

RESPONSIVE ENVIRONMENTS

DIGITAL OUT-OF-HOME ADVERTISING

A Deeper Level of Interaction through Environments Data Analytics

A Thesis

by

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 Xiangyu Sun, 2015

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ABSTRACT

The advertising industry is undergoing a revolution thanks to the development of digital media. Digital out-of-home (DOOH) advertising is part of this revolution. It refers to digital media used for marketing purposes in public and outdoor locations. The industry is growing by about 40% per year and is expected to reach US \$7 billion annually. This thesis project aims to create a deeper level of interaction with DOOH audiences through environmental data analytics. The project allows the advertising team to create a display wherein the billboard content changes automatically and synchronically with changes in the display's environment. Since digital out-of-home (DOOH) offers a market of absolute growth, I am also investigating how to introduce and launch this interactive solution to the DOOH advertising Industry. This plan is for the start-up of SunDOOH Consulting in Toronto, Canada and serves major U.S. market.

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TABLE OF CONTENTS

1. Background	1
2. The Vision / Mission Statement / Team	7
3. The Product and Service	8
• Key Features	9
• Users	11
• Critical Opinion	11
• Competitive Position	12
• Objectives	12
• Key to Success	13
• Company Locations	13
• R&D Review	14
• Research Question	14
• Research Method	15
• Relevant Work	17
• Needs Assessment and Ideation	21
• Prototype Development and Tests	23
2. The Market	
• Key Definition	36
• Size and Growth	37
3. Industry Partners	41
4. Sales and Marketing Strategy	
• Sales Proposition	41
• Initial Route to Market	44
• Current Position and Objectives	46
• Target Sectors	49
• Pricing	50
5. Financial Overview	
• 3 Year Model	51
• Business Structure and Ownership	57
6. Corporate Social Responsibility	57
7. Summary and Next Step	63
8. Bibliography	64
9. Appendix A: User Testing Details	68
10. Appendix B: Consent Form	71

LIST OF FIGURES

Figure 1: The key features of this digital interactive solution	9
Figure 2: A diagram shows the business model of digital out-of-home advertising	10
Figure 3: Key users of this interactive out-of-home advertising solution	11
Figure 4: Akestam Holst. "Wonderful Subway Ad Shows a Woman's Hair Blowing Around Whenever a Train Arrives." AdWeek. February 27, 2014. Accessed May 14, 2015. http://www.adweek.com/adfreak/wonderful-subway-ad-shows-womans-hair-blowing-around-just-train-arrives-155986 .	17
Figure 5: Tate Britain. "Tate Britain's Outdoor Digital Screening." Tate Britain's Outdoor Digital Screening. Accessed May 14, 2015. http://www.digitalarti.com/blog/digitalarti_mag/tate_britain_s_outdoor_digital_screening .	18
Figure 6: A brief demonstration of the prototyping	23
Figure 7: COMB Reports 2007-2014. "Canadian Outdoor Advertising Market Share." Out-of-Home Marketing Association of Canada(OMAC). Accessed May 14, 2015. http://www.omaccanada.ca/ .	39
Figure 8: COMB Reports 2007-2014. "Canadian indoor Advertising Market Share." Out-of-Home Marketing Association of Canada(OMAC). Accessed May 14, 2015. http://www.omaccanada.ca/ .	40
Figure 9: COMB Reports 2007-2014. "Inventory Growth by Region." Out-of-Home Marketing Association of Canada(OMAC). Accessed May 14, 2015. http://www.omaccanada.ca/ .	40
Figure 10: 3-Year Financial Plan (Year 1)	52
Figure 11: 3-Year Financial Plan (Year 2)	53
Figure 12: 3-Year Financial Plan (Year 3)	54
Figure 13: Profit and Lost Projection	55
Figure 14: Balance Sheet Projection	56

BACKGROUND

The Growth of DOOH

The advertising industry is undergoing a revolution, thanks to the development of digital media. Digital out-of-home, or DOOH, refers to digital media used for marketing purposes outside of the home.¹ This excludes TV advertising and radio advertising, but includes digital signage. This is sometimes hyphenated as digital-out-of-home or abbreviated as DOOH. DOOH Installations can be found in many places including your local breakfast diner, a doctor's office, or even on gas pump toppers.

There is great potential in the global DOOH market. Within this sector, digital signage is directly responsible for leveraging this growth. In 2010, revenues from digital signage reached US \$5 billion in equipment and software. Counting service and advertising revenue, the number rises to US \$6.5 billion. The industry is growing by about 40% per year and is expected to reach US \$7 billion annually. Advertising revenue alone from DOOH was US \$2 billion in 2012 and has been growing at about 15% per year.² Global Digital Out-of-Home Media Forecast 2014 found that key indicators for the

¹ "What Is DOOH / Digital Out of Home? - Scala Digital Signage Software." Scala Digital Signage Software. July 22, 2012. Accessed February 17, 2015. <http://scala.com/what-is-dooH-digital-out-of-home/>.

² "Qualified Visitors." Brasil Signage Expo. Accessed February 17, 2015. <http://www.brasil signage.com.br/en>.

first half of 2014 were pointing to accelerate growth for DOOH media of 11.3% by that year's end. According to PQ Media's Emerging Market Intelligence Series (Volume II), DOOH advertising spending has been boosted by a combination of global economic momentum, two sporting mega-events, and increased healthcare, political, and transit advertising spending.³ Reports indicated that by 2015 there would be 10 million users and 22 million digital screens in the world. In the U.S. alone, for example, there were two million digital signage in 2011; that number was expected to grow to seven million over five years. The total DOOH market is expected to reach US \$14,875.6 million by 2020, at an estimated compound annual growth rate of 8.94% between 2014 and 2020. Despite this market of absolute growth, only US \$1.6 billion is spent on all types of out-of-home advertising in the U.S., out of an estimated total of US \$200 billion currently spent on advertising.⁴

The Development of Big Data

"There is a big data revolution," says Professor Gary King, the Albert J. Weatherhead III University Professor and social sciences statistician at

³ "PQ Media." Emerging Market Intelligence Series (Volume II). 2014. Accessed February 17, 2015. <http://www.pqmedia.com/gdoohmediaforecast-2014.html>.

⁴ "Qualified Visitors." Brasil Signage Expo. Accessed February 17, 2015. <http://www.brasilsignage.com.br/en>.

Harvard University, though it is not the quantity of data that is revolutionary. He argues: “The big data revolution is that now we can do something with the data.” King lists some of the many sources of input that feed big data analysis. Data flow is very fast, from phones, credit cards, televisions and computers; from the infrastructure of cities; from sensor-equipped buildings, trains, buses, planes, bridges, and factories. For 2016, Statista projects the global big data market to grow to more than US \$45 billion in revenue⁵.

Big data refers to extremely large data sets that may be analyzed computationally to reveal patterns, trends and associations, especially relating to human behaviour and interactions.⁶ Big data is increasingly used to drive marketing decisions. For instance, familiar uses of big data include “recommendation engines” like those used by companies such as Netflix and Amazon, to make purchase suggestions based on the prior interests of one customer as compared to millions of others. A retailer might use an algorithm to detect when women are pregnant by tracking purchases of items such as unscented lotions—and offer special discounts and coupons to those valuable patrons. Credit card companies have found unusual associations in the course of mining data to evaluate the risk of default: for

⁵ "Global Big Data Market Revenue Forecast 2011-2017 | Statistic." Statista. Accessed February 17, 2015. <http://www.statista.com/statistics/254266/global-big-data-market-forecast/>.

⁶ "Definition of Big Data in English." Big Data. Accessed February 17, 2015. <http://www.oxforddictionaries.com/definition/english/big-data>.

instance, people who buy anti-scuff pads for their furniture are highly likely to make their payments.⁷

However, DOOH data collection practices still have gaps as compared to online data collection marketing. These gaps are being filled gradually, sometimes in unconventional ways. For example, Google started Project Loon in 2013, which places high-altitude balloons in the stratosphere at an altitude of about 32 km to create aerial wireless networks with up to 3G-like speeds.⁸ Project Loon aims to provide free, balloon-powered Internet access to rural and remote areas that are poorly served by existing provisions, and to improve communication during natural disasters in affected regions.⁹ While providing service to patrons, Loon also benefits Google by gathering highly synchronous data from its users and the area's environment.

The arrangements for displaying ad content in traditional out-of-home advertising are inefficient, since the contents are not immediately responsive to the users' environment or circumstances. For example, users might

⁷ Shaw, Jonathan. "Why "Big Data" Is a Big Deal." *Understanding Big Data Leads to Insights, Efficiencies, and Saved Lives*. March 2014. Accessed February 15, 2015. <http://harvardmagazine.com/2014/03/why-big-data-is-a-big-deal>.

⁸Levy, Steven. "How Google Will Use High-Flying Balloons to Deliver Internet to the Hinterlands". June 2013.

⁹Mack, Eric. "Meet Google's 'Project Loon' Balloon-powered net access". CNET. June 2013. Retrieved June 2013. Brodtkin, Jon. "Google flies Internet balloons in stratosphere for a "network in the sky"". *ArsTechnica*. Retrieved 15 June 2013.

respond with greater interest to ad information for hot drinks than for cold drinks during a winter cold snap. Sunscreen ads may be more compelling to users on sunny days than on overcast days. Yet traditional billboard content does not respond to conditions; it changes only when the advertising contract expires.

There is now the potential to benefit both the creative agency and the out-of-home advertising audience by creating two-way communication between them. While out-of-home advertising traditionally pushes fixed content to the users, with SunDOOH Consulting's innovation, a feedback loop is created: Input from DOOH users is delivered very quickly to the creative agency, whose installation then matches the display content to the users' current circumstances. Even slight weather changes are known to affect sales. So what if advertising displays changed content precisely at the right times to strengthen those sales? Now a DOOH billboard on the highway can note the temperature dropping and warn drivers of the risk. The busiest days at Harley-Davidson dealerships are when the weather is exactly 22°C and sunny. Now, their outdoor digital signage can build on the urge to be on the open road by flashing: "Today is 22°C & Gorgeous; Perfect for a ride on your Harley." In another example, do-it-yourself hair removal products surge 1400% when spring temperatures hit 21°C. In response, the local mall's

fancy salon can attract frugal shoppers by using its DOOH display to offer a “Today Only” steep discount on waxing. Also at 21°C, barbeque sales jump 200%. When the temperature drops just one degree in the fall, mousetrap sales surge 25%: Hardware, outdoor and home stores’ DOOH installations can note such changes and offer compelling content at exactly the right time. While marketers cannot manage the weather itself, they can certainly manage the financial implications of weather.¹⁰

Like most retailers, Wal-Mart has been making decisions on weather data for years in obvious ways, such as putting up umbrella or snow-shovel displays in advance of rain or snow fall. Wal-Mart also has found that people are more likely to eat steak when the weather is warm with higher winds and no rain. That rise flattens back to normal when it gets uncomfortably hot outside. On the other hand, ground beef does better with higher temperatures, low wind, and mostly sunny conditions. Salads sell better when the temperature tops 80° F and winds are low. This weather data has led to an 18% improvement in Wal-Mart’s sales of these products.¹¹

¹⁰Influence, By Under The. "Home | Under The Influence with Terry O'Reilly | CBC Radio." CBCnews. February 03, 2015. Accessed February 17, 2015. <http://www.cbc.ca/undertheinfluence/season-3/2014/03/22/sunny-with-a-chance-of-mousetraps-how-weather-affects-marketing-1/>.

¹¹Neff27, Jack. "Cloudy With a Chance of Meatballs: How Weather Forecast Predicts Walmart's Sales Outlook." Advertising Age DataWorks RSS. October 27, 2014. Accessed February 17, 2015. <http://adage.com/article/dataworks/weather-forecast-predicts-sales-outlook-walmart/295544/>.

The development of technologies for using different sensors and open source data programs on the internet makes gathering data from users and a display site's environment inexpensive and achievable. Creative agencies will be able to generate DOOH content optimally engaging content that responds to an ongoing stream of data about their target consumers' behaviours and circumstances.

Noting the huge market potential into the digital signage industry for integrating solutions to the demand for interactive experiences, and the value of optimizing business intelligence through big data, I will open SunDOOH Consulting, providing creative agencies with the support they need to begin designing and generating responsive DOOH content. The firm will also offer ongoing technical support on data collection, analytics and development of data-responsive displays for their digital out-of-home advertising. The service will launch in Toronto this May, 2015, as either a sole proprietorship or a partnership, depending upon funding configuration specifics.

THE VISION

SunDOOH Consulting is envisaged as a business that does excellent consulting work with creative agencies and specialists, providing creative,

data, and technical and experiential support services to companies within the digital out-of-home (DOOH) advertising industry.

MISSION STATEMENT

The mission of Sun Consulting, Inc. is to connect creative agencies responsively with their users through innovative, synchronically interactive DOOH solutions.

THE TEAM

Consultant

Designer

Engineer

Marketer

THE PRODUCT AND SERVICE

The product is an interactive billboard solution that designed to generate responsive contents through analyzing data from visitors and surrounding environment. The prototype consists three major parts, which includes: 1. Collecting data from visitors and surrounding environments. 2. Generating responsive display contents simultaneously with the data and information we

collected. 3. Storing the data and send them to the creative agency and generate information visualization automatically.

The service we provided includes providing consultancy and technical supports on applying this interactive solution to the billboards and out-of-home installation. The long-term maintenance and data management will also be provided to our clients.

Key Features

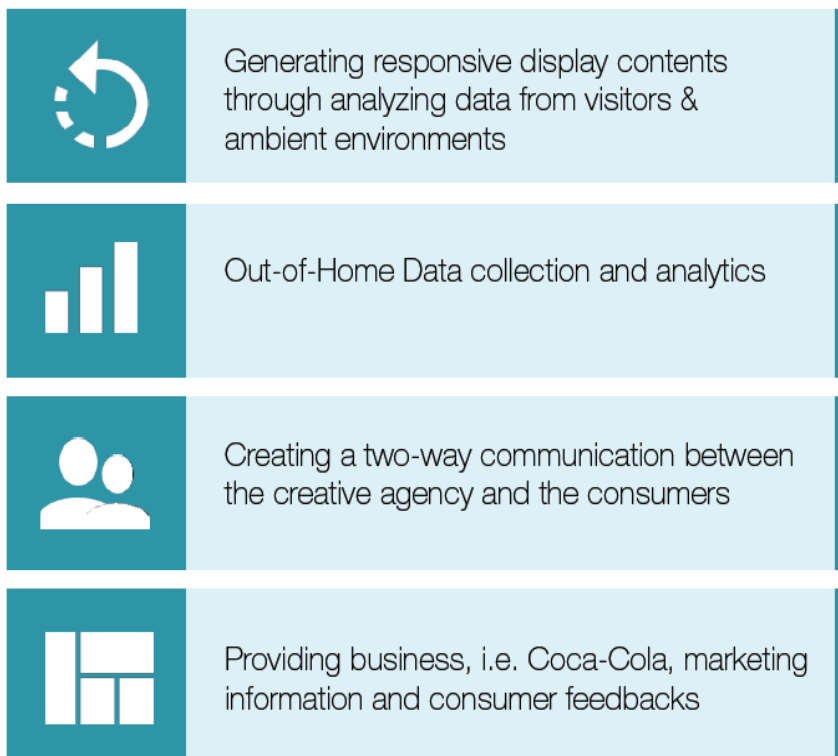


Figure 1: The key features of this digital interactive solution

- The billboard installation could generate responsive display contents through analyzing data from visitors & ambient environments
- Creating data analysis and information visualization based on the data the interactive billboard collected
- Creating a two-way communication between the creative agency and the consumers
- Providing business, such as Coca-Cola, useful marketing information of consumer feedbacks and brand awareness

NEW BUSINESS MODEL

- Traditional Digital Out of Home Advertising

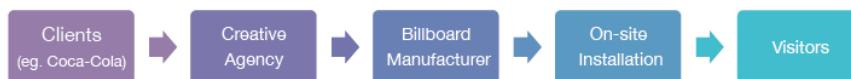


The display contents are unchangeable.



No feedback from visitors is generated.

- Responsive Environmental Out of Home Advertising



Feedbacks from visitors communicate with the creative agency synchronously.



The installation generates responsive contents through analyzing data from visitors & environment.

Figure 2: A diagram shows the business model of digital out-of-home advertising

USERS

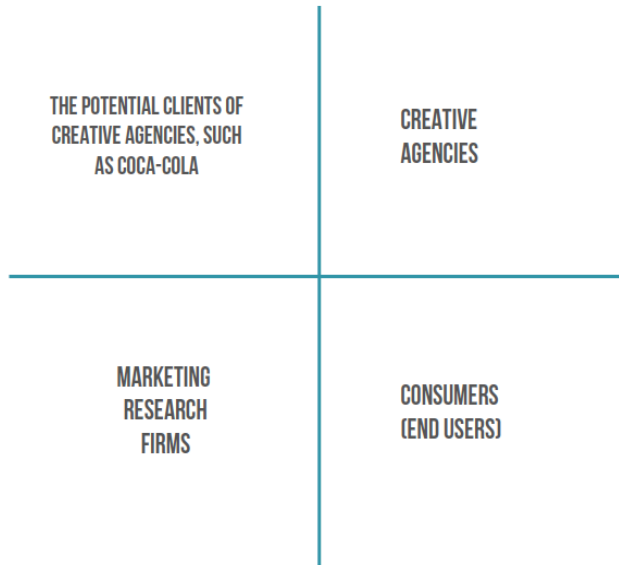


Figure 3: Key users of this interactive out-of-home advertising solution

Critical Opinion

Many people complain that there are too many billboards in the city. Also, the increasing presence of cameras in billboards could increase the risk of digital surveillance. In most cities across the world, the young DOOH industry is not regulated highly, or at all, by government. Future government regulations may affect the survival of the DOOH industry. For instance, In Chile, São Paulo's populist mayor, Gilberto Kassab, passed the so-called "Clean City Law" in September 2006, banning all outdoor advertisements, including billboards, on transit, and in front of stores, regardless that it could cause revenue losses up to US \$133 million and a net job loss of 20,000 for

the city. Despite these detrimental outcomes, the law passed: Fifteen thousand billboards in the world's seventh largest city were taken down.¹² As the survival and growth of the display out-of-home industry may well depend on governments' passive or active support, it behooves the industry to be conscientious about privacy concerns, public-service minded, and to communicate in such a way that evokes empathy and enjoyment.

Competitive Position

The Canadian out-of-home advertising industry has largely been dominated by Pattison Outdoor, which occupies 45% of the Canadian market. Their digital out-of-home division, Pattison OneStop, has created well-established remote display control networks around Canada. Therefore, I decided to focus SunDOOH Consulting's services on providing simply, cost effective solutions for Pattison OneStop and other major digital out-of-home companies in Canada.

Objectives

- Secure SunDOOH's first client; provide them with successful consulting services in 2015

¹² <http://www.newdream.org/resources/sao-paolo-ad-ban>

- Develop a strategic marketing alliance with Pattison Onestop Media Group
- Achieve sales of CAN \$20,000 in 2015
- Generate an operating profit by May 2016
- Establish an effective production team
- Build company's successful portfolio and reputation in the industry

Keys to Success

In order to achieve the company's objectives, there are a number of important steps that must be taken, including the following keys to success:

1. Successfully build an effective team
2. Find our first client
3. Build the company's portfolio and reputation

Company Location

SunDOOH Consulting will open an office in Toronto, Canada to serve the major Canadian DOOH markets.

Toronto, Canada

An Ipsos poll commissioned by the City of Toronto revealed that the vast majority (70%) of Toronto residents believe that digital and illuminated signs

are a normal part of public spaces in large cities like Toronto.¹³ Almost two-thirds (63%) said that these types of signs are useful to them. Digital-out-of-home plays an important role in communicating information about advertisers' products and services, which ultimately has an impact on the local economy. There are more than 10,000 DOOH screens in transit systems and on Canadian roads. As DOOH networks grow, consumers' awareness is increasing. A recent Canadian study revealed that one-third of principal household shoppers in Toronto, Montreal and Vancouver recall DOOH advertising on a weekly basis.

R&D Review

Research Question

My research project aims to demonstrate that a deeper level of interaction between creative agencies and DOOH display audiences can be achieved through synchronous collection of data by sensors in DOOH displays and responsive use of the resulting data's analytics. The main question I will address in this research is: How can one design a DOOH display so that it generates highly responsive content through real-time analysis of data collected at the display site regarding its visitors and the environment?

¹³ <http://www.ipsos-na.com/news-polls/canada/>

I will also explore how this innovative design and use of existing technologies can improve out-of-home advertising results and foster a new, high-growth business model for the industry. I hypothesize that data regarding visitors and the environment, collected continuously from various sensors at the display site and analyzed through online open source data programs, can be used to design DOOH displays that change billboard contents synchronously and automatically to be optimally engaging to visitors.

Please note that this thesis uses the terms display, billboard and installation interchangeably to refer to the digital out-of-home advertising delivery mechanism. It also uses the words user(s), end user(s), viewer(s) and audience(s) interchangeably to reference the individual(s) or group(s) of people who potentially or actually engage with the DOOH display.

Research Method

I used research methods such as user-centered design and participatory design. User-centered design informed my development of a prototype that responds to the needs and wants of creative agencies, marketers, and end users. The assumptions that emerged from the research contributed to furthering the design of my prototypes, which were again tested and optimized according to the user testing responses.

Using user-centered and participatory design methodologies, I undertook the following three-step research process:

1. Interviews with target users, end users and industry experts
2. Observations of current interactive digital signage
3. Development and testing of the adapted prototype to responses and re-tested

Relevant Work

Ad Shows a Woman's Hair Blowing Whenever a Train Arrives



Figure 4: Akestam Holst. "Wonderful Subway Ad Shows a Woman's Hair Blowing Around Whenever a Train Arrives." AdWeek. February 27, 2014. Accessed May 14, 2015. <http://www.adweek.com/adfreak/wonderful-subway-ad-shows-womans-hair-blowing-around-just-train-arrives-155986>.

Ad agency Akestam Holst produced this ad for Apotek Hjärtat's Apolosophy products. This digital subway ad for hair-care products in Sweden was rigged to recognize when trains entered the station, and to switch to an image of the model's hair astir, as if windswept by the train. It is simple, playful, responsive, and seemingly magical in the way it erases the line between the ad and its environment. This ad demonstrates the power to engage users by using sensors to create responsive digital signage

contents. It uses a simple ultrasonic sensor to detect train arrivals and changes the display contents instantly, based on data from the sensor. The main purpose of this ad is to improve brand awareness by attracting passengers to focus on the display's dynamic and appealing content.

Tate Britain, Welcome to London



Figure 5: Tate Britain. "Tate Britain's Outdoor Digital Screening." Tate Britain's Outdoor Digital Screening. Accessed May 14, 2015.

http://www.digitalarti.com/blog/digitalarti_mag/tate_britain_s_outdoor_digital_screening.

Tate Britain has launched an out-of-home ad campaign that features varied combinations of images and text that change according to factors such as

time of day, weather conditions, and even the presence of a full moon. This DOOH display is the creative work of Liveposter. The campaign, displayed on two installations in London, showcases the Tate Britain archival holdings in a fun and unexpected way. Liveposter can automatically display the most relevant image and text combination to audience members at the specific moment that they pass one of the installations. For instance, if traffic on the adjacent motorway is passing slowly, a longer text may appear. In another example, since the adjacent motorway leads to and from Heathrow Airport, the posters may change to reflect recent flight arrivals. For example, just after a flight from France has landed, the ads may appear in French.

Each set of copy is matched with an appropriate image from Tate Britain's archives. A common color scheme links the text to the image, with the predominant hue in the image generating the color of the copy.¹⁴

This project utilizes an online open source data program to input relevant data, such as weather, time, traffic and flight information, directly into the system that will then present contents that are engaging not only because of the posters' words and images themselves, but also because of their

¹⁴ "CR Blog." CR Blog RSS. July 2014. Accessed February 17, 2015. <http://www.creativereview.co.uk/cr-blog/2014/june/ad-of-the-week-tate-britain-welcome-to-london>.

immediacy and relevance. Tate Britain's project successfully integrates art and culture with advertising, making it highly appealing to its audience. It is an excellent example of content that is responsive to ambient environmental conditions and offers its viewers compelling content.

Quividi's Audience Measurement Solution for DOOH-tv

In October 2014, a public announcement was made that DOOH-tv, a digital signage network operating in 17 Belgian shopping malls, would equip its network with Quividi's audience measurement solution. DOOH-tv manages over 100 digital screens and 40 way-finding kiosks in Belgian malls. DOOH-tv conducted a pilot program to integrate the Quividi's solution with BroadSign's content management system. In their pilot, DOOH-tv was able to: measure the footfall of mall visitors; compute number of viewers per screen; analyze visitors' rates of attention to the screens; estimate visitor demographics; and thus, predict the screens' audience size and makeup by day and time.

Quividi analyzes the images from video sensors in real time, counting and qualifying the passers-by through facial recognition. Their system uses a

cloud-based analytics service to aggregate the input into completely anonymous audience data and resulting insights into shopper behaviours.¹⁵

Quividi's data collection solution could benefit businesses through analyzing consumers' data. However, there is also potential issue of digital surveillance and privacy issue for customers in shopping malls. The resulting anonymity is important to consumer acceptance of Quividi's services.

Needs Assessment and Ideation

The demand for closer two-way communication between the creative agency and DOOH audience grows as audiences become increasingly accustomed, with in-home advertising, to a close bond between the advertising they see and their own interests and immediate circumstances. Static out-of-home advertising can be perceived as irrelevant to a tech savvy audience accustomed to an almost uncanny intimacy with the creators of in-home digital advertising. The gap between the creative agency and traditional DOOH display end users is becoming unacceptable both to the agencies' clientele and to their target audiences. Therefore, making the display contents responsive to environmental changes can be valuable for both creative agencies' clients and for local consumers.

¹⁵"DOOH-tv Belgium Selects Quividi for Its Digital Signage Mall Network » Quividi's Blog." Quividis Blog DOOHtv. 2014. Accessed February 17, 2015. <http://www.quividi.com/blog/index.php/2014/dooh-tv-belgium-selects-quividi-for-its-digital-signage-mall-network/>.

The intention in this project is to extend the use of available sensors and open source data programs to create a synchronous, highly responsive loop of information between the creative agency and the DOOH display audience. Continuous data collection of environmental factors and audience behaviours can be used by agencies to change their displays so that they attract greater and more focused viewer attention through content immediacy, relevance and, even, playfulness. The interactive content that the agency develops as a result of data analytics will rivet viewers of varied demographic traits and behaviours to various extents, particularly under changing environmental circumstances. Analytics of data continuously gathered at the site can then be used to further modify display contents to attract the attention of viewers who are not otherwise engaged with the display and/or to deepen the current audience's focus on it. In this way, intimacy becomes increasingly present between an agency and its audience.

Prototype Development & Testing

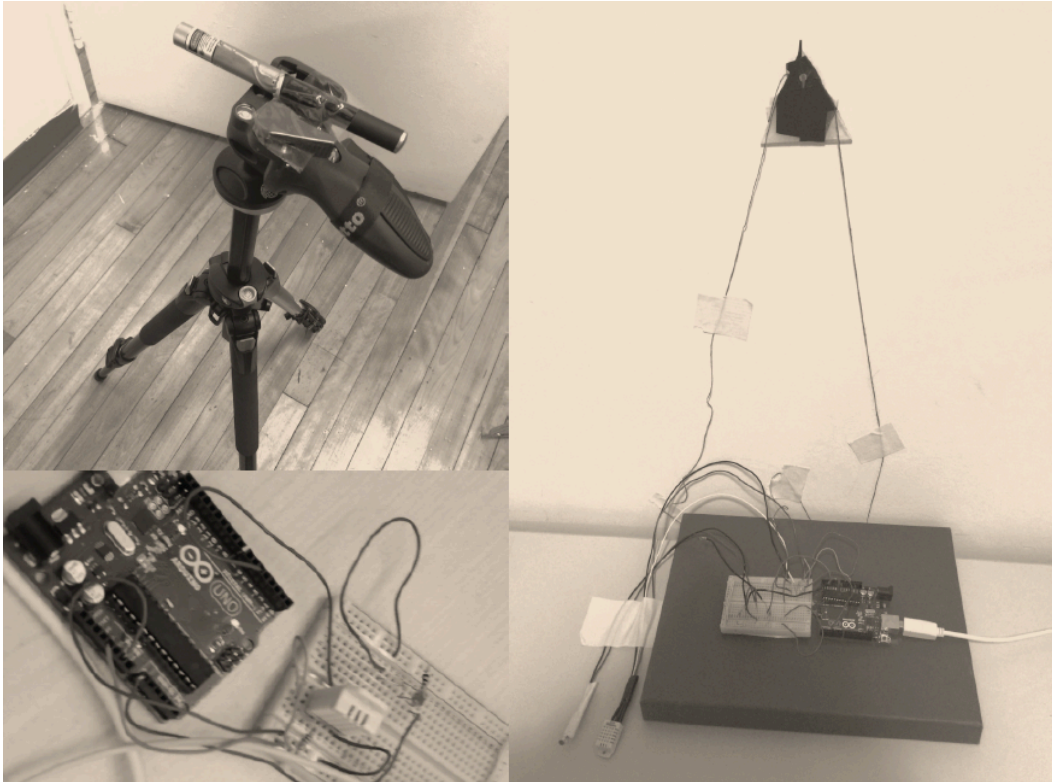


Figure 6: A brief demonstration of the prototyping

A functional and testable prototype of an interactive billboard is designed to generate responsive contents through analyzing data from visitors and surrounding environment. The prototype consists three major parts, which includes: 1. Collecting data from visitors and surrounding environments. 2. Generating responsive display contents simultaneously with the data and information we collected. 3. Storing the data and send them to the creative agency and generate information visualization automatically.

Prototype I

The first prototype achieves the collection of information, such as temperature, humidity, light and the traffic. The display contents could automatically switch to play one of the four versions of an ad based on the ambient environments. All the data is recorded every five minutes automatically and stored in a text file for further analysis.

Part 1: Collecting Data from Visitors and Surrounding Environments

This prototype could detect the weather condition, indoor temperature, light value, time and how many people are walking by. The data is collected through utilizing a variety of sensors and cameras, including temperature sensors, humidity sensors, photoresistors. The sensors are connected to an Arduino, an open-source computer hardware and software platform for building digital devices and interactive objects that can sense and control the physical world. In the next step, the Arduino gathers all the information collected by sensors and sends them simultaneously to an open-source software platform called Processing to control the display contents.

Part 2: Generating Responsive Display Contents with the Data

Processing, an open-source programming platform built for new media arts and programming in a visual context, receives data that is collected through

the Arduino simultaneously. Meanwhile, there are four versions of an existing Coca-Cola' ads being imported into the Processing. The coding allows the Processing run different versions of an ad based on the data collected by the Arduino. For instance, the billboard will play Coca-Cola's You are My Sunshine commercial if the data shows it is a cloudy day, the light value outside is lower than a certain value. Meanwhile, if the light value is low and the humidity value is high, it means there will potentially rain. The billboard will automatically switch to play Coca-Cola's raining day ads. It will automatically choose to play Coca-Cola's Polar Bears commercial if the temperature is lower than a certain value.

On the other hand, the display contents will automatically change to play the most popular ads if it senses there are many people walking by the billboard.

Part 3: Storing the Data and Sending It to the Creative Agency

The data collected from sensors is recorded in every five minutes and automatically stored in a text file in the Processing. The data that has been collected and stored includes temperature, light, number of people walking by the installation, light and humidity.

Reflections on Prototype I

The initial idea attempts to use a camera to detect the nearby people and traffic. However, the existing libraries for people detection by using a camera did not work accurately enough. Alternatively, the first generation of Kinect sensors worked very well to detect people. But the Kinect sensor's view is quite limited and could only detect up to four people at one time within 1.8 metres, which makes it hard to detect the traffic in the real world. And the cost of a Kinect sensor is over \$150, which could add a significant cost for manufacturing the product. In addition, a few users mentioned the potential risk of digital surveillance by using a camera. Therefore, I decided only to use sensors without a camera to detect people. Motion sensors could detect how many objects are moving with the appropriate programming. But they are not accurate enough, and the maximum distance for detecting a people is only 6 metres. The final solution was to use one laser light and one photoresistor pointing at each other to sense the change of light value to detect if there is an object passing by the prototype. The number of times of the light value changes could reveal how many people are walking by without revealing people's identity. There are several advantages to using photoresistors and laser lights. Firstly, the cost of them is much lower than using a camera or Kinect sensors which make them easier to be applied in the real world. Secondly, the laser light I used for the prototype can reach

over 50 metres easily with a stable power supply, which makes it possible to detect people in a wide space. Thirdly, the laser light makes it possible to detect the change of value of the photoresistors in both daytime and nighttime. In addition, there is the potential for using more than one photoresistor to improve the accuracy and collect different types of data, such as the dwell time, in next steps.

The exhibition method of this prototype could also be improved based on the user feedback. The tester had to change the temperature with ice and heater to demonstrate the change of ads. One suggestion was to make the exhibition more inviting by making the users change the temperature, lights and humidity level. Therefore, a hairdryer, a bottle of an ice cube and a flashlight was placed beside of the billboard during the user testing session, so people could better understand the prototype.

The current display contents are Coca-Cola's existing ads. It is legal to display Coca-Cola's ads if it is not for a business purpose. However, it could be much more interesting to create my display contents. The contents could be designed more creative and be better associated with people. For instance, people could see themselves walking on the street in the billboard, but the background of the screen could be changed based on the weather.

A man who just gets off work in a cold winter could see himself walking on the beach in Cuba on the screen. The effect could technically be achieved by using an existing SDK for the second generation of Kinect sensor.

However, there is no existing library that could connect the Processing with the second generation of Kinect sensor. The Kinect's first generation of sensor could also achieve similar effects, but the quality is much lower, and it can only detect and show transitions of two people at one time. A major redesign of the contents will add to the value of this project. The prototype is designed to be a universal solution or machine for displaying all the digital signage. It emphasizes creating creative contents for only one screen-based advertising campaign. I interviewed several experts in the advertising industry and read some books about the value of Digital out-of-home advertising during this period. According to Keith Kelsen, the author of *Unleashing the Power of Digital Signage*, DOOH operates in three different networks: Point of Sale, Point of Transit, Point of Wait. Point of Sale comprises digital signage located in retail areas, anywhere close to a product or a service for sale. This type of network triggers immediate sales. In this case displaying responsive contents to the environments, such as weather and time could target users more efficiently and boost sales. Meanwhile, the users could receive the product information they want. For instance, the digital screens in Tim Horton could display more hot drinks

when the temperature is low. On the other hand, Point of Transit can usually be found when people are on the move; Point of Wait network aims at targeting consumers during dwell time. In both cases, the digital signage are more likely used for improving brand awareness and user experience. Creating interactive display contents could be ideal for those achieving those purposes. Therefore, the value of DOOH is not only delivery useful product information to trigger immediate sales but also improving brand awareness through creating appealing contents. The first prototype could delivery useful information, but the contents could be boring. Alternately, the idea of creating my contents could only be used for branding. Eventually, I decided to redesign the user interface on the billboard to make the contents embrace both purposes. The four Coca-Cola ads were kept. I am considering adding several pieces of animation or motion graphics to make the contents more appealing to the audience. For example, different pieces of motion graphic will be displayed on a portion of the screen that something based on the ambient environments. The motion graphics could also assist in explaining the ads and building interactions with users. For instance, a piece of motion will remind people of going home and having some fun when it is time to leave work. The details of the user interface design will be discussed in details in the next version of the design.

The types of sensors that we used to collect data are also very important for creative agencies to understand the users and conduct marketing research. The first prototype collects data from ambient environments by using sensors. However, some information such as weather could be imported directly from online open data, such as Yahoo weather. The prototype could import the weather information directly from the Internet to Processing in the next step. Meanwhile, the indoor information collected by sensors is still useful since it could show the differences between the indoor condition and the outdoor condition.

In addition, the current data is automatically recorded in every five minutes and stored in a text file in Processing. In the next step, the data could be automatically sent to the Internet and generate information visualization.

Prototype II

The second prototype quits using camera to track people in order to protect people's privacy. Photoresistors and laser lights are compared together to detect how many people are walking by the billboard. Meanwhile, the user interface of the billboard shows ads, motion graphics and weather

information. The motion graphics assists in explaining the contents of the advertising to engage users.

Part 1: Collecting Data from Visitors and Surrounding Environments

This prototype could detect the weather condition, light value, time, dates, how many people are walking by. The data is collected through utilizing a variety of sensors instead of cameras, including temperature sensors, humidity sensors, photoresistors. The sensors are connected to an Arduino. The Arduino gathers all the information collected by sensors and communicates with Processing to control the display contents.

Part 2: Generating Responsive Display Contents with the Data

Processing run different versions of an ad based on the data collected by the Arduino. There is also a motion graphic on the screen to engage users. For instance, it may say, "Hi, It's time to go home!" if it is 5PM in the afternoon. In addition, the weather forecast information will also be displayed on the screen to create an association with the content of the ad.

Part 3: Storing the Data and Sending It to the Creative Agency

There is no specific change in this section. The data is ready to be sent to the database on Internet directly for future visualizations and analytics.

Reflections on Prototype II

The users think that the user interface makes them confusing, since too many contents are displaying at the same time. There is a need to simplify the display contents while creating an association to make people understand this outdoor advertising. The design of the user interface needs to be more appealing. In addition, creative agencies suggest that the online open source weather forecast could be directly imported into the system to make the data collection more efficient. Furthermore, creative agencies show specific interests in the dwell time of passengers. Therefore, it needs to be added to this system.

Prototype III

The third prototype improves the collection of information by adding to track passengers' dwell time. Meanwhile, the system directly imports weather forecast information from Yahoo Weather open source data program to show the both the indoor and the outdoor environment condition. In addition, the user interface of the billboard has been entirely redesigned to make the audience better understand the contents.

Part 1: Collecting Data from Visitors and Surrounding Environments

This prototype could detect the weather condition, indoor temperature, light value, time, dates, how many people are walking by, the number of children, the number of adults, passengers' dwell time and, the color of the environments. The data is collected through utilizing a variety of sensors instead of cameras, including temperature sensors, humidity sensors, photoresistors and pixy sensors.

Part 2: Generating Responsive Display Contents with the Data

Processing run different versions of an ad based on the data collected by the Arduino. The design of the user interface allows users intuitively perceive the advertising contents. The data collection will also be displayed in a minimal style on the billboard to make people understand this new type of advertising.

Part 3: Storing the Data and Sending It to the Creative Agency

The data is ready to be sent to the database on Internet directly for future visualizations and analytics.

Testing and Observation

As this thesis project aims to design an interactive digital out-of-home installation that embraces data analytics to create a deeper level of interaction with audience, we included user observations and other types of engagement to gather data. During testing, users were asked observe, complete physical exercises and share their reflections. The interactions involved simple gestures, such as waving hands. In addition, some interviewees were asked to use their mobile phones to send messages to the test installation. Each user spent about 20 minutes taking the test. We housed the prototype installation, and conducted the user tests, on floors 6 and 7 of 205 Richmond Street West, OCAD University, Toronto, Canada. For the questionnaire and full test responses, see Appendix A.

User Interview Questionnaire:

1. What is your name, gender, age and occupation?
2. How much time do you usually spend on the Internet every day?
3. How many smart devices do you own, including smart phone, laptop, computers, templates and others?
4. How many times have you seen a digital billboard in the past three months?
5. Have you ever made a purchasing decision through digital out of home advertising?
6. Do you feel the data analytics are helpful for creating an effective interaction

with audience?

7. Are the contents of this ad appealing to your eye, fun to watch and memorable?
8. Do you have any suggestions for improving for this installation, including the display contents, interaction methods or exterior design?

Experts Interview Questions:

1. Why do we need digital signage?
2. Do you think that it's valuable to apply data analytics to the digital out of home advertising?
3. How do you think government regulations may impact the future of DOOH data collection practices?
4. How could we make the out-of-home data collection practices benefit people?
5. How could we integrate art & design with digital out-of-home advertising?
6. Which kind of data do you think the management team of a company, marketers and creative agencies are interested to see?

List of Expert Interviewees and their Organizations:

Dmitri Melamed
VP Production, Pattison Onestop

George Argyropoulos
CEO, Meta Design

Heather Simmons
Former CEO, Vital Alert Communication Inc.
Former Marketing Director, Dell

Rosanne Caron
President, OMAC Out-of-Home Marketing Association of Canada

Sharon Switzer
National Arts Programmer and Curator, Pattison Onestop

Tony Kerr
Chair of Advertising, OCAD University

Gary Schwartz
CEO, Impact Mobile

THE MARKET

Key Definition

There is great potential for growth in the global DOOH market, with digital signage as the sector's main leverage point. Current growth is already impressive worldwide: In 2010, revenues from digital signage reached US\$ 5 billion in equipment and software. Including service and advertising revenue, the number rises to US \$6.5 billion. It is an industry that is growing by about 40% per year and is expected to reach US \$7 billion annually. The advertising revenue from digital out-of-home alone was US \$2 billion in 2012 with expected growth of 15% per year. Global Digital Out-of-Home Media Forecast 2014 found that key indicators for the first-half of 2014 were

pointing to accelerated growth for DOOH media of 11.3% by year's end. DOOH advertising spending has been boosted by a combination of global economic momentum, two sporting mega-events, and increased healthcare, political, and transit advertising spending.¹⁶ Reports further indicated that by 2015 there will be 10 million users and 22 million digital screens in the world. In the U.S. alone, for example, there were two million digital signs in 2011, a number that was expected to grow to seven million over five years. The total market is expected to reach US \$14,875.6 million by 2020 at an estimated compound annual growth rate of 8.94% from 2014 to 2020. Even though it is clearly a strong growth market, only US \$1.6 billion is spent on out-of-home advertising out of an estimated total of US \$200 billion currently spent on advertising.¹⁷

Size and Growth

Canadian Market

The total OOH revenue in 2013 in Canada was \$604.3 Million (2013), 4.2% of Canadian ad revenue. Canadian digital out-of-home (DOOH) advertising space is highly influenced by geography. Canada is the world's second-largest country by total area and because its land mass is so vast, there are

¹⁶ <http://www.pqmedia.com/gdoohmediaforecast-2014.html>

¹⁷ <http://www.brasilsignage.com.br/en>

no true national-scale digital out-of-home advertising networks. According to PQ Media, a leading provider of market intelligence, in 2013, Canada ranked third in consumer digital out-of-home exposure behind Australia and the UK. While the US ranked fourth, it remains the world's largest DOOH market by revenue.¹⁸

There are approximately 16 Canadian ad-based DOOH networks that offer advertisers enough scale to reach a critical mass of on-the-go consumers. Major players in Canada's DOOH media space include Astral, Canadian Health Media Network, Captivate Network, Cineplex Cinema Network, Cogeco Métromédia, Eyeshot Media, Lamar Advertising, Pattison Outdoor, Neo Traffic, Newad, UB Media, and Zoom Media & Marketing. Several of these providers also offer smaller niche networks in specialized venues. According to the Canadian Out-of-Home Digital Association (CODACAN), a non-profit trade association, its member networks currently operate over 18,000 digital signage screens across Canada.¹⁹

Major Canadian Out-of-Home Advertising Companies:

Pattison Outdoor

Astral Out-of-Home

CBS Outdoor

¹⁸ Caron, Rosanne. "OMAC." Out-of-Home Marketing Association of Canada, n.d. Web. 20 Mar. 2015.

¹⁹ Caron, Rosanne. "OMAC." Out-of-Home Marketing Association of Canada, n.d. Web. 20 Mar. 2015.

Cogeco Métromédia
 Lamar Transit Advertising
 Zoom Media
 Cieslok Media
 NEWAD Media
 Canadian Health Media Network
 Radiant Group Media
 Vertical Media
 PressDOOH

The tables below demonstrate the market share of the major outdoor and indoor advertising companies in Canada for the past five years:

The data show that Pattison Outdoor keeps on dominating almost half of the outdoor Canadian advertising market in the past five years.

MARKET SHARE OUTDOOR	2009	2010	2011	2012	2013	2014
CBS	38%	37%	37%	36%	29%	29%
PATTISON	42%	44%	43%	43%	43%	43%
ASTRAL	16%	17%	18%	18%	18%	18%
QUEBECOR	N/A	N/A	N/A	N/A	6%	6%
ALL OTHERS	5%	3%	3%	3%	4%	4%

Figure 7: COMB Reports 2007-2014. "Canadian Outdoor Advertising Market Share." Out-of-Home Marketing Association of Canada(OMAC). Accessed May 14, 2015. <http://www.omaccanada.ca/>.

Newad and Zoom Media shares the indoor advertising market.

MARKET SHARE INDOOR	2009	2010	2011	2012	2013	2014
NEWAD	52%	49%	49%	50%	50%	50%
ZOOM MEDIA	48%	51%	48%	51%	50%	50%
WMC	N/A	N/A	<1%	<1%	<1%	<1%

Figure 8: COMB Reports 2007-2014. "Canadian Indoor Advertising Market Share." Out-of-Home Marketing Association of Canada(OMAC). Accessed May 14, 2015. <http://www.omaccanada.ca/>.

Investments in out-of-home advertising are largely being made in the Provinces of Ontario and Quebec.

Region	2007	2014	Indice
Atlantic	2476	1894	76
Quebec	24114	17460	72
Ontario	39136	31115	80
Manitoba	1377	1126	82
Saskatchewan	820	949	116
Alberta	11758	11704	100
British Columbia	12301	10923	88
Total	91982	75171	82

Figure 9: COMB Reports 2007-2014. "Inventory Growth by Region." Out-of-Home Marketing Association of Canada(OMAC). Accessed May 14, 2015. <http://www.omaccanada.ca/>.

Industry Partners

Industry participants fall into four basic categories:

1. Creative Agencies
2. Clients of the creative agencies, such as Coca-Cola
3. Billboard Manufacturers
4. Audiences & End Users
5. Market Research Agencies

SALES AND MARKETING STRATEGY

Sales Proposition

SunDOOH Consulting will assist agencies in building interactive content for their digital out-of-home advertising; it will introduce data analytics and visualization to the Canadian DOOH industry.

Why specialize in serving the DOOH industry?

Neo Advertising Switzerland's website describes the value of digital out-of-home (DOOH) well. "Digital advertising, an expanding medium with the

ability to reach every individual outside their home in a dynamic manner.”²⁰

The agency’s website continues to explain that DOOH works in concert with traditional in-home media by optimizing consumer recognition of TV and press campaigns by being available to consumers throughout their day, from their home to the points of sale. “DOOH is the new communication solution for advertisers looking for a means of communication with a high level of proximity, impact and attraction. Thanks to the great flexibility of its utilization and content, digital advertising can be adapted in different environments. It enhances the recognition, reputation and allocation of the brand.”

Why is interactive and responsive content DOOH valuable?

Research shows that improving brand awareness and boosting sales are the two primary reasons for corporate spending on Digital out-of-home advertising. Making the contents interactive and responsive to the surrounding environment is likely to improve customer experience and, therefore, brand awareness by engaging the audience more meaningfully with the display contents.

²⁰ "Why DOOH? | Neo Advertising." Neo Advertising. Accessed February 17, 2015. <http://www.neoadvertising.com/ch/en/digital-out-of-home/pourquoi-le-doooh>.

Keith Kelsen, author of *Unleashing the Power of Digital Signage*, argues that DOOH advertising operates in three different realms: Point of Sale, Point of Transit and Point of Wait.²¹ Point of Sale is digital signage located in retail areas, anywhere close to a product or a service for sale. This type of network display triggers immediate sales. Point of Transit displays can be found where people are on the move. They primarily consist of digital billboards, signs and displays located along travel routes and in public transit hubs. Point of Wait network displays engage consumers during dwell time. These screens usually entertain people when they are in line at banks, post offices, gyms and airports.

Point of Sale networks that display content responsive to the environment can efficiently tap into user interest and thereby boost sales. Meanwhile, the end users can be receiving the product information they want. For instance, some supermarket Point of Sale displays offer entertaining cooking segments on seasonally appealing recipes.

Digital signage at the Point of Transit and Point of Wait is intended to improve brand awareness and user experience rather than immediately

²¹ Kelsen, Keith. *Unleashing the Power of Digital Signage: Content Strategies for the 5th Screen*. Amsterdam: Focal Press, 2010.

affecting sales. Creating interactive DOOH display content is ideal for boosting achievement of greater brand awareness and user experience in those realms.

Why Data Analytics?

Through data collection and analytics for optimally shifting contents to match the data outcomes, the creative agency could generate synchronously responsive display contents and at the same time, continue to receive valuable data for market research on consumer behaviour. Dwell time, weather, time of year and day, astronomical conditions and even some user demographics can be gathered at the DOOH display site, fed back, analyzed, and almost instantly used to shift the display's content, meeting users more precisely where they are at the moment, thereby becoming more relevant to them and making a deeper impression upon them.

Initial Route to Market

Direct marketing is the major marketing channel to promote our product and services. It is a channel-agnostic form of advertising which allows businesses and nonprofit organizations to communicate straight to the customer, with advertising techniques that can include cell phone text messaging, email, interactive consumer websites, online display ads,

database marketing, fliers, catalog distribution, promotional letters, targeted television commercials, response-generating newspaper/magazine advertisements, and outdoor advertising. Amongst its practitioners, this is often referred to as Direct Response. The business will directly market to the major DOOH companies in North America and demonstrate to them the unique advantages offered by SunDOOH Consulting's technology and services in creating optimally effective content. In addition, we will also market our services through out-of-home marketing associations in North America.

In addition, the business will use Google Adwords to target the indirect market. Google AdWords is an online advertising service that places advertising copy above, below, or beside the list of search results Google displays for a particular search query. AdWords offers pay-per-click (PPC) advertising for text, banner, and rich-media ads, and remarketing. Google AdWords makes it possible to target the users with special interests in certain products or solutions. The pay-per-click (PPC) fee scheme makes it affordable for small business to market products and services through Internet.

Current Market Position and Objectives

Competitors

SunDOOH's competitors are DOOH digital solution companies that are attempting to utilize sensors and open data programs from Internet to create interactive contents.

Amscreen

Amscreen, a UK-based provider of digital place-based advertising networks, is currently running a hyper-local digital out-of-home campaign for Ford dealerships across the UK using thermal sensors and geo-location to drive display content on their network. The thermal sensors monitor weather conditions and trigger differently themed Ford messaging. For example, consumers will see different advertisements under conditions of rain, sleet, ice, snow, fog or when the temperature falls below 5° Celsius. The campaign is running across the UK at Amscreen's 1,335 forecourt locations.²²

²² "Digital Signage Universe." 'Digital Signage Universe' March 5, 2014. Accessed February 17, 2015. http://digitalsignageuniverse.typepad.com/digital_signage_universe/dooh/page/2/#sthash.AdQFdYIT.dpuf.

Quividi

Quividi provides audience measurement for DOOH companies using a lightweight video analytics module to analyze, in real time, images from video sensors that record faces and silhouettes of passers-by. Quividi employs a cloud service to collect this data and consolidate it into aggregate, anonymous audience reports.²³

Taggalo²⁴

Taggalo is a London-based consulting firm that uses on-site sensors to gather data and generate visualization for the DOOH industry.

Garbergs, Stockholm, Sweden

Garbergs is the creative agency that developed a series of ads by showing a woman's hair blowing in the wind whenever a train arrived. They employed ultrasonic sensors to detect train arrivals.²⁵

²³<http://www.quividi.com/blog/index.php/2014/dooh-tv-belgium-selects-quividi-for-its-digital-signage-mall-network/>

²⁴ http://www.taggalo.co.uk/new/?page_id=715

²⁵ Griner, David. "Another Subway Ad Blows a Woman's Hair Around as Trains Arrive, but There's a Twist." AdWeek. October 6, 2014. Accessed February 17, 2015.

Barrier to Entry

Pattison Outdoor dominates over 45% of the OOH market in Canada. The company has already established its own digital control network over Canada. It would be well within its capacity to adopt the synchronous data analysis technologies and adapt them to its purposes without purchasing anything from a third party.

SWOT Analysis

Company Strength:

- Building a deeper level of interaction through environmental data analytics
- Adopting new technology and business model
- Preparing to expand the business to U.S. and China

Company Weakness:

- Lack of experience in the DOOH industry
- Lack of pre-secured clients

Market Opportunities:

- A huge global digital out-of-home market
- The price of sensors is dropping dramatically every year

<http://www.adweek.com/adfreak/another-subway-ad-blows-womans-hair-around-trains-arrive-theres-twist-160588>.

Market Threats:

- Small market in Canada
- Threat from “second wave theft” of the technology

Needs Analysis:

- Creating deeper interactions with audiences
- Value of market research on consumer behaviours through big data

Objectives

- Find our first client and provide successful consulting service in 2015
- Develop a strategic marketing alliance with Pattison Onestop Media Group
- Achieve sales of CAD \$20,000 in 2015
- Achieve a modest operating profit within one year
- Establish an effective production team
- Build a successful portfolio and reputation in the industry

Target Sectors

- Media
- Information Technology

- Advertising
- Business to business media (B2B)
- Digital marketing
- Interactive media

Pricing

Price for Consulting Service:

Each consultation will be billed at an estimated CAD \$7,500, depending on the project's specific requirements. Consultants will advise on creating responsive contents through using a variety of sensors and generate data visualization and analysis. The pricing will include on-site support for initial product installation and technical supports.

Estimated Price for Product:

CAD \$10,000/installation

Price for Maintenance Fee (Annual):

CAD \$500/installation

3-YEAR FINANCIAL MODEL OVERVIEW

Notes & Assumptions:

- All dollars henceforth in the business plan indicate Canadian dollars
- The business starts with \$50,000 bank loan.
- The annual interest rate for the bank loan is 5%.
- The business starts with \$10,000 cash or short-term investments.
- The business starts with equipment worth \$5,000.
- The business sells 5 products in the first year (\$10,000 for each).
- The business conducts 7 consulting service in the first year (\$7,500 for each).
- The business deliveries 5 annual maintenance service in the first year (\$500 for each).
- The growth of sales in the second year is 100% and the third year is 50%.

After 3 Years

The business could expand its product line in order to serve the industry in long run. Alternatively, it would be sold to other business, such as Pattison, after three years of operation.

3-YEAR FINANCIAL PLAN (YEAR 1)

SunDOOH Consulting Inc.

FORECASTED REVENUE

	Units sold annually	Average price per unit	Annual revenue per product
Product	5	10,000.00	50,000.00
Maintaining Service	5	500.00	2,500.00
Consulting Service	7	7,500.00	52,500.00

TOTAL OF FORECASTED REVENUE 105,000.00

COST OF GOODS SOLD

	Expected gross margin	Annual cost of goods sold
Product	35%	17,500.00
Maintaining Service	40%	1,000.00
Consulting Service	20%	10,500.00

TOATL COST OF GOODS SOLD 29,000.00

ANNUAL MAINTENANCE, REPAIR AND OVERHAUL

Factor (%) on capital equipment 5%

ASSET DEPRECIATION

Number of Years 3

TAX

Annual Tax Rate 30%

INFLATION

Annual Inflation Rate 2%

PRODUCT PRICE INCREASE

Annual Price Increase 7%

FUNDING

Loan Amount	50,000.00
Annual interest rate	5.00%
Term of loan (months)	36
Monthly rate	0.41%
Payment	1,496.05
Total Amount Payable	53,857.91

Figure 10: 3-Year Financial Plan (Year 1)

3-YEAR FINANCIAL PLAN (YEAR 2)

SunDOOH Consulting Inc.

FORECASTED REVENUE

Product	Units sold annually	Average price per unit	Annual revenue per product
Product	10	10,000.00	100,000.00
Maintaining Service	10	500.00	5,000.00
Consulting Service	14	7,500.00	105,000.00

TOTAL OF FORECASTED REVENUE 210,000.00

COST OF GOODS SOLD

Product	Expected gross margin	Annual cost of goods sold
Product	35%	35,000.00
Maintaining Service	40%	2,000.00
Consulting Service	20%	21,000.00

TOATL COST OF GOODS SOLD 58,000.00

ANNUAL MAINTENANCE, REPAIR AND OVERHAUL

Factor (%) on capital equipment	5%
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ASSET DEPRECIATION

Number of Years	3
-----------------	---

TAX

Annual Tax Rate	30%
-----------------	-----

INFLATION

Annual Inflation Rate	2%
-----------------------	----

PRODUCT PRICE INCREASE

Annual Price Increase	7%
-----------------------	----

FUNDING

Loan Amount	50,000.00
Annual interest rate	5.00%
Term of loan (months)	36
Monthly rate	0.41%
Payment	1,496.05
Total Amount Payable	53,857.91

Figure 11: 3-Year Financial Plan (Year 2)

3-YEAR FINANCIAL PLAN (YEAR 3)

SunDOOH Consulting Inc.			
FORECASTED REVENUE			
	Units sold annually	Average price per unit	Annual revenue per product
Product	15	10,000.00	150,000.00
Maintaining Service	15	500.00	7,500.00
Consulting Service	21	7,500.00	157,500.00
TOTAL OF FORECASTED REVENUE			315,000.00
COST OF GOODS SOLD			
	Expected gross margin	Annual cost of goods sold	
Product	35%	52,500.00	
Maintaining Service	40%	3,000.00	
Consulting Service	20%	31,500.00	
TOATL COST OF GOODS SOLD			87,000.00
ANNUAL MAINTENANCE, REPAIR AND OVERHAUL			
Factor (%) on capital equipment	5%		
ASSET DEPRECIATION			
Number of Years	3		
TAX			
Annual Tax Rate	30%		
INFLATION			
Annual Inflation Rate	2%		
PRODUCT PRICE INCREASE			
Annual Price Increase	7%		
FUNDING			
Loan Amount	50,000.00		
Annual interest rate	5.00%		
Term of loan (months)	36		
Monthly rate	0.41%		
Payment	1,496.05		
Total Amount Payable	53,857.91		

Figure 12: 3-Year Financial Plan (Year 3)

PROFIT AND LOSS PROJECTION

SunDOOH Consulting Inc.

PROFIT AND LOSS ASSUMPTION

	Year 1	Year 2	Year 3
Annual cumulative revenue increase	0.00%	100.00%	50.00%
Annual cumulative expense increase	0.00%	15.00%	35.00%

INCOME

	Year 1	Year 2	Year 3
Revenue			
Product	50,000.00	100,000.00	150,000.00
Maintaining Service	2,500.00	5,000.00	7,500.00
Consulting Service	52,500.00	105,000.00	157,500.00
	-	-	-
Total revenue	105,000.00	210,000.00	315,000.00

Cost of Sales

Product	17,500.00	20,125.00	27,168.75
Maintaining Service	1,000.00	1,150.00	1,552.50
Consulting Service	10,500.00	12,075.00	16,301.25
	-	-	-
Cost of goods sold	29,000.00	33,350.00	45,022.50

Gross Profit	76,000.00	176,650.00	269,977.50
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Non-Operation Income

Rental	-	-	-	-	-
Interest income	-	-	-	-	-
Loss (gain) on sale of assets	-	-	1,000.00	-	-
Other income (specify)	-	-	-	-	-
Toatal Non-Operation Income	-	-	1,000.00	-	-

TOTAL INCOME	76,000.00	176,650.00	270,977.50	-	-
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EXPENSES

Operating expenses

Sales and marketing	15,000.00	17,250.00	23,287.50
Depreciation	1,666.67	-	-
Insurance	7,500.00	8,625.00	11,643.75

Figure 13: Profit and Lost Projection

BALANCE SHEET PROJECTION

SunDOOH Consulting Inc.

ASSETS

Current Assets	Initial balance	Year 1	Year 2	Year 3
Cash and short-term investments	10,000.00	109,590.03	123,379.39	262,177.69
Accounts receivable	-	-	-	-
Total inventory	-	-	-	-
Prepaid expenses	300.00	300.00	300.00	300.00
Deferred income tax	-	-	-	-
Other current assets	300.00	300.00	300.00	300.00
Total current assets	10,600.00	110,190.03	123,979.39	262,777.69

Property and Equipment	Initial balance	Year 1	Year 2	Year 3
Buildings	-	-	-	-
Land	-	-	-	-
Capital improvements	-	-	-	-
Machinery and equipment	5,000.00	5,000.00	5,000.00	5,000.00
Less Accumulated depreciation expense	-	1,666.67	1,666.67	1,666.67
Total Property and Equipment	5,000.00	3,333.33	3,333.33	3,333.33

Other Assets	Initial balance	Year 1	Year 2	Year 3
Goodwill	-	-	-	-
Deferred income tax	-	-	-	-
Long-term investments	-	-	-	-
Deposits	-	-	-	-
Other long-term assets	-	-	-	-
Total Other Assets	-	-	-	-

TOTAL ASSETS	15,600.00	113,523.36	127,312.73	266,111.02
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LIABILITIES

Current Liabilities	Initial balance	Year 1	Year 2	Year 3
Accounts payable	1,500.00	1,500.00	1,500.00	1,500.00
Accrued expenses	-	-	-	-
Notes payable/short-term debt	-	-	-	-
Capital leases	-	-	-	-
Other current liabilities	100.00	100.00	100.00	100.00
Total Current Liabilities	1,600.00	1,600.00	1,600.00	1,600.00

Debt	Initial balance	Year 1	Year 2	Year 3

Figure 14: Balance Sheet Projection

BUSINESS STRUCTURE AND OWNERSHIP

SunDOOH Consulting will likely be registered as a sole proprietorship in Ontario, since it currently includes only one equity holder. The advantage of starting as a sole proprietorship includes low start-up costs and greatest freedom from regulation. The total cost of registering a sole proprietorship business in Ontario is \$164.95, including the cost of a domain name. The processing time to register a company is five to six business days.

The disadvantages of registering as a sole proprietorship include unlimited personal risk: All assets of the owner are exposed to business creditors. Also, raising capital may be more difficult than with various types of incorporation. In addition, the owner must report all income on her personal tax return, and there is very limited tax planning potential.

CORPORATE SOCIAL RESPONSIBILITY

Corporate Social Responsibility (CSR) is defined as the voluntary activities undertaken by a company to operate in an economically, socially and environmentally sustainable manner. SunDOOH Consulting will respect all the participants in the business and provide fair payments and benefits to partners, employees and contracted workers. The business will maintain a high standard of privacy protection regarding clients' and end-users'

confidential information. We will serve the industry and users with advanced interactive solutions, while standing against non-anonymous digital surveillance and for end users' right to privacy. Personal data is any information relating to an individual, whether it relates to his or her private, professional or public life. It can be anything from a name, a photo, an email address, bank details, posts on social networking websites, medical information, or a computer's IP address²⁶. With the consideration of the ethics of outdoor data capture, only data that would not reveal individual's identity would be collected, which includes, time, dates, weather, the number of passersby, dwell time and individual's body movements. Data that would not be captured includes facial details of all passersby, bank details, smart devices' IP addresses, emails and social networking websites. Meanwhile, it is crucial to inform the audience when there will be potential risks to reveal people's identity and privacy during the data collection process, for example if the billboard utilizes cameras to collect data. Valid consent must be explicit for data collected, and purposes data used. Consent for children must be given by child's parent or custodian, and should be verifiable. Passengers should have the right to request erasure of personal data related to him on any one of a number of grounds any time. In addition, the content of digital signage should be strictly regulated by the

²⁶ European Commission's press release announcing the proposed comprehensive reform of data protection rules. 25 January 2012. Retrieved 3 January 2013.

local government, since they are exposed to the public and could potentially promote unhealthy lifestyles to people that could increase risk for obesity, hypertension and other diseases. For instance, it is controversial to market Coca Cola drinks to teens on hot days, even though the Coca-Cola spends a large amount of money on marketing and advertising. Many governments have strictly regulated the advertising on tobacco and cigarettes. These regulations would also be applied to the advertising contents in this scenario. Furthermore, out-of-home advertising industry is regulated by the city governments. The laws and regulations will be various depending on the city governments. However, new technology has been developed rapidly. There is still potentially a gap between the new industry and the government regulation. Meanwhile, city governments also generate profits through renting public spaces to the industry. Therefore, the digital out-of-home industry should work together with city governments to ensure that digital signage improves the visual culture of a city.

In addition, SunDOOH will hold itself accountable to all components of CSR, as cited here²⁷:

1 Management Structure

²⁷ The Institute of Chartered Accountants of Scotland. "Corporate Social Responsibility Template Report." Icas.org. 2011. Accessed March 23, 2015. icas.org.uk/aa/2011/csrtemplate.pdf.

1.1 Responsibility for CSR matters in the organization

1.2 It may also be relevant to mention the ways in which CSR issues represent areas of risk for the organization. Consequently it may be appropriate to identify the Board Committees (e.g. Risk; Health, Safety and Environmental (HS&E); Ethics) to which reports are presented on CSR matters, and the frequency of such reporting. It may also be relevant to highlight the link between CSR performance and the financial performance of the organization.

2.1 Objectives – may include reductions in the Accident Incidence Rate, the frequency of RIDDORs (reportable incidents under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations), the frequency of “near misses”, or the frequency of prosecutions by the Health & Safety Executive. May also include such matters as the achievement of certification under ISO 18001 (Occupational Health and Safety Management Systems).

2.2 Performance against objectives – KPIs and the progress in those indicators over the previous 3 or 5 years. KPIs could include those issues mentioned at 2.1 and others such as:

- fatalities
- lost time incidents
- restricted work days incidents
- medical treatment cases

- occupational illness cases
- first aid cases
- near misses/potential incidents

2.3 Incident investigation procedures.

2.4 Health and Safety training provided to workforce.

3 Environmental Performance and Sustainability

3.1 Strategy – A short description of the organization’s strategy and approach to the environment and sustainability.

3.2 Objectives – An outline of the organization’s aims and targets, with possible reference to KPIs (see below).

3.3 Statement of the organization’s carbon footprint, measured in tones of carbon dioxide equivalent, using a globally accepted carbon foot printing methodology. Comment on emissions of other greenhouse gases may also be relevant.

3.4 Statement of the organization’s energy usage, measured in joules or carbon dioxide (CO₂) equivalent.

4 Business Continuity/ Disaster Recovery

4.1 Management systems and procedures in place to handle BC/DR, including responsibility structure.

4.2 The regime established to test these plans, and possible references to

third party audit/testing arrangements.

4.3 Reference to BS25999 (Business Continuity) certification.

5 People/ Human Resources

5.1 Objectives – e.g. recruitment strategy, staff retention, workforce diversity, personal development and training.

5.2 Training and its nature, including possible reference to succession planning and leadership training, graduate development plans, apprenticeship programs, encouragement for staff to seek further qualifications (e.g. National Vocational Qualification (NVQ), Master of Business Administration (MBA), National Examination Board in Occupational Safety and Health (NEBOSH), Institute of Environmental Management and Assessment (IEMA), etc).

5.3 Salary policy (may cross-refer to Board Remuneration Report).

5.4 The ethos of the organization, including reference to honesty, openness, integrity, financial propriety and the organization's approach to gifts to staff, bribery and corruption.

5.5 Employee communications – brief description of methods used and their frequency.

6 Community Relations

6.1 The organization's objectives and approach to charitable giving and the policy on encouraging staff involvement in local charities, community projects

and voluntary organizations.

6.2 The level of charitable donations.

6.3 The policy on and level of political donations.

SUMMARY AND NEXT STEPS

The DOOH market has not yet been explored deeply by entrepreneurs with market vision. SunDOOH Consulting will specialize in providing interactive consulting services and products to companies within the DOOH industry, including adopting smart sensors for use in interactive digital signage. The development of a variety of low cost sensors brings in new possibilities for the industry. The major competitive advantage of SunDOOH Consulting will be in its early bird appearance in its DOOH industry markets. The price of sensors will drop dramatically within a few years; a new generation of sensors will be developed, bringing even more possible interactive solutions. Over the same time, there will likely be new competitors seeking to grab shares of the market and potential profits. Therefore, continual innovation will be key to making this business profitable and sustainable. SunDOOH will dedicate its resources to optimizing services to clients and developing new, more responsive and/or cost effective products and solutions to its clients.

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APPENDIX A: USER TEST DETAILS

DOOH User Testing Feedback

Name	Gender	Age	Correlation	Q2	Q3	Q4	Q5	Q6 - appealing	Q6 - Fun to Watch	Q6 - memorable	Q7 - User Interface Understanding	Q7 - Improvement	Q8 - contents	Q8 - interaction method	Q8 - exterior design
	Female	22	A	30+	Yes	Ambiguous	Yes	Null	Null	Yes	Null	Null	1. Customizable, let the agency have some flexibility. 2. color and emotion.	Null	Null
	Male	26	A	10	Null	No	Yes	Yes	Yes	Yes	Yes	Null	Null	Video feedback could be more sensitive.	Null
	Male	23	B	10	No	No	No	No	No	No	Yes	Simplified the layout and focus on the subject that is relevant.	Null	Using motion sensor to add more human interaction.	Multiple Screen installation in events.
	Female	23	A	4-5	Yes	Ambiguous	Yes	Null	Null	Null	Yes	Aided with a video pitch.	More Ads.	Null	Large screen
	Male	22	A	About 10	Yes	Ambiguous	Yes	Yes	Yes	Yes	Null	Simplified the weather part and make it animated.	Relayout and reposition the UI and make it vertical.	Null	Null
	Female	25	A	About 10	Yes	No	Yes	Null	Null	Null	Yes	Have more fun interaction.	Null	Add more human interactions inside. And make the ads animated with human's interaction.	Null
	Female	Null	Null	0	Null	Null	Yes	Null	Null	Null	Null	The infographic should be redesigned. The split screen isn't really working.	1. Clear your style of infographic make it very intuitive and simple. 2. Link different billboards that has different climates. A live feed of another city.	Null	Null
	Male	40+	C	0	Null	No	Yes	No	Null	Null	Yes	Too prototype like.	Null	Null	Electronic part should be encased.
	Female	Null	Null	4-5	Null	No	Yes	Yes	Yes	Yes	No	Different models could be divided by users themselves.	Content should be customized	Add search function on the interface.	Null
	Female	42	A	60-90	Null	No	Ambiguous	Yes	No	No	Null	A simple interface with clean color scale and pastel tones. For weather could use charts.	Null	Notification sound like knocking or a short beep or a phone ringing to get people attention every 2 minutes.	Null
	Male	30+	A	over 90	Null	No	Yes	Yes	Yes	No	No	Create a brand, a brand name and have it show at the screen and a video pitch to explain.	Create a brand, a brand name and have it show at the screen and a video pitch to explain.	Null	Null
	Male	25	B	Several times	Null	Ambiguous	Yes	Null	Null	Null	No	Show the connection between the ads and sensors	A clear notion which can dedicate how this interactive installation can interact with audience and environment	Null	Null
	Male	28	B	Several times	Null	No	Yes	Null	Null	Null	No	Be simple	Null	Null	Null
	Female	24	A	Several times	Null	No	Yes	Yes	Yes	Yes	Null	The interface should be more smart and attractive enough for provoke people's desire of purchasing.	Real-time	Null	Null

In female group, the effectiveness analysis of DOOH

Name	Gender	Age	Frequency in 3 Month	Trigger Direct Purchasing	Occupation
	Female	22	30+	Ambiguous	Branding/Media/Advertising/Publication
	Female	23	4~5	Ambiguous	Branding/Media/Advertising/Publication
	Female	25	About 10	No	Branding/Media/Advertising/Publication
	Female	Null	4~5	No	Null
	Female	42	(20~30) in one month	No	Product Design/Media Production
	Female	24	Several times	No	Branding/Media/Advertising/Publication

80% of the female participants aged from 20~30 with one invalid participants. 30% of the female participants claim high frequency in seeing DOOH in 3 month with one ambiguous data which does not inferior the final result.

The overall Trigger Direct Purchasing in female group proves that the DOOH in marketing is not successful. This results may fluctuated for 80% of the participants comes with a background in Branding/Advertising. However, in participants whose claim is Ambiguous, they admitted that clever advertising may lead to a purchase decision.

According to the analysis, age group over 40(16%) would be more exposed to DOOH.

Two participants(33%) who are under DOOH exposure more frequently may be a result of their location and time spending and some other personal reasons. One of them claim to be ambiguous in purchasing decision question. These two participants should be followed up in further survey.

In male group, the effectiveness analysis of DOOH

Name	Gender	Age	Frequency in 3 Month	Trigger Direct Purchasing	Occupation
	Male	26	10	No	Branding/Media/Advertising/Publication
	Male	23	10	No	Game
	Male	22	About 10	Ambiguous	Branding/Media/Advertising/Publication
	Male	40+	0	No	Music/Software Developing
	Male	30+	over 90	No	Design
	Male	25	Several times	Ambiguous	Branding/Media/Advertising/Publication
	Male	28	Several times	No	Branding/Media/Advertising/Publication

70%(5 of 7) of the participants are under 30s. 15% (1 of 7) of the participants fits in 30~40. 15% (1 of 7) fits in over 40s. 70%(5 of 7) of the participants are from Media and Branding area. 30% are from media related area.

45% of the frequency data are invalid. So 25% of the remains shows high frequency (over 90), 50% claims about 10 times in the last 3 months. 25% claim 0 in frequency. This may relate to his Occupation.

In Trigger Direct Purchasing analysis, 30% claim to be ambiguous while others claim to be a No in direct purchasing, 50% of which claims that if the product is really what he needs, the direct purchasing would be established.

So in general, in male group, Anurga, Tarik and Chen ji would be the participants that this study needs to be followed on in next round of user testing.

Invitation / Consent Form Template

Date: June 21, 2014
Project Title: Responsive Environmental Public Installation through Data Analytics

Principal Investigator:
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OCAD University
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Tom Barker
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INVITATION

You are invited to participate in a study that involves research. The purpose of this study is [the thesis aims to design an interactive installation which embraces data analytics to create intimacy and empathy through reuniting the public and virtual spaces. This project targets to build a deeper level of interaction with audience in the public space through using data analytics and interactive technologies.

WHAT'S INVOLVED

As a participant, you will be asked to play a prototype of interactive installation and comment on the level of interaction and provide reflections the prototype Participation will take approximately 20-30 minutes of your time.

POTENTIAL BENEFITS AND RISKS

Possible benefits of participation include [the opportunity to test and play in a unique new interactive installation and be part of the process of creating a new interactive installation] There also may be risks associated with participation. There are no known or anticipated risks associated with participation in this study.

CONFIDENTIALITY

Data collected during this study will be stored as password protected spreadsheets in the researcher's personal computer and in a backup disk. Data will be kept for a year after which time deleted from all computer records. Access to this data will be restricted to the use of the researcher exclusively.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time, or to request withdrawal of your data (prior to data analysis Feb. 1st, 2015), and you may do so without any penalty or loss of benefits to which you are entitled.

PUBLICATION OF RESULTS

Results of this study may be published in [select from among: reports, professional and scholarly journals, students theses, and/or presentations to conferences and colloquia]. In any publication, data will be presented in aggregate forms. Quotations from interviews or surveys will not be attributed to you without your permission.

Feedback about this study will be available on May 1st by contacting the researcher Xiangyu(Anna) Sun via email (anna.sun8951@gmail.com).

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact the Principal Investigator Xiangyu Sun or the Faculty Supervisor (where applicable) Tom Barker using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at OCAD University [insert file #]. If you have any comments or concerns, please contact the Research Ethics Office through jburns@ocadu.ca.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: _____

Signature: _____ Date: _____

Thank you for your assistance in this project. Please keep a copy of this form for your records.

BELOW ARE SUGGESTIONS ONLY: PLEASE REMOVE TEXT BELOW FROM YOUR FINAL VERSION.

Statements that may be required for specific studies

- Details of any plans to re-contact participants for follow-up sessions or subsequent related studies. Example: *'With your agreement, we would like to contact you again in X weeks to ask you another set of similar questions. You may decide at that time whether or not you wish to participate in that part of the study'*.
- Details of audio or tape recording
- Consent for participants to allow their data to be used in secondary data studies (provide details about the purpose of further studies).
- The names of companies or agencies that are sponsoring the research.
- An indication of whether the study is a single-site project or a multi-centred project.
- A description of any apparent, actual, or potential conflict of interest on the part of the researcher, institution, or sponsor.

- In rare cases, it will not be possible to ensure confidentiality because of mandatory reporting laws (e.g. suspected child abuse) or the possibility of third party access to data (e.g., court subpoena of records). When this is the case, the prospective research participant should be aware of any potential limitations.

Sample confidentiality statements

Confidential survey/questionnaire

All information you provide is considered confidential; your name will not be included or, in any other way, associated with the data collected in the study. Furthermore, because our interest is in the average responses of the entire group of participants, you will not be identified individually in any way in written reports of this research.

Focus Group

All information you provide will be considered confidential and grouped with responses from other participants. Given the format of this session, we ask you to respect your fellow participants by keeping all information that identifies or could potentially identify a participant and/or his/her comments confidential.

Interview with Member Check

The information you provide will be kept confidential, i.e. your name will not appear in any thesis or report resulting from this study. However, with your permission attributed quotations may be used.

Options, depending on study:

Shortly after the interview has been completed, I will endeavour to send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish.

OR

Yes, I would like to hear more about the study. You may reach me by (provide contact information):

Email:

Post:

Phone:

(Advice to the researcher: specify manner of reaching the participant – email, post, last phone/address)

Attributing quotes

In the case that you would like to attribute statements/quotations, consider placing a check box for participants so that they can indicate agreement. Be sure to discuss with them what it involves in terms of potential risk and benefit.

Yes, I wish to be attributed for my contribution to this research study. You may use my name alongside statements and/or quotations that you have collected from me.