Creative AI : a data-driven design approach for creative online ad optimisation using artificial intelligence and big data

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**NANYANG TECHNOLOGICAL UNIVERSITY
SCHOOL OF ART, DESIGN & MEDIA**

**NANYANG
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SINGAPORE

**CREATIVE AI: A DATA-DRIVEN DESIGN APPROACH
FOR CREATIVE ONLINE AD OPTIMISATION USING
ARTIFICIAL INTELLIGENCE AND BIG DATA**

PHAY HAN

SCHOOL OF ART, DESIGN AND MEDIA

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ARTIFICIAL INTELLIGENCE AND BIG DATA**

PHAY HAN

SCHOOL OF ART, DESIGN & MEDIA

A thesis submitted to the Nanyang Technological University
in partial fulfilment of the requirement for the degree of
Master of Arts (Research)

2019

Statement of Originality

I hereby certify that the work embodied in this thesis is the result of original research, is free of plagiarised materials, and has not been submitted for a higher degree to any other University or Institution.

19 August 2019

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Date

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Phay Han, G1700170A

Supervisor Declaration Statement

I have reviewed the content and presentation style of this thesis and declare it is free of plagiarism and of sufficient grammatical clarity to be examined. To the best of my knowledge, the research and writing are those of the candidate except as acknowledged in the Author Attribution Statement. I confirm that the investigations were conducted in accord with the ethics policies and integrity standards of Nanyang Technological University and that the research data are presented honestly and without prejudice.

19 August 2019

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Date

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Associate Professor Jesvin Yeo

Authorship Attribution Statement

This thesis **does not** contain any materials from papers published in peer-reviewed journals or from papers accepted at conferences in which I am listed as an author.

19 August 2019

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Date

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Summary

This thesis aims to identify how present day advertising agencies can compete in an increasingly disruptive technology-driven future. By investigating the early history of advertising and the subsequent modern evolution of advertising technology, it is determined that a new way of creative advertising should evolve with the times. Through the integration of Artificial Intelligence and Big Data with current industry processes, a new kind of advertising agency will emerge that is run like a tech company. Using Big Data to inform creative design and Artificial Intelligence to identify patterns, predictive analysis can be applied to creative online banner ads for the purpose of increasing user engagement through higher click-through rates. This new methodology of data-driven design increases productivity for ad agencies, whilst increasing returns-on-ad-spend for clients.

To support the hypothesis of design driven by data, a controlled experiment is carried out with digitally generated online banner ads. A total of 8 generated digital online banner ads were put through a 7 weeks adversarial A/B test on the *Google Display Network*, with one winning ad determined at the end of the period based on click-through % scoring. Performance data for the ads are presented, as well as a discussion on the implications of the findings, specifically on the positive potentials of data-driven design and the importance of ad agencies becoming like tech companies.

The research is structured in 7 chapters: (1) A Historical Perspective on Modern Advertising, looking at the way creative advertising agencies have evolved throughout the earlier years, (2) Present Day Advertising Technology, continuing the narrative post-internet through exploration of the advertising technology industry in present day, (3) Consumer Psychology, specifically on how creative design attributes in ads, such as visuals, text and sound, can subconsciously have an effect on humans and are important

to the cause of advertising, (4) Data-driven design, a new way of looking at the digital online ad creation process, integrating big data and artificial intelligence to predict the optimal creative attributes in digital ads, (5) Multivariate Testing for Creative Optimisation, a controlled experiment to determine that generated ads do not underperform current human designed ads, (6) Translating Research into Product, where the ad agency as tech company model is brought forth through the form of a startup, and lastly (7) Future Opportunities, that identifies other areas of emerging tech and the implications on future research.

Chapter 1

Advertising: A Historical Perspective

In 1704, the Boston newsletter published a real estate notice within its pages, on behalf of a seller seeking a buyer in the Long Island district of New York (AdAge, 1999). The platform of a widely read newsletter within the region served as a tool for the seller to engage with potential buyers on a non-personal and wide scale. What is known today as the industry of advertising, began with the premise of peer-to-peer, business to consumer platform where messaging can be distributed to wide audiences throughout a region in the format of a well distributed physical medium.

Modern advertising, as it stands today, began earnestly in parallel with the emergence of capitalism and commerce in the 19th century New-frontier America (Mendelova, 2018). As a form of commercial art, advertisements served the primary purposes of making trade memorable and relatable to the consumers, through the usage of catchy slogans and vivid graphical imagery in service of promoting services and products. During the 19th century, advertisements largely took the form of large painted billboard banners and print ads between the pages of locally published newspapers. As the 19th century progressed, along came catchy jingles emanating from the analog radio. The entire experience of advertising filled every part of consumer lives, from the graphic visuals of an outdoor painted ad, to the sounds emitted from radio commercials, and subsequently, moving images projected on early television sets. It is in this period of time that the golden age of advertising truly took form, and laid the stage for the advancements to come.

This particular *Golden Age* of advertising, as popularised by the modern TV series *Mad Men*, can be attributed to the emergence of key figures in the ad world the likes of Sir *David Ogilvy*, of Ogilvy & Mather, and *William Bernbach*, of Doyle Dane Bernbach (DDB). These figures of the creative advertising world introduced new ways of looking at selling

products, focusing less on the dry pitch and more on telling the consumers something interesting.

The Rolls-Royce Silver Cloud—\$15,995

“At 60 miles an hour the loudest noise in this new Rolls-Royce comes from the electric clock”

What makes Rolls-Royce the best car in the world? “There is really no magic about it—it is merely patient attention to detail,” says an eminent Rolls-Royce engineer.

1. “At 60 miles an hour the loudest noise comes from the electric clock,” reports the Technical Editor of *Time* magazine. This muffles out sound frequencies—acoustically.
2. Every Rolls-Royce engine is run for seven hours at full throttle before installation, and each car is test-driven for hundreds of miles over varying road surfaces.
3. The Rolls-Royce is designed as an owner-driven car. It is eighteen inches shorter than the largest domestic cars.
4. The car has power steering, power brakes and automatic gear-shift. It is very easy to drive and to park. No chauffeur required.
5. The finished car spends a week in the final test-shop, being fine-tuned. Here it is subjected to 99 separate trials. For example, the engineers use a microscope to listen for axle whine.
6. The Rolls-Royce is guaranteed for three years. With a new network of dealers and parts-depots from Coast to Coast, service is no problem.
7. The Rolls-Royce radiator has never changed, except that when Sir Henry Royce died in 1933 the monogram HR was changed from red to black.
8. The coachwork is given five coats of primer paint, and hand rubbed between each coat, before six coats of finishing paint go on.
9. By moving a switch on the steering column, you can adjust the shock-absorbers to suit road conditions.
10. A picnic table, covered in French valise, folds out from under the dash. Two more swing out behind the front seats.
11. You can get such optional extras as an Espresso coffee-making machine, a distilling machine, a bed, hot and cold water for washing, an electric razor or a telephone.
12. There are three separate systems of power brakes, two hydraulic and one mechanical. Damage to one system will not affect the others. The Rolls-Royce is a very safe car—and also a very lively car. It cruises smoothly at eighty-five. Top speed is in excess of 100 m.p.h.
13. The Bentley is made by Rolls-Royce. Except for the radiators, they are identical motor cars, manufactured by the same engineers in the same works. People who feel diffident about driving a Rolls-Royce can buy a Bentley.

price. The Rolls-Royce illustrated in this advertisement—i.e. principal parts of entry—costs \$15,995.

If you would like the rewarding experience of driving a Rolls-Royce or Bentley, write or telephone to one of the dealers listed on the opposite page.

Rolls-Royce Inc., 10 Rockefeller Plaza, New York 20, N. Y., Circle 5-1144.

March 1959

“At 60 miles an hour the loudest noise in this new Rolls-Royce comes from the electric clock”, Ogilvy & Mather for Rolls Royce, Sir David Ogilvy, 1958.

Early advertising had been predominantly copy-driven, typically showcased on print format, publicised in newspapers or magazines before the advent of the radio and television. The tactile and leisurely reading of newspapers and magazines during the 60's and 70's, contributed to the experience of the advertising dependent on the medium. Taking the form of copywriting as a craft, *Sir David Ogilvy* used wordplay as a witty form of selling factual information about products. He believed that advertising should foremost capture the interest of the consumer above all. More importantly, he did not subscribe to the notion of advertising seen as pure abstract art, and instead argued that it should be interesting enough for the viewer, to drive interest in purchasing the advertised product (Ogilvy, 1985). This philosophy underlined the purpose of advertising as a professional craft, which first and foremost, served as the tool of marketing for the services of growing company revenues through increased product sales. *Sir David Ogilvy* also stated that consumers tend to think long ad copy reflected a more

sophisticated product even if said consumers did not read the content of the ad in its entirety (Ogilvy, 1985). This trend of the bygone era gave rise to the predominance of copy-driven ads, as various agencies all rushed to copy from each other.

“Lemon”, Doyle Dane Bernbach (DDB) for Volkswagen, Julian Koenig & Helmut Krone, 1960.

The “Lemon” long copy advertisement for *Volkswagen* by the ad agency DDB was a good example of effectively used copywriting as a premise. In the late 50’s, with sexier cars available in the market, promoting an old fashioned car was not an easy sell. With traditional print media in magazines and newspapers, long copy was used effectively to tell a compelling story to consumers. Pivotality, the “Lemon” ad combined both art direction and copywriting to great effect, showing an image that was paired with unexpected headline text, drawing curiosity of the consumer to read further (Hamilton, 2015). This effect of using short headlines to capture attention, followed by longer product introductions once the consumer was enthralled, had become an effective method in which advertisers employ.

Concurrently, on the other side of the world in *Singapore*, ads published during the 50’s also followed similar copy-driven formatting, through the same technique of using a

snappy tagline to capture consumer attention, followed by text heavy descriptions of promotions or product descriptions. Robinson's and Company, a popular retail chain in Singapore during the 1950's stated: "It's Big Sale Time!", followed by an exposition on the products being offered. In the same decade, the Tiger Brand, which peddled their core product of menthol balm, combined graphic heavy layouts with stylised text in Mandarin Chinese characters (National Library Singapore, 2018). With print being the predominant medium of use for advertisers, ads during this period of time across geographies typically replicated editorial style formatting, with long form copywriting in a dry product focused manner.

(L-R) "This is Robinson's Reporting from Singapore", Robinson & Co., 1959 & "Malaya Merdeka Album", Eng Aun Tong Tiger Brand Medications, 1957.

Rising from the growth of commerce and the demand to sell products for brands, the predecessor to the modern advertising agency came to be in the mid-19th century. The development of transport lines across the heartlands led to products being sold not just locally, but regionally and nationally. No longer was local newspaper advertisements enough to fulfil consumer outreach, but product sellers now had to to navigate multiple

regional newspapers and media channels. This demand for regional advertisement scaling led to the creation of the modern advertising agency (Mendelova, 2018).

Although early advertising during the 1950's and 60's were largely dominated by American and European advertising agencies, regional outposts in developing third world nations like *Singapore* sprung up over time due to advertiser demand and consumer growth. The commercial advertising industry had become a global business, as a growing capitalist driven market worldwide brought hiked demand and profits. Strategic considerations entered the advertising agency purview when globalisation took centre stage, as agencies like *Cathay Advertising* offered transnational advertisement services to international clients who looked to sell overseas (Crawford, 2015, pp 60-61). The advertising agencies had at this point began to ply the international markets, growing their purview beyond local ad placements and creative ad designs, transitioning into full-scale behemoths with global strategic solutions.

Across mediums, channels and consumer tastes, the goal of advertising had always been in service of telling a story that is relatable, entertaining and memorable. However, there is an important role that the medium of choice plays in the experience of conveying information and telling the story. In the case of the print medium, long copy advertising fitted perfectly into the long form reading format and experience (Jin, 2015). Thus to fulfil the demand of consumer outreach, advertisers started to use different mediums to convey their messages to the consumers. In 1922, the first historically recorded piece of radio advertising was broadcasted on New York radio station WEAJ (Campaign, 2016). Almost 2 decades later in 1941, on WNBT, the first television advertisement went on air (Rodriguez, 2016). In an advertising ecosystem that took place across multiple mediums and formats, planning for advertisement placements are equally important in ensuring the messaging was medium-congruent. When the placement of an advertisement is specifically tailored for the medium it appeared on, whether it is the radio or television, consumer attention is increased when medium is aligned within the context of the product being sold (Ketelaar et al., 2015).

Even though creative advertising fell within the realm of the arts and design as a commercial craft, advertising was primarily tailored to increase product sales or services rendered for consumer businesses. During these golden birth years of creative advertising, many multinational brands whom peddled fast-moving-consumer-goods (FMCG) would rely on factors such like brand recall and share-of-voice in determining effectiveness of their ad spend and efforts (Court, Gordon & Perrey, 2005). Using these metrics, brands that were able to spend more budget on creative ads could move products through checkout aisles with ease, spending heavily on saturated media channels like the radio and television. As a consequence, brands with huge war chests of marketing funding would place quantity over quality, leading to superfluous ads that consumers are constantly bombarded on newspapers, radio and billboards.

Advertising, and the move towards quantity over quality, had caused advertising efforts to become labelled as superfluous with no inherent social benefits to society, and solely existed to sell products for faceless corporations. Even as the medium of advertising had been used as a tool of consumerism, it also had the ability to inspire society through the telling of stories that represented minorities, or used positively in driving contributions to charitable causes. Advertising content had an effect on emotional sentiment towards products, causes or messaging. Tension is created when the advertisement content was not compatible with the underlying preferences of the targeted consumer, and this lead to negative emotional sentiments related to the brand or product (Gardner & Wilhelm Jr, 1987, p84).

Humankind as a whole have always been drawn to relatable content. A relatable visual design layout combined with the right phrases or keywords enabled good branding, as the consumer begun seeing themselves as part of a brands ongoing narrative. Global consumer brands the likes of *Nike* had become incredibly successful commercially, and this achievement can be primarily attributed to brand storytelling efforts that were timeless in message. Using a classical hero's journey narrative structure, *Nike* simply placed the consumer as the protagonist of the larger story in overcoming the odds, with the brand as long term benefactor to the cause (Fog, Budtz & Yakaboylu, 2005). This

allowed *Nike* to sell more than apparel, as the brand had effectively sold the narrative of being successful against all odds. Messaging like this is highly effective and relatable to consumers all over the world, as it represented a larger human struggle to belong and succeed. Alas, static mediums such as print did not allow the depths of narrative-driven efforts compared to the radio or TV formats, but instead created entire narratives through the alignment of visual and copy combined. As a result, brands like *Nike* typically employed multi-medium advertising efforts, including campaigns that encompassed print, outdoor, radio and TV.

The shift from primarily factual advertising in the mad men era, to the modern day storytelling driven advertisements were a reflection of an increasingly complex consumer base, with varying tastes and preferences. As the decades rolled along, with TV emerging as predominant medium of engagement, no longer do consumers hold the attention span to read long copy slogans, or watch repetitive product commercials that were irrelevant to their needs (Castillo, 2017). Additionally, to stand out in a saturated market, brands had to rely on being connected with their target audiences through creative art direction and copywriting efforts, compared to previously factual and dry advertisements. In such aspects, certain brands stood out from the others due to shifting from factual advertising to emotional ads that conveyed a larger story across multiple mediums, using commonly understood and relatable themes. Effective advertising bridged the consumer to the product being sold, through association towards the brands legacy. The consumer was invited to become part of the larger community based narrative, through the purchase and owning of a product from the advertisement. Contrasted to factually narrated advertising with blatant product placements, narrative driven ads were more emotionally engaging. Ads that were focused on narrative had a marked effect on creating stronger interpersonal connections between what a brand represents through its story, and the consumer personal selves (Laurence, 2018). This was a particularly powerful psychological effect, aligned with the need for human beings to belong within a community or common purpose. Consumers transcended the transactional, and became part of an inside group with exclusive access, embedded in a community of like-minded followers.

The importance of reaching out to the right consumer gave rise to the role of media planners within advertising agencies. Coupled with having the intimate knowledge of how consumers think when confronted with these various mediums, these media specialists drafted brand strategies alongside planning for the placement medium of ads based on the type of product marketed (Tuten, 2012). In that sense, with multiple potential mediums and formats for ads to appear in, the role of the media planner became increasingly important alongside the creative copywriters and art directors. Tailored together, good creativity with appropriate placements increased the likelihood of consumers engaged with the advertisement content.

The full scale advertising agency structure comprised the following areas: client facing, strategy and executive roles. The Accounts department is involved with getting and retaining clients for the agency. After acquiring client contracts, the agency assigned media planners to strategise and conduct research on the target consumer. The resultant creative brief distilled the research and insights for the Creative team, which then thought up the big idea of the ad campaign, executing both the art direction and copywriting components. These 3 main departments worked together in delivering the end-to-end ad agency experience for clients:

1) Accounts Team (Sales and Relationship Management)

The Accounts team is made up of Account Executives, Account Managers and Account Directors who liaised directly with the clients. The clients typically were represented via marketing managers and directors working for the brands. This was a relationship building process, and in the grand scheme of things, began the procedure of client growth by collecting relevant information on the clients product, such as: specifications, target demographic, pricing, branding guidelines, amongst various others. They drafted up *creative briefs* which included such necessary information from the clients, and handed this distilled information document to the media planners and creative teams. Their main goal was to establish relationship with large brands and bringing in primary revenue for the agency business.

2) Planning Team (Market Research and Consumer Strategy)

The Planning team conducted market research on the target consumer, and understood the product strategy of the clients, transforming this strategy into a plan-of-action. They worked across a wide network of media partners with access to placement of their clients ads across multiple mediums. These formats included television broadcast channels, radio stations, outdoor billboard spaces and print media owners. Each corresponding format was decided by the Media team based on factors such as product positioning, brand alignment, and a variety of other considerations. Their main goal was to bridge the agency business to consumer sentiment, which lead to consumers that were more engaged with the messaging.

3) Creative Team (Creative Execution)

The Creative Team was made up of 3 primary players: the Creative Director (CD), the Art Director (AD), and the Copywriter. Typically, a large agency serving multiple states and regions would have multiple creative teams. Within each team, the CD leads the high level conceptual strategy for creative vision, and assisting the CD in execution was the partnership of the AD and copywriter, who constructed the creative vision in the form of visuals and text. Their main goal was the creation of ad campaigns that stood out from the other brands or agency businesses.

Within the traditional advertising agency workflow model, the Account Executive (AE) secured contracts from clients and maintained that relationship. The client requirements were subsequently handed over to the Media Planner (MP), who worked with the AE in conducting relevant commercial research analysis and round table focus groups, that ultimately culminated in the creative brief document. The MP handed over the creative brief to the Creative Director, whom then sat down with his tag team of the Art Director and Copywriter to begin execution for the the advertisement campaign, taking into account format of selected mediums and direction of messaging. This process of obtaining client contract to creative brief, typically took an average of two weeks to one month till client delivery. Throughout this process, AEs worked with MPs in conducting market research and organising consumer round tables. The end goal of this process

was for both roles to understand the market preferences as accurately as possible. Not only is this process time consuming, derived consumer market insight was also restricted by scale of operations (Williams, 2018).

Teams of creative directors, art directors and copywriters collaborated in teams to create advertisement content, from high level conceptual multi-media campaigns, to high churn print or poster advertisements. As can be observed from the different roles and expectations of workflow, the craft of creating advertising campaigns for brands was accomplished through collaboration between multiple silos, which created bureaucracy that slowed down the process. Fundamentally, with the accounts department having revenue driven endpoints, compared to the free flowing creative team, friction occurred when innovative thinking or out-of-the-box ideas are squashed in favour of securing contracts with safer and less creative work. The lack of support for new ideas in a bureaucratic organisational structure ultimately stifled creative thinking and tempered execution quality (Hamel & Zanini, 2017). This culture of bureaucracy had become entrenched in traditionally run advertising agencies, even in the modern day, and was the cause for lack of client growth as the decades rolled on and technology progressed and transformed society (Farmer, 2017).

As explored through this chapter, advertising roots began humbly as a method of connecting individual sellers to potential buyers, and then advanced into a sophisticated commercial strategy for brands, as products reached out to increasingly sophisticated consumer groups across region and demographics. Through multiple mediums of communications, the art of creative advertising was shifting alongside the lines of societal and technological advancements. With the core of advertising industry norms having been established throughout the storied years of the 20th century, the ideologies and methods that used to work well during the golden age of industrialisation had slipped behind in the modern age of the digital, triggered when the smartphone and the internet increased expectations on business speed, accuracy and efficiency. The siloed departmental structures inherent in the culture of traditional advertising agencies thus had become limitations in the subsequent decades, as speed of work and expectations

of clients evolved with the times. With the advent of the internet and mainstream consumer adoption of the digital, a new form of advertising is birthed in the 21st century: ad-tech, which is explored in the following chapter.

Chapter 2

Present Day Ad-Tech

In the early 90's, a transformational shift began to occur in the world through the introduction of the World Wide Web. What began as military research into connecting information nodes hosted on interconnected global servers that communicated data with each other, became a new way of distributing information across the globe (Zimmermann & Emspak, 2017). The ARPANET, or what is known today as the internet, completely transformed billion dollar industries, including the advertising world. As this chapter further explores, the internet as a platform for information dissemination has changed the modern landscape of advertising, creating an entirely new ecosystem of what is known today as ad-tech. This new way of connecting information nodes globally laid the foundation for another piece of technology that completely transformed consumer behaviour and patterns into the landscape of the modern digital age.

Almost a decade after Y2K, in 2007 at the annual Macworld expo, tech entrepreneur *Steve Jobs* introduced the world to what is now commonly known as a smartphone. The iPhone, a small personal device with palm sized screen, combined the power of computing with unmatched portability (Guglielmo, 2017). These now-ubiquitous personal handheld devices have become the primary means, in which digital savvy modern cosmopolites and increasingly the developing world, to obtain information, consume digital content and communicate with global social networks of friends and acquaintances. As the vast pool of knowledge becomes easily accessible through tech search engines like *Google* and *Yahoo*, the consumer attention spans have shortened and product choices have considerably widened. Resultantly, this has led to it being harder in general to attract and retain consumers due to short attention spans and consumers growing impatient at a quicker pace with customer service being expected round-the-clock. As these present evolving challenges for modern advertisers, it also brings benefits, such as messaging from brands having the potential to be spread organically through user sharing on social network nodes (Phillips, 2014).

Resultantly, consumer-facing businesses have been facing seismic shifts in the way they market their products to consumers. With the smartphone proliferating the global diaspora, the manner in which consumers interact with marketing materials or advertising campaigns have changed. Research has shown that the coming wave of Generation Z consumers are increasingly moving towards short-form content driven advertising on mobile platforms, with a correlated parallel decrease in advertising on traditional formats like TV or print (Southgate & Brown, 2017).

The modern advertising landscape looks very different from the largely print and outdoor based mediums of the earlier decades. Shifts in the advancement of widespread consumer technology, the most important being the smartphone, has shifted the paradigm of traditional advertising models and formats. The traditional advertising agency model is now challenged by the tech conglomerates whose primary business of the internet has steadily invaded the territory of advertising agencies and swallowed up advertising spend (Ingram, 2017). On top of that, with globalisation brought about by the internet, traditional agencies with deep understanding of their local consumer market are now expected to execute ad campaigns in regional and global markets for international brands. This causes ad agency personnel to not only take on an increasing amount of creative localisation work, but also dive into campaigns in which the local teams have no experience, cultural understanding or knowledge to execute effectively.

As technology progresses, increasingly complex media platforms enable interactivity as a storytelling device, further expanding the repertoire of advertisers in their quests to tell ever more engaging stories. As the modern consumer has dramatically shifted media consumption to digital platforms, including the smartphone and the wider web, so have tech giants like *Google* and *Facebook* focused efforts to lure advertisers who are hungry to activate the captive audiences on tech platforms. As recent as 2016, *Google* and *Facebook* combined accounted for 99% of market capture within advertising spend in the United States (Ingram, 2017). This has severely disrupted the traditional earnings of

advertising agencies, which are increasingly shifting to digital-led business models (Oakes, 2015).

What had worked in the golden age of traditional advertising is no longer effective in the modern digital landscape. In the present e-commerce landscape for example, product listings are overwhelming, and consumers respond instead to the brands that engage with them the most. The changing demographics for advertising consumption have prompted the advertising industry to move towards programmatic advertising, with targeted ad placement on online websites, mobile phone apps and SmartTVs, providing automated and predictive analysis through algorithms in response to the media planning process. In reflection of the growing digital consumption and shifting marketing spend of brands and companies, ad revenue in the digital space has grown from USD\$267M in 1996 to \$40.1B in 2017 - a growth of 14,885% over a decade (Internet Advertising Bureau, 2017). The digital shift had created immense growth in value from brands looking to capture the attention and mindshare of the savvy digital consumer.

More importantly, the social network effect created by *Facebook*, *Instagram* and other social media networks have created a new dynamic. With traditional advertising being a one-way informational medium, social media has opened up a two-way street of communications between advertisers and consumers (Bezjian-Avery, Calder & Iacobucci, 1998). The *viral advertising* phenomenon, defined as user-initiated sharing of content with their friends and acquaintances through the global medium of the internet, has become the norm in the digital age (Petrescu & Korgaonkar, 2011). This allows for massive consumer sharing of content, sponsored or otherwise, that can pay huge dividends for branding or public relations, often with very little marketing spend involved.

The new digital model has created 2 sides of the demand-supply chain. On the demand side are the brand advertisers looking for the platforms that can provide the most

eyeballs for its advertising. These buyers also include the advertising agencies, which traditionally have worked primarily with mainstream media, but also have shifted to tech platforms where the mass audience inhabits. As individual media owners, the newspapers and magazines have begun scrambling for advertising revenue, forming the supply side of the online advertising ecosystem. The creation of Demand-side and Supply-side platforms came about to provide the bridging service between demand and supply, the advertisers and the media owners. This has culminated in the presently thriving sector of ad-tech.

No longer are single media platforms enough, modern brand marketers demand access to the numbers on the entire online ecosystem - a network of millions of websites and social media platforms (Rosenzweig et al, 2018). This shift has granted tech giants like *Google* and *Facebook*, based on their humongous user base, the power to monetise their platforms into highly demanded advertising spaces. Correspondingly, a 90% of digital advertising spend valued at \$8.8B is going to *Facebook* and *Google* (Jones, 2018). Online giant *Amazon* has also entered the online advertising landscape, with projections to take over 10% of the existing market share from the current duopoly by 2020, representing a value of \$15B (Delventhal, 2019).

The shift towards a digital captive audience is pervasive. Management consultancies, which have traditionally not been in the advertising business, has also made their move into the digital advertising space. The CEO of Accenture Interactive *Brian Whipple* in 2018 has begun steering the consultancy business into the realm of programmatic ad-buying (Morais, 2018). In the modern landscape of digital audiences, advertising has become commoditised with audiences easily available to brand marketers. Resultantly, traditional modes of single platform traditional advertising have become ineffective, with steadily declining revenue from newspapers and magazines (McKinsey, 2015).

These factors have contributed to the growth of digital advertising spend by 20% from the year 2014 to 2015 in the United States, with a significant portion of that growth

attributed to technology giants Facebook and Google, both of whom have intruded into the global advertising market and captured large swathes of marketing spend from brands and advertising agencies. In the United States, Facebook and Google combined accounted for 99% of the \$2.9B (USD) 2016 digital advertising growth (Ingram, 2017).

Online advertising has targeting capabilities which isn't available on traditional media platforms. Digital footprints of consumers are tracked, with key data such as purchase history, personal interests, network of friends and various other minute details of consumer behaviour, can now be easily accessed and used for targeting by advertisers. On top of the added functionality of targeting audience profiles, 84% of surveyed millennial digital natives are increasingly distrusting of traditional mainstream media channels (Chen, 2015). This distrust of mainstream media has led to the rise of social media platforms and peer influencers as a preferred targeting tool for advertisers targeting the millennial crowd. It has become an effective primary method, with advertisers willing to pay top dollars for celebrities like *Kylie Jenner* at up to USD\$1M per social media post (Mejia, 2018).

Global advertising shares by category (percent)

Category	2009	2010	2011	2012	2013	2014p	2015	2016	2017	2018	2019
Digital	17.2	18.6	20.5	22.7	25.5	28.2	31.0	33.3	35.9	37.5	38.9
Television ¹	38.3	39.2	39.1	39.3	38.7	38.7	37.8	37.5	36.4	36.3	35.9
Audio ¹	7.9	7.8	7.5	7.3	7.1	6.7	6.4	5.9	5.6	5.3	5.0
Cinema	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Out-of-Home ²	7.1	7.1	7.0	7.0	7.1	7.0	7.0	6.9	6.9	6.8	6.8
Consumer Magazines ²	6.7	6.3	6.0	5.5	5.0	4.5	4.1	3.7	3.3	3.0	2.7
Newspapers ²	22.4	20.6	19.4	17.6	16.0	14.4	13.3	12.2	11.4	10.7	10.1

¹Does not include online or mobile advertising.

²Print only.

Sources: McKinsey & Company, Wilkofsky Gruen Associates

Global advertising shares projections by category (chart), McKinsey & Company, 2015.

In a study by *McKinsey & Company*, there is a projected consistent upward trend of ad spend growth in digital advertising from 2015 to 2019, averaging 2% year-on-year. On the other side, growth rates for traditional media formats such as TV, radio and print have steadily fallen since 2015. The only format that maintained consistency in the

findings was Cinema pre-roll ads (McKinsey & Co, 2015). The results of the survey provides support to the findings that the millennial audience is increasingly distrustful of traditional mainstream media and have moved primarily to social media platforms and apps, which gives them the power to curate their own feed and generate their own content.

Since the *Cambridge Analytics* scandal of 2018, where the data of *Facebook* users were used for political means, data privacy policies of the tech giant had been under scrutiny. With the amount of users on *Facebook*, they have become too big to fail, with almost half a billion active users as of Q3 2018. In a survey conducted, 28% of *Facebook* users were unperturbed and would continue using the service as before (Gallagher, Schomer & Tran, 2019). This consumer data and active users that belong to *Facebook*, and other tech giants such as *Twitter*, *Snap* and *Google*, have enabled these tech conglomerates to become vital primary channels for advertising agencies or brand marketers seeking to put their ads in front of consumers. The tech conglomerates, with their massive stronghold of active users, are actively competing for ad-spend dollars from traditional agencies and media platforms (Dan, 2019). With dwindling revenues flowing from brands to traditional advertising agencies, there is merit in the idea of running an ad agency using a tech start-up model. The emerging markets of an advancing Asia-Pacific (APAC) region is leading to the higher adoption of technology, and as a result, an increasing market share of digital ad spending. As of 2019, APAC is expected to take up 51.2% of global ad spend (Shum & Liu, 2017).

In recent times, consulting firms such as *Accenture* have been encroaching on the market share of traditional advertising agencies. With a recent *Accenture* buy-over of the famed New York creative ad agency *Droga5*, it is reflective of the changing technology driven landscape of creative advertising and an evolution of client expectations on ad spend (Maheshwari, 2019). This has created a pushback from the traditional ad agencies, which are also encroaching into consulting space, with a good example being the billion dollar acquisition of data analytics firm *Episilon* by one of the

largest advertising conglomerates *Publicis Groupe* (Coffee, 2019). This back and forth exemplifies the changing data-driven landscape of technology advancements in big data, and lays the groundwork for a new concept of tech-driven vs. agency-driven advertising industry models.

The unprecedented digital ad growth is not without its limitations. The growth of online ad blockers in recent years correlates to the fact that modern consumers are constantly bombarded with an incessant number of spam-like advertising online (Hargrave, 2018). Ads are skipped or ignored when they do not capture the imaginations of the digital natives within seconds - with roughly 11% of total internet users currently having Ad-Blockers installed (Scott, 2017). Not only that, but the non-engagement of users with digital advertising has cost the global industries a total of \$41B in losses for 2019, largely due to the issue of ad fraud (Christe, 2019). Ad fraud is currently one of the largest challenges facing digital marketers and advertisers at present, and is defined as falsified metrics provided by shady digital marketing agencies or ad-tech vendors (Davies, 2019).

The complexity of solving ad fraud extend industry-wide as it often involves shady practices within the maze-like network of demand-side platforms and supply-side publishers. A number of client-facing platforms provide pumped-up and falsified numbers to satisfy their clients KPIs and publishers often push inventory onto legally grey areas such as pornographic and online gambling sites. As crucial as it is to address this issue of true ad view-ability that is obscured by fraudulent ad practices, this research does not further address this issue and is only interested on improving the optimisation of existing authentic ad engagements through creative optimisation. At present, there are ad-fraud detection specialist companies such as *Adloox* tackling this specific issue.

As demonstrated in the above examples, digital advertising is certainly not without its pitfalls and is far from the perfect solution. Arising from such controversial issues, crucial concern began to surface for companies with historically strong branding, the

likes of *Procter & Gamble* and *Coca-Cola*. The concept of brand safety is important, specifically when ads are placed on online websites, with brands carefully curating ad placements, for fear of their ads appearing on morally grey categories, such as pornographic or online gambling sites. The irony in such instances is that for agencies, in order to derive high KPI in the form of views, they often place the ads of clients on these blacklisted sites in effort to boost the reported numbers (Gibson, 2018). Additionally, it is rare for agencies to be transparent with the client in reporting of their online ad performance. Agencies typically inflate the numbers, or report falsely on the performance, to ensure they are able to receive the next lucrative contract tender from the brands in subsequent campaigns (Joseph, 2018). Additionally, online advertising via social media has also been criticised for allowing individual data to be used for political agenda. In the recent *Cambridge Analytica* scandal, user data from *Facebook* was used by the agency to drive political agendas without the knowledge of the end users. This subsequently caused a huge negative media blitz and exposed the free-for-all data sharing practices of the tech conglomerates (Meredith, 2018).

Consequently, the aftermath of the scandal was the introduction of the General Data Protection Regulation (GDPR) laws, protecting end-users from the shadow practices of data-sharing by tech giants. (eugdpr.org) In parallel, the *Singapore* government has established the Personal Data Protection Commission (PDPC) to oversee user data. (www.pdpc.gov.sg) Without dwelling into the moral responsibilities of tech companies with vast amounts of user data, these new laws have shifted power towards the consumer and digital advertisers henceforth are required to be careful with user data in implementing their ad campaigns.

Facing the challenges of modern digital advertising on the client front via the legacy practice of diminishing brand transparency, coupled with increasingly strict personal data protection laws around the world, the advertising agency of the future would have to respond directly and overcome these limitations. Traditional ad agency models, with multiple departments spread out over client servicing, account maintenance, creative and digital teams, struggle with bureaucracy in the group functions (Jones, 2000). To be

agile, advertising agencies of the future should be run like a tech company (Bossert & Desmet, 2019). Using tech innovations to facilitate tedious low-level roles in ad agencies, resources can be devoted to high-level decisions that address the core issues of client-agency transparency and using data in an ethical manner.

Integrating of big data into ad tech innovations is not without its downsides. By using tracking cookies to analyse user behaviour, this increases the data requirements for the end consumer, which may translate into higher data costs. Additionally, mobile ads with the small sizing on the screens of smartphones inadvertently lead to accidental clicks by the consumer. These accidental click-through do not differentiate from authentic user-engaged clicks and are often unreported by agencies (Kleinberg, 2016). The issue of transparency within the ad tech ecosystem has become a point of contention in recent times. Impressions on online ads were often reported as views based on the loading of the webpage even if the ads were at the bottom of the page and unseen by the end user. The big players of the ad tech ecosystem has responded to this potentially revenue derailing issue by signing an open letter declaring their observation of certain rules of ad transparency (Shields, 2018).

The modern ad-tech ecosystem is increasingly complex and saturated with startups and industry giants serving different segments of the online advertising market. On the demand side, which is the client facing, Demand-Side Platforms (DSPs) have sprung up to cater and help brands or marketers target their online ads to the right audiences. For the media publishers, whose websites and platforms deliver the eyeballs to the end consumer, Supply-Side Platforms (SSPs) have sprung up to help them maintain floor pricing for automated ad bidding rates. In between the DSPs and SSPs, we have the Data Management Platforms (DMPs), which track user cookies and behavioural patterns to marketers to trigger re-marketing and targeting campaigns (Marshall et al, 2015).

Current ad-tech is concerned with the primary issue of optimising online ad placements. Going forward, DSPs like *The Trade Desk* have introduced AI-powered ad placement optimisation products, such as the *Koa* platform which uses big data and predictive

analysis to ensure client ad-spending is used in the best possible configuration. This lowers the ad spend and increase the efficiency of online advertisements (Rogers, 2018). The benefits of using AI-based platforms include real-time intelligent optimisation capabilities, and the ability to identify patterns in large amounts of datasets.

The SSPs also benefit from the inclusion of AI-based systems, particularly in the pricing floors automated through the process. In such scenarios, publishers inventory prices can be automatically set using calculations about brand demand, viewership and ad performance metrics. Using such automation ensures publishers are able to maximise their revenues with a decrease in periods where their ad spaces are left empty (Dunaway, 2018).

Within the ad-tech ecosystem, the DSP's serve as an ad delivery platform that connects with the SSP's to publish online ads in real-time. As a platform, DSP providers target advertisements on the web to the relevant audiences who are most likely to be interested and complete a purchase of the product. This automated tech-driven process has eliminated the need for traditional ad buyers in agencies (Marshall, 2014). Examples of current ad-tech DSP players are *MediaMath* (www.mediamath.com) and *AppNexus* (www.appnexus.com).

The DSP primarily aims to consolidate online ad placement targeting functionalities into a single platform. For any brand advertising online, ad spend is important in correlation to the effectiveness of the online ad in driving either brand awareness, or increasing online product sell-through conversions. As a result of this aim, DSPs combine digital marketing tactics like retargeting and optimise placement efficiency based on data on user behaviour and patterns. A good case study example was when *Xaxis* worked with *Shoe-d-vision* to optimise their online ad buying. *Shoe-d-vision* was a great client as they had a fully functioning online e-commerce driven storefront. Using existing consumer data and tracking their patterns of purchase behaviour, *Xaxis* managed to optimise the online ads for *Shoe-d-vision*, increasing the return-on-investment by 37%.

With the social media and online search dominated by both *Facebook* and *Google* respectively, particularly in western-media consuming countries, such as *Singapore*, the *Philippines* and various others, there still exists strong opposition to the tech giants in *China*. The key tech giants in *China's* landscape, such as *Tencent* and *Baidu* have dominated the *Chinese* market by both being within a nationalist protected yet immense market (China population: 7.2B) and an understanding of local nuances in the many emerging cities within *China's* vast landmass. Tencent's core product *WeChat* has assimilated a social network, e-payment wallet, advertising platform and person-to-person (P2P) chat into one singular multi-purpose phone app - something that *Facebook* is now trying to emulate to lesser success in the western markets (Statt & Liao, 2019).

As digital adoption grows around the world, consumers are increasingly engaging with content-focused ad formats such as online video. As per the *Internet Advertising Bureau* (IAB) report on video advertising spend in 2019, brands are expecting to spend an increase of 25% (\$18M) on online video ads, consistently growing year-on-year since 2017. Video advertising as a format performs well on social media channels, with 46% of consumers watching video ads on the social platforms more often as compared to on traditional TV formats (Lerner, 2018).

Digital Video Ad Spend growth chart since 2017, Internet Advertising Bureau, 2019.

A worrying trend for advertisers and publishers is the increasing adoption of online ad blockers. Online users are constantly bombarded with large amounts of ads as they consume their content, with sentiment often linked to ads being spam (Hargrave, 2018). Consumers react negatively to online ads intrusiveness and clutter. Perceptions can be improved if ads focus on delivering pleasure, benefits and credibility to end users (Redondo & Aznar, 2018).

The mixture of myriad ad-tech players within the modern digital advertising landscape makes the entire ecosystem complex and maze-like. Client-facing DSPs satisfy the demand for brands to seamlessly buy ads digitally, increasingly automated by AI-powered platforms. Publisher-serving SSPs seek out the best prices to increase revenues and ROI for websites serving the online ads, with AI systems assisting with automated floor price setting. Crucially, an effortless digital ad buy-sell process between brands and publishers requires integration between DSP and SSP platforms. Through the ad-tech ecosystem, traditional ad buying processes have been eroded by automated computer systems, and human media planners are directly competing with faster and more intelligent AI predictive algorithms. The future of the advertising industry has become faster, requiring less manpower and is increasingly data-driven. Modern clients not only demand results from their ad spend, but expect it to be delivered faster and cheaper. To survive into the next decade, ad agencies must function like tech companies.

During AdWeek's NexTech Conference (2019), ex-WPP (<https://www.wpp.com>) CEO Sir *Martin Sorrell* reinforced the transforming advertising landscape going forward. In his speech to attendees of the conference, he iterated that traditional advertising agencies were not tailored for the digital era, and thus were not able to execute effectively in the ad-tech driven climate. Additionally, he argued that advertising agencies should embrace tech companies like *Facebook* and *Google*, due to their platforms being the primary tool that help advertisers to increase the value chain for their clients. The

evidence suggests that digital-focused strategic agencies are increasingly rare, with traditional ad conglomerates slowly becoming superseded by tech based platforms that provide measurable results for clients and increase productivity for agencies.

As this chapter explored the myriad of mediums for ad placements existing on the digital networks around the world through the internet and smartphone connectivity, it is important to acknowledge that ads are primarily sensual stimulus with the capacity to attract consumers through subconscious reactions to the human senses in the form of visuals, words and sounds. With the current ad-tech ecosystem focused primarily on the optimisation of digital ad placements, the creative components have been largely neglected. Calibrated to the right variations of creative components, digital ads have the potential to convert passive consumers into active brand ambassadors through subconscious triggers. The next chapter will further explore how creative design decisions, from visuals, to copy text and sounds, holds the ability to subconsciously trigger emotional reactions from the digital consumers today, increasing engagement rates with ads.

Chapter 3

Consumer Psychology and the Intangibles of Taste

As discussed in the preceding chapter, digital ads with low engagement rates have cost advertisers billions of dollars per year in losses due to lack of returns on ad spend. A new ROI-driven methodology for digital advertising is necessary in the modern digital age. This chapter explores the impact that visuals and copy have on consumer psychology, to subsequently drive an increase in active user engagement. In the context of the research, visuals refer to in-ad imagery and colours, whilst copy refer to text accompanying ads. Consideration in design attributes within digital creative advertising collaterals - from typography used, to colour displays, affects consumers who view them on both conscious factual and subconscious emotional levels. These conscious and subconscious triggers combine to powerful effect, as subliminal messaging that compels consumers to purchase certain brands or products. Basic design choices, such as the colours used, can also contribute greatly to subconscious feelings and emotions (Morin, 2014). This chapter explores the various methods in which ad design related considerations relating to the human senses have the power to increase consumer engagement with ad content.

Robert Plutchik's Emotional Colour Wheel.

Robert Plutchik's Emotional Colour Wheel provides a simple visual mapping of the way in which colours are linked to certain emotional moods in the human mind. Colours have the ability to trigger human emotions on a subconscious level, activating feelings as diverse as comfort, relaxation, happiness, energetic, tenseness or depression ("What you need to know about colour theory (part 1) - purvis.", 1996). Additionally, colours go beyond these inherent emotional triggers, with cultural practices and environmental context affecting subtle shifts in the perception of colours by disparate groups of people. The use of colour to affect specific responses out of viewers is powerful, but also requires a highly nuanced understanding of international cultural norms and industry practices. In general, good branding requires a certain amount of differentiation in terms of advertisement style to stand out (Beard, 2017).

In the global advertising industry, the use of colours requires a keen understanding of the target consumer and market. As colours often hold specific cultural context dependent on the market location, creatives need to adapt design choices on colour schemes and image types used due to sensitivities in messaging. Alongside the implementation of the right colour schemes due to regional and cultural factors, timing is an additional factor that requires consideration. For example, in Chinese-dominated societies such as Hong Kong SAR, China and Singapore, the colour Black is largely deemed taboo during the auspicious Lunar New Year period of festivities (Thor, 2014). On the reverse, colours can also be considered positive when it is affirmative of cultural festivities, such as the colour Green during Muslim festivities celebrated in countries as diverse as Indonesia, Malaysia and Singapore. In Islamic cultures, the colour Green symbolises the concept of paradise and immortality and as such, is held in high regard (Beam, 2009).

The complexity increases when industries also have their own embedded associations with certain colours. As an example, the colour red is often utilised by gambling establishments to incite the emotion of excitement in visitors to get them to spend more,

but the same colour when used in the financial industries is deemed inappropriate due to its association with financial loss (Hanke, 1998). With this understanding, it is important to note that no singular colour scheme or visual types can be used across the world without necessary adaptation. As a signalling tool, such insights also hold the potential to not just affect the primary targeted consumers but also to secondary audiences, such as investors or internal staff within a brand (Dahlen, Rosengren & Karsberg, 2017). This opens up applicable use in the fields of public relations and internal communications, where the primacy of increased engagement is with the media and human resources.

The importance of using visuals as a stimulus to create the right subconscious effect in consumers is crucial as it determines the likelihood of viewer engagement with the content. Effectively, when content is engaging the audience, it creates a *flow state* which is a period of feel-good and focus. Physiologically, such states are brought about when the body releases dopamine in the brain. The *flow state* is unique to individuals, with no individual responding exactly the same to all stimuli (Thomson & Jaque, 2017).

Considering visual aesthetics and design decisions, targeted advertising and creative content management is crucial to trigger appropriate *flow states* in target demographics, which as explored can vary drastically depending on culture, location, education level and social standing, made more complex by a variety of outside factors that determine unique individual aesthetic preferences and emotional engagement.

Examples of fast food logos (L-R) of McDonald's, Burger King, KFC and Pizza Hut.

Using fast food branding as a case study, the primary colour schemes present across the industry are the combination of the colours *Red* and *Yellow*. Known as the “ketchup and mustard” colour pairing, this combination of colours evokes the subconscious imagination with the condiments and creates underlying impulses to eat (Urie, 2018). This selection of colours is not done at random, but through deliberate understanding of the power of the use of these colours in influencing consumer behaviour subconsciously. These colour combinations can be observed in the brand logos of fast food restaurants such as *McDonald’s*, *KFC*, *Burger King* and *Pizza Hut*. The power of selective design attributes cannot be understated. In a study conducted by Wellesley College (2013), neuroscientists discovered that colours are a primary category of visual data that the human brain captures, analyses and processes before any other visual cues. In the context of digital advertising, where consumers attention span averages only 8 seconds, it is imperative that advertisers use visuals to generate emotional engagement fast (Faro & Grimes, 2017).

Familiarity towards a brand can also cultivate consumer attachment and loyalty. A good case study is the global coffee chain *Starbucks*, which have successfully created the concept of their stores being a *3rd place*, a home away from home. This sort of emotional branding maintains customer loyalty above the conscious product level, through crafting an experience when customers step into any *Starbucks* store worldwide. Even though *Starbucks* is in the business of selling coffee, when consumers think of the popular coffee chain, it typically evokes imagery of a comfortable environment where they can work on their laptops, read a good book or hang out with friends (Dollinger, 2018). Such experiential branding also relies on visuals to maintain consistency, primarily with the green icon of the *Starbucks* mermaid on the takeaway cups and mugs, green apron of the baristas, and cosy wooden furnishing seen throughout brick and mortar stores globally.

Adding on, there are also certain intrinsic impulses that act as triggers in advertising. As the common adage goes, *sex sells*. Alongside visual emotional triggers, consumers react to advertising content based on primal subconscious triggers, typically sexual and status driven in nature. A study of non-human primates (NHPs) revealed, at the baseline, NHPs associate sexual imagery within their environment to symbols based on frequent conditioning (Acikalin et al, 2018). This reflects the power of advertising imagery in consumer cultures, where ideals in matters of sexual and status-driven nature contribute to the psyche of entire societies. This can be observed in brands peddling beauty and fashion products, which tend to use airbrushed models in their advertising materials, creating a synthetic ideal for the benefits of selling their products through the triggering of subconscious desires of people to fit in, or to be accepted in a identified group (Swinson, 2011). Creative advertising is most powerful when it can effectively use a combination of visuals and subconscious primal desires to trigger deep emotional responses.

Video still from Carl's Jr. advertising featuring celebrities like Paris Hilton and Kate Upton.

Case in point, around 2005, the American burger chain *Carl's Jr* launched racy ad campaigns featuring celebrity models the likes of *Paris Hilton* and *Kate Upton* devouring their cheeseburgers with close up shots accompanied by sensual background music. Even though the product they were selling was not directly correlated to sex, there is a psychological basis to link the two seemingly disparate acts of eating and sex. Food, like

sex, is highly sensual in the interactions of our five senses, namely: touch, smell, taste, hearing and sight. The underlying psychology ties back to the function of primal needs, with sex and food bringing forth the emotional trigger of craving, which leads to seeking behaviour. Physiologically, the brain reward centres for food and sex reside in close proximity, lending credence to this effect (Kang, Zheng & Zheng, 2016). The campaign was exceedingly successful, delivering 2.5B media impressions in 2 weeks, affirming the power of growing engagement with visuals combined with the right primal desire triggers (Nudd, 2015).

Multiple shades of the colour blue, Pantone Chart.

In a profile on ex-Google CEO *Marissa Mayer* by the New York Times (2009), an anecdote was presented on the power of colours in attracting user engagement. During testing on the ideal colour for a toolbar on the *Google Search Engine*, it was discovered that a particular shade of blue elicited higher engagement responses from users on the site. Although this contrasted with the designer preferences, *Mayer* proceeded to choose a colour that was a shade in between the original and the effective shade. Subsequently, she implemented an A/B testing system that consistently determines the most optimal of blue out of 41 potential shades. This example personifies the power of using simple design attributes like colour to increase engagement, one of the most important success metrics for a technology company.

Google made the design decision to extend the length of their search bar in 2009.

(Mayer, 2009)

The focus of *Google* on using visuals to increase engagement even extends to the size of its search bar, which was lengthened in 2009 (Mayer, 2009). Simple visual-based enhancements such as this, exemplifies the data-driven approach tech companies have used to optimise engagement of users on their platforms. Conversely, it seems that the advertising agencies are still relying on the aesthetics of its designers in creating ads, where a data-driven approach would return better engagement for their clients. Minute changes to visual design attributes can lead to a change in user behaviour, demonstrating the benefits of data-driven insights that affects design decisions.

Alongside visuals, copywriting also plays an important role in the effective of advertising. The power of words, or language, depending on cultural context and other factors, can directly affect the engagement of viewers. Using the right words with the right target audience can create the effect of belonging to part of a group (Miller, 2016). This feeling of belonging to a group is crucial for brands seeking to establish devoted followers. Good examples of global brands that have done this exceptionally well is *Nike*. Transcending product-focused advertising campaigns, the sports and lifestyle brand have used words strategically, tailoring messaging on their marketing collaterals towards their cult-like customer base. In 2018, *Nike* ran an ad campaign featuring NFL Quarterback *Colin Kaepernick*, who had gained supporters during that period for his political stance towards

police brutality and underlying racism. It was a masterclass example in the power of using copy to achieve powerful emotional response on real-time events, with the line in the voiceover scripting reading, “Believe in something, even if it means sacrificing everything” (Rucker, 2018). This is aligned with *Nike’s* branding of *Just Do It*, which represents more than just athletic shoes or lifestyle sneakers, but encompassing the beliefs of its core audience and selling the dream that anything is possible, if you want it enough. Selling products are often not as effective as selling dreams, and words carry the power to shift the former to the latter. Other factors to consider in informing the copywriting process includes the category of advertised material, the location it is being shown and the demographic of the main audience. Identifying the best approach whilst taking into consideration these multiple factors determines effective copywriting on ads (Hennerberg, 2013). Identifying the right copy is highly effective in brand recall, with examples like “Think Different” by Apple, “Because You’re Worth It” by L’Oreal, “Finger Linkin’ Good” by Kentucky Fried Chicken and “Open Happiness” by Coca-Cola being recognisable elements in and of itself, even without evoking visual brand imagery.

Beyond the use of words, the arrangement and typography of fonts on the ad collaterals must also be considered. For example, various digital ad dimensions would require multiple typographical layouts to improve visibility. Varying factors to consider that affect engagement of viewers include semantic connotations towards the selected font types, legibility of the text in contrast to the background imagery/colour scheme and visual appeal of the typeset taken against the overall design of the ad layout (McCarthy & Mothersbaugh, 2002).

No consumer reacts to design attributes in exactly the same manner, resulting in presently designed ads that largely cater to big groups of consumer profiles. Visual taste is extremely subjective, with differing combinations of design attributes being appealing or unappealing to individuals based on multiple factors such as culture, upbringing and

experiences. This understanding of taste means that each unique consumer hold conscious and subconscious preferences that ultimately affect engagement with visual content (Urist, 2017). An effective manner to cater to distinct visual taste profiles on an individual level would be the testing of thousands potential permutations of digital ad design, based on factors described above: swapping out attributes like fonts, background colours, colour combinations, sizing of imagery and keywords till an ideal combination of attributes are achieved on user targeting. Through the alignment of visual appeal as reference to individual consumer taste, engagement with ads will be increased on a conscious and subconscious basis. The world of high art makes a good case for taste subjectivity, with collectors buying artworks with visual styles ranging from the fun irreverent pop culture references in screen prints atypical of *Andy Warhol*, to the dark and often macabre stylisations of *Damien Hirst's* ready-made sculptures. Both are highly renowned artists, with collectors revering and paying millions for their works, based on subjective visuals tastes that resonated best with the individual.

(L-R) *Mickey Mouse* (1981), *Andy Warhol & God Knows Why* (2005), *Damien Hirst*.

Advertising as an experience relies on more than visual elements to convey emotions. As a multi-sensory experience in formats such as video advertising, sound plays an equally important role. Catchy jingles retains a place in consumer memory long after the ad

campaign has finished running. Music is powerful in setting the tone for storytelling in video ads, with studies showing that relationships between characters in a scene can be framed as either harmonious or adversarial dependent on positive or negative inflections of the background music (Tan et al, 2010, pp 275). Sound is another sensory medium that affects ad engagement. Music or sounds in ads can also be used to trigger emotions and alter moods in individuals. Optimising the background music in video ads can add-on to the effect visual optimisation by triggering *valence* in an individual, through activation of positive memories tied to the music of choice (Juslin & Sloboda, 2013). In the field of psychology, *valence* is defined as either a positive or negative force in the triggering of intrinsic stimulation-directed responses in individuals, broadly referred to as strong emotional response. In ad targeting, this could reflect the type of musical genres individual consumer prefers, through analysing their music streaming playlists and identifying the content type that keeps them engaged. Music in ads also serve to reinforce messaging of brands or products, or creating tension when unexpected sounds are used (Hodges, 2010). Though for the purpose of this research, sound will not be a component of the mobile and online digital ads, it is worth considering its role in the subsequent development of customised online video ads and deployed alongside visuals, hold even greater potential for increasing consumer engagement.

As this chapter demonstrates, creative elements such as visuals, copy and sounds have substantial effects on consumer response towards advertising. Through the optimisation of variations and combinations of creative attributes within digital ads, examples being fonts, colours, imagery, keywords and typography, assist in creating relatability or valence triggers in individual consumers, due to subjectivity and individuality towards visual taste. In the coming decades, with the proliferation of big data and artificial intelligence systems that can analyse patterns within large datasets and automate processes, digital advertising holds the potential for customised tailoring on individual

consumers based on the understanding of subjective visual taste. In the following chapter, this next phase of digital advertising is given a name: data-driven design.

Chapter 4

Data-Driven Design: Big Data & Machine Learning in Creative Advertising

Applications

In current practice for creation of advertisement collaterals, teams of art directors, graphic designers and copywriters in agencies or studios design and churn out artwork, such as digital online banners or posters, from personal aesthetic or stylistic preference. Although most of these professionally crafted ad banners look pleasing to the eyes, the design choices within the ad may not reflect the visual preferences of the consumers due to cultural and environmental differences (Reinartz & Saffert, 2013). Additionally, using human manpower to manually design high churn ads is a time consuming and laborious process that does not add much to the value chain in growing effective engagement of digital advertising. As the mediums of traditional advertising has evolved over the last few decades through new media and the internet, the methods of designing advertising creatives should also be advancing to suit the digital age.

The traditional advertising agency model, which has carried on into the contemporary age, involves the composition of professionals in accounts, media planning and creative departments. These professionals each bring their own unique and differing professional mental models of how creative advertising should be designed and crafted. One of the potential weaknesses in this multi-layered and variable approach, in a study conducted on said mental models, is the typical separation of marketing strategy from the artistic craftsmanship within the creative process (Nyilasy, Canniford & Kreshel, 2013, p. 1704). As a result, with the creative elements often separately crafted from factual consumer data points, award-winning creative advertising may not perform its original role of moving products from brand into consumer spending. Although it should be considered that for advertisers looking at solely branding efforts, delivered impressions remains the key metric for consideration on ad performance.

Without using commercially factual datasets as a basis for creative advertisements, the predictive success factor would also be elusive to brand marketers who seek assurance

of good returns on advertising spend vis-a-vis product sales. This is correlated to the evolving requirements of advertising agencies in the digital age, when generalist legacy advertising agencies are competing head-on with specialist digital only ad-tech firms for advertising spend. In parallel, brands are increasingly looking to lower marketing spend whilst having to substantiate effective of their spending in terms of metrics like digital engagement and viral word-of-mouth across social media platforms (Sacks, 2010). Following on, the tension between brand marketers and advertising creatives often arises from the risk-averse attitude of the client pushing against the creation of highly original off-centre advertising material championed by the creative executives (O'Connor, Kilgour, Koslow & Sasser, 2017). A solution to this fear of uncertainty would be to generate ad creatives directly from a market-data feedback driven model that could give predictive assurance of market response and success factor. Deriving a generated creative ad from the factual market-based engagement data can then provide assurance to advertisers or brand marketers.

In its current iteration, programmatic (or targeted advertising) serves the digital marketplace with a automated placement selection of advertising materials that can be targeted to the right audience using a variety of data from consumer habits and behaviours (Li, Yuan, Zhao & Wang, 2017). One of the main models currently used in the targeted advertising industry involves the CPM (cost-per-thousand-impressions) pricing model, targeted delivery based on geography, behaviour and demographics (Turner, 2012). This solution creates a better focus on the medium, which is the platform for delivery of the creative collaterals, and serves to enable the highest reach for ad based on targeted media placements. This planning of ad placement increases the amount of views on advertising material, but does not address the issue of audiences actively engaging the displayed advertisements. Engagement is difficult to achieve and requires active input from the targeted consumer, but leads to better returns-on-ad-spend (ROAS) for advertisers.

The crux of engaging advertising relies on the creative material and its ability in telling a compelling story to capture the attention of an increasingly fickle digital audience.

Creative channels such as visuals, sounds and words, come together cohesively to create effective storytelling, which is vital to user engagement in creative advertising materials (Kelly, 2008). The present programmatic model of platform and placement ad targeting represents a component of effectively capturing consumer attention, but by itself is not enough to drive audience engagement (Hutchison, 2016). The growth of online ad blockers correlates to the fact that modern consumers are constantly bombarded with an incessant number of advertising online (Hargrave, 2018). Ads are skipped or ignored when they do not capture the imaginations of the digital natives - with roughly 11% of total internet users currently using Ad-Blockers (Scott, 2017). This leads to brands and agencies spending large sums of budget on placement optimisation, with little to show in valuable conversions.

This chapter attempts to respond to the above issues, by proposing the concept of *data-driven design* for use in the creation process of digital advertising collaterals. In essence, data-driven design involves testing designed ads within the public consumer digital ecosystem, and collecting real-time feedback based on the either positive or negative responses. Subsequently, depending on engagement rates, which can vary over time depending on current trends, creative ad element are swapped out for multiple variations of creative attributes to derive the design for optimal user engagement performance. Engagement rates are defined dependent on the medium of digital ad placement, examples being web, mobile and digital out-of-home. This aims to fulfil the purpose of achieving data-driven ads that are best suited to the specific target audiences based on variables such as location, gender, age and product category.

The automation of creative processes within an algorithmic format is difficult due to the concept of visual aesthetics being highly subjective and cultural differences around the world that affecting subconscious biases. In the use of technological automation in our creative processes, we must take into account additional considerations, including how algorithms will create content, and how the outcome might be considered successful (Frankham, 2016). This is more straightforward in the context of commercial advertising, as compared to other art forms like film or paintings where success is subjectively

judged solely on artistic merit. As a form of commercial art, successful advertising can be correlated to the function of it, which is to engage consumers in the process of selling products or services. In the digital age, the most straightforward way of measuring digital ad success is through online metrics such as impressions, clicks and conversions (Internet Advertising Bureau, 2017). By labelling the individual creative attributes that makes up the design of an advertisement, online metrics can be tagged alongside the attributes, providing a causation-based link between design and performance.

Within the current advertising technology ecosystem, online advertisements are optimised primarily based on channel placements. On the *Google Display Network*, the affinity audience functionality allows for advertisers to target their ads based on user profiles and location, which decides what websites the ad shows up on and at what time during the day. (<https://support.google.com/google-ads/answer/2497941?hl=en>) The optimisation of audience is effective, but solely optimising for online placements is not enough. Increasingly, online users dislike seeing advertising on websites they frequent, to the tune of \$21.8B in lost ad spend revenues (Rosenwald, 2015). This increasing use of online ad blockers not only hurt the advertising industry, but also the publishers of websites whom rely on the revenues generated from ad display to keep site content free for the end users. Users are increasingly frustrated with the frequency of online advertising, with a survey showing that users would prefer seeing fewer ads (Cohen, 2018). Instead of throwing out large quantity of ads to maximise ad spend, advertisers should instead focus on showing quality ads that focuses on user engagement through visual design.

Showing ads en-masse spreads the messaging, but do nothing for the quality of said-messaging. For fewer ads to be shown by advertisers, the focus needs to be geared towards increasing the engagement of each online ad shown. Ad tech, as it is in the present, does not address the issue of ad design and performance. A singular ad creative, is displayed across multiple websites and channels through programmatic, often attempting to increase conversion through repeated exposure to the ad for

consumers. To take content and relatability into account, a new way of looking at ad tech success has to be considered. Through the concept of data-driven design, ads have the potential to be customised and designed in real-time by an AI system, displaying unique content that visually appeals to the user, thereby increasing the rate of engagement with each piece of advertising content. Instead of a focus on the channel spread of an ad, brands and advertisers can now focus on the metrics that matter - an increase of ad engagement, which leads to better probability of product conversions or purchase.

In recent years, Artificial Intelligence (AI) as a sub-discipline of computer science has seen a booming resurgence. Dubbed 3rd wave AI, a renewed excitement on the technology of simulated intelligence has set over the US military complex, media and the tech startup ecosystem-at-large (Daws, 2018). Within the broader scope of Artificial Intelligence implementation, the focus of this research is specifically on the area of predictive analytics, which uses big data and machine learning to generate unique pattern insights. The algorithm over time learns to read certain patterns in the market research data, and is able to eventually refine its recommendations based on hard data. Predictive analytics is presently used by online merchants, with the ability to sort customers by the potential of purchase possibility derived from data such as electronic direct mail (eDM) engagements and online shopping cart history (Artun & Levin, 2015).

The AI requirements across multiple applications within the advertising industry requires the integration of big data for the intelligent analysis and subsequent identification of trend patterns within a set period of time. Big Data generally refers to large sets of logical data, often unrelated, that is incomprehensible to humans analysts and current data management platforms due to its sheer scale and non-linearity (Zicari, 2013). These enormous sets of data have grown across industries and companies within the last decade, as mobile connectivity and the internet have generated an increasingly endless amount of information on consumer behaviour and online activity. At present, big data owned by most companies are not put to work due to a lack of technology that can analyse these datasets and produce useful insights. Various industries would

require differing outputs in service of different goals, leading to confusion amongst industry decision makers on the best way to proceed with utilisation of their big data. As such, the advertising industry holds large troves of historical ad performance datasets that can be repurposed for various analysis methods and outcomes.

The implementation of an independent AI driven creative advertising algorithm requires a combination of two cutting-edge AI techniques. In order to replicate the role of the agency Art Director and generate original visual designs, the General Adversarial Network (GAN) would be well suited for this task. The GAN is an unsupervised learning neural network that has the ability to connect disparate and often unrelated information nodes, with creativity and innovation triggering when unexpected data is connected in surprising ways (Marr, 2019). With a fully developed GAN system tailored for the advertising industry, original imagery and graphics can be generated through the AI algorithm, resulting in ads that do not require photographers. A good demonstration of it's capabilities can be experienced in *This Person Does Not Exist*, an auto-generated sampling of synthetic human faces using GAN. (<https://thispersondoesnotexist.com>) By training an AI GAN model with ad imagery, original ad content can be fully generated through it, removing the need for pre-production requirements in the visual content creation process. The accompanying role of the agency Copywriter for generating of original copy text and tagline requires the use of Natural Language Processing (NLP). The NLP is a language recognition text generating algorithm, based on the Recurrent Neural Network (RNN) model. RNN algorithms is important in NLP implementation, due to its ability to remember sequencing both in the context of pre and post. As language requires proper sequencing to make sense, RNN and the resulting NLP algorithm would be able to learn from language scripts and replicate natural sounding human copy (Moreno & Redondo, 2016). Through the combination and integration of GAN and NLP algorithms, generated ads with both visuals and accompanying copy can be accomplished.

Sample images of GAN-generated synthetic faces of people.

At present, AI systems are being developed to replicate innovative decision making. Based on neuroscience and mapping of the human mind, AI neural networks simulate connections between nodes within an interconnected network inside the human brain matter. The intelligence of said systems would be the ability to connect the disparate knowledge nodes together into a singular concept to derive intelligence. In order to replicate this complex process, scientists have been attempting to identify the organic and chemical processes that create intelligence. The potential of replicating the human mind is on the frontier, with *Neuralink*, a company run by tech entrepreneur *Elon Musk*, attempting to implant and merge AI technology into the human brain as an intelligence enhancer (Lopatto, 2019).

Various studies on innovation and creative triggers have been conducted on humanity's closest relatives - the primates. Research on primates both in the wild and in captivity provides some clues on the ideal environmental factors to trigger innovative thinking. In non-human primates, lower ranking individuals in the hierarchy tended to develop innovative and creative behaviour. This is due to the competition for survival in a harsh environment, where shortcuts or alternate methods are required for the purpose of survival (Reader & Laland, 2001). In the parlance of AI systems, the controlled output of the algorithm should thus be simulated in a similar fashion to potentially give life to data-driven design. This survival-of-the-fittest structure has been replicated in the arena of vision computing such as the GAN and NLP. In traditional machine learning AI models, fixed and static datasets from big data are often used to train AI algorithms in identifying pattern repetitions, and will be further developed in time to come.

Beyond the utilisation of big data from the internet and corporations, the digital-out-of-home (DOOH) space is also ripe for data mining. As digital screens grow rapidly around urban city centres, mainly through DOOH companies like *JCDecaux* and *Clear Channel*, new data sources have emerged for mining. With camera sensors accompanying these cutting-edge DOOH screens, advertisers are able to identify and record data points such as consumer eye movements, facial emotional responses and demographic information (Rogers, 2018). Ad targeting based on emotional data holds immense potential for engagement optimisation, and will be incredibly valuable for time-based ad formats such as video. This complements existing web and mobile data, as camera tracking cannot be deployed on those formats due to personal user privacy issues.

JCDecaux Digital-Out-of-Home billboard as seen in Funan Mall Singapore.

Another productivity problem faced by the global advertising industry at present moment involves localising the creative assets for different markets around the world. For brands and agencies having to face the prospect of producing new assets for each unique market, both time and extra marketing budget is required to execute global campaigns (Dawar, 2016). Advertisement copy cannot be directly translated to adapt in international markets due to nuances and slangs used in certain countries or cultures. Occasionally, instances occur in which global ad agencies hand over overseas client

accounts to creative teams. These creative teams have trouble beginning to conceptualise the ad campaigns due to a lack of understanding of the culture and visual preferences of consumers in the overseas markets. As such, *transcreation* processes, which involves adapting advertising materials to suit local market tastes and norms, is highly valued when selling a product through creative advertising across markets (Cruz-García, 2018). At present, the *transcreation* process requires manpower and is time consuming. Specialised *transcreation* agencies such as LEAP (<https://leap.london>) have sprung up to cater to the requirements of regional marketers tasked with running advertisement campaigns across multiple regions and borders. In such situations, the AI-powered Natural Language Processing (NLP) algorithms have the potential to solve these issues, through the learning of particular language nuances and way of speech. Alas, at the present moment, NLP technology still faces difficulties in translating the subtle nuances of human language, such as slangs or sarcasm (Garbade, 2018). Nevertheless, as the existing NLP libraries evolve and learn from larger datasets, co-opting the technology into areas of *transcreation* would be the logical next step for localising ad campaigns.

Through this chapter, it is brought forth that the next phase of digital advertising can gain much through tapping into the power of AI and big data in informing the creative design of digital ads on the web, mobile and DOOH. With the primary goal of advertising efforts being to bring improved sales or brand awareness for businesses, a data-driven ad design model would effectively increase marketing efficiency through better visual targeting on consumer groups, reduce production costs through the reduction of manpower requirements, and most importantly, improve return-on-investments (ROI) for brands that advertise on digital platforms via better ad engagement. Both NLP and GAN technologies in AI have been demonstrated to replicate key processes in the ad campaign creation process, assisting in both pre-production work and localisation of ads for creative teams. The following chapter will test generated digital online banner ads on the Google Display Network (GDN), to identify preliminary engagement

effectiveness of computer-generated digital ads against standard engagement rates benchmark in the present ad-tech ecosystem.

Chapter 5

Method: Multivariate Testing for Creative Optimisation

As presented in the earlier chapter, the concept of data-driven design requires a combination of big data sources with machine learning algorithms that can calibrate the effectiveness of digital advertising design based on real-time market feedback. The most direct method of correlation is to examine the click-through rate (CTR), represented in percentage (%) format as an aggregate of the proportion of clicks compared directly to ad impressions. Tying this to the individual breakdown of creative components within an ad, over a period of time, an AI system can begin to get an idea of the effectiveness of ad creatives combinations that generates the best CTR % for advertisers. The hypothesis of this controlled experiment is the determination of the general effectiveness in digitally generated online digital banner ads, in comparison to current industry benchmarks, and its implication for the advertising industry moving forward.

Multivariate testing models have been used in the online and web industries over the last decade. Whereas traditional A/B testing models are used to compare and contrast effectiveness of entire websites, multivariate testing examines the individual components of elements within a creative advertisement. By optimising the various possible combinations of elements, which potentially number in the thousands, advertisers would be able to reach the ideal combination of components for user engagement.

For the purpose of this research, to demonstrate an multivariate testing run, computer generated ads via an internally developed Ad Generator tool (<http://3.1.220.78:8000/accounts/login/>) that have random combinations of ad creative components will be tested in the real-world, through ad placement on *Google Ads*. (<https://ads.google.com>) The *Google Ads* platform is an ad publishing platform with access to over 2 billion websites globally, including functionality that allows the ad placements to be controlled

via factors such as region locking, ad spend budget capping and targeted audiences. It is selected as the publishing platform for the purpose of this research, due to its accessibility, range of websites under purview, and functionalities that would assist this controlled experiment. [Developmental prototyping process of the Ad Generator tool can be referenced in Appendix A.]

The best method to correlate the design of online advertisements to their Return-On-Ad-Spend (ROAS) is to use the engagement metrics trackable ad engagement metrics such as impressions (CPM) and click-throughs (CPC). For the purpose of this study, we compared the ad design to the Click-through Rate % (CTR %), represented by a percentage(%) of the Impressions divided by the Click-throughs recorded. The formula for this calculation is represented as $CTR \% = Impressions / Click-throughs$. An increase percentage score in the CTR % metrics will reflect the active user engagement via ad clicks controlling for the amount of total impressions delivered due to ad spend.

As the purpose of this controlled test is determining the effectiveness of digitally generated online banner ads in comparison to current industry standards, in order to control for consistency during the ad testing period, the ads had baseline attributes consisting:

- 300 x 600 pixels online banner dimensions
- location targeted solely within the Singapore region
- ran live for a time period of 7 days each
- optimised in Google Display Network (GDN) as a cost-per-click (CPC) campaign
- have a max CPC capped bidding price of SGD\$1.00 ad spend
- include affinity audiences targeting comprising websites in the categories of
 - Avid Business News Readers
 - Business Professionals
 - Media & Entertainment
 - Technology

In-market audiences, which are profiles of online users who are actively seeking Business Technology products have also been targeted.

For the purpose of this study, the creative ad components that will be correlated includes the type of fonts as either Serif or Sans-serif, background image types and predominant colour schemes, and copy key words. These components will comprise the ad creative components that is correlated to the CTR % rate. The call-to-action (CTA) button and brand logo placement will remain consistent, with the CTA enclosed in a red box on the bottom left corner of the ad with the text “Find Out More Today”, and the brand logo placed on the top right corner of the ad. This is due to the prototype ad generator tool being presently unable to produce variations on both the CTA button text and brand logo. Limitations in this study include possible higher ad engagement rates during public holidays or weekends periods when more users are online. Additionally, controlled CPC ad bidding budget cap of SGD\$1.00 used in this test may limit maximum ad performance.

The testing was carried out with two generative creative digital online ads each week across 7 weeks, with variance in the font type, background type and colour, and copy text. At the end of weekly intervals, total ad impressions, clicks and CTR % were recorded via GDN. The highest scoring ad creative based on CTR % will advance each round. Through a period of 7 weeks, and 7 iterative multivariate testing cycles, there will be one remaining top performing ad creative for the Technology product category. This study also aimed to demonstrate an A/B method in which multivariate testing models can be used in optimising online banner ad designs to drive higher user engagement. As a reference point, the average CTR % for a technology ad on the GDN is 0.84 CTR % (Volovich, 2016).

The subsequent section will comprise a weekly A/B test report of generated digital online ads, with results tallied at the end of each week comprised of visual attributes within each banner ad, total earned impressions, tallied clicks and overall CTR %. The winner of each round is selected based on the higher CTR % score, controlled for impressions and ad spend. For the purpose of this experiment, display advertisements scoring above the industry average 0.84 CTR % would be deemed as successful.

Week 1 - Round 1

A

B

A

Tag-line: AI GENERATED ADVERTISING

Font type: Sans-serif

Visuals: Pattern, Red

B

Tag-line: AI Generated Advertising

Font type: Serif

Visuals: Image, Blue/Grey

Results:

A - 9,974 impressions, 107 clicks (CTR 1.07%)

B - 11,183 impressions, 108 clicks (CTR 0.97%)

Winner: **A**

Week 2 - Round 1

C

D

C

Tag-line: Automated Ad Generation by Luminaire

Font type: Serif

Visuals: Pattern, Green/White

D

Tag-line: Automated Ad Generation by Luminaire

Font type: Sans-serif

Visuals: Pattern, Purple/Black

Results:

C - 11,192 impressions, 118 Clicks (CTR 1.05%)

D - 13,170 impressions, 112 Clicks (CTR 0.85%)

Winner: **C**

Week 3 - Round 1 Finals

A

C

A

Tag-line: AI Generated Advertising

Font type: Sans-serif

Visuals: Image, Pink/Red

C

Tag-line: Automated Ad Generation by Luminaire

Font type: Serif

Visuals: Pattern, Green/White

Results:

A - 10,096 impressions, 81 clicks (CTR 0.8%)

C - 13,492 impressions, 150 clicks (CTR 1.11%)

Winner: **C**

Week 4 - Round 2

E

F

E

Tag-line: Adaptive Digital Advertising

Font type: Serif

Visuals: Pattern, Green/White

E

Tag-line: Adaptive Digital Advertising

Font type: Sans-serif

Visuals: Image, Blue/Green/Black

Results:

E - 11,166 impressions, 110 clicks (CTR 0.99%)

F - 11,493 impressions, 131 clicks (CTR 1.14%)

Winner: **F**

Week 5 - Round 2

G

H

G

Tag-line: Digital Generated Ads For Your Business

Font type: Sans-serif

Visuals: Pattern, Off White

H

Tag-line: Digital Generated Ads For Your Business

Font type: Sans-serif

Visuals: Image, Red

Results:

G - 11,493 impressions, 137 clicks (CTR 1.19%)

H - 13,138 impressions, 127 clicks (CTR 0.97%)

Winner: **G**

Week 6 - Round 2 Finals

F

G

E

Tag-line: Adaptive Digital Advertising

Font type: Sans-serif

Visuals: Image, Blue/Green/Black

G

Tag-line: Digital Generated Ads For Your Business

Font type: Sans-serif

Visuals: Pattern, Off White

Results:

F - 9,536 impressions, 122 clicks (CTR 1.28%)

G - 5,963 impressions, 91 clicks (CTR 1.53%)

Winner: **G**

Grand Final: Week 7

C

G

C

Tag-line: Automated Ad Generation by Luminaire

Font type: Serif

Visuals: Pattern, Green/White

G

Tag-line: Digital Generated Ads For Your Business

Font type: Sans-serif

Visuals: Pattern, Off White

Results:

C - 12,181 impressions, 98 Clicks (CTR 0.8%)

G - 12,594 impressions, 138 Clicks (CTR 1.10%)

Winner: **G**

Round 1 Elimination Chart

Round 2 Elimination Chart

Grand Finals Elimination Chart

Winning Ad Design

G

Tag-line: Digital Generated Ads For Your Business

Font colour: Dark Green

Visuals: Pattern (curves), Off White

1st Round - 11,493 Impressions, 137 clicks (CTR 1.19%)

2nd Round - 5,963 Impressions, 91 clicks (CTR 1.53%)

Finals - 12,594 Impressions, 138 Clicks (CTR 1.10%)

Total Average: 10,017 impressions, 122 clicks (CTR 1.27%)

Results

Overview

Throughout the entire test campaign, a total of 173,601 impressions were delivered, resulting in a total of 1,802 clicks, scoring an average engagement ratio of 1.04% CTR whilst cost-per-clicks (CPC) averaged SGD\$0.36. Total ad spend during the campaign was capped at SGD\$1.00 CPC per ad, with total ad spend amounting to SGD\$656.60.

Limitations in these results would include potentially different performance scoring across other advertiser product sectors such as Real Estate, Legal Services, Health and Medical, amongst various others. Due to the controlled and small sample sizing, it is inconclusive to determine that all variants of non-human generated creative online banner ads perform better than industry in terms of user engagement. Nevertheless, the engagement results provided assurance that generated display ads do not underperform as compared to current human designed display ads. Additionally, as this experiment was tested through only 7 cycles, there remains possibility for further testing through longer cycles in further research to determine if deviances occur with a longer horizon.

Ad Design

The winning ad creative G delivered the highest peak of engagement scoring with a 1.53% CTR, based off 5,963 delivered impressions with 91 clicks. The lowest performing ads were A and C with a draw of 0.8% CTR, based off 10,096 delivered impressions with 81 clicks and 12,181 delivered impressions with 98 clicks, respectively. This sets the range of ad performance for this test campaign within 0.8% CTR at lowest, to 1.53% CTR at highest (0.8%-1.53%). Accounting for only the winning ad creatives in each competitive round, the 7 best performing ads scored an average of 1.17% CTR, based off a total of 76,201 impressions delivered with 872 clicks.

As logo placement and CTA box colour/text remains unchanged due to technical limitations, further testing including these variables could provide additional conclusive evidence. Additionally, future testing can be done on different ad sizing formats beyond the 300 x 600 pixels ad sizing used in this experiment to complement the results.

Medium

The best performing medium was Tablets, whilst Computers performed the worst. Mobile Phones scored 1.06% CTR, based off 165,260 delivered impressions with 1,756 clicks. Tablets scored 1.15% CTR, based off 3,637 delivered impressions with 42 clicks. Computers scored 0.06% CTR, based off 4,616 delivered impressions with 3 clicks. TV Screens scored 1.14% CTR, based off 88 impressions and 1 click. This sets the range of ad performance based on medium within 0.06% CTR at lowest, to 1.15% CTR at highest (0.06%-1.15%).

Demographics (Gender and Age)

On available binary gender data, Males engaged with higher frequency than Females. Males delivered 119,722 impressions representing 81.48% of known total impressions, and Females delivered 37,031 impressions representing 25.2% of known total impressions. Due to limitations of online anonymity, category defined as Unknown are not considered, as they could represent either gender. Males represented 1,322 clicks whilst Females represented 383 clicks, delivering 1.10% CTR and 1.03% CTR respectively. This sets the range of ad performance based on gender demographics within 1.03% CTR at lowest, to 1.10% CTR at highest (1.03%-1.10%).

On available age group data, the 45-54's engaged with the highest frequency, followed in order by the 55-64's, the 65+, the 25-34's, the 35-44's and the 18-24's. The 18 to 24's delivered 59,054 impressions representing 40.19% of known total impressions, 25-34's delivered 53,021 impressions representing 36.08% of known total impressions, 35-44's delivered 21,714 impressions representing 14.78% of known total impressions, 45-54's delivered 9,061 impressions representing 6.17% of known total impressions, 55-64's delivered 4,106 impressions representing 2.79% of known total impressions, and the

65+ delivered 3,524 impressions representing 2.4% of known total impressions. Similar to gender data, due limitations of online anonymity, category defined as Unknown are not considered. The 18 to 24's represented 614 clicks delivering 1.04% CTR, the 25-34's represented 576 clicks delivering 1.09% CTR, the 35-44's represented 231 clicks delivering 1.06% CTR, the 45-54's represented 121 clicks delivering 1.34% CTR, the 55-64's represented 48 clicks delivering 1.17% CTR, and the 65+ group represented 40 clicks delivering 1.14% CTR. This sets the range of ad performance based on age demographics within 1.04% CTR at lowest, to 1.34% CTR at highest (1.04%-1.34%).

Aggregating gender and age, the best performing categories are the 55-64 Males, representing 1.57% CTR based off 2,425 impressions and 38 clicks, followed closely by the 45-54 Females, representing 1.50% CTR based off 2,533 impressions and 38 clicks. The worst performing category is the 55-64 Females, representing 0.59% CTR based off 1,536 impressions and 9 clicks. This sets the range of ad performance based on aggregated age and gender demographics within 0.59% CTR at lowest, to 1.57% CTR at highest (0.59%-1.57%).

Discussion

Overview

With average total ad design performance placing within the range of 0.8% to 1.53% CTR, and round winners averaging 1.17% CTR, generated ads perform near par and more often higher than the average industry benchmark 0.84% CTR expected for the technology product category. This demonstrates that generated ad performance does not lose out to present human designed ad performance expectations for the technology sector. Through integration with historical big data on ad performance over a longer period of time, there is possibility that CTR % performance can be further raised through AI-powered predictive analysis models.

Ad Design

For purposes of online banner ad design for the technology category, the most ideal design is determined to be a combination of a neutral pattern-based background, overlay with sans-serif font types, using the key words of consisting of “digital”, “generated”, “business”. Clear legibility of text placement above repetitive background patterns also seem to be ideal for increasing user engagement in this category. Winning ad banner design G performed higher than industry expectations across 3 rounds, ranging from 1.10% to 1.53% CTR, and consistently outperformed industry averages across cycles. It is also interesting to note that for the technology category, digital banner ads with subdued colours seemingly perform better than ads with bright colours, which goes against seemingly mainstream logic that brighter colours attract viewers. Through replicating this A/B creative testing model across multiple other business industries, data can be collated and more of such unique insights can be uncovered with even better accuracy.

Medium

In terms of medium-based performance, tablets achieved the highest CTR % scores, whilst computers scored the lowest. Likelihood of higher engagement on tablets could be attributed to the targeting of business professionals and executives under the technology category, whom generally use tablets in corporate presentations or research. It is also plausible that tablets receive the highest engagement scores amongst the other platforms due to the clearer legibility on the banner ads when viewed from a larger screen. With such insights, further developments of generated ads could include creative optimisation based on medium as well. It is unclear why computers scored the lowest, but possible reasons include business executives using the computer solely for work documents, whilst using the tablet to surf the web. Additional research should be done on optimising design for medium to increase ad personalisation even further.

Demographics (Gender and Age)

As the online banner ads were targeting high level C-suite decision makers in companies across Singapore, the results on age and gender aggregation supports this notion with the bulk of engagement coming from the 55-64 males, followed closely behind by the 45-54 females. As the ads advertised a largely business-to-business (B2B) product type under the technology category, it makes logical sense that the slightly older age groups whom are likely top level management staff, engaged the most with the display ads. Although this experiment does not target ad design to specific ages, it is worthwhile to further identify these data so that future ad personalisation can include unique ads for different age groups.

Implications for Data-driven Design as an Approach

Through the experiment, it had been deduced that the most ideal creative attributes on online display ads under the technology category are the sans-serif font types, subdued colour schemes and key words such as “digital” that are directly related to the service or product. This method of multivariate testing, via an elimination round system with scoring based on online engagement rates as determined by CTR%, holds the potential to be integrated into AI machine learning algorithms with accuracy improving over test cycles. Limitations in such integrations with AI algorithms would be the collection of a sufficiently large dataset, which requires time. Potential methods of accelerating accuracy and data training for the AI, would be obtaining historical data from past campaigns across digital marketing and advertising agencies. Implementing the method demonstrated in this chapter, over a longer time frame and larger dataset, would provide results that are even more accurate in prediction of consumer taste. With advertisers concerned about return-on-ad-spend (ROAS), data-driven design as a new approach to ad design can provide them with better assurance on performance.

Implications for the Ad Agency as Tech Company in Future

Over larger scales of datasets, current advertising agencies would benefit from implementing technology stacks not unlike technology companies. Tech stacks would include integration of technology such as data classification algorithms, AI predictive

analytics and automated processes for repetitive high churn design work such as online banner ads. Through such tech-based business models, the current manpower-driven structure that advertising agencies employ will be disrupted in a positive way. The integration of AI systems would assist ad agencies in screening and analysing millions of data points effectively, whilst delivering better results to their clients through predictive analytics on creative ad performance. These changes would bring down operational costs for ad agencies through reduction of manpower requirements and increase productivity across departments, whilst satisfying clients with faster and increasingly accurate results, culminating in higher profit margins for the ad industry and advertisers with both sides achieving their goals.

Conclusion

The experiment in this chapter proposes the method in which multivariate testing can be used within a creative advertising context. By taking into account the composition of creative ads, both in areas of art direction (colours, images, fonts) and copywriting (tag-line, call-to-action) and pitting them against each other, businesses and brands can optimise the effectiveness of their advertising not through guesswork but a data-driven approach to ad design. Beyond the direct multivariate testing displayed here, deep learning AI systems can identify patterns and trends in collected datasets over a period of time, providing advertisers with insights on market and cultural paradigm shifts. Additionally, with consumer taste changing over time due to trends, deep learning AI systems can adapt and generate new creative ads that reflects the evolving sentiments towards design styles and copy.

In the world of innovation-driven technology startups, speed and agility is paramount to success in the highly competitive landscape, both in fund raising and fulfilling client needs. As technological advancements and digital technology continues to evolve and present new ways of interacting with our physical world, it is fundamentally crucial that companies adapt to the changes that arise. Specifically, the current advertising agency structure would do well through integrating tech models into the creative processes, to

optimise results for clients and improve internal productivity across departments. Using a data-driven approach for ad design and restructuring ad agencies to run as tech companies, the advertising industry can expect satisfied clients and better profit margins. The following chapter further explores the potential for a new frontier in data driven design through ad agency as tech company, utilising the vehicle of a tech startup to build an advertising agency of the future.

Chapter 6

The Silicon Valley Tech Startup Model: Translating Research Into Product

As referenced earlier in Chapter 2, the argument for traditional advertising agencies to be transformed into an agile tech startup model is critical in the current digital age. Across industries globally, digitalisation has begun encroaching in multiple areas of business, from operations to marketing, supply chain to transactions, transformative ways of doing things has disrupted the status quo. Even the traditional banking industry, typically slow to change, has made the decision to run like a tech company. In a recent interview with the CEO of DBS Bank Singapore *Piyush Gupta*, he states: *“DBS is today increasingly recognised as a global leader in digital transformation. As an example, we were named as World’s Best Digital Bank by Euromoney twice in the last three years. To understand how this came about, we need to go back to 2014, when our Chief Information Officer Dave Gledhill visited a number of the big tech companies. His takeaway from the trips was that we could be the “D” in GANDALF—a term we coined to refer to the likes of Google, Amazon, Netflix, Apple, LinkedIn and Facebook. So in running the company, we started to act less like a bank and more like a tech company...”* (Patel, 2018). As traditional businesses have begun to understand the fundamental importance of shifting towards a tech-driven model of business, they can begin to have a fighting chance against the likes of tech giants dominating Silicon Valley today.

In the context of the advertising industry, which in recent years have been looking to turn fully digital, it was crucial to enter the market in sync with market shifts. This includes the fact that traditional management consultancies, like *Accenture*, have begun to invade the traditional advertising agency model by also including online advertising programmatic services for their clients (Joseph, 2018). This transformation of management consultancies into the ad business, coupled with the rise of tech giants such as *Google* and *Facebook* whom in 2018 have captured 59% of advertising spend in the United States, traditional ad agencies are slowly being eroded (Heberger, 2018). It

is the right time for a new type of advertising agency that run like tech companies. In tandem with the rise of market hype in the rise of Artificial Intelligence and Industry 4.0, there is huge opportunities in testing the research out in the commercial market, whilst potentially disrupting an industry that is worth more than USD\$600B (McNair, 2018).

The successful creative advertising agency of the future will ideally be run like a tech company, strategically using big data and AI analysis to predictively generate advertising content that works for their clients. Large multi-national corporations (MNCs) account for large deals in the ad industry, with conglomerates like *Procter & Gamble* (P&G) growing increasingly distrustful of ad agencies and the business outcome they can deliver (Neff, 2019). By reinventing the ad agency as a technology enterprise rather than a client retainer, MNCs worldwide can expect more effective returns on their ad spend. Additionally, on the micro level, the ad agency as tech company also solves certain issues facing local Small-Medium Businesses (SMBs), namely the lack of expertise for in-house staff to deal with design and digital advertising related workflows, and the speed of getting digital ad campaigns started. This aims to solve the issues on two fronts, by improving productivity through automation of the digital ad design processes, and the lowering of costs through reducing staffing requirements on in-house designers and digital marketing specialists. Such gains would help boost the thin revenue margins of local SMBs, helping them thrive in the future economy. This is important as it is projected that SMBs will be the lifeblood of Singapore's economy in the next decade (Seow, 2019).

In the highly saturated ecosystem of ad-tech, incumbents have a tough time creating product differentiation in the market. With ad spend having remained largely the same throughout most of modern advertising history, capturing a slice of the pie requires deposing of current dominant players through disruption (Gallagher, 2017). Even though the landscape is crowded by various ad-tech vendors ranging from the DSPs, the SSPs and Data Management Platforms (DMPs), there is still opportunity within the space. The Blue Ocean Strategy, conceived by renowned business professors *W. Chan Kim* and *Renee Mauborgne*, defines saturated industry spaces such as the ad-tech sector as a

Red Ocean. In contrast, the Blue Ocean is defined as a space with lack of competitors and easier route to capturing market share, offering entrepreneurs and business decision makers the opportunity to create a bigger economic pie for all. At the end of this strategy is the goal to make current processes more efficient and at a lower cost (Denning, 2017). The ad-tech industry at present is ripe for a Blue Ocean shift in incumbent strategy, with a focus on improving the current processes and formulating the right business model to deliver efficiencies at faster speeds and lower cost.

The incumbent advertising agencies that have global businesses are unlikely to adopt a tech-driven business model in the next few years, as their size and organisational structure requires both planning on the management level and the requisite time for corporate restructuring. As a result, advertising conglomerates have taken to acquiring tech-driven startups for assimilation into their own portfolios (Bloom, 2019). Intense competition between the tech publishers like *Google* and *Facebook*, alongside consulting firms like *Accenture* seeking a slice of the advertising pie had caused the previously dominated territory of the advertising giants to become eroded. It is these confluences of factors that have opened up opportunity for lean and agile tech startups to compete, either disrupting the industry to become the next giant, or getting acquired by existing ones. Creativity alone is no longer enough for ad agencies to thrive in the future, but going beyond mere survival would be the ones that successfully merge creativity with data in presently unexplored ways.

As proven through controlled testing in the previous chapter, automated generative digital online banner ads have the potential to perform better than industry average in terms of engagement scoring with real-world consumers. More importantly, the data-driven design approach will serve to improve efficiencies and lower staffing costs across marketing departments of consumer product companies large and small, through the automation of the design process. Alongside productivity increase, the market data driven approach creates better ROI for businesses in relation to ad spend, through increasingly accurate fact-based predictive analysis of consumer engagement in relation to ad design and spend. This opens up new avenues for tech-driven ad agencies to

emerge in the coming years, with access to larger pies of revenue from corporations seeking to improve profit margins and optimising inefficient processes.

The Silicon Valley tech startup model has proven success in the last decade, acting as fertile ground for explosive company growth alongside the emergence of technology. Companies the likes of *Google*, *Facebook*, *Apple* and *Amazon* place annually on the Fortune 500 list of the biggest corporations, generating billions of dollars in revenue each financial year (<https://fortune.com/global500/2019/>). This explosive growth is best personified by the success of the *Amazon's* CEO and Founder *Jeff Bezos*, whose stake in his own company has made him the richest man in the world, with a net worth in triple-digit billions (<https://www.forbes.com/billionaires/#761054f9251c>). These companies all share a common thread in focusing on technology-driven platforms that enable millions of their customers to transact more effectively and efficiently within their categories. By adopting the tech startup model of building ecosystems rather than singular products, these businesses are able to capture the benefits of globalisation and scale quickly and with lean resources (Martins, Dias & Khanna, 2016). There is much potential for the advertising agency of the future to be run on a tech startup model, specifically through an end-to-end tech driven ecosystem that is agile compared to the slow bureaucracy of traditional ad agencies.

The field of academic entrepreneurship is full of opportunity, with Technology Transfer Offices (TTO) sprouting up in universities worldwide. The transference of research into viable commercial products is a treasure trove filled with potential, often with research institutions holding onto a large number of unused patents. For reference, 95% of patents registered by the top research universities remain unused for commercial purposes (Fisher, 2014). This gap between world class research and practical deployment of technological patents has deprived society of innovations that have the potential to transform industries and improve lives. Various TTO's have adopted the Lean Startup methodology when it comes to commercialising their research, focusing heavily on recruiting skilled and experienced entrepreneurs to execute on the business model and go-to-market strategy, conducting customer reviews to define product-

market fit and subsequently, connecting the right investors to the university-backed startups for fund raising efforts (Chung, 2015). With the growing support of translating academic research into commercial products, the present moment is ripe for research-based ideas entering the market to receive industry validation.

Additionally, the island-state of *Singapore* is one of the best places in the world to start a business. With the ease of registering a company, low corporate taxes, international diaspora available for talent staffing, and a pro-technology government, it is a good watering ground for emerging tech disruptors across industries. Typically, start-ups are made up of between 2-4 cofounders running the business on lean budgets, often self-financed or acquiring funding from Government Grants, Angel Investors or Venture Capital firms. Due to the liberal business taxes and geographical location in the midst of an economically growing South-East Asia, venture capital firms have been increasingly willing to invest in Singapore-based startups, pumping in US\$3.5B for funding as recent as 2016. Deep tech startups, specifically in areas like Artificial Intelligence and IoT, have become hot commodities for investment portfolios (Spring Singapore, 2018). Research focused institutions like the Agency of Science, Technology & Research (A*STAR) have also begun to partner with startups in the country for capability development, deploying their scientific manpower and resources in new areas of innovation. The Singapore government has also begun recognising the need at present moment in placing commercial innovations at the forefront of local economic infrastructure plans, with *Minister Chan Chun Sing* declaring that the Ministry of Trade and Industry (MTI) is putting IP innovation at the forefront in order for the nation to prosper in the knowledge and innovation driven markets of today (MTI, 2019).

It is with these confluences of technological disruption, supportive funding ecosystem and advertising market sentiments that the decision was made to concurrently put this research into practice as a real-world tech startup headquartered in Singapore. As a practical component alongside this research, it aims to replicate the *Silicon Valley* bootstrap start-up model of building a Minimum-Viable Product (MVP) and launching it into the market for traction. This has been accomplished through the launch of a tech

startup within the Singapore ecosystem, *Lumin(ai)re* (www.luminaire-ai.com). The registered company (Private Limited) had been officially incorporated on the 14th August 2018, after having been awarded the Enterprise Singapore's (ESG) Startup SG Founder grant (<https://www.startupsg.net/programmes/4894/startup-sg-founder>), alongside co-funding equity investment from venture capital firm Spaze Ventures (<https://www.startupspaze.com>). [Further information pertaining to the startup can be referenced in Appendix B.]

As demonstrated in the previous chapter, the prototype codenamed the *Luminaire Ad Generation Platform* (<http://3.1.220.78:8000/accounts/login/>), is built to automatically generate multiple variations of digital online banner advertisements based on the input factors of Campaign Name, Industry Category, Ad Sizes, Brand Logo, On/Off Generated Tag-lines, and Background Visuals type. Also included are optional inputs such as Product Image upload and Customised Ad Copy. After entering the required inputs, the platform automatically generates variations of digital online banner ads, with variations on font type, font colours and background visuals. At the current stage of development, the prototype has limitations on the amount of inputs, with further developments post-research including but not limited to: Gender, Age Range and Region, in the subsequent versions of the platform. The software is presently hosted remotely on the *Amazon Web Service* (AWS).

As explored in this chapter, the traditional advertising agency disrupted through a tech startup model provides leverage when going up against the technology conglomerates of the present day. At the same time, research based innovations have started to gain traction, with supportive government initiatives for technology startups, university Technical Transfer Offices rendering patent-related assistance and a fertile venture funding ecosystem for disruptive ideas. Combining these factors, the decision was made to create a technology startup *Lumin(ai)re*, as both an accompanying practical component and a testbed for commercial innovation through validation in the real-world markets. The following concluding chapter will explore the most immediate emerging

technologies in the next decade that will further disrupt the present status quo, and the implications of their applications within the advertising industry in the coming future.

Chapter 7:

Looking to the Future: Emerging Technologies and Opportunities

In the next decade, technological advancements will create even more opportunities for delivery of digital advertising, and provide for increasingly detailed consumer data points. A few key technological trends that are emerging includes Augmented Reality and Virtual Reality (AR/VR), 5G wireless network connectivity (5G), Internet-of-Things (IoT) and blockchain. Each of these coming advancements will shape and influence the future of digital advertising in a myriad of new ways. These tech developments will augur change in the fundamental ways that digital advertising has been created, monetised and consumed in the modern day. The collective developments of these emerging technologies in the next decade will inform the mediums that digital advertising will be presented to consumers, and provide advertisers with innovative and engaging methods to craft new advertising experiences.

The emerging field of AR deals with merging digital interfaces and visuals with the real world. In parallel, VR takes it a step further, and inserts the user into an entirely digital faux world through the use of specially designed headsets that provide 360 degrees visuals and audio. The AR/VR industry has experienced growth and adoption in the modern day, with uses in fields as diverse as interior design to mobile gaming. By creating a hybrid between physical reality and the digital realm, AR/VR can be seen as the bridge between both.

With almost 2.5B of the world's population using smartphones daily, the ubiquitous personal devices have become the de-facto manner in which digital consumers engage with AR technology (Taylor & Silver, 2019) (Chang, 2017). AR as software has proven value, as demonstrated by the mobile game *Pokémon GO!*, which has earned almost \$2B in revenue as of 2018, with 147M monthly active users (MAU) on the app (Chamary, 2018) (Tassi, 2018). The massive success of the *Pokémon GO* mobile game bodes well for the user engagement capabilities of AR as a platform. The high Monthly-Active-

Users (MAU), which stands for the number of active users engaging with the app on a month-on-month basis, opens up an avenue for advertisers to include their ads within the worlds of such games. This would be a primary source of revenue generation for such gaming apps, as their software is typically free-to-download, and monetises based on ad placements and in-app purchases (IAPs). Mechanisms could include getting players to scan a real-world product and triggering a reaction within the AR world. There are many possible ways that the AR technology can be further utilised in such manners to engage and entertain consumers in the future.

Correspondingly, VR has opened up many possibilities in the enterprise technology sector, from simulated “face-to-face” international corporate meetings, to educating future medical practitioners in a simulated operating theatre environment, the applications are dynamic with wide breadth. The management consultancy *Deloitte* has given examples of this in real-world case studies, such as replicating in-store displays for regional retailers with product packaging. They have termed VR as *digital reality* and estimates that the timeframe for adoption will ripen in the coming years (Deloitte, 2018). Main formats for engaging in VR at present includes the video gaming industry, such as the *Playstation VR* (<https://asia.playstation.com/en-sg/psvr/>), alongside VR-focused headset manufacturer *Oculus* (https://www.oculus.com/?locale=en_US), which was acquired by *Facebook* for \$3B in 2014 (Heath, 2017). The potential growth and adoption of VR technology, both in the gaming and social media markets, holds potential for advertising monetisation in the coming years. With the added immersive experience of VR as a platform, new forms of experiential ads can be created by brands and advertisers.

As the smartphone becomes increasingly advanced over the last decade, so have home appliances and ancillary devices we use on a daily basis. Looking ahead at the developments that will be occurring in the coming decade, consumer data will be increasing exponentially (Ismail, 2017). One of the key contributors to this growth is the development of the Internet-of-Things (IoT). Under this concept, household appliances

are designed to connect with the internet, transmitting real-time information such as usage frequency and energy consumption to manufacturers. Such information, can also be re-tooled to fit the purposes of targeted advertising. The Internet-of-Things, also known as IoT, can be construed as a network connecting home devices to the internet. A list of smart devices presently in the market includes smart laundry machines, refrigerators, coffee machines, TVs, driverless cars and voice-controlled AI assistants like the Amazon *Alexa* and Apple *HomePod*. By providing constant feedback between the manufacturers and users, the future *smart home* will bring unparalleled convenience to the end users through actions like predicting the time when refrigerator soda supplies run out and subsequently placing an order online, or recommending viewers of SmartTVs television shows which they would most likely enjoy, the possibilities of applications are endless (McKinsey, 2017). On the advertising front, the big data generated by these feedback loops can inform digital ad targeting based on real-time user needs, such as showing ads for detergent when it is running low, or pushing ads for action films based on SmartTV watch histories.

The Samsung Family Hub Smart Refrigerator, part of the incoming IoT SmartHome rollout in home appliances.

The biggest challenge when connecting the growing number of smart devices that require increasingly complex data exchanges is the issue of network connectivity. Existing 4G mobile communications networks are sufficient for streaming videos on *YouTube* and playing online multiplayer video games, but with technologies like

driverless cars that require constant accurate and large data exchanges, it is neither stable nor quick enough for practical function. Currently in development is a new and faster connectivity network, named 5G, which promises to deliver data faster and more securely than existing 4G technology. Through the emergence of 5G wireless networks, safety critical connected systems like driverless cars, flying drones and advanced military systems will become mainstream. The power of this upcoming wireless network is reflected in the geopolitical tensions caused by the growth of China's 5G network, primarily led by China tech giant *Huawei Technologies* (Tan, 2019).

Lesser understood by the public comparatively to the above mentioned technologies but equally hyped amongst the tech crowd, is blockchain. Blockchain is a method of encryption that uses distributed information nodes versus the current status quo of singular authority. The technology is deeply linked to cryptocurrency, and the finance and banking industries (Murray, 2018). Most recently, the buzz around cryptocurrency, specifically Bitcoin, had created a huge increase in valuation and made a number of early investors millions in profits in a short period of time (Mahdawi, 2018). This demonstrates the volatility of the technology. Although used in mainly in the finance world, blockchain technology holds potential to be implemented in the advertising industry, potentially solving the issue of ad fraud (Zmudzinski, 2019). Another potential application for blockchain within the advertising ecosystem is the launch of unique advertiser cryptocurrency. As demonstrated in recent times, cryptocurrency have become the de-facto decentralised monetary system in transnational exchanges. Popular examples include *Bitcoin* and *Ethereum*, with investors and hedge fund managers seeking alternative high-risk opportunities, buying the blockchain-powered currencies in droves. This has led to intense investor and public speculation, driving prices up 200% in 2019 alone (Browne, 2019). Intangible digital assets such as cryptocurrency have in the technological shift, become attractive to consumers due to anonymity and reduced reliance in the global banking system. Even *Facebook* has recently announced the launch of its very own cryptocurrency named *Libra*, aiming to target the unbanked individuals in third world nations. With the 2B users currently on the

social media giant's platform, global monetary regulators are beginning to worry about the private company becoming the official world currency (Al Jazeera, 2019). Limitations in cryptocurrency and blockchain presently includes negative associations such as nefarious organisations taking advantage of its anonymous nature to perform illegal operations, politically motivated clandestine funding for black ops and untraceable global money laundering (Malik, 2018). Repurposed for the advertising industry, digital ads of the future would likely include the earning of cryptocurrency through consumer engagement with ads, leading towards brick-and-mortar store redemptions. This will increasingly blend digital experiences with physical conversions, incentivising store spendings and creating an interesting dynamic for advertisers seeking to monetise blockchain in integrating both the online and offline experiences.

These emerging mediums combined, fundamentally provides the framework for digital ads to become increasingly engaging and requiring less user intervention to progress. Automation in various processes within the advertising ecosystem will become norm. Complementarily, the technique of *Gamification* has been used in recent times by companies to drive user engagement rates, induce brand loyalty and create immersive environments that have a sticky effect on users, who often come back for more (Angelovska, 2019). The video gaming industry, which has proven success in the last decade, with the video game consumer market bringing in total sales of USD\$131B in 2018 (Lanier, 2019). The *gamification* technique creates fun, which is increasingly vital in the modern digital world, with 7% drop off in online ad engagement if the ad loads later by 100-millisecond (Wertz, 2017). By creating reason for digital users to engage voluntarily in an enjoyable manner, future advertisers would be able to increase user engagement on content, possibly above the average range of conversions. Most recently, global e-commerce giant *Amazon* has acquired *Twitch* for close to USD\$1B in 2014. The video game streaming online community holds potential for video game advertising, an emerging format of ad delivery that is estimated to earn up to USD\$20M by 2020 (Johnson, 2019). Content creators on *Twitch* are also realising the potential of their reach, with popular streamers on the platform monetising their content via patron

donation sites like *Patreon*. To that extent, the content creators are becoming more influential within the niche advertising space, often trending towards the post-millennial consumers which advertisers are having a hard time reaching. In the next decade, creative content creators will likely become siloed, working independently with advertisers rather than going through an agency.

Kate Stark, a full-time Twitch streamer, chatting with her fans on the video-game streaming platform (Seitz, 2018).

Currently, social media influencers have become a respected medium for marketers to publish ads, even spawning a new class called *micro-influencers* with small fanbases of between 1,000 to 3,000 followers. The influencer and micro-influencer are predominantly targeted towards younger digitally native consumers who tend to trust influencers more than traditional advertising mediums like TV or outdoor. Using influencers, advertisers are able to connect deeply with their highly personal audiences and build brand trust through social engagement (Wissman, 2018). There is room for growth, with ad spend in the social media medium growing in the next decade, which brings to front the potential that AI predictive analytics could also be utilised to optimise influencer ad performance.

Accordingly, the concept of *stealth advertising* has crept into advertising platforms like media websites and social media content. The term *stealth advertising* refers to

advertising content that is often created to appear like original non-sponsored content. This could take the form of a sponsored post crafted to look like an editorial in a news website, or a shout-out by social media influencers *recommending* specific products to their followers. This new phenomenon of advertising method has critics citing the potential for misleading audiences that trusts in news channels or influencers to be unbiased (Chernov, 2010). This present trend of *stealth advertising*, coupled with the use of *gamification* to keep consumers hooked, introduces the implications for advertisements of the future. Future ads might not resemble current ads at all, instead being an entire experience tailored specifically to sell products to consumers, without them being aware of it.

Future Research

As explored in this chapter, the multitude of various emerging mediums and platforms hold immense potential for the experience of digital advertising in the near future. Although this research covers the gaps of online digital display advertising, where success is often determined by ad clicks as engagement, the experience of ad viewers within AR or VR environments may require different strategies and metrics to measure success. With digital online display ads predominantly a 2-D visual layout, there is potential for adapting AI-powered creative optimisation processes to be further developed in generating 3-D environmental VR worlds. With the successful gamification of VR as demonstrated by games like *Pokémon GO!*, a future world of brand-sponsored VR worlds could exist in the near future. Moreover, with 5G connectivity and IoT developing further along in the next decade, faster internet networks and individual device data tracking can be further utilised for ads that are more experiential and personal, moving from the digital out-of-home, into the connected homes and driverless cars of the future. In the development of technological advancements and new mediums of experiencing digital content, the potential for emerging ways for ads as a medium of expression is only constrained by the imaginations of future ad creatives, researchers and technologists.

Additionally, blockchain technology is an emerging field at present within financial and banking sectors, but have still been relatively unexplored in the advertising industry. As briefly explored in this chapter, the use of cryptocurrency holds the potential to be utilised towards incentivising ad engagement for users. Opportunities for further research in this area is becoming increasingly lucrative, as companies rush to launch their own crypto-coins via Initial Coin Offerings (ICO). This model requires further testing to determine the effectiveness of cryptocurrencies in improving ad engagement. As a supplement, blockchain as decentralised arbitrator of data flows can also be implemented within the current ad-tech ecosystem to provide better transparency. With ad fraud cases growing, blockchain systems hosted via decentralised networks can ensure that ad agencies are accountable for deliverables without fabricated results to clients. With the growing ad transparency concerns and hype surrounding cryptocurrencies and decentralisation of data, blockchain integration within existing advertising processes will be interesting area for researchers and practitioners to further explore.

Lastly, although the core of this research was focused on visuals and words, there are also the other human senses to explore - sound, taste, smell and touch. Using the multivariate testing model discussed in Chapter 5, the same predictive analysis model can be transplanted into areas of the other senses. This opens up vast opportunities in future industries, examples include luxury perfumes, food and beverages, media and healthcare. There is room for disruption in these longstanding industries, with predictive analysis on *consumer taste* across multiple sensory engagement points potentially bringing cost-savings, increased productivity, reduced waste and accuracy - benefits that will no doubt ensure a sustainable and beneficial ecosystem for humanity in an increasingly complex world.

Conclusion

Through exploring the historical beginnings of advertising as a medium for commercial messaging, and the evolution of mediums and formats of ad creatives over time, a parallel can be drawn between technological advancement permeating through society

and the evolution of the way advertising is delivered both creatively and medium-wise. Subsequently, due to the recent advent of the internet and the ubiquitousness of the smartphone, the manner in which humans communicate with each other had drastically and fundamentally shifted. Arising from this new digital frontier, the field of ad-tech was born - primarily as a response to the digital savvy consumers of the modern world. Through the integration with computer systems that can organise millions of data points whilst operating 24 hours a day, 7 days a week, programmatic advertising came to the forefront of ad-tech. With this new technology and method of ad delivery, traditional ad roles were disrupted, productivity improved and profits were made.

In the midst of the change, art direction and copywriting as a visual tool still remained relevant as ever. As ad-tech optimised and improved digital ad placements, less focus was being placed on the art direction and copywriting. Humans are still primarily visual creatures, and it is shown that subtle nuances in both visual and words, hold powerful sway over the psychological response in consumer minds. A new method of data-driven design is proposed to address this issue, through the optimisation of creative variations based on subtle nuances in visuals and text on online banner ads. It is thus suggested that a multivariate testing model powered by Artificial Intelligence algorithms would work broadly to achieve this goal. As a result, digital creative ads can be constantly optimised and adjusted in real-time to respond dynamically to consumer behaviour. The future of data-driven digital creative ads would serve advertisers better through predictive analysis of creative attributes, leading to higher returns on their ad spending through visually stimulating ad designs for the consumers.

Non-human generated ads had also demonstrated in the controlled experiment to outperform current industry user engagement standards, achieving an average engagement of 1.17 CTR % compared to 0.84 CTR % across the technology category within Singapore. Additional research is still required on this front moving forward, with further ad testing across multiple locations, and taking into account additional inputs such as age group, gender and other product or service categories.

With ad spend remaining consistent throughout, ad agencies will be required to adopt a digital-first approach moving forward in order to compete with the tech giants of the modern day. Through the integration of AI systems into the current ad agency practices, processes can be accomplished faster and cheaper with higher accuracy in delivering optimal results for clients. The future of ad-tech and data-driven design holds immense potential in the coming decades owing to the emergence and mainstream adoption of IoT, AR and VR technologies, blockchain and 5G network connectivity. Future research would additionally be focused on the applications of automation through technology within these upcoming formats of advertising. As a result, the advertisers of the future will do well to embrace data-driven design in the effective delivery of creative advertising towards increasingly digital savvy brands and consumers.

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Appendix A

Initial Ad Platform Visual Mock-ups

The following images are the initial visual mock-ups for a data management platform, targeted towards the advertising agencies. This was during the initial stages of the concept, and was initially conceived as a creative brief generation platform.

Proposed mock-up layout of the User Interface (UI) home page for input and management of ad campaigns.

The mock-up shows the input UI layout for the Beta Platform. The header includes the logo, the date and time (February 9, 2019 4:29 PM), and a user profile icon with a "LOG OUT" button. The main content area has a "Set Campaign Name" field. Below this are two sections: "Select Data Sources" with radio buttons for "Commercial Data", "Live Data", and "Brand Data"; and "Select Category" with a dropdown menu showing "Handphone Colour". There are also input fields for "Age" (with a placeholder "Please Enter your Age"), "Gender" (with radio buttons for "Male" and "Female"), and "Education" (with a placeholder "Please select your Education"). An "ANALYSE" button is at the bottom right.

Input UI layout for the Beta Platform, visual mock-up.

Luminaire Ad Generation Platform (Minimum-Viable-Product)

Through user insights, it was determined that generating creative briefs were not sufficient to potential customers. The current Minimum-Viable-Product (MVP) iteration of the ad platform can automate the ad design process through creative online banner ad generaUsers can enter inputs such as industry/product category, poster sizing for generation and upload brand logo. Inputs will automatically generate relevant online banner ad designs.

The screenshot shows a web browser window with the URL "Not Secure - 3.1.220.78". The page is titled "Lumin(a)re" and has a user profile "luminaire_admin". The main content area contains four sections for user input:

- Name your Campaign!**
What would you like to name your campaign?
Input field: "Your campaign name..."
- What's your industry?**
Let's tailor your campaign to your industry.
Dropdown menu: "Education"
- What size of posters are you looking for?**
Select one or more poster sizes.
Radio buttons: ☐ 728 x 90 ☐ 320 x 100 ☐ 300 x 600 ☐ 336 x 280 ☐ 300 x 250 ☐ 1200 x 628
- What's your logo?**
Next, let's take a look at your company's logo.

(Above) User input screen for campaign name, industry targeting, online banner sizing and logo upload. (Below) Generated online ad banner designs.

Appendix B

Lumin(ai)re: Startup Activities

This section collates startup activities by *Lumin(ai)re* since incorporation in August 2018, including media interviews, podcasts and event appearances.

PitchdeckAsia interview with Han Phay (December 2018): [https://youtu.be/](https://youtu.be/41fhEbGShyE)

[41fhEbGShyE](https://youtu.be/41fhEbGShyE)

Lumin(ai)re at the Artificial Intelligence Roundtable organised by The Hungry Lab (December 2018): [https://luminaire-ai.com/news/f/event-recap-startups-stuff-ai-](https://luminaire-ai.com/news/f/event-recap-startups-stuff-ai-roundtable-121218)

[roundtable-121218](https://luminaire-ai.com/news/f/event-recap-startups-stuff-ai-roundtable-121218)

Lumin(ai)re was invited to the Anglo-Chinese School (International) for a career talk
(March 2019): <https://luminaire-ai.com/news/f/visit-to-ac-s-international-8319>

Lumin(ai)re pitching at the Echelon Asia Summit 2019, held in the Singapore Expo as a
TOP100 APAC startup (May 2019): <https://vimeo.com/339284200>

The Podcast Startup Story interview with Han Phay on the Rodcastor (July 2019):

<https://rodcator.com/2019/07/16/s04e01-startup-story-han-phay-and-luminaire/>

Lumin(ai)re wins the Vikingcubator 2019 pitch competition (August 2019):

<https://luminaire-ai.com/f/luminaire-wins-the-vikingcubator-2019-crown-01082019>