive analytics were then performed for each section of the questionnaire or engagement measure (visual, informative and emotive). Starting with the visual engagement data and in the same manner as the overall engagement analysis, the entire visual data set was descriptively analysed followed by an analysis at an experimental group level. This is detailed and illustrated in Table 11 and Figure 39.

Table 11 - Descriptive statistics for all the visual engagement scores

Descriptive Statistics					Shapiro-Wilk Test	
Mean	0,342592593	Range	9		W	0,960193
Standard Error	0,168043141	Maximum	6		p-value	0,002602
Median	0	Minimum	-3		alpha	0,05
Mode	0	Sum	37		Parametric	No
Std Deviation	1,746355548	Count	108			
Sample Variance	3,049757702	Kurtosis	0,115687			
Skewness	0,327660					

Figure 39 - Visual engagement delta histogram for the entire data set



Following the overall data analysis, each individual experimental group was analysed on the same basis.

Table 12 - Descriptive statistics for the visual engagement scores for each test group

Descriptive Statistics						
	AR	*CAR*	*EAR*	*VAR*	*Video*	*Web*
Mean	Mean	-0,33333	1,210526	0,8	-0,0625	0,111111
Standard Error	Std Error	0,311168	0,346907	0,367065	0,413005	0,360545
Median	Median	-1	1	1	0	0
Mode	Mode	-1	1	1	-1	0
Standard Deviation	Standard Deviation	1,42595	1,512134	1,641565	1,652019	1,529663
Sample Variance	Sample Variance	2,033333	2,28655	2,694737	2,729167	2,339869
Kurtosis	Kurtosis	-0,67342	-0,13567	-0,71013	0,139797	-0,02889
Skewness	Skewness	0,199071	-0,18267	0,276032	0,51845	-0,20863
Range	Range	5	6	6	6	6
Maximum	Maximum	2	4	4	3	3
Minimum	Minimum	-3	-2	-2	-3	-3
Sum	Sum	-7	23	16	-1	2
Count	Count	21	19	20	16	18
Shapiro-Wilk Test						
	AR	CAR	EAR	VAR	Video	Web
W	0,931404	0,965874	0,949295	0,920033	0,944469	0,936987
p-value	0,146867	0,641146	0,330327	0,086905	0,26671	0,189876
alpha	0,05	0,05	0,05	0,05	0,05	0,05
normal	yes	yes	yes	yes	yes	yes

While the Shapiro-Wilk test did not yield a parametric result for the data at a macro level, it did confirm that all experimental groups were parametric, again allowing for parametric statistical testing against this data set at a group level. The results of the group based descriptive analytics are also illustrated in the box plot a bar chart in the figures below.

Figure 40 - Visual engagement delta box blot by experimental group

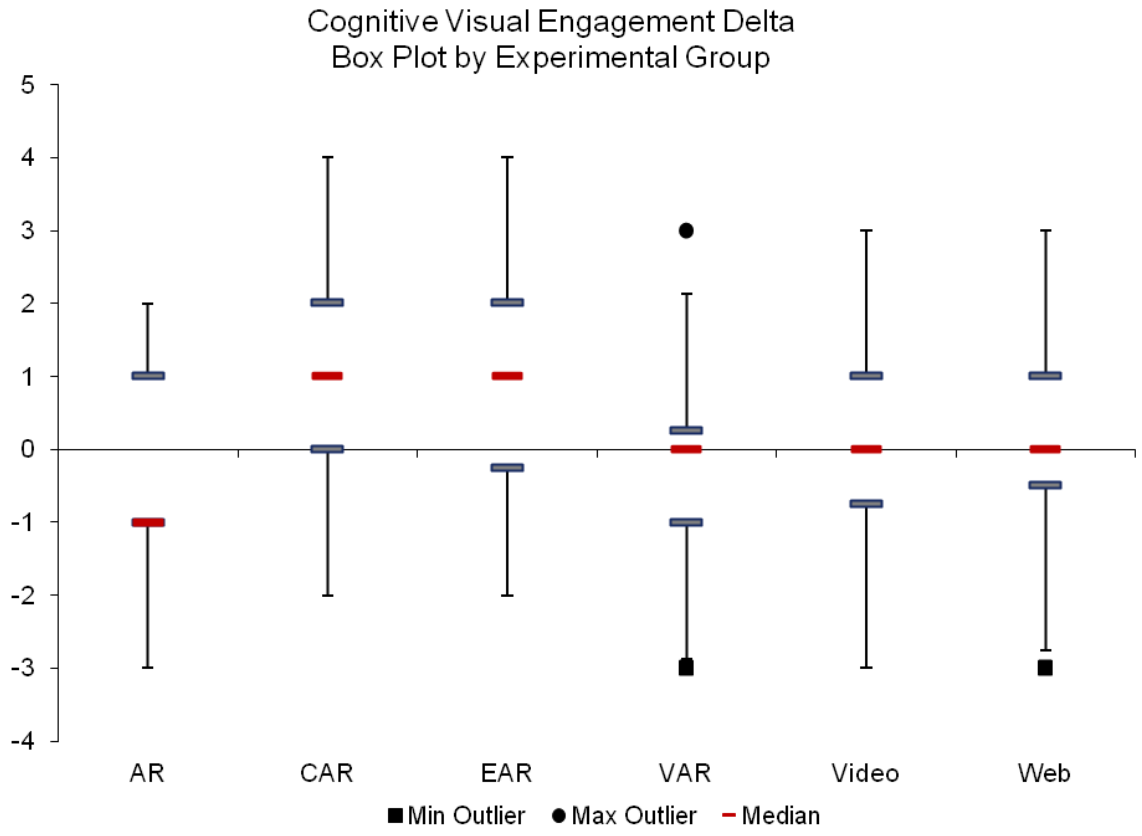
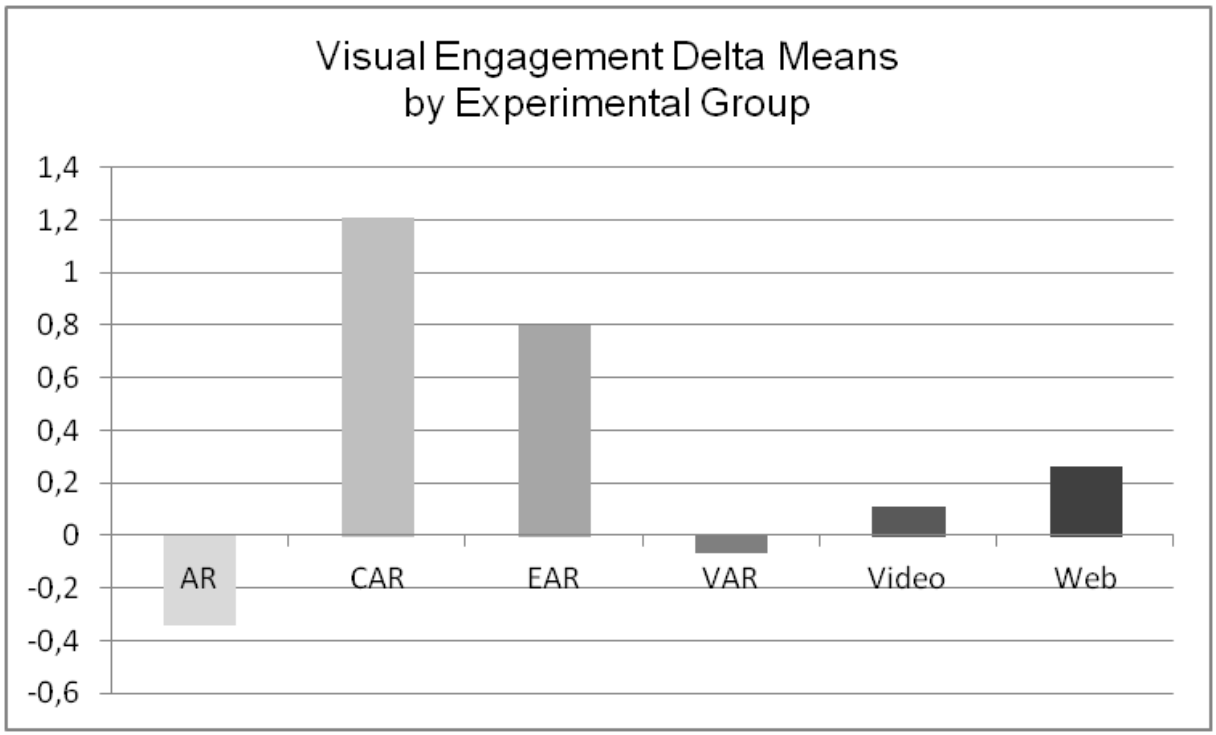


Figure 41 - Visual engagement delta means by experimental group



5.6 Descriptive Analysis: Cognitive Informational Engagement

In line with the visual analysis, the same analysis methodology was performed on the informational engagement data at an overall and group level, the result of which are shown in the tables and figures to follow.

Table 13 - Descriptive statistics for all the informative engagement scores

Descriptive Statistics					Shapiro-Wilk Test	
Mean	1,333333333	Range	14		W	0,958686377
Standard Error	0,202496027	Maximum	9		p-value	0,001681121
Median	1	Minimum	-5		alpha	0,05
Mode	2	Sum	148		normal	No
Std Deviation	2,133428028	Count	111			
Sample Variance	4,551515152	Skewness	0,35487230			
Kurtosis	1,762778366					

Figure 42 - Visual engagement delta histogram for the entire data set

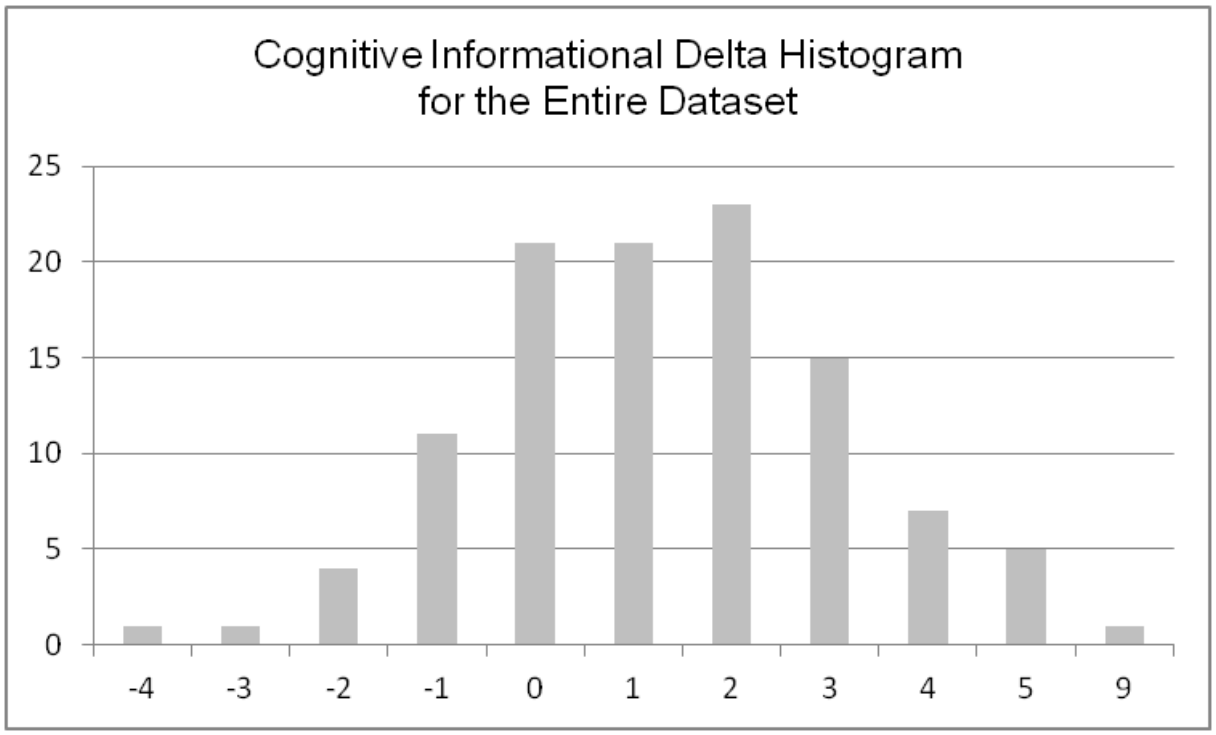


Table 14 - Descriptive statistics for the visual informative scores for each test group

Descriptive Statistics						
	AR	*CAR*	*EAR*	*VAR*	*Video*	*Web*
Mean	1,3	1,3158	1,35	1,25	1,5263	1,2105
Standard Error	0,5482	0,3591	0,3346	0,559	0,4737	0,6692
Median	1	1	1,5	1,5	2	1
Mode	0	1	2	2	2	1
Standard Deviation	2,4516	1,5653	1,4965	2,2361	2,0647	2,917
Sample Variance	6,0105	2,4503	2,2395	5	4,2632	8,5088
Kurtosis	2,3888	-0,3851	-0,7711	-0,1765	-0,7594	2,4593
Skewness	0,6139	-0,2976	0,1652	-0,0716	0,1274	0,6231
Range	12	6	5	8	7	14
Maximum	8	4	4	5	5	9
Minimum	-4	-2	-1	-3	-2	-5
Sum	26	25	27	20	29	23
Count	20	19	20	16	19	19
Shapiro-Wilk Test						
	AR	*CAR*	*EAR*	*VAR*	*Video*	*Web*
W	0,9243	0,9533	0,9335	0,9622	0,9501	0,926
p-value	0,1198	0,4205	0,1801	0,5881	0,3689	0,1296
alpha	0,05	0,05	0,05	0,05	0,05	0,05
normal	yes	yes	yes	yes	yes	yes

Figure 43 - Informative engagement delta means by experimental group

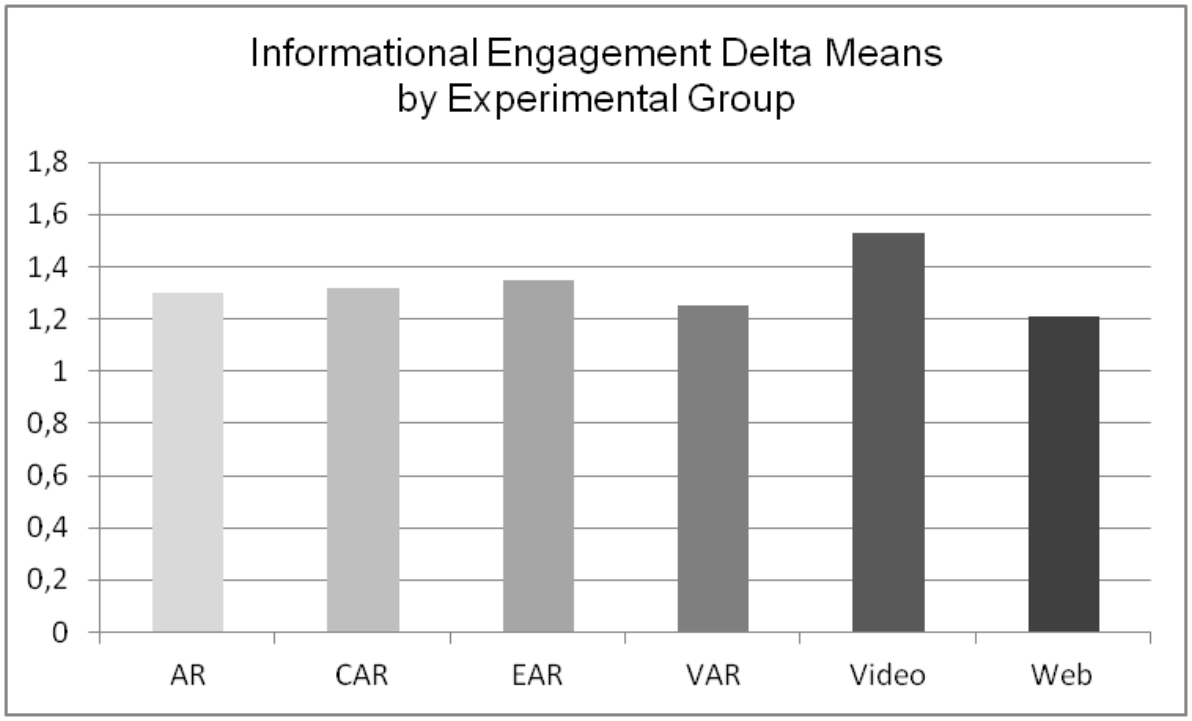
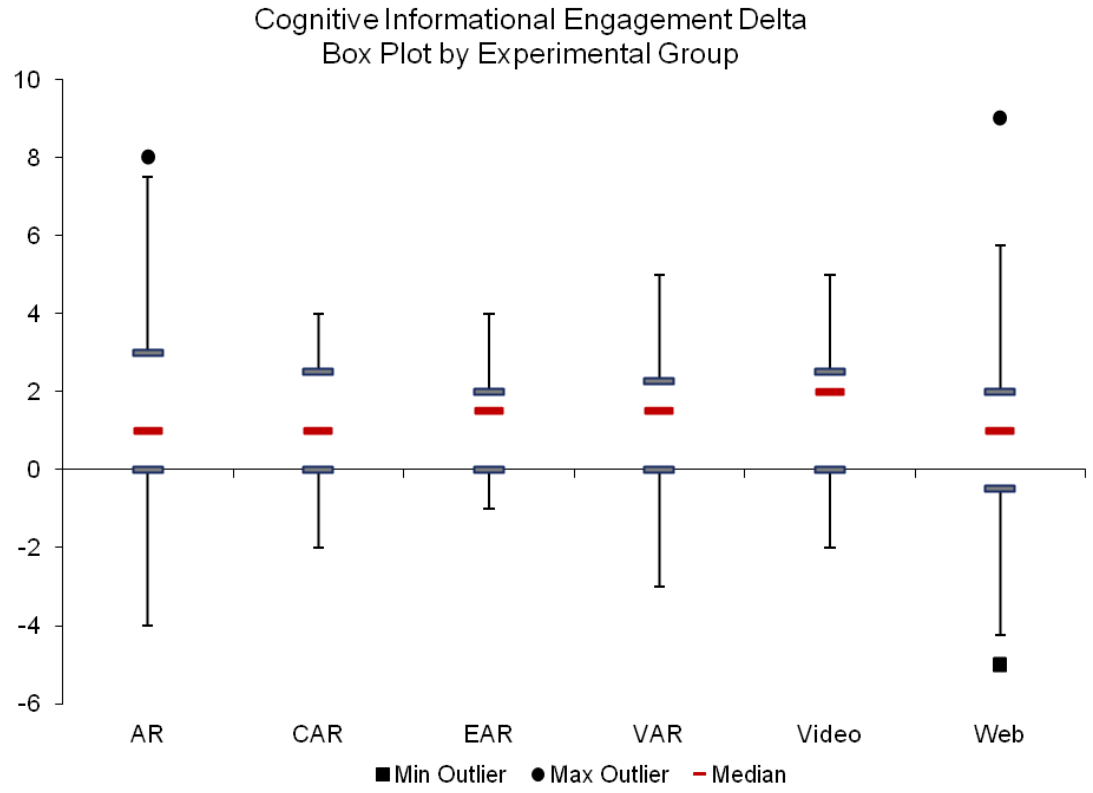


Figure 44 - Informative engagement delta box blot by experimental group



Again the tests confirmed that the data was parametric at a group level allowing for parametric testing for the hypothesis against the informational engagement data set.

5.7 Descriptive Analysis: Emotive Engagement

Finally the emotive engagement data was subject to the same descriptive analysis as the previous engagement data sets. It is however important to note that the Shaprio-Wilk test yielded positive parametric results for all experimental groups with the exception of the emotive AR group (EAR). This will therefore require non-parametric methods be applied when this group is involved statistical tests against a hypothesis.

Table 15 - Descriptive statistics for all the emotive engagement scores

Descriptive Statistics					Shapiro-Wilk Test	
Mean	3,900901	Range	145		W	0,811111
Standard Error	1,287816	Maximum	74		p-value	1,28E-10
Median	3	Minimum	-71		alpha	0,05
Mode	-6	Sum	433		normal	No
Std Deviation	13,56798	Count	111			
Sample Variance	184,0901	Skewness	-0,13591			
Kurtosis	13,64432					

Figure 45 - Emotive engagement delta histogram for the entire data set

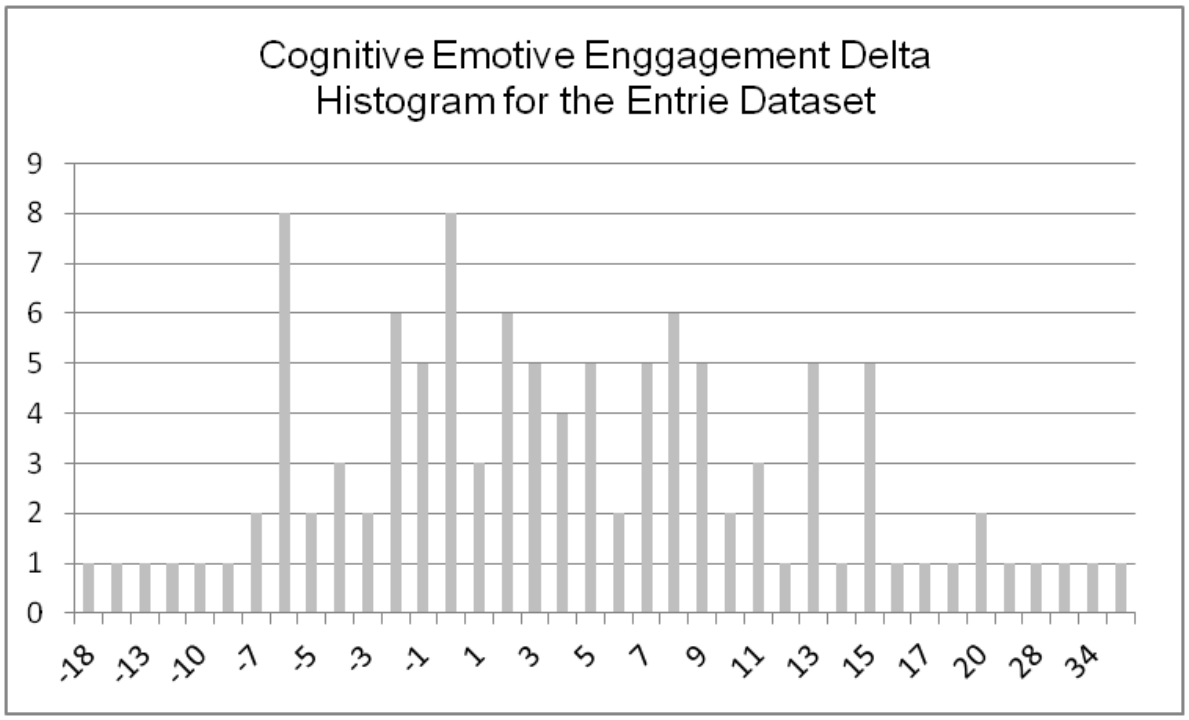


Table 16 - Descriptive statistics for the emotive informative scores for each test group

Descriptive Statistics						
	AR	*CAR*	*EAR*	*VAR*	*Video*	*Web*
Mean	7,809524	3,368421	2,25	5,0625	5,684211	-1,21053
Standard Error	1,376017	1,706901	1,891637	2,422927	2,799387	2,140638
Median	8	3	0	5,5	2	-1
Mode	9	-2	0	15	0	-6
Standard Deviation	6,305704	7,44021	8,459657	9,691706	12,20224	9,330827
Sample Variance	39,7619	55,35673	71,56579	93,92917	148,8947	87,06433
Kurtosis	-0,6706	-0,47973	10,9971	0,239875	0,281509	-0,11182
Skewness	0,12576	0,230167	2,950421	-0,53273	0,72348	-0,26904
Range	23	28	40	37	46	35
Maximum	20	19	34	20	33	15
Minimum	-3	-9	-6	-17	-13	-20
Sum	164	64	45	81	108	-23
Count	21	19	20	16	19	19
Shapiro-Wilk Test						
	AR	*CAR*	*EAR*	*VAR*	*Video*	*Web*
W	0,979186	0,979507	0,679095	0,93699	0,940519	0,96608
p-value	0,91326	0,918123	1,53E-05	0,189906	0,223117	0,645705
alpha	0,05	0,05	0,05	0,05	0,05	0,05
normal	yes	yes	no	yes	yes	yes

Figure 46 - Emotive engagement delta box plot by experimental group

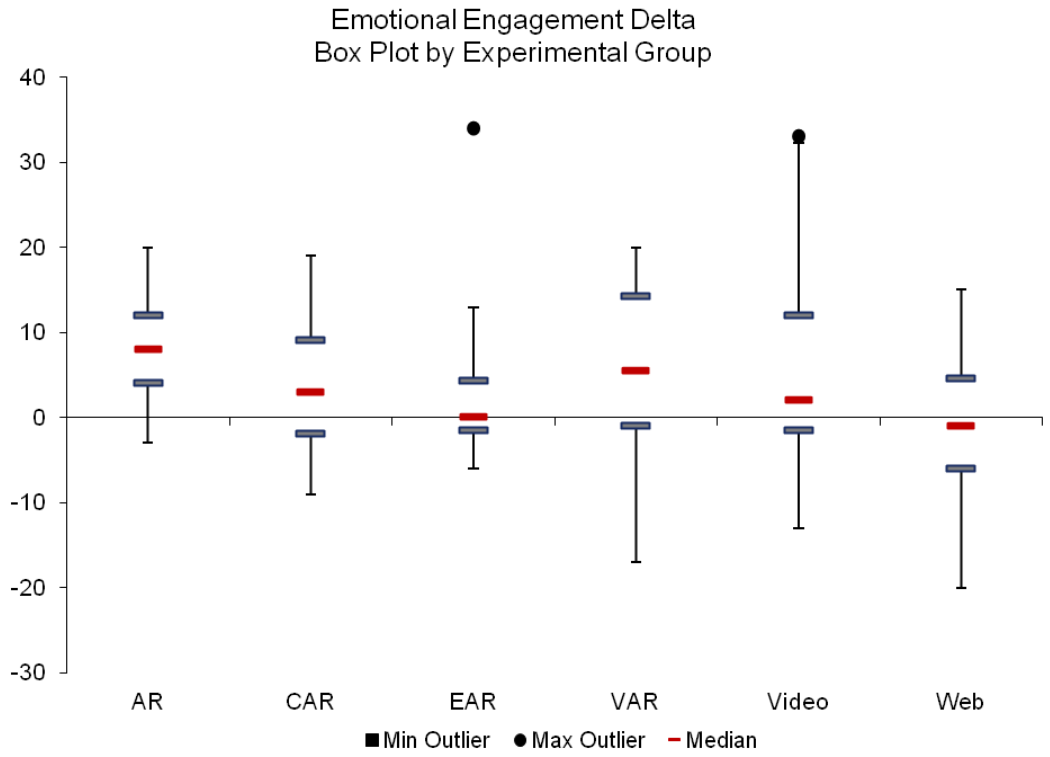
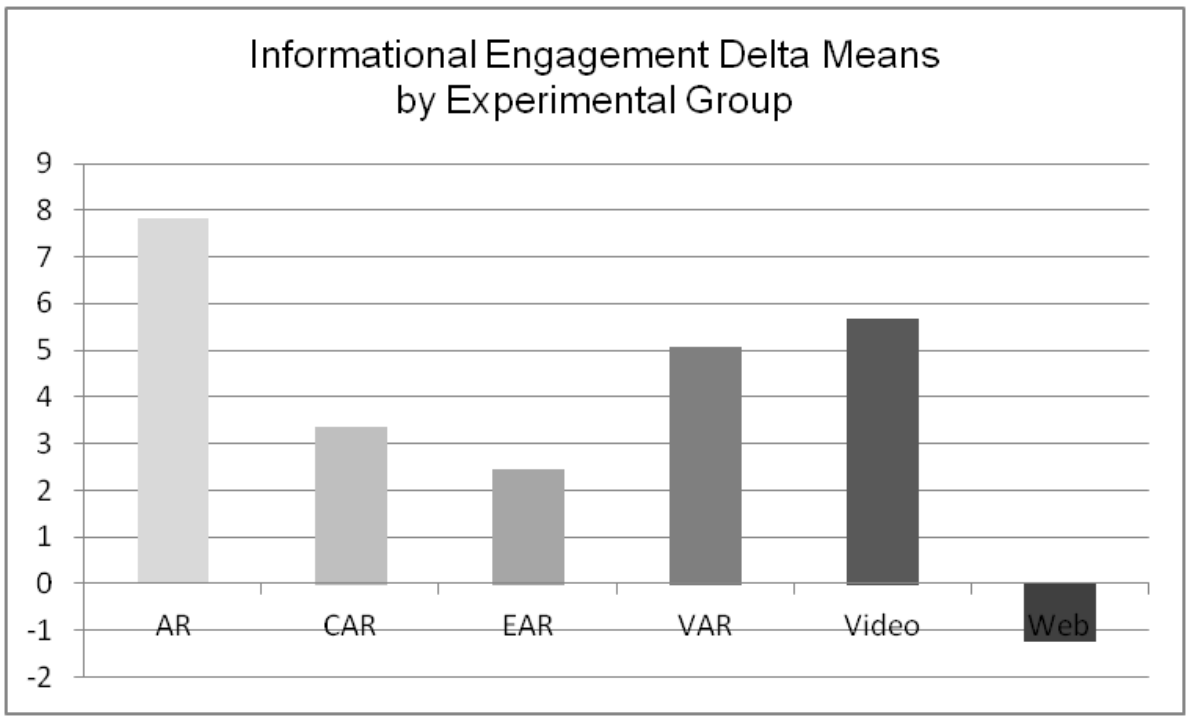


Figure 47 - Emotive engagement delta means by experimental group



5.8 Hypothesis Testing: Contextual Relevance

In testing the contextual relevance hypothesis only two test groups were analysed relative to one another being the information AR (AR) and the contextual AR (CAR). As per the descriptive statistics, parametric testing could be used for all engagement types, where a T-test for two independent samples of unequal variance was performed. These are detailed for all engagement types below.

5.8.1 AR and CAR Analysis

The statistical analysis across the informative AR and contextual AR groups yielded significant results for the overall, visual and emotive engagement dimensions. This is detailed in Table 17 below.

Table 17 – Statistical significance analysis across all engagement dimensions for AR and CAR group

Overall Engagement — T Test: Two Independent Samples

Groups	*Count*	*Mean*	*Variance*	*PARAMETERS*		*POOLED (AR & CAR)*	
AR	21	0,038977	0,010983	Alpha	*0.05*	*Variance*	0,011175
CAR	19	0,120078	0,011387	df	37,453	*Std Err*	0,033501
				T TEST: Unequal Variances		t	2,420824
	p-value	*t-crit*	*lower*	*upper*	*sig*	*df*	38
One Tail	0,010255	1,687094			yes	*Cohen d*	0,767202
Two Tail	0,020509	2,026192	-0,14898	-0,01322	yes	*Effect r*	0,365533

Emotive Engagement — T Test: Two Independent Samples

Groups	*Count*	*Mean*	*Variance*	*PARAMETERS*		*POOLED (AR & CAR)*	
AR	21	10,8181	237,013	Alpha	*0.05*	*Variance*	47,4564
CAR	19	3,21052	57,6198	df	31,568	*Std Err*	2,20025
				T TEST: Unequal Variances		t	2,042374
	p-value	*t-crit*	*lower*	*upper*	*sig*	*df*	38
One Tail	0,02458	1,69551			yes	*Cohen d*	0,652319
Two Tail	0,04916	2,03951	0,02956	15,1857	yes	*Effect r*	0,314505

Informative Engagement — T Test: Two Independent Samples

Groups	*Count*	*Mean*	*Variance*	*PARAMETERS*		*POOLED (AR & CAR)*	
AR	21	1,285714	5,714286	Alpha	*0.05*	*Variance*	4,168184
CAR	19	1,315789	2,450292	df	31,568	*Std Err*	0,633302
				T TEST: Unequal Variances		t	0,047489
	p-value	*t-crit*	*lower*	*upper*	*sig*	*df*	38
One Tail	0,4812	1,690924			no	*Cohen d*	0,014731
Two Tail	0,962401	2,032244	-1,3171	1,25695	no	*Effect r*	0,007704

Visual Engagement — T Test: Two Independent Samples

Groups	*Count*	*Mean*	*Variance*	*PARAMETERS*		*POOLED (AR & CAR)*	
AR	21	-0,33333	2,033333	Alpha	*0.05*	*Variance*	2,153278
CAR	19	1,210526	2,28655	df	31,568	*Std Err*	0,466015
				T TEST: Unequal Variances		t	3,312896

	p-value	t-crit	lower	upper	sig	df	38
One Tail	0,00103	1,687094			yes	Cohen d	1,052102
Two Tail	0,00207	2,026192	-2,4881	-0,59962	yes	Effect r	0,47339

5.9 Hypothesis Testing: Level of Integration

Testing the media integration hypothesis involved 3 test groups, across which two T-tests for independent samples with unequal variance, were run. The first and primary tests were applied across the informative AR and video integrated AR groups. The results of these are detailed in the tables below for each engagement measure.

5.9.1 AR and VAR Analysis

Table 18 details the statistical analysis between the means of the informative AR and Video Integrated AR groups, across all engagement measures. No statistical significance differences in the means were found.

Table 18 - Statistical significance analysis across all engagement dimensions for AR and VAR group

Overall Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & VAR)	
AR	21	0,038977	0,010983	Alpha	0.05	Variance	0,015809
VAR	16	0,059028	0,022243	df	25,682	Std Err	0,04374
						t	0,458405
						df	35
						Cohen d	0,15947
						Effect r	0,077253

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,325311	1,708141			no
Two Tail	0,650622	2,059539	-0,11014	0,070034	no

Emotive Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & VAR)	
AR	21	7,809524	39,7619	Alpha	0.05	Variance	62,97645
VAR	16	5,0625	93,92917	df	24.33	Std Err	2,786395
						t	0,98587
						df	35
						Cohen d	0,346157
						Effect r	0,164376

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,16701	1,710882			no
Two Tail	0,33403	2,063899	-3,00381	8,49786	no

Informative Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & VAR)	
AR	21	1,285714	5,714286	Alpha	0.05	Variance	5,408163
VAR	16	1,25	5	df	33,266	Std Err	0,764597
						t	0,04671
						df	35
						Cohen d	0,015357
						Effect r	0,007895

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,481512	1,69236			no
Two Tail	0,963025	2,034515	-1,51987	1,591299	no

Visual Engagement						T Test: Two Independent Samples	
Groups	*Count*	*Mean*	*Variance*		*PARAMETERS*		*POOLED (AR & VAR)*
AR	21	-0,2381	2,490476		Alpha	0.05	Variance 2,592772
VAR	16	-0,0625	2,729167		df	31,638	Std Err 0,537743
				T TEST: Unequal Variances			t 0,326541
	p-value	*t-crit*	*lower*	*upper*	*sig*		df 35
One Tail	0,373105	1,695519			no		Cohen d 0,109051
Two Tail	0,746209	2,039513	-1,27233	0,921138	no		Effect r 0,055112

5.9.2 VAR and Video Analysis

In order to test the relative impact of the addition of the video component into the video integrated AR group (VAR), a series of T-tests were run against the enhanced video test group (Video) results and the integrated video AR group results (VAR). In line with the primary analysis across the AR and VAR groups, no significant mean differences were found. These results are shown below.

Table 19 - Statistical significance analysis across all engagement dimensions for VAR and Video groups

Overall Engagement						T Test: Two Independent Samples	
Groups	*Count*	*Mean*	*Variance*		*PARAMETERS*		*POOLED (VAR & Video)*
VAR	16	0,059028	0,022243		Alpha	*0.05*	*Variance* *0,017984*
Video	19	0,076023	0,014434		df	28,725	*Std Err* *0,046367*
				T TEST: Unequal Variances			t *0,366545*
	p-value	*t-crit*	*lower*	*upper*	*sig*		*df* *33*
One Tail	0,358357	1,701131			no		*Cohen d* *0,126735*
Two Tail	0,716714	2,048407	-0,11197	0,077983	no		*Effect r* *0,063678*
Emotive Engagement						T Test: Two Independent Samples	
Groups	*Count*	*Mean*	*Variance*		*PARAMETERS*		*POOLED (VAR & Video)*
VAR	16	5,0625	93,92917		Alpha	0.05	*Variance* 123,9104
Video	19	5,684211	148,8947		df	30,793	*Std Err* 3,702315
				T TEST: Unequal Variances			t 0,167925
	p-value	*t-crit*	*lower*	*upper*	*sig*		*df* 33
One Tail	0,43385	1,693889			no		*Cohen d* 0,055851
Two Tail	0,867699	2,036933	-8,16308	6,919659	no		*Effect r* 0,029219
Informative Engagement						T Test: Two Independent Samples	
Groups	*Count*	*Mean*	*Variance*		*PARAMETERS*		*POOLED (VAR & Video)*
VAR	16	1,25	5		Alpha	0.05	*Variance* 4,598086
Video	19	1,526316	4,263158		df	32,908	*Std Err* 0,732719
				T TEST: Unequal Variances			t 0,37711
	p-value	*t-crit*	*lower*	*upper*	*sig*		*df* 33
One Tail	0,354373	1,697261			no		*Cohen d* 0,12886
Two Tail	0,708746	2,042272	-1,77273	1,220095	no		*Effect r* 0,065505

Visual Engagement						T Test: Two Independent Samples	
Groups	*Count*	*Mean*	*Variance*	*PARAMETERS*		*POOLED (VAR & Video)*	
VAR	16	-0,0625	2,729167	Alpha	0.05	Variance	2,522352
Video	19	0,111111	2,339869	df	30,793	Std Err	0,548239
				T TEST: Unequal Variances		t	0,316671
	p-value	*t-crit*	*lower*	*upper*	*sig*	*df*	33
One Tail	0,376843	1,697261			no	*Cohen d*	0,109314
Two Tail	0,753687	2,042272	-1,29326	0,946042	no	*Effect r*	0,055892

5.10 Hypothesis Testing: Message Style

A total of four groups were subject to an equal number of statistical significance tests across the groups in order to assess the various aspects of the hypothesis. These four test groups included informative AR (AR), emotive AR (EAR), web and video. In line with previous analysis, T-tests for independent samples and unequal variances were applied with the exception of tests involving the EAR test group which was deemed non-parametric in the descriptive statistical analysis. To that end Mann-Whitney Test for Independent Samples was applied.

The four sets of tests conducted in line with the experimental design, were applied across the groups:

- Informative AR (AR) and emotive AR (EAR)
- Informative AR(AR) and informative Non-AR or web (Web)
- Emotive AR (EAR) and emotive Non-AR or the enhanced video (Video)
- Web and Enhanced Video

Again, the statistical analysis was applied across all engagement measures. The results of this analysis are detailed in the tables below.

5.10.1 AR and Web Analysis

The tables below detail the statistical analysis between the means of the informative AR and Web groups, across all engagement measures. Only the emotive engagement dimension yielded a statistically significant difference between their respective means.

Table 20 - Statistical significance analysis across all engagement dimensions for AR and Web groups

Overall Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & Web)	
AR	21	0,038977	0,010983	Alpha	0.05	Variance	0,015723
Web	19	0,052242	0,020989	df	32,518	Std Err	0,040345
				T TEST: Unequal Variances		t	0,328784
	p-value	t-crit	lower	upper	sig	df	38
One Tail	0,372231	1,693889			no	Cohen d	0,105787
Two Tail	0,744461	2,036933	-0,09544	0,068915	no	Effect r	0,05326

Emotive Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & Web)	
AR	21	7,809524	39,7619	Alpha	0.05	Variance	62,16832
Web	19	-1,21053	87,06433	df	31,160	Std Err	2,544751
				T TEST: Unequal Variances		t	3,544571
	p-value	t-crit	lower	upper	sig	df	38
One Tail	0,000636	1,695519			yes	Cohen d	1,143996
Two Tail	0,001271	2,039513	3,829996	14,2101	yes	Effect r	0,498475

Informative Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & Web)	
AR	21	1,285714	5,714286	Alpha	0.05	Variance	6,859526
Web	19	1,210526	8,508772	df	34,917	Std Err	0,833889
				T TEST: Unequal Variances		t	0,074591
	p-value	t-crit	lower	upper	sig	df	38
One Tail	0,464954	1,690924			no	Cohen d	0,023749
Two Tail	0,929909	2,032244	-1,64916	1,799531	no	Effect r	0,011943

Visual Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (AR & Web)	
AR	21	-0,2381	2,490476	Alpha	0.05	Variance	3,723519
Web	19	0,263158	5,093567	df	31,840	Std Err	0,621833
				T TEST: Unequal Variances		t	0,806089
	p-value	t-crit	lower	upper	sig	df	38
One Tail	0,213166	1,695519			no	Cohen d	0,259765
Two Tail	0,426332	2,039513	-1,76949	0,766984	no	Effect r	0,129661

5.10.2 AR and EAR Analysis

Two significant differences were uncovered between the AR and EAR groups at an emotive and visual engagement dimension. The analysis on the overall engagement results yielded a near significant result. Mann-Whitney test had to be applied across the emotive engagement dimension due to the non-parametric nature of the EAR group scores .The tables below detail this analysis.

Table 21 - Statistical significance analysis across all engagement dimensions for AR and EAR groups

Overall Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance
AR	21	0,038977	0,010983
EAR	20	0,096852	0,017157

PARAMETERS	
Alpha	0.05
df	36,382

POOLED (AR & EAR)	
Variance	0,013991
Std Err	0,03716
t	1,557449
df	39
Cohen d	0,489289
Effect r	0,24198

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,064056	1,688298			no
Two Tail	0,128112	2,028094	-0,13324	0,017489	no

Emotive Engagement

Mann-Whitney Test

	AR	EAR
count	21	20
median	8	0,5
rank sum	559,5	301,5
U	91,5	328,5

	one tail	two tail
alpha	0,05	
std dev	38,34058	
z-score	-3,09072	
effect r	0,482689	
p-value	0,000998	0,001997
sig	yes	yes

Informative Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance
AR	21	1,285714	5,714286
EAR	20	1,35	2,660526

PARAMETERS	
Alpha	0.05
df	35,423

POOLED (AR & EAR)	
Variance	4,122841
Std Err	0,616901
t	0,12526
df	39
Cohen d	0,038056
Effect r	0,019801

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,460064	1,689572			no
Two Tail	0,920128	2,030108	-1,35645	1,227883	no

Visual Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance
AR	21	-0,2381	2,490476
EAR	20	1	2,888889

PARAMETERS	
Alpha	0.05
df	36,852

POOLED (AR & EAR)	
Variance	2,679198
Std Err	0,520232
t	2,379893
df	39
Cohen d	0,7564
Effect r	0,360161

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,011368	1,688298			yes
Two Tail	0,022737	2,028094	-2,29317	-0,18302	yes

5.10.3 EAR and Video Analysis

The visual engagement dimension yielded a significant result across the EAR and Video test groups. Again a non-parametric test method has to be applied to the emotive dimension for the same reasons given earlier. This and the analysis of the other engagement dimensions is detailed in Table 22 below.

Table 22 - Statistical significance analysis across all engagement dimensions for EAR and Video groups

Overall Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance
EAR	20	0,096852	0,017157
Video	19	0,076023	0,014434

PARAMETERS	
Alpha	0.05
df	36,958

POOLED (EAR & Video)	
Variance	0,015833
Std Err	0,040219
t	0,517876
df	37
Cohen d	0,165532
Effect r	0,084831

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,303856	1,688298			no
Two Tail	0,607713	2,028094	-0,06074	0,102396	no

Emotive Engagement

Mann-Whitney Test

	EAR	Video
count	19	19
median	2	2
rank sum	373	368
U	178	183

	one tail	two tail
alpha	0,05	
std dev	34,25274	
z-score	-0,07299	
effect r	0,01184	
p-value	0,470908	0,941817
sig	no	no

Informative Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance
EAR	20	1,526316	2,152047
Video	19	1,526316	4,263158

PARAMETERS	
Alpha	0.05
df	31,840

POOLED (EAR & Video)	
Variance	3,207602
Std Err	0,58107
t	0
df	37
Cohen d	0
Effect r	0

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,5	1,693889			no
Two Tail	1	2,036933	-1,1836	1,183601	no

Visual Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance
EAR	20	1,166667	2,5
Video	19	0,111111	2,339869

PARAMETERS	
Alpha	0.05
df	33,962

POOLED (EAR & Video)	
Variance	2,419935
Std Err	0,518538
t	2,035638
df	34
Cohen d	0,678546
Effect r	0,329601

T TEST: Unequal Variances

	p-value	t-crit	lower	upper	sig
One Tail	0,02494	1,69236			yes
Two Tail	0,049881	2,034515	0,000582	2,110529	yes

5.10.4 Video and Web Analysis

Finally the same analysis was applied across the Video and Web test groups with a significant result emerging from the emotive engagement analysis. The tables below detail this analysis.

Table 23 - Statistical significance analysis across all engagement dimensions for Web and Video groups

Overall Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (Web& Video)	
Web	19	0,052242	0,020989	Alpha	0.05	Variance	0,017712
Video	19	0,076023	0,014434	df	36,382	Std Err	0,043179
						t	0,550775
T TEST: Unequal Variances						df	36
	p-value	t-crit	lower	upper	sig	Cohen d	0,178695
One Tail	0,292694	1,690924			no	Effect r	0,091412
Two Tail	0,585389	2,032244	-0,11153	0,063968	no		

Emotive Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (Web& Video)	
Web	19	-1,21052	87,064327	Alpha	0.05	Variance	117,9795
Video	19	5,684210	148,89473	df	33,686	Std Err	3,524046
						t	1,956483
T TEST: Unequal Variances						df	36
	p-value	t-crit	lower	upper	sig	Cohen d	0,634767
One Tail	0,029457	1,692360			yes	Effect r	0,310015
Two Tail	0,058914	2,034515	-14,06446	0,274988	no		

Informative Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (Web& Video)	
Web	19	1,210526	8,508772	Alpha	0.05	Variance	6,385965
Video	19	1,526316	4,263158	df	32,417	Std Err	0,819882
T TEST: Unequal Variances						t	0,385164
	p-value	t-crit	lower	upper	sig	df	36
One Tail	0,351332	1,693889			no	Cohen d	0,124964
Two Tail	0,702664	2,036933	-1,98583	1,354256	no	Effect r	0,064062

Visual Engagement — T Test: Two Independent Samples

Groups	Count	Mean	Variance	PARAMETERS		POOLED (Web& Video)	
Web	19	0,263158	5,0939256	Alpha	0.05	Variance	3,756057
Video	19	0,111111	2,339869	df	31,777	Std Err	0,630932
T TEST: Unequal Variances						t	0,240988
	p-value	t-crit	lower	upper	sig	df	36
One Tail	0,405576	1,695519			no	Cohen d	0,078453
Two Tail	0,811152	2,039513	-1,13475	1,438841	no	Effect r	0,040701

6 Results Discussion

This chapter represents a culmination of all previous chapters, where the experimental results and accompanying analyses detailed in Chapter 5 will be examined against the relevant hypothesis given in Chapter 3, in the context of the associated literature review and experimental methods elaborated upon in Chapters 2 and 4 respectively. To achieve this, key elements from each of these sections are brought together to better contextualise the discussion and interpretation of the results. Through this process, the validity of the hypothesis will be confirmed, as well any additional insights extracted, which may be relevant to the problem definition.

6.1 Contextual Relevance

The hypothesis given with respects to the impact of contextual relevance on AR advertising, theorised that a contextually relevant AR advert would be more engaging to its audience versus a non-contextual counterpart. To this end two AR adverts were created, one in a non-contextual and the other in a contextually relevant environment. These are illustrated in Figure 48, in juxtaposition to one another.

Figure 48 – Similar visuals from CAR and AR experiments shown in juxtaposition to one another

Contextual AR Advertisement (CAR) Informational AR Advertisement (AR)

Two independent groups were tested against each of the respective adverts and their levels of engagement assessed. A summary of the statistical analysis performed against the experimental results is detailed in Table 24.

Table 24 – Summary of statistical analysis for the contextual relevance hypothesis

	Overall	Visual	Informational	Emotive
AR Mean	0,04	-0,33	1,27	7,81
CAR Mean	0,12	1,21	1,32	3,32
Mean Delta	-0,08	-1,54	-0,04	4,49
Range	0,43	6,00	12,00	28,00
Delta % Range	-19%	-26%	0%	16%
Significance	yes	yes	no	yes
	98%	100%	6%	95%

Reviewing these holistically, and considering that 3 out of the 4 tests performed, yielded statistically significant outcomes, it gives sufficient basis to reject the null hypothesis and infer that contextual relevance is significant in impacting the level of audience engagement when consuming Augmented Reality advertising. This aligns to Wang's (2006) finding with respects to audience engagement and contextual relevance for new media. However, further to this it should be noted that the overall improved level of engagement is driven almost exclusively at a visual level, tempered by a negative emotive dimension. Contextual relevance had practically no impact on the level of informational engagement.

In attempting to understand why the visual dimension was so prominent in the contextual experiment it could be surmised that this is as a result of the vehicle being rendered in a familiar surrounding environment, it was visually easier for the audience to cognitively process and therefore engage with the advert. This is supported by the media naturalness hypothesis presented by Kock (2005) where more natural communications require less cognitive resource and are less ambiguous.

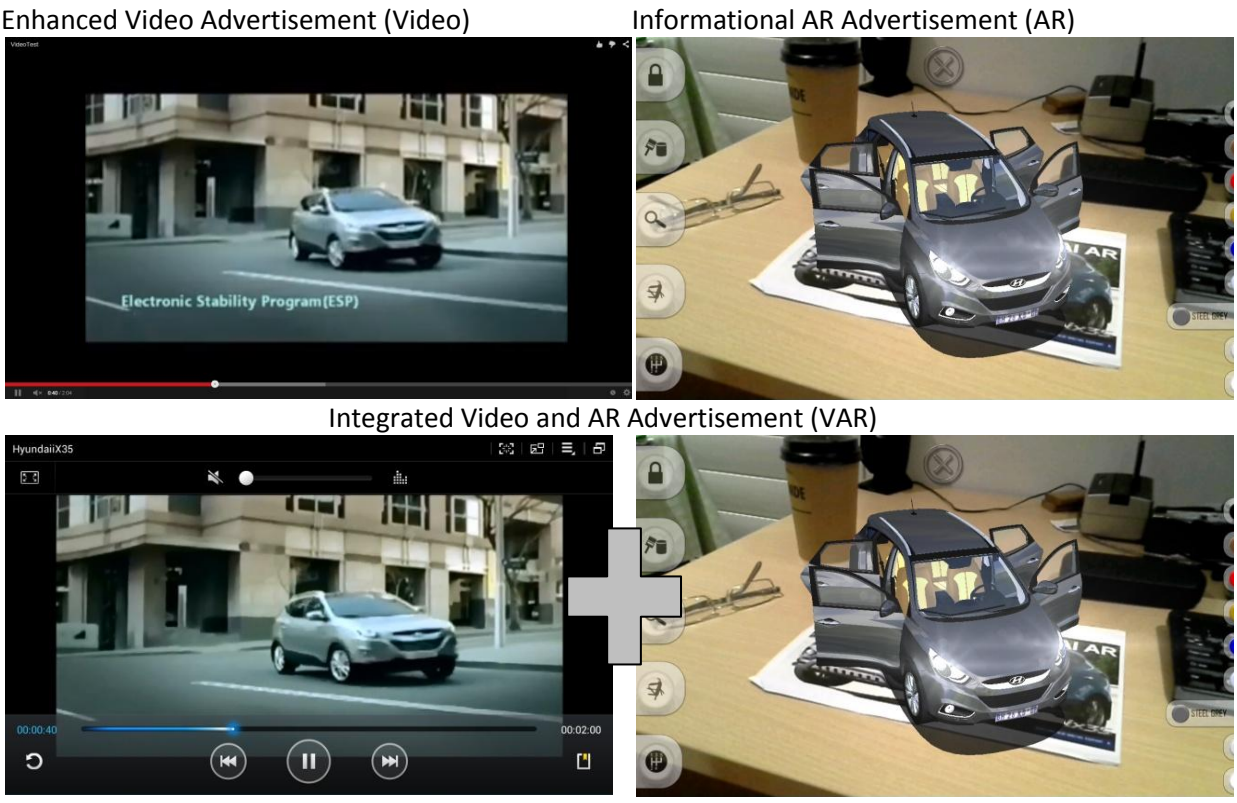
In interpreting this result it should be kept in mind that the design of the contextually relevant experiment only covered one out of the two contextual dimensions. As noted in Chapter 4, the contextual relevance of the AR experience was limited to integration with the surrounding environment and did not address the audience's personal context. Siltanen et al.,(2012) noted the importance of the audience's personal context in driving a successful AR advertising campaign. Had both aspects been addressed the level of differentiation may have been even greater, possibly with a more significant impact in the informational, and especially, emotive engagement dimensions. This however would be an area of further study and analysis.

6.2 Level of Integration

Through the literature study it was hypothesised that the level of engagement obtained through Augmented Reality advertising could be significantly enhanced through integration with other media types. Further to this it was inferred that AR would be most effective when employed in the latter half of the advertising funnel and supported upfront by a medium proven in creating awareness and interest in an audience.

To test this, participants within an independent experimental group were exposed to a video prior to consuming the AR advertisement. The results of this experiment were compared and analysed against the test group which were only exposed to the AR advert. In addition an enhanced version of the video was shown to another "control group". The latter experiment was performed in order to ascertain what degree of the engagement in the integrated test was driven by the video versus the Augmented Reality experience. Screens from each of the three tests are shown together in Figure 49.

Figure 49 - Similar visuals from Video, IAR and AR experiments shown in juxtaposition to one another



Two sets of statistical analysis were performed across the three test groups in order to assess the validity of the hypothesis. A summary of the primary analysis performed between the AR and VAR test groups, is shown in Table 25.

Table 25 - Summary of statistical analysis for the media integration hypothesis across AR and VAR groups

	Overall	Visual	Informational	Emotive
AR Mean	0,04	-0,35	1,27	7,81
VAR Mean	0,06	-0,06	1,25	5,06
Mean Delta	-0,02	-0,29	0,02	2,75
Range	0,63	6	12	37
Delta % Range	-3%	-5%	0%	7%
Significance	no	no	no	no
	35%	40%	2%	67%

Reviewing these results it is clear that there is no statistically significant distinction between the levels of audience engagement for the standard versus the video supported AR advertisement. The only dimension to display any material difference, although not statistically, is the emotive engagement test results, which curiously yielded a lower engagement mean score for the integrated test. This result in itself is counterintuitive and completely opposed to that which was theorised. We therefore cannot reject the null hypothesis in this case and thereby infer that integrated AR advertising is no more engaging than AR in isolation.

As a result of the lack of a statistically significant result from the primary analysis, comparing the integrated test group with that of the enhanced video is for the most part moot. The only insight which may be gained, is by contrasting the emotive engagement mean scores across the three groups. While there was a relatively small difference between integrated and enhanced video group's scores, the plain AR group's emotive scores were materially higher. This hints at the strength of AR alone to drive emotive engagement and possibly an area of further exploration.

Table 26 - Summary of statistical analysis for the media integration hypothesis across VAR and Video groups

Contextual	Overall	Visual	Informational	Emotive
VAR Mean	0,06	-0,06	1,25	5,06
Video Mean	0,08	0,11	1,53	5,68
Mean Delta	-0,02	-0,17	-0,28	-0,62
Range	0,63	6	8	46
Delta % Range	-3%	-3%	-3%	-1%
Significance	no	no	no	no
	28%	25%	2%	13%

Something to note in respect of the results obtained for the media integration tests was that the video and AR integrated test group had the least number of participants (16 versus 20). The results may have yielded significant scores, especially in the emotive engagement dimension, had the number of participants been greater.

6.3 Message Style

The third and final hypothesis attempted to address the impact of advertising message style on audience engagement. To this end audience groups were exposed either to an emotive or informative styled advert and the corresponding engagement levels assessed. However, an additional dimension was included within the experimental scope, where participants were further divided into AR and non-AR advertising groups. The purpose of this added dimension was to be able to compare AR's relative sensitivity to changes in message style versus other established media types. The resulting experimental design thus comprised four independent test groups. In the illustration in Figure 50 are 4 scenes from each of the different advertisements to which each specific group was exposed.

Figure 50 - Similar visuals from Video, VAR, EAR and AR experiments shown in juxtaposition to one another

Emotive AR Advertising

Informational AR Advertising

Enhance Video (Emotive non-AR) Advertising

Web (Informative non-AR) Advertising

As a starting point, a review of the statistical analysis performed between the two AR groups reveals two significant changes within the visual and emotive engagement scores for the emotive and informative AR test groups. These results are show in Table 27.

Table 27 - Summary of statistical analysis for the media integration hypothesis across AR and EAR groups

	Overall	Visual	Informational	Emotive
AR Mean	0,04	-0,24	1,29	7,81
EAR Mean	0,10	1,00	1,35	2,35
Mean Delta	-0,06	-1,24	-0,06	5,46
Range	0,50	6	12	40
Delta % Range	-11%	-21%	-1%	14%
Significance	no	Yes	no	yes
	87%	98%	8%	97%

Most surprising and almost counterintuitive is the emotive engagement results, where the informative AR advertisement scored a statistically significant better mean than that of the emotive AR advert. This result is contrary to Plummer's et al., (2010) view that "high levels of emotional content will equate to high levels of engagement". This trend of contradictory results extends into the visual engagement results, where the emotive AR group's mean score was significantly higher than that of the informative AR test group. While the overall normalised engagement results were not statistically significant for the given alpha, they are material enough for consideration, with the emotive AR advertisement scoring 11% higher in overall engagement measure. Before any conclusions can be drawn and especially considering the conflicting results reviewed thus far it is important to examine the results of the other tests performed as part of the experimental scope. To this end, shown below are the summaries performed across the AR and Non-AR test groups.

Table 28 - Summary of statistical analysis for the media integration hypothesis across AR and Web groups

	Overall	Visual	Informational	Emotive
AR Mean	0,04	-0,24	1,53	7,81
Web Mean	0,05	0,26	1,53	-1,21
Mean Delta	-0,01	-0,50	0,00	9,02
Range	0,50	9	14	35
Delta % Range	-3%	-6%	0%	26%
Significance	no	no	no	yes
	26%	57%	6%	100%

Table 29 - Summary of statistical analysis for the media integration hypothesis across AR and Web groups

	Overall	Visual	Informational	Emotive
EAR Mean	0,10	1,17	1,53	1,53
Video Mean	0,08	0,11	1,53	1,53
Mean Delta	0,02	1,06	0,00	0,00
Range	0,50	6	7	46
Delta % Range	4%	18%	0%	0%
Significance	no	yes	no	no
	39%	95%	0%	0%

Examining these results further reinforces what we have seen in the comparison between the informative and emotive AR tests, that being:

- The informative AR group demonstrated a strong and statistically significant improved level of emotive engagement when compared against both AR and Non-AR adverts. This is also evident in the results of the contextual and integrated engagement tests as well.
- The emotive AR group showed a strong statistically significantly higher visual engagement score against the AR and non-AR test groups.

Finally, as a litmus test a statistical analysis was performed between the two non AR groups, being the Web and Video test groups.

Table 30 - Summary of statistical analysis for the media integration hypothesis across Web and Video groups

	Overall	Visual	Informational	Emotive
Web Mean	0,05	0,26	1,21	-1,21
Video Mean	0,08	0,11	1,53	5,68
Mean Delta	-0,02	0,15	-0,32	-6,89
Range	0,61	9	14	46
Delta % Range	-4%	2%	-2%	-15%
Significance	no	no	no	no
	41%	19%	30%	94%

Examining these results the scores are in line with what one would intuitively expect. This can seen in the emotive engagement score which is a few points shy of significance but nonetheless demonstrates the video adverts' ability to better engage with audiences at an emotive level versus a website. These results therefore ratify the validity to some extent of the results and method of testing.

Returning to the hypothesis, neither can we reject or accept the null or alternative hypothesis for that matter. What the analysis has told us is that emotive and informative AR advertising drives audience engagement in different ways and quite the opposite to what one would intuitively expect.

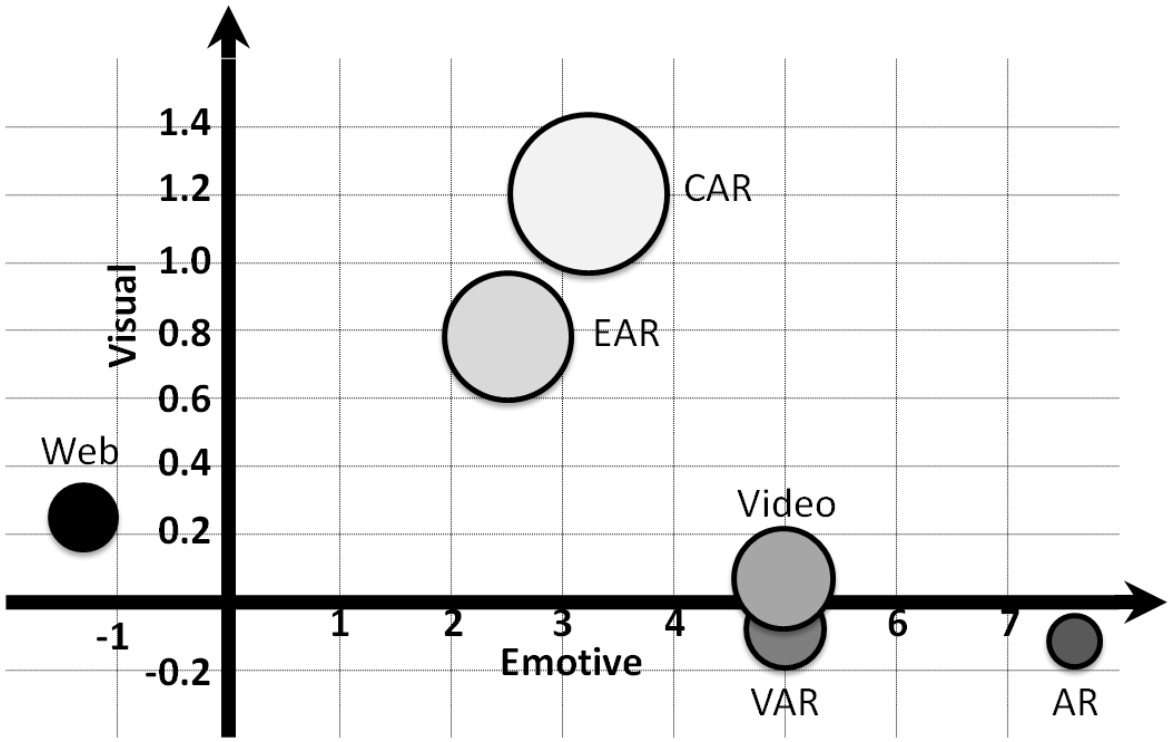
6.4 Engagement Overview

Having examined the experimental group in the context of each hypothesis, it is also helpful to take a broader view in order to gain a more holistic perspective. In each of the experiments it has almost consistently been found that the informative engagement scores were never significantly impacted by the various advertising media. This was somewhat contrary to findings by Connolly et al., (2010)

who performed a similar but far more limited study, and whose finding suggested AR advertising to be less effective with respects to informational engagement.

As a result this dimension of the engagement was omitted to simplify the analysis. The resulting analysis compared engagements across all the experimental groups in respect to their visual, emotive and overall engagement scores. This comparison is shown in the graph of visual versus emotive delta mean scores below, with the size of each bubble representing the relative overall engagement scores.

Figure 51 – Bubble chart plotting the visual, emotive and overall engagement dimensions across all groups



Examining the graphic, a number of the observations noted earlier can be seen here, including:

- The high emotive engagement scores obtained for the informative AR experimental group
- The lack of differentiation between integrated AR(VAR) and video groups
- The low engagement scores received for the web advertisement group across all dimensions

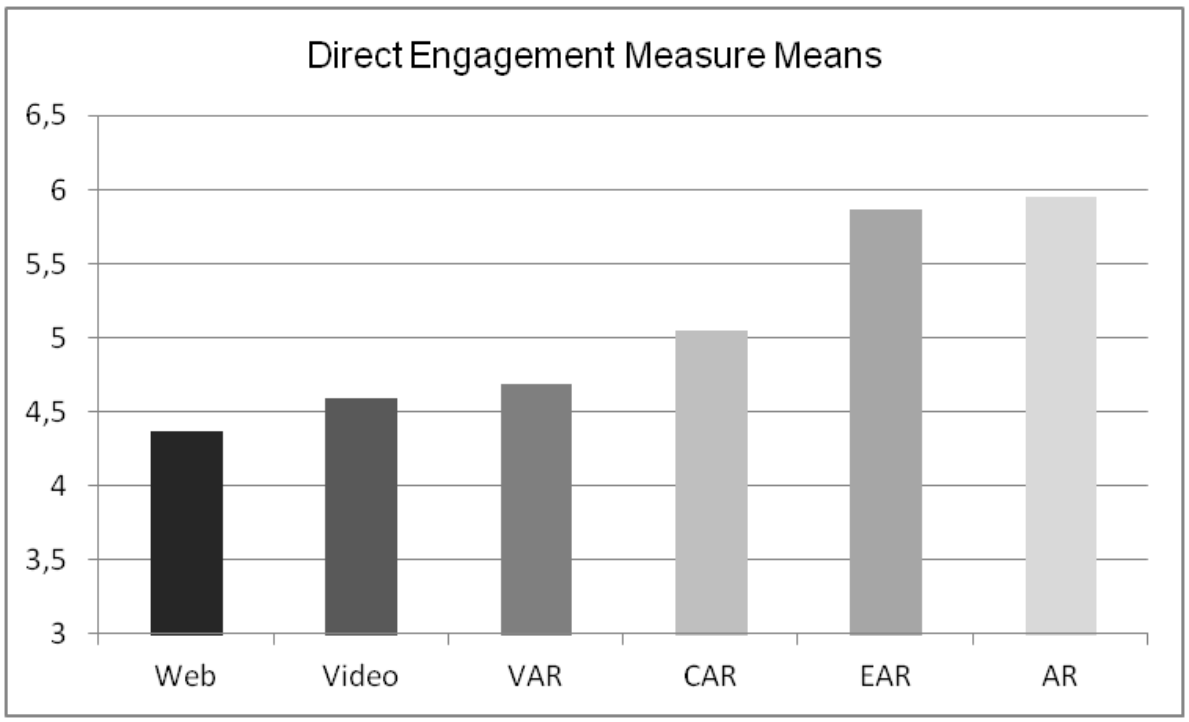
In addition, other trends which weren't evident in the individual analysis can be seen in the graphic, more specifically:

- The contextual AR experimental group's clear overall lead in terms of engagement

- The emotive and contextual AR advertisements representing the cluster of the most overall highly engaged groups

Comparing these results and insights with the direct engagement average scores for each group, reveals some level of correlation at a visual level. The average direct engagement scores for each test group is shown in Figure 52.

Figure 52 – Bar chart of the mean scores for the direct engagement scores for each test group



6.5 Demographic Results

In addition to the analysis performed around each hypothesis, further analysis was done with respects to the demographics recorded for each participant. In line with the broader research question in terms of what constitutes an effective Augmented Reality campaign, it was sought to provide insight in terms of which demographic group were most partial to AR advertising.

In performing the age analysis Generation Theory was used to divide the original age groups in Millennials and Generation X'ers, as their approach and attitudes to new technologies have been shown to be different (Strauss & Howe, 1991). Statistical analysis was then performed to assess differences between the two groups, specifically with their engagement levels for the AR adverts only. This analysis is summarised in Table 31. Examining the results, no statistically significant difference between the two groups could be found. However, the results with respect to differences

in the emotive engagement of the two groups are noteworthy, with Millennials showing a 31% higher level of engagement than Gen X'ers.

Table 31 - Summary of statistical analysis performed across the Millenial and Generation X age groups

	Overall	Visual	Informational	Emotive
Millenials	0,08	0,38	1,21	6,14
Gen X	0,06	0,24	1,03	3,54
Mean Delta	0,02	0,14	0,18	2,60
Range	0,09	1,65	1,87	8,41
Delta % Range	26%	8%	10%	31%
Significance	no	no	no	no
	71%	26%	30%	78%

Moving onto the gender analysis, females' average engagement scores were consistently higher than their male counterparts, except in informative engagement, which for all intents and purposes was equal. The emotive engagement scores again yielded large and almost statistically significant differences of 43% in favour of female participants. The visual mean delta is also noteworthy, being on average 23% higher. These results are shown in the table below.

Table 32 - Summary of statistical analysis performed across the gender groups

	Overall	Visual	Informational	Emotive
Male	0,06	0,26	1,16	3,30
Female	0,09	0,61	1,15	6,55
Mean Delta	-0,03	-0,35	0,01	-3,24
Range	0,08	1,52	1,69	7,55
Delta % Range	-34%	-23%	1%	-43%
Significance	no	no	no	no
	82%	64%	2%	91%

Therefore from a demographic perspective, and based upon these results, it appears the younger audiences, especially females, engage better with AR advertising.

7 Conclusion

While only one of the three null hypotheses was rejected, based upon the statistical analysis performed, the results from the other two still provide valuable insight into the nature of the Augmented Reality advertising. A summary of the outcome of the research performed for each hypothesis is given below.

Table 33 – A summary of the hypothesis analysis

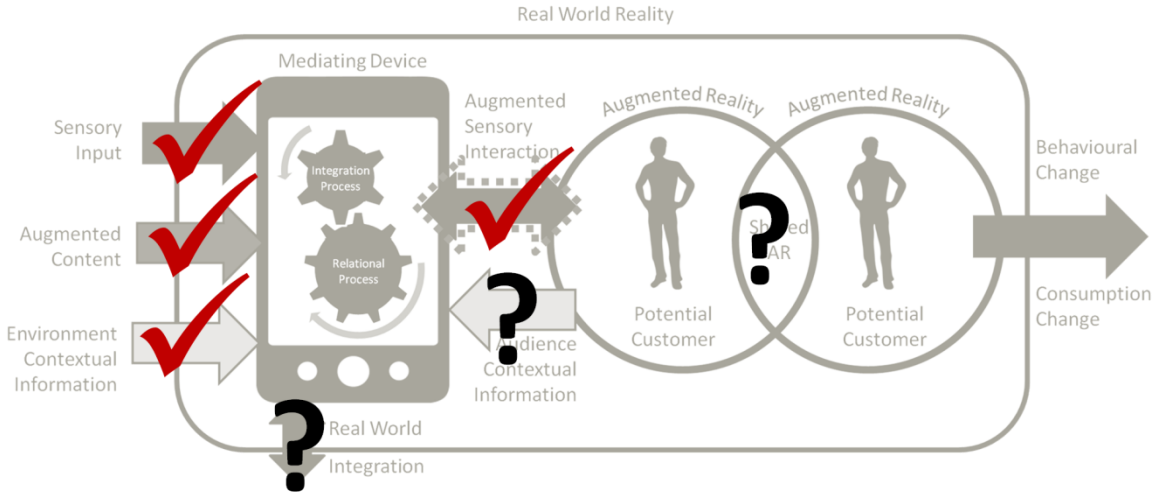
Result	Hypothesis	
	Contextual Relevance	H_0: Contextual relevance of the AR advertising will make no difference in terms of audience engagement.
✓		H_1: Contextually relevant AR advertising will result in a more engaged audience than non-contextual AR advertising.
✓	Integrated Advertising	H_0: AR advertising integrated with traditional media will have no effect on audience engagement as opposed to AR advertising on its own.
		H_1: AR advertising integrated with traditional media will be more engaging than the AR advert alone.
✓	Message Style	H_0: Informational based AR advertising will be no more engaging than emotive based AR advertising.
		H_1: Informational based AR advertising will be more engaging than emotive based AR advertising.

Using these, the degree of validity of the theory and models derived through the literature review in Chapter 2, as well as the associated hypotheses, can be assessed. In addition, areas of the theory not addressed through the experiments and subsequent analyses can be identified for further research.

7.1 Results and Literature Review

A key model developed throughout the literature review was that of the ”AR 2.0 system” illustrated in Figure 13. This is again shown in Figure 53, but this time with an overlay of areas addressed as part of the experimental research and those that would require research beyond this paper.

Figure 53 – AR 2.0 model overlaid with research scope



In summary, the research scope addressed the major external system inputs, including the sensory input, augmented content and environmental context. It also covered the augmented sensory integration.

While the sensory input and augmentation was fundamental to the model, no direct connection was made in the literature review, between the type of sensory input and the engagement response at a theoretical level. This, however, came through strongly in the experimental results, where the manner in which audiences engaged visually with the AR advertising was the most potent driver of overall engagement across emotive and contextual AR experimental groups. This enhanced visual engagement, however, was not seen in the web and video media or the informative and integrated AR test groups. As observed earlier, this is possibly due to that fact that the rendered visual experience, especially in the contextual AR advert, occurred in a familiar context and was therefore easier for the audience to subconsciously process and engage, which is supported by the media naturalness hypothesis presented by Kock (2005). **Based upon this it can be concluded that audience engagement is significantly enhanced at the sensory level which is augmented, but only if the augmentation is contextually relevant**

Building on this, and drawing attention to the lack of any significant difference between test groups with respects to the informational engagement, it can be reasoned that this is as result of the media having no inherent enhancing effect on informational aspects of the content. It may be argued that the reason for this, was that the information was not contextually relevant, however, counter to this would be fact that information can be communicated to an audience as effectively through non-AR channels. **The conclusion therefore is that AR is no more effective at communicating informational based advertising content than any other comparable medium.**

This debate, with respects to informative communication, leads into a reflection on the messages style hypothesis which ties into the augmented content input, in the model. As it was established through the statistical analysis, the message style hypothesis which stated that AR would be best suited to engaging audiences in an informative manner, was shown to be incorrect. But examination of the results beyond the hypothesis revealed a practical reality that was quite the opposite, with the informative styled AR advert scoring the highest emotive engagement levels, both through direct and indirect engagement tests. While the other AR groups also performed well in the emotive engagement dimension, the informative AR group's emotive delta mean was a clear outlier. The reasons behind this anomaly are unclear. Bulearca et al., (2010) suggested that some degree of engagement should be attributed to the novelty associated with the relatively new technology, but then similar levels should have been experienced in the other AR groups considering that they were independent of one another. **Regardless of the underlying factors, AR advertising proved effective at driving emotive engagement with its audience, in spite of a limited ability to integrate emotive elements within the content.**

This observed ability of AR advertising to drive both emotive and visual engagement, could in part be explained by hemispheric processing theory, where the right brain is responsible for emotional and visual processing (Kensinger & Choi, 2009). Whether AR was driving both dimensions (visual and emotive) or one was "pulling" the other along remains to be seen. Again this would be an area for further study.

Beyond the scope of the research, certain aspects of the AR2.0 model were not directly addressed, more specifically the impact of:

- Contextual relevance in relation to the audience (not the surrounding environment)
- Integration with the real environment beyond sensory integration
- Shared or socially integrated Augmented Reality

The first two, implemented correctly, could further enhance the contextual relevance of the advertising. To this end, these should yield a positive correlation with audience engagement. Likewise, socially integrated AR should enhance the level of emotive content within the AR advert, further driving audience engagement. However, the impacts of these three areas can only be accessed through further research on the subject.

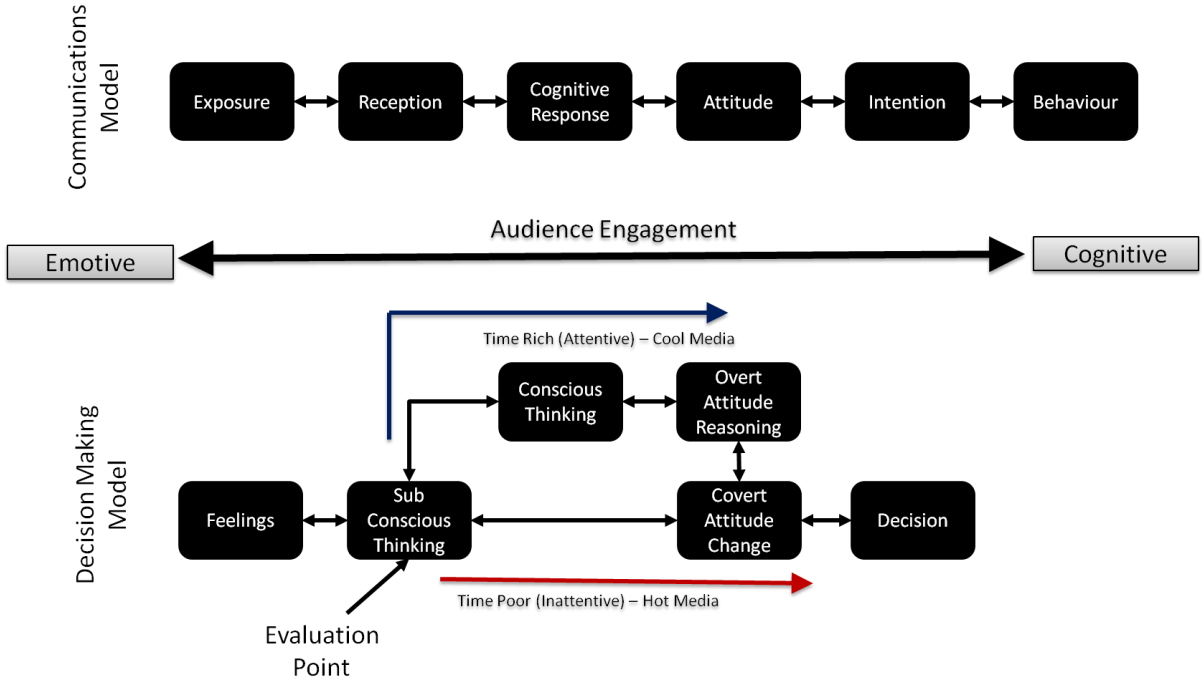
With the failure to find any significant relationships with the integrated media tests, the question of how, and with what media should an AR advert be coupled with, in an integrated marketing campaign, remains mostly unanswered. However, the results need to be understood beyond the

failure to reject the integrated media null hypothesis. Examining Figure 51 – Bubble chart plotting the visual, emotive and overall engagement dimensions across all groups, three important aspects are noteworthy with respects to the results:

- The integrated and video groups both score similar levels of emotive engagement that were significantly lower than the stand-alone informative AR group
- The levels of visual engagement improvements across all three tests (AR, VAR and Video) are practically zero.
- The emotive engagement scores for the VAR and Video groups are still higher that the contextual and emotive groups.

These results can in part be explained by returning to the integrated communications and decision model derived in the literature review and shown again, for convenience, below

Figure 54 – The decision communication model derived in the literature review (repeat)



Based upon the above model and reflecting on the relative scores of the integrated hypothesis test groups, it could be surmised that because the video was shown first in the integrated test, and as per the model, the emotive engagement levels with the audience were established up front by the video. In line with this thinking, the level of cognitive visual engagement for the AR and VAR groups, was almost the same, and therefore as per the decision-communications model, set in the latter half of the advertising exposure, by the AR components of the respective tests. **It is therefore maintained that the decision communication model is still valid; however the assumption that AR**

is not effective at communicating and engaging at an emotive level with audiences is incorrect, as already noted.

The outcome with respects to integrated advertising communications and AR, is therefore inconclusive. The design of the experiment to test this aspect was too superficial, and would require a more in depth investigation. It is difficult to accept that AR cannot be integrated into an advertising campaign effectively. To this end, further research will be required in order to explore which types of advertising media are more effective when integrated with AR media, and where in the advertising funnel it is best positioned.

As a final conclusion, beyond the hypothesis analysis, the demographic results revealed that the most receptive target audience to Augmented Reality advertising, appear to be young woman. This insight should further assist practitioners in deciding whether to employ AR as a media component in the campaigns based upon their target audience.

7.2 Summary of Findings

Returning to the original research question on what constitutes an effective Augmented Reality advertisement, based on the research results and analysis given in this thesis, it can be concluded that:

- Contextual relevance of the advertisement is essential to driving engagement at the sensory level at which the augmentation is implemented (in this case it was visual).
- AR advertising is effective at driving emotive engagement with its audience. The link between the content composition and the level of engagement, is however, unclear.
- Integrating AR advertising with video in a campaign would like be no more effective than AR or video alone.
- AR is poor at communicating and engaging audiences at an informational level and should not be deployed for such purposes.
- The ideal target audience for an AR advertising campaign are young women.

7.3 Areas of Further Research

Throughout the preceding chapters, mention has been made of areas of research not covered in this scope that would build on this research and answer some of the questions not done so through this thesis. For clarity's sake, these are listed below:

- How to effectively integrate AR advertising into an integrated marketing campaign; and specifically, where in the communication funnel it should integrate, and with what types of other media.
- Understanding the impact of extending the contextual relevance paradigm to include audience relevance in an AR advertisement.
- Assessing the level of engagement derived through socially integrated AR advertising.
- Exploration of other advertising audience uses, besides marketing, such as structuring time, enjoyment, scanning the environment, social interaction, self affirmation and entertainment
- The nature and extent of engagement derived through other forms of Augmented Reality, such as olfactory, haptic and gustatory.

8 References

Alio, J., Ibrahim, M., Pickton, D., & Bassford, M. (2009). A Systems-Based Media Effectiveness Framework for E-Marketing Communications. *3rd Annual IEEE International Systems Conference,.* Vancouver: IEEE.

Andrews, C. J., & Durvasula, S. (1991). Suggestions for Manipulating and Measuring Involvement in Advertising Message Content. *Advances in Consumer Research vol 18*, 194-201.

ARF. (2006). *Defining Engagement Initiative*. Retrieved May 1, 2013, from The Advertising Research Foundation: http://www.thearf.org/research-arf-initiatives-defining-engagement

Arthur, C. (2012, June 27). *Think smartphones are ubiquitous now? Just wait a few years*. Retrieved May 1, 2013, from The Guardian: http://www.guardian.co.uk/technology/2012/jun/27/smartphones-iphone-mobile-market

Ball-Rokeach, S. J., & DeFleur, M. L. (1976). A dependency model of mass-media effects. *Communication Research 3 (1)*, 3–21.

Beltrone, G. (2013, January 24). *Ads Trump Football in Super Bowl Survey.* Retrieved from Adweek: http://www.adweek.com/news/advertising-branding/ads-trump-football-super-bowl-survey-146776

Bijker, W. E., Hughes, T. P., & Pinch, T. J. (1987). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology.* Cambridge, MA: MIT Press.

Braziller, G. (1968). *General System Theory: Foundations, Development, Applications.* New York: George Braziller Inc.

Bulearca, M., & Tamarjan, D. (2010). Augmented Reality: A Sustainable Marketing Tool? *Global Business & Management Research; 2010, Vol. 2 Issue 2/3*, 237-252.

Calder, B. J., & Malthouse, E. c. (2005). Managing Media and Advertising Change with Integrated Marketing. *Journal of Advertising Research, December*, 356-361.

Calder, B. J., & Malthouse, E. C. (2008). Media engagement and advertising effectiveness. *Kellogg on advertising and media*, 1-36.

Connolly, P. C. (2010). Augmented Reality Effectiveness in Advertising. *In 65th Midyear Conference on Engineering Design Graphics Division of ASEE.* Houghton, Michigan.

Damasio, A. R. (2000). *The Feeling of What Happens.* London: Heinemann.

Dovey, J. (2008). Dinosaurs and butterflies media practice research in new media ecologies. *Journal of Media Practice, Volume 9, Number 3*, 243-256(14).

Elodie, J., & Bourgeon-Renault, D. (2012). Impact of Mediation Devices on the Museum Visit Experience and on Visitors' Behavioural Intentions. *International Journal of Arts Management , Vol. 15 Issue 1*, 18-29.

Eubank, S. (2006). Elevating Engagement above the Silos : TV, Print and. *1st Annual Audience Measurement Symposium.* New York.

Fawkes, J., & Gregory, A. (2000). Applying communication theories to the Internet. *Journal of Communication Management Vol. 5 Iss: 2*, 109 - 124.

Fenn, J. (2010). *Executive Advisory: Six New Technologies That Will Reshape Your Business.* Stamford: Gartner.

Frank, A. (2013). *Hype Cycle for Advertising, 2013.* Stamford: Gartner.

Gagnier, S. (2013, September 30). *Toyota most valuable auto brand worldwide, again; Chevy cracks top 100*. Retrieved from Auto News: http://www.autonews.com/article/20130930/OEM/130939990#axzz2kE0viwlK

Geroimenko, V. (2012). Augmented Reality Technology and Art: The Analysis and Visualisation of Evolving Conceptual Models. *16th International Conference on Information Visualisation*, (pp. 445-453).

Ghubril, A. C., & Prentice, S. (2013). *Hype Cycle for Human-Computer Interaction.* Stamford: Gartner.

Google. (2013, October). *Our Mobile Planet*. Retrieved from Think With Google: http://www.thinkwithgoogle.com/mobileplanet/en/graph/?country=za&wave=2013&age=all&gender=all&chart_type=

Heath, R. (2007). How do we predict advertising engagement? *In the ARF Annual Convention 2007.* Bath: University of Bath Online Publication Store.

Hoffman, D. L., & Novak, T. P. (2006). A New Marketing Paradigm for Electronic Commerce. *The Information Society: An International Journal*, 43-54.

Hughs, I. (2012). Virtual Worlds, Augmented Reality, Blended Reality. *Computer Networks*, 3879-3885.

Jaeyoung, K., & Heesung, J. (2011). Implementation of image processing and Augmented Reality programs for smart mobile device. *Strategic Technology (IFOST), 2011 6th International Forum vol.2*, 1070,1073, 22-24 .

Jenkins, H. (2006). *Convergence Culture Where Old and New Media Collide.* New York: New York University Press.

Jensen, B. (2011, July). Creating Synergies Between Print and Digital Media That Pay. *The Magazine for Magazine Management, Vol. 40 Issue 7*, p. 18.

Jones, N. (2010). *Contextual Smartphone Applications Will Exploit Augmented Reality.* New York: Gartner.

Katz, E., Blumler, J. G., & Gurevitch, M. (1973). Uses and gratifications research. *The Public Opinion Quarterly 37.4*, 509-523.

Kealy, A., & Scott-Young, S. (2006). A Technology Fusion Approach for Augmented Reality Applications. *Transaction in GIS (10)2*, 279–300.

Kensinger, E. A., & Choi, E. S. (2009). When Side Matters: Hemispheric Processing and the Visual Specificity of. *Journal of Experimental Psychology: Learning, Memory, and Cognition Vol. 35, No. 1*, 247–253.

Kilger, M., & Romer, E. (2007). Do Measures of Media engagement Correlate with Product Purchase Likelihood. *Journal of Advertising Research*, 313-325.

Kirkland, C. (2011, September 30). *14 epic social media fails.* Retrieved February 21, 2013, from eConsultancy - Digital Marketing Excellence: http://econsultancy.com/za/blog/7913-14-epic-social-media-fails

Kock, N. (2005). Media richness or media naturalness? The evolution of our biological communication apparatus and its influence on our behavior toward e-communication tools. *IEEE Transactions on Professional Communication, vol. 48, no. 2,*, 117-130.

Kotler, P., & Keller, K. L. (2012). *A Framework for Marketing Management.* Edinburgh: Pearson Education Limited.

Kozinets, R. V., de Valck, K., Wojnick, A. C., & Wilner, S. J. (2010). Networked Narratives:Understanding Word-of-Mouth Marketing in Online Communities. *Journal of Marketing*, 71-89.

Lazcniak, R. N., Kempf, D. S., & Meuhling, D. D. (1999). Advertising Message Involvement: The Role of Enduring Situational Factors. *Journal of Current Issues and research in Advertising Vol 21 no 1*, 51-64.

Lucas, B. D., & Britte, S. H. (2012). *Measuring Advertising Effectiveness.* New York: McGraw Hill.

Luciano, C., Banerjee, P., Florea, L., & Dawe, G. (2005). Design of the ImmersiveTouch™: a high-performance haptic augmented virtual reality system. *In Proceedings of the 11th international conference on human-computer interaction.* Las Vegas.

Macnamara, J. (2010). Remodelling media: The urgent search for new media business models. *Media International: Australia*.

Manovich, L. (2001). *The Language of New Media.* Massachussets: MIT Press.

McKay, Z. (2012, July 2). *Move Over Social Media - Here Comes Augmented Reality.* Retrieved from Forbes: http://www.forbes.com/sites/insead/2012/02/07/move-over-social-media-here-comes-augmented-reality/

Mcluhan, M. (1962). *The Gutenberg Galaxy: The making of Typograhic Man.* Toronto: University of Toronto Press.

Mcluhan, M. (1964). *Understanding Media: The Extensions of Man.* Toronto: University of Toronto Press.

Mcluhan, M. (1967). *The Medium is the Message: An Inventory of Effects.* Toronto: University of Toronto Press.

McLuhan, M., & Innis, H. (2008, December 23). *Old Messengers, New Media: The Legacy of Innis and McLuhan*. Retrieved January 13, 2013, from Library and Archives Canada: http://www.collectionscanada.gc.ca/innis-mcluhan/index-e.html

McLuhan, M., & McLuhan, E. (1988). *Laws of Media.*

McMains, A., & Morrisey, B. (2009). Online Ads Turn to Traditional Ads. *Adweek 50*, p. 7.

McPartlin, P. (2011, June 24). *New media classification - bought, owned and earned or 'BOE'.* Retrieved February 22, 2013, from Business and Leadership: http://www.businessandleadership.com/marketing/item/30960-new-media-classification

Milgram, P., Takemura, H., Utsumi, A., & Kishino, F. (2007). Augmented Reality: A class of displays on the reality-virtuality continuum. *Proceedings of Telemanipulator and Telepresence Technologies*, 2351–34.

Morris, J. D., & Boone, M. A. (1998). The Effects of Music on Emotional Response, Brand Attitude, and Purchase Intent in an Emotional Advertising Condition. *Advances in Consumer Research Volume 25*, 518-526.

Napoli, P. M. (2011). *Audeince Evolution: New Technologies and the Transformation of Media Audiences.* New York: Columbia University Press.

Nguyen, T. H. (2011). *Innovation Insight: Augmented Reality Innovations Add Business Value.* New York: Gartner.

Noll, M. A. (2007). *The Evolution of Media.* Plymouth: Rowman and Littlefield Publishers.

O'Donohoe, S. (1994). Advertising uses and gratifications. *European Journal of Marketing 28.8/9*, 52-75.

Perey, C. (2011). *Print and publishing and the Future of Augmented Reality.* Montreux: Perey Research & Consulting.

Pfeiffer, M., & Zinnbauer, M. (2010). Can Old Media Enhance New Media. *Journal of Advertising Research*, 42-49.

Plummer, J., Cook, B., Diforio, D., Schachter, B., Sokolyanskaya, I., & Korde, T. (2007). Measures of Engagement Volume II. *ARF Annual Convention.* New York: The Advertising Research Foundation.

Pradeep, A. K. (2010). *The Buying Brain: Secrets for Selling to the Subconscious Mind.* Hoboken New Jersey: Jhn Wiley & Sons.

Price Waterhouse Coopers. (2013). *IAB Internet Advertising Revenue Spend Report 2012.* New York: Internet Advertising Bureau.

Retail Prophet. (2011, June 2). *The New Media Marketer's First Date.* Retrieved February 22, 2013, from Retail Prophet: http://www.retailprophet.com/blog/advertising/the-new-media-marketers-first-date-2/

Reuters. (2012, August 16). *Revenues for Augmented Reality in Consumer Electronics Industry to Approach $600 billion by 2016, Forecasts Semico Research.* Retrieved January 13, 2013, from Reuters: http://www.reuters.com/article/2012/08/16/idUS165030+16-Aug-2012+BW20120816

Riknas, M. (2012, October 5). *Adoption of Augmented Reality accelerates*. Retrieved February 24, 2013, from Network World: http://www.networkworld.com/news/2012/100512-adoption-of-augmented-reality-263103.html

Romanuik, J., & Gugel, C. (2010). The ARF 360 Model - Update to a Human-Centric Approach. *Hornal of Advertising Research*, 334-343.

Rossiter, J., & Percy, L. (1997). *Advertising and Promotion Management.* New York: McGraw-Hill.

Sang Min, K., Suk Chang, W., & Gu Ji, Y. (2013). Usability Principles for Augmented Reality Applications in a Smartphone Environment. *International Journal of Human-Computer Interaction 29.8*, 501-515.

Sarner, A., Gassman, B., & Frank, A. (2012). *Hype Cycle for Digital Marketing.* New York: Gartner.

Saunders, M., & Lewis, P. (2012). *Doing Research in Business and Management.* Edinburgh: Pearson Education Limited.

Schramm, W. (1965). How Communication Works. In W. Schramm, *The Process and Effects of Mass Communication 6th Edition* (pp. 3-26). Urbana: University of Illonois Press.

Siltanen, S., & Aikala, M. (2012). Augmented reality enriches hybrid media. *In Proceeding of the 16th International Academic MindTrek Conference* (pp. 113-116). ACM.

Strauss, W., & Howe, N. (1991). *Generations: The History of America's Future, 1584 to 2069.* New York: William Morrow and Company.

Szymczyk, M. (2011, January 28). *Why So Many Augmented Reality Apps Fail in the Real World.* Retrieved from Ad Age Digital: http://adage.com/article/digitalnext/augmented-reality-apps-fail-real-world/148540/

Takuji, N., Shinya, N., Takashi, K., Tomohiro, T., & Michitaka, H. (2011). Augmented Reality Flavors: Gustatory Display Based on Edible Marker and Cross-Modal Interaction. *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 93-102). Vancouver: ACM.

Technabob. (2008, December 17). *Mini Augmented Reality Ads Hit Newstands*. Retrieved February 23, 2013, from Technabob: http://technabob.com/blog/2008/12/17/mini-augmented-reality-ads-hit-newstands/

Trend One. (2010, February 10). *The new TrendONE Media Evolution.* Retrieved April 21, 2013, from Trend One: http://blog.trendone.com/2010/02/10/die-neue-trendone-media-evolution/

Tripathi, M. N., & Vilakshan, N. (2009). Customer Engagement – Key to Successful Brand Building. *XIMB Journal of Management 6(1)*, 131-140.

Tsirulnik, G. (2010, December 23). *Mobile Augmented Reality is overhyped technology for now: Forrester*. Retrieved from Mobile Marketer: http://www.mobilemarketer.com/cms/news/research/8576.html

van Krevelen, D. W., & Poelman, R. (2010). A Survey of Augmented Reality Technologies, Applications and Limitations. *The International Journal of Virtual Reality, 9(2):*, 1-20.

Wang, A. (2006). Advertising Engagement: A Driver of Message Involvement on Message Effects. *Journal of Advertising Research*, 355-368.

Wedel, M., Teixera, T., & Pieters, R. (2012). Emotion-Induced Engagement in Internet Video Advertisements. *Journal of Marketing Research Vol. 49 Issue 2*, 144-159.

Wyner, G. A. (2006). Coping With Media Fragmentation. *Marketing Research*, pp. Vol. 18 Issue 2, p6-7.

9 Figure Listing

10 Table Listing

11 Appendices

11.1 Appendix: Pre-Test Questionnaire

ADVERTISING RESEARCH QUESTIONAIRE

Good day, my name is _____ and I am conducting research for Garnet Jensen who is an MBA student at the Gordon Institute of Business Science (GIBS), which is part of the University of Pretoria. This research deals with advertising effectiveness and aims to better understand how different media make an impact. Should you choose to participate, you will be required to complete a pre-test as well as a post-test questionnaire. This should not take more than 10 minutes of your time. It is important to be completely honest and open with your answers as this is critical to the integrity of the research.

Please note that:

- Any information obtained from the questionnaires will be used exclusively for the purposes of the research
- All information will be treated with strict confidentiality
- Your name will not be reflected in the dissertation
- Your participation is voluntary and you can withdraw at anytime without penalty
- You are under no financial obligation or commitment

The direct benefit to you participating in this study is that this information will provide a better understanding of marketing media. By participating and completing this interview, you indicate that you voluntarily participate in this research

If you have any concerns, please contact myself or my supervisor. Our details are provided below:

Researcher Name:	Garnet Jensen	**Supervisor Name:**	Dr Clive Corder
Email:	itisbliss@gmail.com	**Email:**	cliveco@icon.co.za
Phone:	083 441 5550	**Phone:**	082 655 6740

ADVERTISED PRODUCT

The product used in the advertising under evaluation is the iX35 sport utility vehicle, manufactured by Hyundai and widely available in South Africa. Please answer the questions related to this product in the sections to follow.

PERSONAL DETAILS

Tell us a little more about yourself (mark with an X where appropriate):

What is your age?		15 to 24		25 to 34		35 to 44		45 to 54
		55 to 64		65 to 74		75+		
What is your gender?		Male		Female				
Do you own or have recently driven an ix35?		Yes		No				
What mobile devices do you own and or use?		Feature Phone 		Smart Phone 		Tablet 		

QUESTIONNAIRE NUMBER ☐

SECTION 1

Below are listed a number of question statements dealing with the Hyundai iX35. Please indicate with an 'X' the corresponding correct answer, to the best of your knowledge.

Question	JK	Answer JK	LM	Answer LM	NP	Answer NP	QR	Answer QR
What is the starting price for the base model?		R269K		R283K		R290K		R299K
How many airbags does the executive model have?		8		6		4		2
What colour is the driver instrument cluster lighting?		Green		Blue		Red		Orange
What is the engine capacity in the available models (litres)?		1.8		2.0		2.2		2.4
How many models are available in the vehicle?		5		6		7		8
What feature is NOT available in any model of the vehicle?		EBD		ABS		ESP/ESC		DAC
What is the max power output of the petrol variant (kw)		110		112		122		130
What is the max torque output of the diesel variant (nm)?		392		398		412		415
How many gears does the automatic variant have?		5		6		7		8
Which is NOT a standard colour option available for the vehicle ?		Blue		Red		White		Orange

SECTION 2

Below are images of various features of the Hyundai iX35 as well as similar images from other vehicles. Please indicate with an 'X' the corresponding correct feature image from the Hyundai iX35, to the best of your knowledge.

JK	Answer JK	LM	Answer LM	NP	Answer NP	QR	Answer QR
Which start engine button belongs to the Hyundai iX35 ?							
							
Which steering wheel belongs to the Hyundai iX35?							
							
Which vehicle, viewed from behind, is the iX35?							
							
Which image below shows the grill of the iX35							
							
Which image below shows the front headlight cluster of the iX35?							
							
Which image below shows the standard alloy rims supplied with the iX35?							
							

SECTION 3

Please indicate with an 'X' on the 7 point scale below, the extent to which the description pairs best describes your opinion of the Hyundai iX35.

Descriptor	Rating	Descriptor
Mundane		Exhilarating
Sufficient		Powerful
Standard		Cutting Edge
Unremarkable		Beautiful
Moderately Efficient		Hyper-Efficient
Common		Exclusive
Functional		Luxurious
Expected Value		Excellent Value
Moderately Responsive		Highly Agile
Passive		Aggressive
Inconspicuous		Striking
Bulky		Sleek
Standard		Feature Rich
Functionally Ergonomic		Optimised Ergonomics
Sufficiently Durable		Highly Durable

11.2 Appendix: Post-Test Questionnaire

ADVERTISING RESEARCH - POST TEST QUESTIONAIRE

Firstly, thank-you for taking the time to assist with this research. Following the pre-test questionnaire you should have been exposed to a specific piece of advertising as specified by the researcher. Below are the post test questions you are required to answer following your exposure to the advertising. **Please do not attempt this questionnaire if you have not viewed the require/specified advertising**.

This final step should not take more than 5 minutes of your time. Again it is important to be completely honest and open with your answers as this is critical to the integrity of the research.

As noted in the previous questionnaire:

- Any information obtained from the questionnaires will be used exclusively for the purposes of the research
- All information will be treated with strict confidentiality
- Your name will not be reflected in the dissertation
- Your participation is voluntary and you can withdraw at anytime without penalty
- You are under no financial obligation or commitment

If you have any concerns, please contact myself or my supervisor. Our details are provided below:

Researcher Name:	Garnet Jensen	**Supervisor Name:**	Dr Clive Corder
Email:	itisbliss@gmail.com	**Email:**	cliveco@icon.co.za
Phone:	083 441 5550	**Phone:**	082 655 6740

OVERALL PERCEPTION

Tell us a little more about your experience of the advertising shown; on the 7 point scale below (mark with an X where appropriate):

How would you rate your level of engagement with the advert shown	Not at All		Highly Engaged
How likely are you to discuss the advert with a friend?	Not at All		Almost Certain
Given a convenient opportunity would you take time to view the advert again?	Not at All		Definitely
How informative did you find the advertising	Not at All		Very Informative
How entertaining did you find the advert?	Not at All		Very Entertaining

QUESTIONNAIRE NUMBER

SECTION 1

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Moderately Responsive		Highly Agile
Passive		Aggressive
Inconspicuous		Striking
Bulky		Sleek
Standard		Feature Rich
Functionally Ergonomic		Optimised Ergonomics
Sufficiently Durable		Highly Durable

11.3 Appendix: Hyundai Consent Form

Hyundai Automotive South Africa (Pty) LTD
Corner Norman Road and Lucas Lane
Bedfordview, 2006
010 248 8000
www.hyundai.co.za

19 June 2013

To whom it may concern

RE: USE OF HYUNDAI MOTOR VEHICLES AS TEST SUBJECT FOR AUGMENTED REALITY RESEARCH

Please be advised that we give Garnet Jensen, limited permission to use Hyundai's motor vehicle products as virtual test subjects for his research into augmented reality advertising, as part of his MBA research at the Gordon Institute of Business Sciences (University of Pretoria). This includes display and or playback of any relevant Hyundai product related media (or part there-of), including graphic, visual and audio based advertising media.

This permission however does not:

- Extend beyond the purposes of the research.
- Mean we endorse the results of the research.
- Necessarily give him access to Hyundai's resources or non-public information.

The researcher is not allowed to present Hyundai's brand or products in an intentionally negative manner. Any media provided by Hyundai remains the intellectual and if applicable physical property of the company.

We recognise the fact that the results of the research and the research paper remain the property of the university, and may be made public through academic and other channels.

Regards

Francois Marais
Hyundai Automotive South Africa
Marketing Manager