

**THE EXPANDING REACH OF NON-TRADITIONAL MARKETING:
A DISCUSSION ON THE APPLICATION OF NEUROMARKETING AND BIG DATA
ANALYTICS IN THE MARKETPLACE**

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A Brief History on the Impact of Traditional Marketing

Marketers are continuously looking for the best ways to connect consumers to their products, services and brands. Most often, businesses that are looking to garner the attention of targeted consumers are likely to do so through a combination of several promotional methods and materials aimed at a specific population segment. The action of marketing is two-fold, to be able to educate consumers about a product or service previously unbeknownst to them, and to provide differentiation through branding against competitors. This process has been consistently applied through different means and mediums as time progresses, allowing different tactical abilities to unfold through new available technologies and communication tools. It is through this process that we have seen the rise and differentiation of traditional marketing and its counterpart, nontraditional marketing.

Traditional marketing essentially encompasses forms of promotional mediums that include broadcast media and print media (Schultz, 1992). These typically include newspapers, magazines, flyers, billboards for print media, along with radio and television for broadcast media. Additionally, direct sales and telemarketing are also considered to be foundations of traditional marketing. Print media started its roots in the 1800's and grew significantly in the latter of the 19th century with the commencement of mass marketing following the development of the industrial revolution (Peppers & Rogers, 1995). While this era is known for its newfound ability to mass produce goods, this also led to a significant increase in business competition. This struggle to maintain a superior position in the marketplace created a need to differentiate products to consumers and to effectively introduce and inform them about a specific product in comparison to competitors. The first mass marketing push of this type was by Pears Soap, which under Thomas J. Barrat--coined "the father of modern advertising" (Haig, 2005 p.219), was one

of the first companies to deliver traditional print advertising (Mirzoeff, 2002). This was due in part to Pears Soap being the first and longest lived established brand since 1798, and therefore the first to constitute market branding shortly thereafter. The New York Newspaper Advertising Bureau's 1891 Marketing Communications Report describes the success of Pears' branding through one of the first published Christmas Annuals, where one of the most enduring catchphrases "Good morning. Have you used Pears' soap?" is consistently portrayed. Following the success of the ads in the annual print media, consumers found Pears' ads more interesting than the literature itself "which is not surprising, for the latter are for the most part pretty dull." (The New York Newspaper Advertising Bureau's Marketing Communications Report, 1891 p.735)

Moving forward with the continual shift in technology, radio and television served to be the next successful platforms for marketing on a massive scale. Radio advertising dates back to 1922 when the first ad was launched over the platform for a real-estate promotion in New York City, which clocked in at ten minutes for the price of \$100 (Chicago Tribune, 2000). The radio became one of the fastest emerging sources of entertainment with an estimated 25 million listeners in 1927 (Smithsonian Institute, 1986). Again, marketers took advantage of this emerging target segment. With the realization that millions of listeners would gather around and tune in for entertainment, news and politics, advertisers saw the opportunity to promote directly and in a way that guaranteed attention. This was a notable differentiation factor with radio; whereas consumers could easily flip past newspapers and billboards without paying attention, radio encouraged the listening of promotions in order to continue on to the remaining program. From this, came a new partnership where sponsors would supply the capital to fund radio programming and development. This became the norm by the 1930's where, in fact, many shows

were not only sponsored by advertisers but produced by them as well to ensure the utmost effectiveness in promotions (Smithsonian Institute, 1986). The pervasiveness of the radio is seen by its widespread and continued use to this day where over 90% of the population still has or uses an AM/FM radio (Santhanam et al., 2013). This translates into the continued spending on the medium. Although the percentage of media spending in the category has declined, it still represents 5.4% of all media spending globally (Nielsen Media, 2014).

The last of the major mass media platforms of traditional marketing, television, has worked its way into millions of homes globally and has shaped generations and cultures (Fiske, 2002). Shortly before the 1950's, a television was not a household item that a significant portion of the population owned. There was, however, an obsession with the new invention as seen in the manner that people would flock to public facilities that had televisions on display, and watch a primetime schedule that ranged over four channels (Acuna, 2012). Sure enough, with this new format of mass media, marketers were attentive to make the best of this new access to their target markets. It is no surprise then that the beginning of the "golden age of television" (The Campaign for America's Libraries, 2014) was created in-hand with the sponsorship and promotion of marketing. In 1942, the first major televised sporting event consisted predominantly of boxing matches was watched by an estimated audience of 150,000 through only 5,000 television sets (High-Tech Productions, 2014). The segment was called the Gillette Cavalcade of Sports and went on to broadcast American major sporting events for upwards of 25 years (McKibben, 1998). The company understood the importance of branding and marketing over mass media platforms. Because of this persistence in broadcast media, Gillette's mandate was that for every razor sold, the company would set aside 50 cents towards advertising in the early to mid 1900's (Lucas, 2003).

Television began to penetrate the western world's culture from the 1940's to the 1950's, beginning in 1948 when only 2% of the American population had a household television to 1956 where 70% of America households had purchased the device (Encyclopedia Britannica, 2014). This trend continues on today, where 98% of the population either owns or watches television (Santhanam, 2013). It is not surprising then, that television dominates the majority of marketer's interests in promotional platforms. This is seen through organizational spending habits with 58% of ad budgets going towards TV globally followed by 18% for newspapers (Nielsen Media, 2014). Today, marketers are willing to pay high prices for big viewership. In the U.S. the average prime-time 30 second ad spot costs \$7,800, with specialty spots in popular shows costing upwards of \$400,000 for 30 seconds (Flint, 2014) (Poggi, 2013). This trend, however, is not expected to continue; the past few years have seen a global decline in the overall sales of televisions. This has been attributed to a combination of market saturation along with the consumer movement toward the use of mobile devices like cell phones and tablets (IHS, 2013) With the emergence of these new technologies, the rate of television purchases and utility are expected to continually decline in the face of mobile technology (Osawa, 2013). Inevitably, T.V. will follow the same route as radio and be pushed out with the influx of newer platforms. It is in this manner, that we see the shift of marketing from traditional to non-traditional means through the arrival of new platforms, trends and consumer desires.

The General Shift Towards a Combination of Traditional and Non-Traditional Media

Non-traditional marketing has been the deviation of promotional and communication tactics outside of the use of conventional print and broadcast media. These new methods to find and stimulate buyers have been gaining steady traction over the past decade. Through this spark of technology and evolution of digital devices, non-traditional marketing separates itself in its

ability to interact with the specific target segment and use new technological platforms like the internet, digital devices, and targeted services to achieve goals. PQ media, a media econometrics firm from the U.S. encapsulates the definition as described by their president Patrick Quinn: “Technological advances have led to critical changes in consumer behaviours and media usage patterns, which have pushed the advertising and marketing ecosystems into a seminal period of transition. Driven by these market forces, brand marketers are seeking new strategies to connect with consumers through engaging means in captive locations, while at the same time providing proof-of-performance metrics.” (PQ Media, 2008) (Marketing Charts, 2018). Non-traditional marketing, however, is not bound by electronic platforms, rather it can encapsulate as a reimagining of traditional media in new forms such as vehicle wraps, point-of-purchase displays (POP displays), guerrilla marketing, scaffolding, and even aerial banner or bubble cloud ads to name a few. A more extensive list of new-age media can be found in the attached appendix. All of these new methods are focused on garnering consumer attention to get their message noticed, and they are succeeding in doing so. The advantages in these techniques include stimulating interest through novel means that capture attention, creative and versatile placement, personalization and directly targeted messages, and lower implementation costs (Blakeman, 2014)

What then, are the dominating trends and factors that surround the evolution on nontraditional marketing? While new-era marketing does make use of some innovative tactics like vehicle wraps or POP displays, nothing has changed the marketing landscape as significantly as digital media. Although TV continues to dominate the average businesses’ media budget, Internet advertising is making a significant application jump and will continue to close the gap as global ad spending increases, especially this past year at 5.7% (Nielsen Media, 2014). In fact,

internet advertising made up just 4.5% of global ad spending in 2013, but had a positive change of 32.4% from the prior year (Nielsen Media, 2014). These numbers are even higher in the mobile ad revenue sector where sales surged 92% in 2013 from 2012, raising the total capital spent to \$19.3 billion (IHS Report, 2014). Search engine optimization (SEO), the process of increasing viewership to digitally hosted locations through search engines like Google by targeted ads or organizing links by queries, is also a growing market. In 2013, search ad revenues accounted for 43% of all internet ad revenue to total \$18.4 billion (Goodwin, 2014). Again, mobile advertising is seen to significantly rise in this sector as well with a growth from 9% in mobile search ads in 2012 to 17% in 2013. (Goodwin, 2014). These platforms are just a few segments of the entirety of digital and internet advertising which sums up to be just short of \$500 billion in 2013 (Magna Global, 2013).

These shifts in marketing media spending are expected with the adoption of digital devices by the global population. Just over 3 billion people have internet access, and in North America specifically, 88% of the total population uses the internet in some form or another (IWS, 2014). Comparing the global internet usage rates from the year 2000, there has been a 741% growth of use up to this year (IWS, 2014). The new mobility and access of this resource is also increasingly widespread with 1 in 5 people worldwide owning a Smartphone and one in five people also owning a computer (Heggestuen, 2013). Last, of those online individuals, 74% use social networks sites (Pew Research Center, 2014). These include applications like Facebook, Twitter, Instagram, and LinkedIn. Globally, the population is becoming more reliant on digital and electronic platforms to communicate, connect, purchase goods, and share information. With this, marketers are increasing their efforts into making the best of their promotional efforts in an online manner. More importantly, marketers are taking advantage of the combination of

traditional and non-traditional mediums, especially those that are morphing into a more digital application. Take the newspaper, which is the oldest form of advertising, with the first ad dating back to 1704; this platform still accumulates 19% of global ad spending (Nielsen Media, 2014) (Ad Age, 1999). The growth trend of the past ten years shows an increase in online newspaper readership, leading to an increase in online newspaper ad revenue and a decrease in print newspaper sales and corresponding print ad revenue (Pew Research Center, 2009) (Edmunds et al., 2013). In the U.S., online newspapers have seen significant increases in traffic with unique visitors generating a 27% increase in readership (Nielsen Online, 2008).

Similar evolutions are happening within other platforms. In the place of television commercials come pre-roll ads, or video ads that play before an online video an individual was looking to watch on YouTube for example. Last year, Americans watched 48 billion online videos, in the month of July (comScore, 2013). A viewership statistic like this provides a massive market to promote, engage and brand products and their related companies. Moreover, these ads can be targeted and personalized similarly with methods used by SEO. This combination proves to be very effective with a 27 times increase in click-through rates compared to standard static ads (Abramovich, 2013).

As discussed, non-traditional advertising does not need to be digital to be defined as alternative but can be a mixture of both. Take a television campaign created by Nestlé for their dog food brand Beneful. While to most consumers the commercial looks and sounds like a standard pet food ad, the campaign is loaded with high pitch frequencies only dogs can hear. This leads to an increased attention by the dog to the television, and in turn an interest of the dog's owner in response to that behaviour (Gianastasio, 2011). British Airways developed a set of

digital billboards in the United Kingdom which would display the route of one of their planes as they flew over the area (Gonzales, 2013). Motorola created an interactive print ad for their new Moto X mobile Smartphone with the help of mini LED lights hidden in the pages of magazines. By pressing on a variety of available colours listed on the ad, the image of the phone would change correspondingly through the paper (Motorola Mobility, 2013). As a last example, the company ORPHEA, a bug spray manufacturer, wanted to prove the efficacy of their product. To do so, they took a traditional billboard and transformed it into a giant insect trap through the application of glue and their product to the surface. As days passed the billboard amassed thousands of dead flies and mosquitoes as they were trapped and killed (ORPHEA, 2013).

While non-traditional advertising continues to gain traction with marketers, it is not infallible. Some of the counterpoints mentioned by Robyn Blakeman in the book *Nontraditional Media in Marketing and advertising* (2014), include the inability to effectively reach the target market, difficulty in measuring ROI, budget increases due to lengthier creative input, and lack of long term buzz generation. While many of these issues are understandable when looking at nontraditional media that are not part of the electronic landscape, it would seem that many of these issues would not be significant factors if they were digital. Looking at measurable return on investment, reputable marketing firms or even most major business have working knowledge analytics programs that measure click-through rates, playback numbers, data usage rates, and incoming traffic sources through relatively simple programs like Google Analytics (Google, 2014). Further, part of the success of alternative marketing relies on buzz generation. Viral videos are a relatively new result of sharing information and entertainment on a massive scale through online platforms. Meaningful advertising that captures the interest in sharing what one has seen with people around them creates word-of-mouth over a digital platform that expands

past the number of connections one would typically have otherwise. A study by the Time-sharing Experiments for the Social Sciences concluded that on average, people only have two close friends in comparison to hundreds on social media networks (Williams, 2011). Many nontraditional advertisements feed off the ability to be shared, reposted and talked about on a larger scale stimulating word-of-mouth references that can generate up to 50% of all consumer purchase decisions (McKinsey Quarterly, 2010). This snowball effect ultimately proves to be a kind of social sift for ads, promoting the ones that connect with people, and allowing those that falter to be left behind. It is not surprising then that some of the most memorable ad campaigns of the past few years have been viral success stories such as Old Spice's *The man your man could smell like* and Dove's *Real beauty sketches* (Nudd, 2013). The creative process to produce worthwhile and outstanding ads or marketing tactics, however, is longer than typical reruns of similar ideas across platforms or resizes, but this budgeting cost is expected in the ad agency fee breakdown.

The Backend Research of Successful Campaign Across All Media: Marketing Research

While non-traditional marketing covers a wide array of types, platforms, and methods, marketers will always strive to stretch value of their dollar to align themselves with consumers. Most often, companies, marketers, and advertising agencies alike find that often the best way of getting messages across to consumers is through multi-platform marketing. By combining traditional media and non-traditional media, the two methods are likely to cover any expected gaps in quality of the intended message. Further, a major interest to marketers is being able to gain access to consumer information and behaviour. By having deeper insight into consumer habits, marketers are better able to make fundamental decisions regarding the implementation of promotional materials across both traditional and non-traditional mediums. This is why there has

always been a strong requirement for marketing research. This process essentially captures the five W's and How of the consumer landscape. By investing in market research, campaign efforts are more successful by delivering a message in a more direct manner to the intended consumer rather than a best-guess approach.

Marketing research itself is evolving in a non-traditional manner. Through traditional marketing, most research involves viewership rates, demographic usage, focus groups, interviews and observations to name a few methods. Non-traditional market research however, is a variety of new metric systems aimed at examining consumers through new technology. The term “new” is used in the sense of a novel research method never before established or repurposing existing methods with the assistance of new technology. This can include processing viewership rates by click-through rates on videos or ads, demographic usage through IP address trafficking, or qualitative data mining from social media. These examples are but a fraction of the many ways market researchers work on getting a better grasp of who their consumers are and what are their preferences. These methods are continuously adapting to the changing economic environment. It is this topic that the remainder of this paper focuses on, specifically on the emergence and defining aspects of neuromarketing and big data analytics.

Why Use Neuromarketing?

At the same rate that technology increases exponentially in both storing capacity and processing power as described by Moore's Law (Moore, 1965), the applications for new developments spread across economies of the private and public sector. From consumer goods such as cellphones and personal computers, to federal banking systems, humanity is prospering from the successes of this exponential capability growth across industries. As these technologies

expand, their intended specific applications spread out and evolve to play significant roles in other sectors. There is a new connection between cognitive neuroscience and marketing research that has spurred inquiry into the social phenomena that goes in-hand with market exchanges (Senior & Lee, 2008). This has been the case for developing the new sub-section of science and business that is neuromarketing. The first to lay claim the term neuromarketing was Nobel Prize winner Ole Smidts in 2002 (Smidts, 2002) and from there, the current definition stands as marketing research that studies sensorimotor, cognitive and affective responses to marketing stimuli (Suomala et al., 2012). Specifically, the emerging use of medical imaging in the wake of the functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) has been responsible in founding the new sector of neuromarketing. Originally tied to healthcare and psychological studies, medical imaging has been a key player in the new methods of diagnosis medical issues.

So what does neuromarketing have to offer in terms of gaining insight of the consumers mind? Neuromarketing deals mainly in the workings of the subconscious, and it is there that it will find the most information. As well, our unconsciousness is where 95% of our thinking occurs (Ciprian-Marcel, 2004). The predominant amount of thinking below the communicable threshold gives neuromarketing an important place in today's research methods, over traditional consumer insight methods such as interviews, surveys and focus groups respondents (which are known to have difficulty in describing and discussing their true wants and intentions). That is not to say that this new field of study will eliminate these methods but rather it will provide an additional information source where test subjects are not able to verbalize their true thoughts effectively (Ford, 2010). This is where neuromarketing will excel; by being able to be used as a quantifiable data method to test and evaluate the effectiveness of marketing tactics through

sensory input and cerebral processing (Ciapri-Marcel, 2004). It is believed that if used effectively, neuromarketing will not only be able to avoid some of these common information collection biases such as confirmation bias and response bias, but amass a deeper understanding of the hidden information of true preferences. This ultimately leads to determining more than preferences, associations, or responses, but a potential view of what makes people want to buy (Ariely&Berns, 2010).

Neuromarketing may be the answer to amassing communication efforts across target market, better matching of consumers with products, building better branding, and creating company trust through motivation and behaviour. These abilities are the goals of most marketers, so it is no surprise the massive jump in neuromarketing interest is seen in search engine queries for the topic. In 2008, Googling “neuromarketing” pulled up 800,000 results (Kenning, 2001), and in 2014 that number closes in at 1.75 million.

This idea however, doesn't come without conflict. Many consumers and researchers are declaring ethical issues on the front of neuromarketing. The term “buy button” has many people apprehensive about this new segment of research being able to scrap free will in consumerism. Like any pioneering field, there will be concerns about testing methodology and implication for humanity. At the present, there is no evidence of potential subconscious control to push the buy button in consumer's minds. Although neuromarketing is both an applied and pure science there does need to be discretion in applying ethical norms. Let us start with how that information is first captured.

What are the primary methods of conducting neuromarketing research?

Neuromarketing has its theoretical perspective and research rooted in neuroimaging. The reason for this is attributed to the connecting factor between pre-existing medical practices that use the same research techniques: neuroscience, cognitive psychology and physiologic psychology. Adapting the use of medical analysis and neuroscience techniques for reading consumer responses to a variety of marketing principles is not new. With the first instance of neuroimaging invented in 1890, Angelo Mosso managed to monitor the change in blood flow to processing parts of the brain in patients with skull breaches (Sandrone et al., 2014). A developing road to peer into the human subconscious began which would ultimately lead to research linking to marketing and consumerism.

Moving into the 20th century, by the 1960's, modern neuroimaging technology had become a major tool in health and research progression and was slowly being implemented in consumer research. Although not as advanced as today's means, researchers like Herbert Krugman began ground-breaking work on conscious and unconscious reactions to advertising stimuli. With simple but effective techniques, the process involved monitoring pupil dilation and tracking eye movement during exposure to film and packaging materials (Krugman, 1968). Similarly, galvanic skin response (GSR) provided examiners an introductory method to monitor subconscious arousal by degree and frequency through the appearance or interaction with specific ads or products (Barker et al., 2012). Taking these research developments further, Hansen Flemming (1981) was also one of the first to work on the different processing effects of marketing on left and right brain hemispheres by monitoring the alpha and beta brainwaves detectable by EEG technology.

Today, neuromarketing research is still used for some of these applied methods to get a better understanding of consumer reaction to marketing tactics. The most effective and popular methods of study tools are positron emission topography (PET), functional magnetic resonance imaging (fMRI), electroencephalography (EEG), magnetoencephalography (MEG), and GSR.

EEG was the first to hold the spotlight before the invention of fMRI in 1990's. The system works to measure the electric signals as they pass between neurons within the brain.

Typically this process is done by wearing a cap full of sensors that rest against the patient's scalp. The results are detectable changes in brain waves and their associated function. It was first discovered that changes in brain waves were a result of changing demands in mental function (Mundy-Castle, 1957). This provided a key stepping stone in today's use of EEG equipment for measuring activity in both location and wave type. With this, neuromarketing is able to determine whether marketing stimulus produces asymmetrical responses in brain hemispheres and regions, such as higher alpha brain waves in the left frontal region which is associated with positive emotional reactions (True Impact Marketing, 2012). Furthermore, unlike magnetic imaging sensors which returned less than ideal spatial information of the brain, EEG now has the capacity to detect activity in sections as small as a squared centimeter each millisecond (Vecchiato et al. 2011).

Although EEG is still often used today, fMRI is the go-to method used by neuromarketers. A non-invasive procedure, the system allows researchers a more effective glimpse into the human mind. Although the technology was credited to Seiji Ogawa and Ken Kwong 20 years ago, its use still revolves around the same initial properties, and fMRI still

provides one of the most effective methods of measuring brain activities when linked to responses in marketing stimuli.

Originally, magnetic resonance imaging, which is the basis that fMRI employs, makes use of hydrogen atoms acting as atomic magnets. Due to the human body being comprised of hydrogen-rich cells, when it is introduced to a strong magnetic field the hydrogen molecules within these cells align themselves with the pulses of the magnetic field, providing an image. This system presents the brain's structural and functional applications as well as an improved spatial resolution compared to other imaging methods.

Following the application of MRI, fMRI was the first major true application of magnetic resonance imaging applied to neurology. The key finding supporting this change is that when there is a burst of neural activity in a specified location in the brain, a small increase of the magnetic resonance signal is also detected. The noticeable increase is only a 1% jump, but it still provides a differentiation for mapping active and non-active regions of the brain with a specific task at-hand (UC San Diego, 2014).

This change in the magnetic resonance is not a direct result of neural activity, but instead the change in blood flow to that active location. The cause of this change is the properties of oxygen interaction alongside hemoglobin-rich blood cells. This difference in the amount of oxygen is responsible for a change in the magnetic signal. Where oxygenated blood propagates, the magnetic resonance signal is better than blood that has been absorbed of its oxygen. This change in blood oxygen coined *blood oxygenation level dependent (BOLD)* is what creates the operational basis for fMRI (Devlin, 2005). These changes in cerebral blood flow can be observed in real-time with the assistance of fMRI. By connecting the magnetic resonance imaging to 3D

modelling software, the technology allows researchers to visually cross-section parts of the brain to determine heightened activity levels and make scientific inference as to the causation.

These advancements, originally intended to determine how under normal circumstances a functioning brain works to trouble shoot and determine diseases, has given rise to visualizing internal reactions to marketing stimuli that are otherwise unobservable or confounded by other conscious measuring techniques.

Neuromarketing Research Findings, Studies and Applied Techniques, from Coca-Cola to Vehicle Manufacturers

With a new visual insight into humanity's mind, how does marketing research take advantage of this technology and apply it to better connect with consumers? The answer lies in the number of applied marketing tactics themselves.

One of the major tactics that embeds itself across the four pillars of marketing (product, price, place, promotion) is branding. Creating a brand is one of the major factors that differentiates one product from another, especially in a highly saturated market with similar products or services such as vehicles, beverages, and internet service providers. It is not surprising then that branding plays a key part in advertising and marketing as a whole. As expected, the costs can be astronomical as Davide Grasso, vice president of Nike's global marketing indicates when he describes Nike as on "a journey, a long-term journey for the brand" (NYT, 2013). The company has spent 3.2 billion on branding and advertising between 1995 and 2012 (NYT, 2013).. Surely then, marketers are going to want to find ways to emphatically test

campaign and branding materials before they hit the market to guarantee intended effects and success. This is one major advantage of neuroimaging. Of course, a multi-billion dollar company will be running hundreds of focus groups along all phases of product development to make sure the idea and the final results will seamlessly integrate with consumer desires. However, even the most effective focus groups, along with their interviewers and moderators unfortunately, will create some biases or fail to fully share desires or preferences. By introducing neuromarketing, businesses like Nike can better integrate what they find consumers subconsciously prefer at every level of product development (Ariely & Burns, 2010). This facilitates eliminating concepts or products that fail to deliver early on, and push those that succeed, increasing profit margins. Even further, these techniques can be implemented in the same development testing as branding preference and response to ads. Nike itself has been a massive success with its awarded televised commercials (Taube, 2013) and has carved out its successful niche with the “Just Do It” trademark. Neuromarketing could better enable even successful business to determine what and how branding preferences stick through ad communication, as well as help striving businesses determine what they are missing for brand cohesion. Once a brand is effectively planted, it can be difficult to sway. By obtaining one’s preferred brand over the competition, one’s brain is primed with neurotransmitters that bring a wave of positive emotions similar to the same ones found in drugs, predominantly cocaine (Touhami et al 2011). This is partially why consumers can become so partial or even addicted to specific product brands.

Moving to another branding giant, Coca-Cola was the subject of one of the first and most famous neuromarketing studies that researched consumer behavior towards branding. Conducted by McClure et al., 2004, the study put Coca-Cola and Pepsi in a head-to-head competition for consumer preference. From essentially the same product composed of the same ingredients,

consumers elicit a strong personal preference for one or the other consciously due to their learned brand preferences. Monitoring respondents' subconscious neural activity through fMRI by controlled and blind taste testing methods, their subconscious and vocal expressions differed. When testing through blind tasting, subjects vocally shared no determinant real behavioural preference between the two drinks. Under cognitive imaging, taste results revealed different information in unconscious responses in the dorsolateral prefrontal cortex and pleasure related areas. As found, these areas were seen to be more active while respondents were testing Pepsi. This unconscious reaction is assumed to be due to the incremental increase in sweetness which bumps up dopamine production. However, when presented with the visual branding of the beverage there was a significant preference for CocaCola. Not only did respondents vocally express their choice but brain scans show an increased amount of activity to Coca-Cola in the prefrontal cortex which modifies emotion. A change also occurred in the hippocampus, which aids in recalling learned cultural effects, preferences, and memory for brand recall. The change in activation in the dorsolateral prefrontal cortex and the hippocampus between tests shows that brand preference is not concrete. Touhami et al.(2011) explain in their follow up on McClure's paper, that this means "preference becomes a matter of behavior; and behaviour is not always in line with the "cerebral preference" (p.1530). Specifically, the preference for a brand is not only based on intrinsic components of the product. The "branding" plays a key role in the mechanism of preference. This directly influences the buying behavior and loyalty" (Touhami et al., 2011).

Similarly to the McClure et al. study, Schaefer et al. conducted a brand preference study on car manufacturers in *Neural correlates of culturally familiar brands of car manufacturers* (2006). Conducted in Germany, the study implemented the use of an fMRI as the subjects were exposed to car maker logos such as BMW, Acura, Honda, Pontiac and others for a total number

of 14 brands. As hypothesized, the respondents had preference for the car brands that held more of a cultural familiarity and significance for them, in this case being German, BMW, Volkswagen and Mercedes. Furthermore, similar to the Coca-Cola versus Pepsi study, participants were also seen to have a heightened activity in the ventromedial prefrontal cortex. The inference to this preference was due to the regional association regarding information storage of rewards and punishments, positive emotions and selfidentification in this area of the brain. This in turn, triggers mental associations related to the branding of events surrounding it which binds neural connections in that relationship. These positive associations provide significantly important insights as it is found to relate to purchasing perceptions and habits. With purchasing related to the brain's rewards systems, the perceived benefits and costs have to be weighed up against each other in these cerebral pleasure and pain receptors (Prelac, 1998).

Pulling the results from Schaefer's study, marketers can better implement tactics to create a culturally relevant and positive self-identification reward correlation to offset from costs and increase cerebral pleasure activity. To further adapt marketing materials to fit within a cultural standpoint of acceptance and branding, it is not only important to determine where the activity in the brain is located, but where the respondents visually follow the activity of the ad itself to light up those specific regions. This is especially true with objects like cars that are seen to coincide as status symbols. By displaying social domination not only with culturally distinct vehicles, sports cars, limousines and show cars were seen as more attractive and activated a higher response in activation in ventral striatum, orbitofrontal cortex, anterior cingulate occipital regions associated with social ranking, domination and reward (Touhami et al., 2011).

When moving from the lab to applying vehicle branding in the market, researchers are looking to showcase differentiating factors of their makes and models. Sands Research for

instance, one of America's more active and transparent neuromarketing companies, was hired to determine the effectiveness of a vehicle manufacturer's ad that was looking to specifically highlight the model's dashboard in a pre-launch commercial. The research agency found however, that through psychophysiological eye-tracking, by the time the commercial had featured the dashboard in the video frame, it had been met with an actor's face just out of central focus. The instinctive nature in humans to read facial expressions would draw all the visual glances towards facial recognition until which point the shot was changed and the dashboard was hardly noticed (Ford, 2010). These minor details can severely impact and distract from a brand's message that was originally intended and can waiver the consumer's concentration from millisecond to millisecond. "We have found that in the first 800 milliseconds of every participant watching television commercials there is a spike in activity," says Ron Wright, CEO of Sands Research and that "The following 4 to 5 seconds are crucial in retaining the viewer's attention. A good to great commercial will sustain the viewer's attention all the way through and you will see a high plateau of the brain's signal response." (Ford, 2010 p. 1)

Furthering attempts to increase vehicle sales, neuromarketing can look towards managing all sensory stimuli to provide consistent branding. The German car manufacturer Audi provides a seamless example of implementing a stable sonic (auditory) branding method. A few years ago with the release of the model R8 the company sat down with its think tank to define the question – does Audi have a sound? After scrutinizing every sector of the company, the answer is a resounding yes. Corporate sound, Margarita Bochman, head of Audi's brand development and corporate identity, is described as having a focus on consistent sound that is affiliated with the product across all media channels (Audi Deutschland, 2010). In an acoustic chamber, sound engineers are testing and recording every conceivable sound each model makes. From glove box

clicks, stereoscopic recordings of in-cabin sounds on the racetrack, to even hiring voice actors to create personal voicemail greetings, Audi is set on creating a bonding tie with sound recognition in the consumer's brain. Florian K ppler, chief sound engineer, has solidified eight acoustic colours for Audi that pull at the unconscious strings of sound affiliation. These iconic 8 sounds are intrinsically used to have a subconscious recall of the brand through sound recognition.

Furthermore, they provide a hidden sense of quality. Many people comment on the sound of a closing door giving them an internal good sense of quality with a heavy and hearty thud of a door. So much so that it is a sizeable factor in car purchases which are significant purchases for the general population. (Kuwano et al., 2006, Patizet et al., 2008). It is much more understandable then, how much of a subconscious factor all individual components add up in auditory branding in which Audi takes significant care in solidifying. With sound being such an important sensory organ, sonic branding extends across nearly all product sectors, yet 83% of advertising is only visual (Fast Company, 2013).

Take as an example an experiment conducted in Las Vegas which revealed that when slot machines in a casino were muted, their revenue dropped by 24%. Even though the brain only contributes 3% of its neurons towards hearing, those billions of connections are still able to create strong bonds that are often attributed to having that song or jingle being stuck in your head (Grady, 1993). Take the world's most branded sounds that without visual ad cues many will be able to connect with: Intel, McDonalds, National Geographic, and State Farm to name a few (Fast Company, 2013). Not only does this play a key component of product identification, but with music and film as well. Predetermining unconscious consumer reaction to sound in film before the release of a big budget blockbuster can provide subtle cues of information to tweak

edits and changes for the desired reaction. Major motion picture directors go so far as even to say that sound accounts for 50% of the movie experience, just as much as vision (Lynch, 2013).

Although the connection to neuromarketing has a strong impact on branding, the first thing many think of is how neuromarketing can show insight on how we react to everyday commercials and advertising. Moving towards a more applied introspective aspect of realworld promotional materials, looking to the most watched American television broadcast--the Super Bowl, is a good place to start (Hibberd, 2014). With the average cost of a 30 second Super Bowl ad reaching 4 million, having pre-testing of ad materials is an important risk management factor. University of California Los Angeles was the first to look at the unconscious response reactions of those watching ads to be aired for the 2007 Super Bowl XLI (Sherman, 2007). The results are surprising and significant; effects of the fMRI imaging showed significant BOLD activity in the amygdala which is associated with fear and anxiety in almost all the commercials. The highest anxiety level was stirred by GM, and the lowest was by Honda "which showed participants were less engaged during the ad than they were when they looked at a blank screen" (Sherman, 2007 p.1).

Taking Super Bowl neuromarketing one step further, Sands Research posts their findings of consumers' neurophysiological responses while observing Super Bowl ads from 2009 to 2013. The research is extensive and uses a combination of neuroimaging technologies to achieve an effective performance indicator for ads and their relationship to cognitive responses. The strong reasoning behind this new method of field testing becomes clear as "It's an enormous event and you have 110 million people grading your homework," says Joel Ewanick, the global marketing chief for the largest U.S. auto maker (Vranica, 2012 p.1). Sands Research does just that with a combination of three neuromarketing techniques. Eye tracking is used while videos are played

and monitors key areas of subject focus from reading copy to tracking facial cues and movements in the actors. Simultaneously an EEG machine displays the changing levels in alpha and beta brain waves, while and fMRI indicates when increased vascularity in sections of the brain are indicating arousal which are primarily the occipital area responsible for vision and the parietal which manages perception and attention. These three imaging methods are combined in real time and can be viewed by the public from the company's press releases.

From the driver's seat, to the football field, to the sales floor, neuromarketing is also making more concrete conclusions for retailers on better targeting for shopping practices. There have been numerous studies on effective placement on products within grocery stores and supermarkets to be discussed further in this text. However, with newer technology, marketers are now able to not only see where consumers are looking while shopping, but how their unconscious reactions match their shopping experience. By equipping shoppers with unobtrusive eye-tracking devices and mobile EEG machines, POPAI, the global association for marketing at retail, generated neurological and psychophysiological information by capturing data as subjects shopped. This use of technology vastly improves consumer reaction monitoring for granular information that would otherwise be unable to be measured; the minute physiological changes would be unable to be seen standing adjacent to the person or otherwise create an unnatural environment while watching. The results of matching what the subjects were perceiving, along with their brain activity noted that product displays played a significant role in creating interest in certain product categories through endcaps and floor standing displays which pulled consumers to the associated aisle (POPAI, 2012). This was a major breakthrough in realizing that floor ends and displays did not succeed in their intention to create impulse buys, but had a deeper cognitive function of in-store direction. Learning the extent to which consumers will subconsciously travel

through the store for purchases can be valuable even in a controlled flow layout such as Ikea where impulse buys account for 67% of purchases (Kazim, 2004).

Researchers were also surprised to see in the POPAI report just how fast consumers glance from product to product and updating defining the term of “fixating” on a product. Lev-Glick the CIO and founder of Shopper Sense reveals that "the shopper demonstrates an initial fixation on a display from several feet away. This initial fixation is somewhat central on the display itself," says LevGlick, adding that a "fixation" is defined as a 200-millisecond gaze, and that three consecutive fixations totaling 600 milliseconds count as a "view" that indicates an active consideration of the display and products. This sensory information is also processed differently depending on the gender of the consumer. When monitoring cerebral activation times, there is a noticeable difference between females and males with females showing a stronger activation of arousal after the 400ms mark in different areas of their brains. With males having a stronger special awareness, neural activity is higher in the right temporal lobe, where females experience higher parieto-occipital lobe arousal which accounts for product knowledge (Vecchiato et al., 2011.) (Kimura D., 1996).

This logged information provides the ability to observe the rate of consumers checking back and forth (Sands Research, 2012). This revelation in neurological behaviour monitoring led the Advertising Research Foundation to share that neuromarketing provides a "deep, useful understanding – not available through traditional research – of the otherwise elusive world of consumer emotion....It would be competitive folly for advertisers to defer learning about neuromarketing research.... the potential contribution that neuromarketing could make to great advertising is too significant!" (ARF NeuroStandards Project, 2011 p.4)

These tactics combined with other sensory marketing techniques tug at consumers' purchase behaviours. The retail environment is rife with subtle cues to help sway perception, preference, and impulse buys. As discovered by Nespresso, it is often not the product itself that sells but the environment with 60% of the sensory experience coming from the retail setting rather than the coffee itself (Dooley, 2007). Taking the neuromarketing information from the retail store to the home product, the subsidiary of Nestle adjusted their home-brewing machines to be designed to emit more olfactory stimulation than contemporary home-brew systems to mimic the store where customers are tuned in to the branding experience on several fronts.

Fragrance also plays a key role in marketing and it is important to effectively segment it just like other marketing materials according to the target market. This is becoming more relevant as studies show olfactory sense management subconsciously differs between females and males (Spangenberg et al., 1996). The use of feminine scents in women's retail clothing stores doubled the purchase rate of goods. The same response was found in men's retail outlets when masculine scents were diffused. It was noted that similar to the Schaefer et al. study on brand preference, culturally relevant and self-identifying fragrances will vary from culture to culture. Though, when effectively implemented, the gender-specific scent will subconsciously create a longer shopping experience and create higher price purchases. Even gender neutral scents such as citrus will create a browsing experience that lasts 25-40% longer in stores than without (Brumfield et al., 2008). It is understood then, why Advertising Age rated scent as one of the top ten trends to watch in 2007 (Thomaselli, 2007). It is not surprising that retailing cues catered to the senses for subconscious branding and behaviour change extends from single business models such as Audi's sonic branding to general retail outlets. Moreover, the

effectiveness of this type of neuromarketing by auditory implementation is eye-opening. Sonic affective response can be so compelling that for some retailers like Victoria Secret, the choice in store music was determined to have more influence on the purchasing decision than the product itself (Morrison, 2001). Many of us are familiar that our choice of music can change our mood and thus our behaviour, but unconsciously this change can be employed to increase sales by 38% through playing slow music (Milliman, 1982). Auditory usage further extends to play a role in our choices for which store to enter, even if the stores are the same (Baker et al., 1992). Once inside, more typical strategies such as combining auditory cues of seasonal music are shown to increase store sentiment as a whole (Spangenberg et al., 2005).

Last, on retailing specifics, Brenda Soars identifies *in Driving sales through shoppers' sense of sound, sight, smell and touch* (2009) that implementing effective strategies can have a neurological impact on all types of shoppers: task/needs shoppers who come into the store for a specific purchase in mind who can still be shown to be altered by external stimuli; complex purchase shoppers who are going to be using higher secondary process thinking and thus open to judging available alternatives; and the recreational browsing shoppers who are often ignored to have capital value, yet the research shows it plays a specific role in consumer behavior and purchase habits.

Prospect Theory and Purchase Framing

These accumulated studies on the unconscious interaction of the senses and stimuli provide a new level of understanding of the brain's self-monitoring system and its results on purchase behaviour. These deep unconscious motivations, although new in the sense of applied neuromarketing, are reminiscent of Psychodynamic Theory from Sigmund Freud's era. The majority of the famous psychologist's work revolved around human behaviour being a proponent

of unconscious will. He separated these portions of consciousness into three distinct segments. The id is the most subconscious portion of our brain and it is what carried over from our evolutionary past. Our id constantly manifests our primal urges for instant gratification such as food, sex and safety. Freud argues that we have no control over this portion of our being, but that it is in a constant push to make its wants heard and expressed in order to reach satiety. On the opposite end of our cognition lies the Superego. This segment of our being is at the forefront of our humanistic moral judgement and rationality. Freud explains that these two forms of consciousness are constantly in a battle for satiety even though they both strive for separate outcomes. Enter the Ego, which provides a middle ground between the two. The Ego itself is a middle-man to both levels of consciousness by justifying simple gratification for the id when urges become overwhelming, and appeasing the Superego's aptitude for moralistic societal expectations (Freud, 1922). It is not surprising then, that there is a deep connection between these theories of psychology, neuroimaging and marketing itself when looking for new methods for engaging consumers. Although aspects of Freud's psychodynamic theory have been replaced by newer models of consciousness, there still exists an internal debate and dialogue that marketers and neuromarketers are trying to placate through effective product marketing, branding and promotion.

One of the connecting researchers of these theories is Daniel Kahneman, Nobel Prize winner in economics [year] for prospect theory. Kahneman proposed that human rational logic is not completely sound in its thinking when humans are exposed to a variety of choices (Kahneman & Tversky, 1979). The study goes to promote the idea that humans are not the rational beings economic theories assume when confronted with situations that mirror each other in terms of winning, losing and gambling. The core of traditional economic utility theory

explains that under all circumstances a change of a possession, in this case money, has an equivalent change in utility. Kahneman, as a foremost psychologist noted that this was not the case with true human perception of utility by noting that we hold a significant loss aversion bias and subconsciously perceive utility on a relative scale. In his book *Thinking, Fast and Slow* (2011), he explains that the psychological value obtained by a certain gain in wealth is determined by the increase relative to the initial amount owned. That is, if someone were to have \$1000 dollars and won \$500 they would obtain a higher level of psychological pleasure and perceived utility than someone who begins with \$10,000 and wins the same \$500 amount. This is reflected similarly on losses with one significant difference; through evolution, humans have passed on a type of cognitive safety mechanism regarding loss aversion. This innate avoidance means we are more likely to avoid situations of unnecessary risk and gambling. Because of this trait, when compared to gains, losses have around twice the impact on our psychological value placed on that utility (Kahneman & Tversky, 1979). The two components of losses and gains show a non-linear relationship as they curve along their respective tangents at increasing rates. As the theory shows, however, the curve for losses is much steeper than that of gains. While this information holds true in a general sense, prospect theory can be utilized and even partially negated through marketing techniques. Betts and Taran (2006), go on to show that for large purchases such as vehicles, prospect theory holds true in general but waivers slightly in regards to the consumer's mental association of quality in the purchase. This idea of managing prospect theory by marketers has been successful in terms of framing the purchase decision to coerce consumers, but does not ultimately disregard the foundations of the theory. Framing purchases through sales, add-ons such as buy-one-get-one-free, limited time offers, and bulk deals only changes the perception of gains and losses in the consumer's mind, but still maintains the general

theory as a whole true (Gamliel&Herstein, 2011) (Urbany& Dickson, 1990) (Diamond &Sanyal, 1990).

Neuromarketing has further been able to trace certain traits of perceived losses. In a study by Knutson et al. (2007), it was found that a specific area of the brain was more active during price recognition. This area, the insula, was seen to react highly in accordance with pricepain. In the experiment, respondents were given \$20 to spend on a product while having their brain activity monitored. Sure enough, when exposed to a product they preferred, but with a higher listing price in proportion to what they had on hand, the brain's insula lit up in a demonstration of price pain in relation to the gains and losses theory. This malleability of reframing the theory is reminiscent of neuromarketing's insight on the human brain perceiving quality and branding regardingthe promotion of items such as Coca-Cola or Pepsi. Although we may not be able to override engrained evolutionary preferences like sugar content in beverages or loss aversion, perceiving the stimulus can greatly impact the decisions of consumers regardless.

Ethics in Neuromarketing

With these new insights into consumer's minds, preferences and purchase framing, it may seem that researchers and marketers are reducing or eliminating human free will in consumerism. This fear has been highly vocalized specifically in regards to neuromarketing. Through the ability to monitor and act on unconscious brain activities and choices, many are fearful of marketers locating a hypothetical "buy button" in the brain (Morrin, 2005).Those who are against this idea support their view that through neuromarketing and imaging, researchers are not only able to determine our preferences, but induce pleasurable responses through marketing stimuli like trust, pleasure and excitement which leads to purchases (Wilson et al., 2008). Stepping back to 1957, a

similar outcry was seen when marketing executive James Vicary claimed to have increased movie concession sales by subliminally flashing “Drink Coca-Cola” and “Eat Popcorn.” The claim was real, but the scientific evidence to back up the premise was non-existent. That, however, did not stop the uproar from the general population who worried about marketing mind control (Karremans et al., 2006). Multiple national media outlets shared titles of “the most alarming invention since Mr. Gatling invented his gun” and “minds had been entered and broken” (Moore, 1982, p.1). These uneasy feelings extend to the present where 85% of people believe advertisers subliminally advertise to the public (Rogers & Smith, 1993). It is important then, that today’s and future research must be careful to effectively manage public perception of neuromarketing ethics as well as follow the rigid medical and scientific ethics in place to protect human rights also known as the “Common Rule” defined by Federal Protection of Human Subjects (Umscheid et al., 2011). The study of the human brain and thought processes still does not sit well for many. Commercial Alert is a non-profit organization that promotes communities against commercialization which is in a constant struggle against neuromarketing progress (Commercial Alert, 2014). Gary Ruskin, executive director of the company, argues that the increase in neuromarketing insight abilities will ultimately lead to dishonest companies taking advantage of consumers, contributing to detrimental effects on mental wellbeing (Ciprian-Marcel et al., 2004.) The majority of the scientific community on the clinical side view it as an additional aid into learning about the processes of the human mind, regardless of determinant outcome (Senior et al., 2011) (Lee et al., 2012). Marketers also argue that through neuroimaging techniques, better products can ultimately be created to better perform with consumers’ preferences (Thomson, 2011).

Those who are skeptical about neuroimaging, however, should not be dismissed. There are significant issues that raise the ultimate question of whether marketing enterprises are truly following ethical standards, or making worthwhile contributions. First, where clinical and scientific neuroimaging studies are strict on the ethical common rule by enforcement of the Institutional Review Board, these methods are often abandoned in the commercial sector where there are few enforcement laws or federal regulations due to the non-invasive nature of neuroimaging study (Murphy et al., 2008). Moreover, much of the information shared by the companies who conduct the research does not end up in peer-reviewed academic distribution channels, but instead on a variety of blogs which fail to properly address the methods of study and clear discussions of results (Morin, 2011). This creates false media hype similar to the 1957 subliminal advertising story, and the public runs with the idea of an accessible “buy button.” A certain level of worry and concern can be somewhat understandable as neuromarketing remains a new endeavour. When it comes to the studying of the safety of the science itself, there are currently few academic papers addressing it as a non-issue in terms of marketers being able to subconsciously control consumers (Ariely& Burns, 2010). Many clinical neuroscientists go so far as to say that neuromarketing is just a fad to stimulate revenue growth between science business (Javor et al., 2013). Other scholars argue that given the lax ethical laws on commercial research, sometime in the future marketers will be able to find a closer connection between purchase habits and consciousness and move from clinical studies to applied studies in the marketplace (Wilson et al., 2008). This will ultimately lead to two fundamental issues regarding human rights in neuromarketing: “the protection of various parties who may be harmed or exploited by neuromarketing and, protection of consumer autonomy”(Murphy et al., 2008, p.294).

Concluding Thoughts

As successful marketers know, having the proper research into target segments is one of the major foundations for effective promotion. By analyzing the consumers in their environment, it is easier to determine and predict their behavioural choices and apply techniques to master the ability to pull them towards a particular product. By delving into the brain, marketers are entering an entirely new type of environment of consciousness on levels of neurotransmitters and synaptic connections. Studying consumer behaviour on this level has granted new marketing insights that were previously unthought-of or not effectively provable. While the costs for accessing the information through neuroimaging are high (Ariely, 2010) it appears that the weighted benefits outweigh these costs with 90 practicing businesses in the United States alone focussing solely on this type of research as their business model (Reid, 2006). While traditional clinical studies through medical imaging, psychology and economics have given rise to neuromarketing, the new research method has much ground to cover if it is to be considered a go-to method for marketing information. The results so far have provided key evidence on ideas that were previously only speculation such as when asked questions consumers do not always share their true thoughts or feelings, and that branding has played a significant role in changing out subconscious preferences. As technology increases, it is a sure bet that marketers, retailers, economists and medical researchers alike will break new ground regarding the processing that takes place in the brain in relation to behaviour and stimuli. However, as with any new method of introspective analysis there will be the need to set ethical rules and guidelines. Presently, with the debate of the true power of neuromarketing on behaviour control, it is important that conflicts of interest, mental health and human autonomy are dealt with and consistently monitored to ensure the wellbeing of those involved. Nevertheless, neuromarketing appears to be on the forefront of two

ground-breaking subjects and there is sure to be a cornucopia of new knowledge regarding how our brain interacts with the environment.

Big Data Analytics – The Next Revolution in Business Information

While combining neuroimaging and marketing together has been shown to increase our insight into consumer behaviour, marketing itself still revolves highly on data compilations to effectively determine opportunities. Although the human mind has a high range of neuroplasticity to adopt to the changing external environment, the total storage capacity maxes out at around 2.5 petabytes or 2.5×10^6 gigabytes (Reber, 2010). While the stored information in the human mind varies from person to person through perception of materials which provides a broad range of information, neuromarketing still has a long way to go in terms of giving more specific consumer insight over the general population. This is where big data comes in as a summarized consciousness in consumer preferences. Big data is often labelled as the next revolution in affecting how we live, how companies thrive and how we analyze the world around us (Schönberger, & Cukier, 2013) (Shaw, 2014) (Groves et al., 2013). IBM formally defines big data analytics as “use of advanced analytic techniques against very large, diverse data sets that include different types such as structured/unstructured and streaming/batch, and different sizes from terabytes to zettabytes (IBM, 2014). Not only is big data analytics a relatively new term, but the size of the data involved is also a new achievement. This exponential boom in data compilation and storage has spread across the globe. Going back only 20 years, the highest capacity storage unit was the IBM 3390 model 9, which held 34 gigabytes at a cost of at least \$90,000 (IBM, 2014). Today, with the 2014 release of the Western Digital helium-filled hard drive, one can purchase a 10 Terabyte system for \$600 (Mearian, 2014) (B&H, 2014). This ondemand space capacity for data was not always the case, especially in the early 2000’s where

there was a significant gap in the incoming data and the ability to store it following the boom of the data age.

As data sourcing increases, there is always the constraint of Moore's Law regarding the available capacity for storage, especially now that the size of today's information is growing exponentially. Since 2010, there have been estimates that the world's cumulative data exceeds seven exabytes annually. That is the equivalent to seven million terabytes or 60,000 U.S. Libraries of Congress (Mckinsey Institute, 2011). Even if all the words spoken by humans were captured and coded into text, they would still have a lower sum of 5 exabytes (Mckinsey Institute, 2011). With a few sample figures like 1 in 5 people in the world now owning a smartphone and or a PC, 1.23 billion people using Facebook and 8.6 trillion texts sent per year the rate of compleible data as exponentially expanding is expected (Heggestuen, 2013) (Kiss, 2014) (Gant, 2014). In fact, the global creation of data is increasing by 40% every year (IDC, 2014). With massive amounts of data on this scale, business of all types can find, review and analyze the resources to create a positive impact on company growth.

As this trend continues to emerge, some business are better than others at beginning to take advantage of the opportunities big data provides. 2009 saw just 38% of businesses actively practising big data collection where 85% said they would be looking to do so in the following threeyears (Russom, 2009). This provides an interesting insight into the newness of big data as a separate entity from typical market research. Where almost all businesses collect at least some information and market research through things like purchases, customer tracking and target segments, many businesses are either unaware of big data capabilities or unable to manage the constraints that come along with it. This extends deeper by not only to collecting the databut

analysis as seen with 23% of organizations not actively practising any form of analytics and 40% not practicing analytics on big data (Russom, 2009). This gap between collecting data and its analysis also creates a gap in business intelligence, which is one of the predominant reasons for adapting big data analytics overall. Essentially, business intelligence is the ability to turn raw data into meaningful and useful insights through analyzing tools and techniques (Watson & Wixon, 2009). By adopting the collection of big data and analyzing it, enterprises may be better able to determine trends, consumer preferences and strategies. These new advances flow in-hand with marketing. By developing a clearer insight to target segments, marketers can pinpoint the direction of the segment and the necessary promotional materials to follow them. This link is so important that 94% of CMO's say that big data analytics can help reach their target goals. In IBM's *Stepping up to the challenge: How CMOs can start to close the aspirational gap*, John Kennedy, Vice President of Marketing, Global Business Services notes "Companies across all industries are striving to integrate their physical and digital presence in order to provide a more integrated, seamless customer experience" (IBM, 2014). Yet, 82% of responding CMOs say they are unprepared for the data revolution. These figures are even lower in Canada. Only 50% of companies employ at least some sort of data mining and a quarter make use of analysis for predictive purposes (O'Kane, 2013). The International Data Corporation of Canada reports that only 21% of Canadian companies effectively incorporate business analytics into their overall business model (O'Kane, 2013). Clearly with such an integral new form of business management and analysis companies will need to establish an implementation of big data in order to compete in the corporate environment.

The Major Factors Defining Big Data Analytics

To effectively implement big data analytics, it is important to understand the core facets that build its foundation. Industry analyst Doug Laney is credited as one of the major definers of mainstream big data analytics back in 2001. He breaks analytics up into three core component V's: volume, velocity, and variety (Laney, 2001). Volume is the backbone of the system, bydefining big data as information exceeding terabytes or even petabytes. Having a system in place to organize and manage the mass of information is a major component of the system. The volume itself is then divided further into sub-sections of type such as transactions, records, or tables depending on the business or industry standards.

Velocity of the data may or may not be a demanding factor for certain users. Where collecting data in batches may be ideal for analytics in a supermarket chain, real time or near time streams may be the ultimate choice with more advanced uses such as satellite tracking systems or customer movements. Even at a micro-level, large-scale data matched with proper velocity can give better insight for real-time consumer actions. Take the local Edmonton based company Granify. Their e-commerce tracking system streams keyboard queries and mouse locations while a consumer shops online. As the consumer moves from link to link across the site, through mouse routing movement captures, the Granify system can then predict if a consumer is likely to leave, purchase, or abandon digital shopping carts and interject with relevant messages in response to their actions. This is a game changer for online business where 78% of business are not completely sure why customers abandon their desired purchases (Ingram, 2013). With effective velocity management through big data, Granify's real-time results show a 36% increase in online sales for many of their clients, providing direct customer intelligence and actionable insights (Granify, 2014).

Last, the variety of incoming information will have a significant effect on applying business intelligence techniques. When looking at social media as an example, most facts and figures will be unstructured qualitative information which must be tackled in a different matter than more straightforward and organized structured data. Major software companies that specialize in business analytics such as the SAS Institute go further to add variability of peak load times for data and complexity of interconnecting server platforms (SAS Institute, 2014).

Big Data Applications in the Business Landscape – Retail to Social Media

Through having a better understanding of the foundations of big data analytics, we can look at how this revolutionary tool can help in the marketing sector. One of the most famous stories of the true effectiveness of big data analytics is how the algorithm system of the major retailer Target knew how one of their younger female customers was pregnant before her father did (Duhigg, 2012). Andrew Pole, who works as a statistician for Target was looking to find the ultimate connection between purchase habits, human behaviour and statistics to give the retailer a predictive and competitive edge. Pole goes on to describe how after childbirth, most new infant names go on public record in addition to sharing the news with the parent's friends and family. Retailers may also access this information and therefore will push their products against competitor's natal products in the form of gifts or necessities from friends and families. Target wanted to hone in by analyzing a consumer's purchases to effectively predict the need for baby purchases. Aiming for this insight around the second trimester, the company was hoping to achieve a lockdown on loyalty. By determining common upcoming baby purchases such as scent-free lotions, hand sanitizers and washcloths, Pole's predicative algorithm's accuracy is statistically significant. He describes: "Take a fictional Target shopper named Jenny Ward, who is 23, lives in Atlanta and in March bought cocoa-butter lotion, a purse large enough to double as

a diaper bag, zinc and magnesium supplements and a bright blue rug. There's, say, an 87 percent chance that she's pregnant and that her delivery date is sometime in late August.”(Duhigg, 2012, p.4).At that point of statistical significance, a combination of traditional direct marketing can be applied and discounts or promotions on related items can be sent to the consumer. It is from this method of targeted direct marketing that the media story began. Under the program Andrew Pole created a young pregnant woman in Minnesota who began receiving direct promotions to her residence where she lived with her family. Her father, upset at receiving what he thought was falsely targeted mail, complained to the retail giant. Shortly thereafter Target received a followup call from the father who, after talks with his daughter, noted that the company was right and that she was due that coming August. Where data metrics can display significant predicative abilities as seen with Target, data on this scale also serve a key purpose in brand marketing and associations. Through the vast information of purchase habits, marketers can better personalize interaction and create a more user-friendly and centred experience in all types of interaction. While normally, these associations are built on a combination of first-time experience and longitudinal interaction, available data can now specify targeted promotions and experiences to enhance or change brand perspective. In doing so, spam marketing that does not effectively target relevant consumers may be abolished and create larger margins for the company. Effective direct marketing through this method can increase sales by up to 10% and increase the return on investment of marketing materials by eight times (Gordan&Spillecke, 2013).

Direct marketing is now also seen to excel in a new form through targeted ads via the web. While all the statistics point to big data analytics as a revolutionary method of launching and monitoring the effectiveness of marketing materials, the adoption rate for online positioning is still low. Even with smaller online business analytic platforms like Google Analytics, which

creates a dashboard for a breadth of consumer trends, only 10% of the world's total marketing is online based (Dachis, 2012). This becomes a loss for major promotional abilities within engagement and research, especially when it comes to social media. In this new era of data capabilities, marketers are now able to identify, manage and measure the performance of their brand in near real-time. One of the biggest barriers to effectively extracting business intelligence information from social media is the nature of the data. With social media being a predominantly qualitative data set through supported platforms such as Twitter, Facebook and Instagram, it can be difficult to successfully extract worthwhile information on a large scale. Twitter for instance breaks records with 600 billion tweets a year, a daunting mediascape but a goldmine for sentiment and trend mining under the surface (Live Stats, 2013). There has been a variety of stipulated methods to effectively gather qualitative information from selective tweets that cap at a total of only 140 characters or less. Pak and Paroubek (2010), created a method that found an 81% success rate of determining positive or negative sentiment through the use of emoticons in tweets (☺, ☹, etc.). Bruns and Steiglitz (2013), worked to incorporate a similar method through associated hashtags like #angry and #happy. Further, several major companies are devoted to strictly creating big data algorithms for analyzing a multitude of these qualitative and quantitative aspects alike to provide insightful metrics for the world's largest companies.

Sysomos, a data analytics company based in Toronto, provides social media insights for the likes of Microsoft, Nike and Coca-Cola in both historical and real-time streaming for contentbased information. Their business is able to pull effective demographics for gender, age, sentiment, trends, influencers, and geotagging which allows geographic distinction (Sysomos, 2014). Through these tactics we come full circle to reviewing the effectiveness of Super Bowl ads but under a data analytics viewpoint. Where neuromarketing companies like Sands Research

look for the exchange of neurochemical data within the brain, Dachis Group, a major data analytics firm, looks to the exchange of information between people. More specifically, the company assesses the data of social media to pull information that may contradict traditional marketing evaluation models that still constitute the general standard for promotional benchmarking (Huddleston, 2012). For the 2012 Super Bowl, USA Today's Ad Meter was the returning source for comparing the effectiveness of Super Bowl promoter ads. The 2012 benchmarking comparison methods were a combination of measurement techniques that have not changed significantly since the review's creation in 1989 (Moses, 2014.). Typically the review involves traditional marketing methods of analysis which include focus group testing, surveys and polls. In 2012, by the traditional Ad Meter review methods, Coca-Cola's ad "the catch" scored 15th out of the entire line-up of 40 (USA Today, 2012). On the other hand, through the Dachis Group social metrics method, Coca-Cola took the top spot. This conclusion was arrived at by measuring three major components of brand awareness, engagement and social rankings. Dachis shows how it analyzes trillions of social media permutations down to 15 minute intervals surrounding the air time of the ad and compiles the permutations based on their three major components of branding success. (Dachis Group, 2012). This provides a more thorough review of the information exchange between members of the population. By analyzing the qualitative population data at large rather than through traditional methods, the company can best determine the success and exchange of promotional materials across the digital landscape. The analytics company argues that with the new form of consumer engagement that social media enables, there should likewise be a new form to benchmarking the ad interest.

There are also problem identification systems in the data to make use of. By being able to see shortcomings in certain segments, geographic regions, or markets, algorithmic tactics can

navigate their way around them or find better ways to manage the gaps acknowledged in the environment (Bowden, 2013). This becomes significantly important as the marketing and sales environment changes. Where most marketing and sales managers monitor historical performances in targeted areas, data analytics can open up new opportunities where a wedge may be placed for breaking into new territory.

Developing a working model that predicts human behaviour and purchasing habits is a major objective as seen in neuromarketing, but now with the proper big data to cover a major proportion of the target market, marketers are better able to determine general behaviours elicited through purchases rather than neural functioning. By adapting the velocity and variety in massive volumes, analysts can pinpoint their own “buy button” hidden in consumer data.

The Costs of Information Analytics – Implementation and Savings

With the size and scale of big data, there is sure to be a number of high-priced associated costs. Furthermore, to make the investment worthwhile, there must be a significant profit margin in the opportunities for implementation. True enough, this has been exemplified with the media giant Netflix who offered a \$1 million dollar prize to create an algorithm that would have a 10% better suggestion rate of new movies available on the platform (Ellenberg, 2008). By having an open source data linkage to Netflix, Gavin Potter, a Ph.D. in machine learning, secured the top prize. In his coded algorithm, Potter applied an ability to personalize Netflix’s customer offering. While the entire media Netflix hosted were always available before the applied data system, by not managing them within a personalized customer experience, there was a gap in click-through rates to new viewings. By bridging the gap of available resources, tailoring customer offerings on a large-scale significantly boosted the usage rate of video streaming to their 44 million subscribers (Daly, 2014). Following in similar footsteps, many other major enterprises are willing

to pay for these business intelligence systems as seen in the merging and acquiring of IT companies that specialise in big data. Looking across the globe, Australia's largest grocery store chain Woolworths purchased a 50% stake in the data analytics company Quantum in order to gain better insight to their target segment for a price of \$20 million (Howarth, 2013). Quantum founder Tony Davis noted that the merger will "help to further seed the business's growth and development" (Mitchell, Ramli, 2013). This comes at a time where Australia is expecting to have significant competition incoming from major western retailers and is looking to keep a firm grip on their market share. Another giant in Australia, Telstra Telecommunications, similarly announced an increase of \$60 million towards its IT and data management program.

Many companies are also looking internally to create teams devoted solely to managing the stream of massive information quantities. Intel for example began its major big data analytics marketing merger in 2010 by branching off an entire division – Marketing Return on Investment (MROI) (Nichols, 2014). By adjoining the best of the available financial resources and tabulating them into a marketing process, the company was able to determine the effectiveness of its ad placement on a variety of online websites. The results show that through paid Facebook advertising the company was able to increase user search queries of the Intel brand by 2.3% therefore increasing sales numbers. Although the costs range in the millions, big data is slowly becoming standard practice for the major corporations that can afford them. With consumer information coming in by the terabyte, it is important to be able to keep a leg-up on the competition. By having a better analytics system in place, a major industry leader can fill the cracks in consumer purchases and make habit forming relationships. It is evident then why 75% of corporate marketing departments are preparing to leverage funds to partners and internal analytics (IBM, 2014).

Concluding Thoughts

Big data analytics is a massive undertaking from both a financial and time perspective. The processes that go into building, maintaining and exercising programs and systems of this nature are highly demanding. This all comes at a significant cost of capital. But as discussed, the achievements and accomplishments of big data analytics are a worthwhile endeavour if a business is looking to develop a deeper insight into the marketplace and its consumers. This in essence, creates a full circle from marketing and market research; by being able to better understand the consumer at hand, one may better align the business, marketing objectives and the consumers themselves to the selling process. Data analytics today creates a basic marketing foundation for customer insight for most businesses. Whether it is managing email lists, customer accounts or website traffic statistics through applications like Google Analytics, most businesses have implemented some form of customer tracking or analytics. Big data analytics is simply one step ahead in terms of abilities and cost compared to more traditional or basic analytic functions. In the future it is most likely expected that smaller businesses today will grip the analytical abilities that major corporations presently hold. Further, those large and capital-dense corporations will also continue to be on the cutting edge of market research, looking to pull any relevant business intelligence from consumer behaviour and purchase habits. Looking forward, big data analytics is here to stay and will likely continue to become a continually successful method of looking into the actions of the marketplace through buyers.

Summary of Learning

Through my research on these topics, this paper has increased my knowledge significantly regarding the application of neuroscience and big data analytics. Moreover, rather than these

specific topics themselves, I have gained extensive knowledge on the practices of involving new technology alongside marketing research. As a marketing major, I like to think that I have a somewhat decent grasp on the marketing processes that go on around me when I play the role of the consumer. However, compiling a paper like this has opened my eyes and has made me come to the realization that what I believe I know is really only a surface view of the true applications of marketing research. Due to my focus more on the communications and advertising aspects of marketing, I was more under the notion that target markets are decided on through group discussions, general past actions and purchase habits of consumers. I realize now that consumers can be best sorted by algorithms and are much more predictive than most would like to admit.

In addition, my writings on neuromarketing have broadened my knowledge on the combination of several sciences together and how they each build off of each other. What I found consistently interesting in both the big data analytics research and neuromarketing research, is the extend of what consumers think they know about their own preferences, wants and desires, only to be subconsciously deviated by their own brain. Just like the subconscious preference of CocaCola versus Pepsi, there are likely to be an infinite number of subtle neurological combinations that impact the true desires of the brain against what our consciousness deem to be worthwhile. Marketers have always strived to create brands that resonate with a certain image, level of quality and lifestyle to increase sales. The research on neuromarketing has showed me that this scientific application can essentially prove these theories of correlation through witnessing the processes happen in the human brain in real-time. I find it deeply interesting that “I” am my brain and yet my brain keeps so much of what is going on hidden from my consciousness. The fact that I cannot understand these processes no matter how hard I look

introspectively and yet neuromarketers are looking to take advantage of these processes seems like something out of science fiction.

Overall, I am confident that my paper in its entirety is an accumulation of my knowledge in these subject areas. I made the decision to focus on these topics as they originally spurred an interest and I was eager to learn more about them. This paper has given me the freedom to choose what I found to be most interesting in terms of marketing research, and bring them together into one text. I made a sincere attempt to create an interesting piece in that if I, as an undergrad student with an interest in marketing whom had no knowledge of these topics, would find this paper to be engaging, informative and increase my knowledge in the area. In doing so, I am confident that I have in-turn had the same effect on myself while completing this paper.

References

Abramovich G., 2013 *15 Mind-Blowing Stats About Online Video Advertising*. Retrieved from: http://www.cmo.com/articles/2013/8/27/video_15_mind_blowing.html

Acuna, K., 2012 *Here's what TV's First Prime-Time Schedule looked like in 1946*. Retrieved from: <http://www.businessinsider.com/televisions-first-prime-time-schedule-2012-5>

Ad Age, 1999. *Ad Age Advertising Century: Timeline*. Retrieved from: <http://adage.com/article/special-report-theadvertising-century/ad-age-advertising-century-timeline/143661/>

ARF NeuroStandards Project, 2014 Retrieved from: <http://neurospire.com/pdfs/arfwhitepaper.pdf>, 2014

Ariely, D., & Berns, G. S. (2010). Neuromarketing: the hope and hype of neuroimaging in business. *Nature Reviews Neuroscience*, 11(4), 284-292.

B& H, 2014 Price listing. Retrieved from:

<http://www.bhphotovideo.com/bnh/controller/home?O=&sku=1070042&gclid=CNX0OzL1cECFc5cfgodnAYAyQ&Q=&is=REG&A=details>

- Baker, J., Levy, M., & Grewal, D. (1992). An experimental approach to making retail store environmental decisions. *Journal of retailing*.
- Barker, N., Valos, M., & Shimp, T.A. (2012). Measures of Behaviour. *Integrated Marketing Communications*
- Blakeman R., 2014. *Nontraditional Media in Marketing and Advertising*. University of Tennessee at Knoxville
- Bowden J., 2013 Retrieved From: <http://www.socialmediatoday.com/content/infusion-brand-marketing-and-bigdata-analytics-0>
- Brumfield et al 2008 – Retrieved from: <http://www.amazon.ca/Whiff-Revolution-Scent-Communication-Information/dp/0981746004>
- Bruns, Axel, and Stefan Stieglitz. "Towards more systematic Twitter analysis: Metrics for tweeting activities." *International Journal of Social Research Methodology* 16.2 (2013): 91-108.
- The Campaign for America's Libraries, 2014. *The Golden Age of Television Began With Boxing* Retrieved from: <http://www.atyourlibrary.org/culture/golden-age-television-began-boxing>
- Ciprian-Marcel, P., Lăcrămioara, R., Ioana, M. A., & Maria, Z. M. (2004). Neuromarketing– getting inside the customer's mind. *Journal of Economic Literature*, 1, 804-807.
- Chicago Tribune, 2000. Retrieved from: http://articles.chicagotribune.com/2000-08-28/news/0008280034_1_facecharges-white-men-divorce-decree
- comScore, 2013. Retrieved from: <http://www.comscore.com/Insights/Press-Releases/2013/8/comScore-ReleasesJuly-2013-US-Online-Video-Rankings>
- Dachis, 2012. Retrieved from: <http://www.businessinsider.com/big-data-is-the-future-of-marketing-2012-7>
- Dachis Group, 2012. Retrieved from: <http://dachisgroup.wpengine.com/wp-content/uploads/2012/02/Dachis-GroupSocial-Winners-v1.7-hi-res-e1329142267985.png>
- Daly, 2014. Retrieved from: <http://www.radiotimes.com/news/2014-02-27/how-many-people-are-watching-netflix>
- David Lynch, 2013 -Retrieved from <http://filmdoctor.co.uk/2013/01/14/monday-prescription-sound-thealarm/>, 2014
- Devlin, 2005 – Retrieved from: <http://psychcentral.com/lib/what-is-functional-magneticresonance-imagingfmri/0001056>, 2014
- Diamond, W. D., & Sanyal, A. (1990). The effect of framing on the choice of supermarket coupons. *Advances in consumer research*, 17(1), 488-493.

Dooley, 2007 – Retrieved from: <http://www.neurosciencemarketing.com/blog/articles/espresso-sensory-selling.htm>, 2014

Dooley Roger, 2010 - Retrieved from: <http://www.neurosciencemarketing.com/blog/articles/sonic-branding.htm>, 2014

Duhigg, 2012. Retrieved from: <http://www.nytimes.com/2012/02/19/magazine/shoppinghabits.html?pagewanted=1&r=2&hp&>

Edmonds R., Guskin E., Mitchell A., Jurkowitz, M. 2013. *Newspapers: By the Numbers*. Retrieved from: <http://www.stateofthedia.org/2013/newspapers-stabilizing-but-still-threatened/newspapers-by-the-numbers/>

Encyclopedia Britannica, 2014. *Television in the United States*
<http://www.britannica.com/EBchecked/topic/1513870/Television-in-the-United-States>

Ellenberg, 2008. Retrieved from: http://archive.wired.com/techbiz/media/magazine/1603/mf_netflix?currentPage=all

Fast Company, 2013 - Retrieved from: <http://www.fastcompany.com/1555211/10-mostaddictive-sounds-world>, 2014

Fiske, J. (2002). *Television culture*. Routledge.

Flint J., 2014. *TV networks load up on commercials*. Retrieved from: <http://www.latimes.com/entertainment/envelope/cotown/la-et-ct-nielsen-advertising-study-20140510-story.html>

Ford, 2010 - Retrieved from: <http://www.cnn.com/2010/TECH/innovation/10/05/neuro.marketing/>, 2014

Freud, S. (1922). The unconscious. *The Journal of Nervous and Mental Disease*, 56(3), 291-294.

Gant 2014, Retrieved from: <http://www.tweaktown.com/news/34968/whatsapp-sees-50-billion-messages-per-daymore-than-all-sms-combined/index.html>

Gamliel, E., &Herstein, R. (2011). To save or to lose: does framing price promotion affect consumers' purchase intentions?. *Journal of Consumer Marketing*, 28(2), 152-158.

Gianatasio D., 2011. *Pet-Food Brand Makes TV Commercial Only Dogs Can Hear But are they buying it?* Retrieved from: <http://www.adweek.com/adfreak/pet-food-brand-makes-tv-commercial-only-dogs-can-hear-135391>

Goodwin D., 2014. *Search Ad Revenues Hit \$18.4 Billion in 2013 [Report]*. Retrieved from: <http://searchenginewatch.com/sew/study/2339606/search-ad-revenues-hit-usd184-billion-in-2013-report>

Gonzales L., 2013. *British Airways Billboards Interact With Their Planes Overhead*. Retrieved from: <http://www.psfk.com/2013/11/british-airways-interactive-plan-billboards.html#!ql9qd>

Gordan & Spillecke, 2013. Retrieved from: <http://www.forbes.com/sites/mckinsey/2013/07/22/big-data-analytics-and-the-future-of-marketing-sales/>

Grady, 1993 - Retrieved from: <http://discovermagazine.com/1993/jun/thevisionthingma227>, 2014

Granify, 2014 – Retrieved From: <http://granify.com/>

Groves P., Kayyali B., Knott D., Van Kuiken S. (2013) *The 'big data' revolution in health care*. [Hyperlink](#)

Haig, M. (2005). *Brand failures: the truth about the 100 biggest branding mistakes of all time*. Kogan Page Publishers.

Hansen, F. (1981). Hemispherical lateralization: Implications for understanding consumer behavior. *Journal of consumer research*, 23-36.

Heggestuen, 2013. Retrieved from: <http://www.businessinsider.com/smartphone-and-tablet-penetration-2013-10>

Hibberd, James, 2014 - Retrieved from: <http://www.hollywoodreporter.com/blogs/livefeed/super-bowl-dethronemash-sets-53083>, 2014

High tech productions, 2014. Retrieved from: <http://www.high-techproductions.com/historyoftelevision.htm>

Howarth, 2013. Retrieved from: http://www.cmo.com.au/article/529936/big_data_analytics_new_black_magic_marketing/

Huddleston, 2012. Retrieved from: <http://www.sprinklr.com/social-scale-blog/the-future-of-superbowl-ad-success/>

IBM, 2014 *What is Big Data Analytics?* (2014) Retrieved from: <http://www01.ibm.com/software/data/infosphere/hadoop/what-is-big-data-analytics.html>

IBM, 2014 – Model Listing – Retrieved From: http://www03.ibm.com/ibm/history/exhibits/storage/storage_3390.html

IBM, 2014 - Retrieved From: “*Stepping up to the challenge: How CMOs can start to close the aspirational gap*, <http://www-03.ibm.com/press/uk/en/pressrelease/43458.wss>

IHS, 2013. *TV Market Declines Again in 2013 as Sales in both Developed and Emerging Regions Decrease*. Retrieved from: <http://press.ihs.com/press-release/design-supply-chain-media/tv-market-declines-again-2013-salesboth-developed-and-emerg>

IHS Report, 2014. *Global Mobile Advertising Revenue The State of Mobile Advertising Around the World*. Retrieved from: http://www.iab.net/media/file/IAB_Global_Mobile_Ad_Rev.pdf

Ingram, 2013. Retrieved from: <http://www.cmswire.com/cms/customer-experience/marketing-the-most-profitableplace-for-big-data-analytics-022383.php>

IWS, 2014. Retrieved from: <http://www.internetworldstats.com/stats.htm>

Javor, A., Koller, M., Lee, N., Chamberlain, L., & Ransmayr, G. (2013). Neuromarketing and consumer neuroscience: contributions to neurology. *BMC neurology*, 13(1), 13.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica: Journal of the Econometric Society*, 263-291.

Karremans, J. C., Stroebe, W., & Claus, J. (2006). Beyond Vicary's fantasies: The impact of subliminal priming and brand choice. *Journal of Experimental Social Psychology*, 42(6), 792-798.

Kazim, F. (2004), "Experiencing the retail promenade of Ikea", unpublished MSc paper, UCL, London.

Kenning, P., & Linzmajer, M. (2011). Consumer neuroscience: an overview of an emerging discipline with implications for consumer policy. *Journal für Verbraucherschutz und Lebensmittelsicherheit*, 6(1), 111-125.

Kimura, D. (1996). Sex, sexual orientation and sex hormones influence human cognitive function. *Current opinion in neurobiology*, 6(2), 259-263.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Giroux.

Kiss, 2014 Retrieved from: <http://www.theguardian.com/technology/2014/feb/04/facebook-10-years-markzuckerberg>

Konrad, Alex 2013 <http://www.forbes.com/sites/alexkonrad/2013/02/02/even-with-recordprices-10-million-spot/>

Knutson, B., Rick, S., Wimmer, G. E., Prelec, D., & Loewenstein, G. (2007). Neural predictors of purchases. *Neuron*, 53(1), 147-156.

Krugman, H. E. (1968). Processes underlying exposure to advertising. *American Psychologist*, 23(4), 245.

Kuwano, S., Fastl, H., Namba, S., Nakamura, S., & Uchida, H. (2006). Quality of door sounds of passenger cars. *Acoustical science and technology*, 27(5), 309-312.

Laney D., 2001 – Retrieved From: <http://blogs.gartner.com/doug-laney/>

Lee, N., Senior, C., & Butler, M. J. (2012). The Domain of Organizational Cognitive Neuroscience Theoretical and Empirical Challenges. *Journal of Management*, 38(4), 921-931.

Live Stats 2013 – Retrieved From: <http://www.internetlivestats.com/twitter-statistics/>

- Lucas, P. 2003. Retrieved from http://money.cnn.com/magazines/fsb/fsb_archive/2003/04/01/341005/
- Magna Global, 2013. Retrieved from: <http://news.magnaglobal.com/ipgmediabrands/press-releases/magna-globaladvertising-forecast-2014-ipg-mediabrands.htm>
- Marketing Charts, 2008. *Alternative Media Poised for Strong Growth in '08, Despite Slowing Economy*. Retrieved from: <http://www.marketingcharts.com/television/alternative-media-poised-for-strong-growth-in-08-despiteslowing-economy-3975/?camp=rssfeed&src=mc&type=textlink>
- Mark Sutherland 2007 –Retrieved from:
http://www.sutherlandsurvey.com/Column_pages/Neuromarketing_whats_it_all_about.htm
- Martino, G. (2014). Weighing brain activity with the balance: Angelo Mosso's original manuscripts come to light. *Brain*, 137(2), 621-633.
- Mayer-Schönberger, V., &Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. U.S.A. Houghton Mifflin Harcourt
- McClure, S. M., Li, J., Tomlin, D., Cypert, K. S., Montague, L. M., & Montague, P. R. (2004). Neural correlates of behavioral preference for culturally familiar drinks. *Neuron*, 44(2), 379-387.
- Mckinsey Institute, 2011 – Retrieved from:
http://www.mckinsey.com/~media/McKinsey/dotcom/Insights%20and%20pubs/MGI/Research/Technology%20and%20Innovation/Big%20Data/MGI_big_data_full_report.ashx
- McKibben, G. (1998). *Cutting Edge: Gillette's Journey to Global Leadership*. Harvard business Press. McKinsey Quarterly, 2010. Retrieved from:
http://www.mckinsey.com/insights/marketing_sales/a_new_way_to_measure_word-of-mouth_marketing
- Mearian, 2014. Retrieved from: <http://www.computerworld.com/article/2604311/wd-leapfrogs-seagate-with-worlds-highest-capacity-10tb-helium-drive-new-flash-drives.html>
- Milliman, R. E. (1982). Using background music to affect the behavior of supermarket shoppers. *The Journal of Marketing*, 86-91.
- Mitchell S., & Ramli D. 2013 – Retrieved From:
http://www.afr.com/p/business/companies/quantum_leap_for_woolworths_GVE7EDP9KOkqhdeH5rLw3I
- Mirzoeff, N. (2002), *The visual culture reader*. Routledge
- Morrison, M. (2001). The power of music and its influence on international retail brands and shopper behaviour: a multi case study approach. In *Australia and New Zealand Marketing Academy Conference 2001*. Clarendon.

- Moore, G. E. (1965). Cramming more components onto integrated circuits.
- Moore, T. E. (1982). Subliminal advertising: What you see is what you get. *The Journal of Marketing*, 38-47.
- Morin, C. (2005) *Neuromarketing: Is There a 'Buy Button' in the Brain? Selling to the Old Brain for Instant Success*. U.S.A. Salesbrain Publishing
- Morin, 2011. Retrieved from: http://neuromarketing.ning.com/profiles/blogs/neuromarketing-and-ethics-a-call-formore-attention-and-action-to#_ENREF_32
- Moses, 2014. Retrieved from: <http://www.adweek.com/news/advertising-branding/usa-today-expands-super-bowl-ad-meter-155123>
- Motorola Mobility, 2013. Retrieved from: <https://www.youtube.com/watch?v=iMrZmSPpIRw>
- Mundy-Castle, A. C. (1957). The electroencephalogram and mental activity. *Electroencephalography and clinical neurophysiology*, 9(4), 643-655.
- Murphy, E. R., Illes, J., & Reiner, P. B. (2008). Neuroethics of neuromarketing. *Journal of Consumer Behaviour*, 7(4.5), 293-302.
- Nichols, 2014. Retrieved from: <https://hbr.org/2014/07/how-big-data-brings-marketing-and-finance-together/>
- Nielsen Media, 2014 Retrieved From: <http://www.nielsen.com/us/en/insights/news/2014/tv-remains-the-reigningchamp-but-display-internet-ads-are-the-mvps-of-3q.html>
- Nielsen Online, 2008. Retrieved from: http://www.nielsen.com/content/dam/corporate/us/en/newswire/uploads/2009/01/pr_090127.pdf
- Nudd T., 2013. *The 10 Best Ads of 2013 The year's greatest triumphs in concept and craft*. Retrieved from: <http://www.adweek.com/news-gallery/advertising-branding/10-best-ads-2013-154404#dove-real-beauty-sketches-1>
- NYT, 2013 - Retrieved from: <http://www.nytimes.com/2013/04/15/business/media/nike-oncecutting-edge-seeks-toregain-its-brand-aura.html?pagewanted=all,2014>
- Ohme, R., Reykowska, D., Wiener, D., & Choromanska, A. (2009). Analysis of neurophysiological reactions to advertising stimuli by means of EEG and galvanic skin response measures. *Journal of Neuroscience, Psychology, and Economics*, 2(1), 21.
- O'Kane, 2013. Retrieved from: <http://www.theglobeandmail.com/report-on-business/careers/management/big-dataputs-more-power-in-marketers-hands/article19080295/>
- ORPHEA, 2013. Retrieved from: <https://www.youtube.com/watch?v=xgvXZsgr9IQ>

Osawa J., 2013 *Decline in Global TV Sales Expected to Continue*. Retrieved from: <http://blogs.wsj.com/digits/2013/10/08/decline-in-global-tv-sales-expected-to-continue/>

Pak, Alexander, and Patrick Paroubek. "Twitter as a Corpus for Sentiment Analysis and Opinion Mining." *LREC*. 2010.

PAPAI 2012 - Retrieved from: <http://www.neoadvertising.com/ch/wpcontent/uploads/2012/05/Media-ToplineFinal.pdf>, 2014

Parizet, E., Guyader, E., & Nosulenko, V. (2008). Analysis of car door closing sound quality. *Applied Acoustics*, 69(1), 12-22.

Peppers, D., & Rogers, M. (1995). A new marketing paradigm: share of customer, not market share. *Managing Service Quality*, 5(3), 48-51.

Pew Research Center, 2009. *Newspapers Face a Challenging Calculus*. Retrieved from: <http://www.pewresearch.org/2009/02/26/newspapers-face-a-challenging-calculus/>

Pew Research Center, 2014 - *Social Networking Fact Sheet*. Retrieved from: <http://www.pewinternet.org/factsheets/social-networking-fact-sheet/>

Poggi J., 2013. *TV Ad Prices: Football Is Still King*. Retrieved from: <http://adage.com/article/media/tvad-prices-football-king/244832/>

Prelec, D., & Loewenstein, G. (1998). The red and the black: Mental accounting of savings and debt. *Marketing Science*, 17(1), 4-28.

PQ Media, 2008. *Alternative Media Spending Growth Accelerates in 2007, Hastening Transition from Traditional to Alternative Advertising & Marketing Strategies*. Retrieved from: <http://www.pqmedia.com/about-press-20080326amf2008.html>

Reber 2010 – Retrieved from: <http://www.scientificamerican.com/article/what-is-the-memory-capacity/>:

Reid, Alasdair. 2006. MRI Scanners Can Improve Advertising Effectiveness. *The Economic Times*

Rogers, M., & Smith, K. H. (1993). Public perceptions of subliminal advertising: Why practitioners shouldn't ignore this issue. *Journal of Advertising Research*.

Russom, 2009 – *Next Generation Data Warehouse Platforms* http://www.sybase.com/files/White_Papers/TDWI_BPR_NextGenDWplatforms_Q409.pdf

Sandrone, S., Bacigaluppi, M., Galloni, M. R., Cappa, S. F., Moro, A., Catani, M., ...&

Sands Research, 2012 - Retrieved from: http://www.sandsresearch.com/Article_ShopperMarketing.aspx, 2014

Santhanam, L.H., Mitchell, A., Rosenstiel, T. *Audio: By the numbers 2013* Retrieved from: <http://www.stateofthedia.org/2012/audio-how-far-will-digital-go/audio-by-the-numbers/>

SAS Institute, 2014. Retrieved from: http://www.sas.com/en_us/insights/big-data/what-is-big-data.html

Schaefer, M., Berens, H., Heinze, H. J., & Rotte, M. (2006). Neural correlates of culturally familiar brands of car manufacturers. *Neuroimage*, 31(2), 861-865.

Schultz, D. E. (1992). Integrated marketing communications. *Journal of Promotion Management*, 1(1), 99-104.

Senior, C., & Lee, N. (2008). Editorial: A manifesto for neuromarketing science.

Senior, C., Lee, N., & Butler, M. (2011). PERSPECTIVE-Organizational Cognitive Neuroscience. *Organization Science*, 22(3), 804-815.

Shaw, 2014. Retrieved from: <http://harvardmagazine.com/2014/03/why-big-data-is-a-big-deal>

Sherman 2007, - Retrieved from: <http://www.reuters.com/article/2007/02/06/television-nflsuper-advertising-scans-didUSL0549647620070206>, 2014

Smidts, A. (2002). Kijken in het brein: Over de mogelijkheden van neuromarketing.

Smithsonian Institute, 1986. Retrieved from: http://smithsonianeducation.org/educators/lesson_plans/radio/ATZ_HelloAmerica_Fall1986.pdf

Soars, B. (2009). Driving sales through shoppers' sense of sound, sight, smell and touch. *International Journal of Retail & Distribution Management*, 37(3), 286-298.

Spangenberg, E. R., Grohmann, B., & Sprott, D. E. (2005). It's beginning to smell (and sound) a lot like Christmas: the interactive effects of ambient scent and music in a retail setting. *Journal of Business Research*, 58(11), 1583-1589.

Spangenberg, E. R., Crowley, A. E., & Henderson, P. W. (1996). Improving the store environment: do olfactory cues affect evaluations and behaviors?. *The Journal of Marketing*, 67-80.

Suomala, J., Palokangas, L., Leminen, S., Westerlund, M., Heinonen, J., & Numminen, J. (2012). Neuromarketing: Understanding Customers' Subconscious Responses to Marketing. *Technology Innovation Management Review*, (December: Recent Research).

Taube, 2013 - Retrieved from: <http://www.businessinsider.com/25-nike-ads-that-shaped-the-brands-history-20138?op=1>, 2014

Thomaselli, 2007 - Retrieved from: [http://adage.com/article/print-edition/trends-watch-](http://adage.com/article/print-edition/trends-watch-2007/113905/)

[2007/113905/](http://adage.com/article/print-edition/trends-watch-2007/113905/), 2014

Thompson, 2011. Retrieved from :<http://www.independent.co.uk/news/media/they-dont-just-want-your-moneythey-want-your-brain-311817.html>

Touhami, Z. O., Benlafkih, L., Jiddane, M., Cherrah, Y., Malki, H. O. E., & Benomar, A. (2011). Neuromarketing: Where marketing and neuroscience meet. *African journal of business management*, 5(5), 1528-1532.

UC San Diego, 2012 - Retrieved from:

<http://fmri.ucsd.edu/Research/whatisfmri.html><http://www.trueimpact.ca/introduction-to-electroencephalogram-ee/>, 2014

Umscheid, C. A., Margolis, D. J., & Grossman, C. E. (2011). Key concepts of clinical trials: a narrative review. *Postgraduate medicine*, 123(5), 194.

Urbany, J. E., & Dickson, P. R. (1990). Prospect theory and pricing decisions. *Journal of Behavioral Economics*, 19(1), 69-80.

USA Today, 2012. - Retrieved from: <http://usatoday30.usatoday.com/money/advertising/story/2012-02-07/usatoday-facebook-super-bowl-ad-meter-final-scores/53004026/1>

Vecchiato, G., Astolfi, L., De Vico Fallani, F., Toppi, J., Aloise, F., Bez, F., ... & Babiloni, F.

(2011). On the use of EEG or MEG brain imaging tools in neuromarketing research. *Computational intelligence and neuroscience*, 2011, 3.

Vranica 2012 - Retrieved from: [Online WSJ Hyperlink](#), 2014

Watson, H. J., & Wixom, B. H. (2007). The current state of business intelligence. *Computer*, 40(9), 96-99.

Williams Z., 2008. *Social networking aside, how many close friends do you have?* Retrieved from: <http://www.theguardian.com/uk/2011/nov/08/social-networking-close-friends>

Wilson, R., Gaines, J., & Hill, R. P. (2008). Neuromarketing and consumer free will. *Journal of Consumer Affairs*, 42(3), 389-410.

