

BAUHAUS UNIVERSITY WEIMAR

MASTER THESIS

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# Comparison of Interactive and Non-Interactive advertisement in public display

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## Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Introduction . . . . .	2
1.2	Advertisement performance . . . . .	3
1.3	Research Questions . . . . .	3
1.4	Procedures . . . . .	4
1.5	Methodology . . . . .	4
1.5.1	Prototypes . . . . .	5
1.5.2	Evaluations . . . . .	5
1.6	Research context . . . . .	5
1.7	Thesis outline . . . . .	6
<b>2</b>	<b>Background</b>	<b>8</b>
2.1	Advertising . . . . .	9
2.1.1	History of advertisement . . . . .	9
2.1.2	Traditional Advertising . . . . .	9
2.1.3	Online advertising . . . . .	9
2.1.4	Pervasive Advertising . . . . .	10
2.1.5	Advertising program . . . . .	10
2.1.6	Advertisement performance . . . . .	11
2.2	Public displays . . . . .	13
2.2.1	History of public display research . . . . .	13
2.2.2	Auto-active displays . . . . .	14
2.2.3	Interactive displays . . . . .	15
2.2.4	Engagement with displays . . . . .	15
2.2.5	Metaphors . . . . .	17
2.2.6	Interaction models . . . . .	18

2.2.7 Technologies . . . . .	20
<b>3 Attraction attention</b>	<b>23</b>
3.1 Introduction . . . . .	24
3.2 Attention . . . . .	24
3.3 Approaches . . . . .	25
3.3.1 Prototypes . . . . .	25
3.3.2 Hypothesis . . . . .	26
3.4 Study design . . . . .	26
3.4.1 Participants . . . . .	27
3.4.2 Location . . . . .	27
3.4.3 Procedures . . . . .	27
3.4.4 Data gathering . . . . .	27
3.5 Findings . . . . .	28
3.5.1 Observation findings . . . . .	28
3.5.2 Interview Findings . . . . .	29
3.6 Conclusion . . . . .	32
<b>Appendices</b>	<b>40</b>
<b>A Attracting attention</b>	<b>41</b>
A.1 Glance count sheet . . . . .	41
A.2 Interview Questionnaire . . . . .	42
A.3 Interview consent form . . . . .	43
A.4 Interview Color codes . . . . .	44
<b>B Focus Group</b>	<b>45</b>
B.1 First sketch . . . . .	46
B.2 Second sketch . . . . .	47
B.3 Third sketch . . . . .	48
<b>C Low Fidelity</b>	<b>49</b>
C.1 Coded Interviews . . . . .	49
<b>D Heigh Fidelity</b>	<b>50</b>
D.1 Body Interview codes . . . . .	51
D.2 Mobile Interview codes . . . . .	52
D.3 Pariticipant performance . . . . .	53
D.3.1 Body . . . . .	53
D.3.2 Mobile . . . . .	53

<b>E Field Study</b>	<b>54</b>
E.1 Interview Questionnaire . . . . .	55
E.2 Non-Interactive glance count . . . . .	56
E.3 Body Interactive glance count . . . . .	57
E.4 Body Interactive glance count . . . . .	58
E.5 Non-Interactive interview code . . . . .	59
E.6 Body Interactive interview code . . . . .	60
E.7 Mobile Interactive interview code . . . . .	61
E.8 Non-Interactive observation notes . . . . .	62
E.9 Body Interactive observation notes . . . . .	63
E.10 Mobile Interactive observation notes . . . . .	65
<b>F Enhanced body interactive Field Study</b>	<b>66</b>
F.1 Enhanced Interactive advertisement Glance count . . . . .	66
F.2 Enhanced Interactive observation notes . . . . .	67

## List of Figures

2.1 Advertising Program, [37] . . . . .	11
2.2 Conversion Funnel . . . . .	12
2.3 Three zones of interaction, [76] . . . . .	18
2.4 Four interaction phases, [76] . . . . .	19
2.5 A diagram of public interaction flow accross thresholds, [15] . . . . .	19
2.6 The Audience Funnel, [2] . . . . .	20
3.1 Attraction attention methods . . . . .	26
3.2 Traditional Advertising display . . . . .	26
3.3 University Mensa . . . . .	27
3.4 Observation method . . . . .	28
A.1 Glance count sheet . . . . .	41
A.3 Interview consent form . . . . .	43
A.4 Good Advertisement . . . . .	44
A.5 Bad Advertisement . . . . .	44
B.1 First sketch . . . . .	46
B.2 Second sketch . . . . .	47
B.3 Third sketch . . . . .	48
C.1 Interview codes . . . . .	49
D.1 Body Interview codes . . . . .	51
D.2 Mobile Interview codes . . . . .	52
D.3 Pariticipant's body performance . . . . .	53
D.4 Pariticipant's mobile performance . . . . .	53

E.1	Interview questions for all conditions . . . . .	55
E.2	Non-interactive glance counts . . . . .	56
E.3	Body interactive glance counts . . . . .	57
E.4	Mobile interactive glance counts . . . . .	58
E.5	Non-Interactive interview code . . . . .	59
E.6	Body Interactive interview code . . . . .	60
E.7	Mobile Interactive interview code . . . . .	61
E.8	Non-Interactive observation notes . . . . .	62
E.9	Body Interactive observation notes (1) . . . . .	63
E.10	Body Interactive observation notes (2) . . . . .	64
E.11	Mobile Interactive observation notes . . . . .	65
F.1	Enhanced Interactive advertisement Glance count . . . . .	66
F.2	Enhanced Interactive observation notes . . . . .	67

**List of Tables**

1.1	Thesis Outline . . . . .	6
3.1	Cross tabulation of deployment and attention level . . . . .	28
3.2	Cross tabulation of Following and traditional attention level . . . . .	29
3.3	Cross tabulation of Firework and traditional attention level . . . . .	29
3.4	Cross tabulation of Silhouette and traditional attention level . . . . .	29
A.2	Questions . . . . .	42

# 1

## **Introduction**

## 1.1 Introduction

Advertisement is the mean of conveying message(s) to people about something from which both producers and consumers get benefit. P. Kotler [85] defines advertisement as “*any paid form of non-personal presentation and promotion of ideas, goods, or services by an identified sponsor. Advertisers include not only business firms but also charitable, nonprofit, and government agencies*”. Technology is dramatically changing our lives and it is integrating in our environment and obviously it is affecting the advertisement too. With the use of media, advertisements are published in TV, newspapers, radio, magazines, banners, mobile phones, public displays and more. Currently advertisements are found in the form of, (1) Non-Interactive advertisement and (2) Interactive Advertisement.

Non-interactive advertisement is the traditional advertisement that “the presentation of content is linear and the consumer is passively exposed to product information” [42]. User has no control over the flow of the advertisement. It is delivered using media like TV, radio, public displays, banners and many other various mediums. Above all, still most of these advertisements are boring, not clear for a lot of viewers. And people tend to ignore advertisements [49, 40]

Where on the other hand, with the use of innovative technologies, advertisers can make interactive advertisement. These interactive advertisements can be more attractive and interesting and open new ways and techniques to boost advertisement effectiveness [97]. Interactive advertisement is a type of advertisement that is done by using various interactive media like Internet, mobile phones and public displays. It allows users to actively traverse the advertisement content and depends on where the user want to go from one step to another [42]. Advertisers reserve appropriate website sections for their interactive advertisements. The use of interactive public displays are increasing to provide passers-by opportunity to interact with advertisement contents, for example using smartphone to control interactive elements. Or by using body-sensing technologies, like Kinect<sup>1</sup> cameras, which could be used to allow passers-by to be engaged without the use of any other device. These technologies give us opportunity to explore more possibilities of attraction methods, novel interactions and engagement techniques to provide the users with better experience and increase their interest.

There is a need to investigate that how much interactive advertisement in public displays are attractive, engaging and can change user behaviors compared to non-interactive advertisement. If they were significantly different, what kind of models and interactive design space would be suitable for future advertisements. Furthermore, this thesis explores and investigates public display advertisements in general. What makes a suitable advertisement for audience. What are the common attraction attention methods. Is there a difference in body interactive advertisement and mobile interactive advertisement and what kind of environmental setup is required.

In order to be able to conduct the advertisement comparison, there was a need to create realistic advertisement and have realistic target groups and environment. Therefor, first a small study was done on attracting attention methods in University Mensa<sup>2</sup>. The advertisement content was made for *Bauhaus-Walk*<sup>3</sup>. With the help of Bauhaus-Walk members *Weimar Tourist Information Center*<sup>4</sup> was contacted to install the advertisement display and

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<sup>1</sup>Microsoft Kinect: <https://developer.microsoft.com/de-de/windows/kinect>, Last accessed: 1/05/2016 at 13:21:00

<sup>2</sup>Bauhaus University Mensa: <http://www.stw-thueringen.de/english/dining-halls/facilities/weimar/mensa-am-park.html>, last accessed 25 may 2016

<sup>3</sup>Bauhaus Walk: <https://www.uni-weimar.de/en/university/profile/bauhausatelier/bauhaus-walk/>, last accessed 25th May 2016

<sup>4</sup>Weimar Tourist Information Center: <http://www.weimar.de/homepage/>, last accessed 10 April 2016

evaluate our applications in wild.

## 1.2 Advertisement performance

When a company develops an advertisement and campaigns it for long time in different locations. The company mainly expects to have a higher *conversion rate*, which is “*The percentage of visitors who take a desired action.*”[58]. There are different forms of action goals, like it could be buying the product, joining an event, registering for a website, paying a charity or even could be participation in a rally or protest. So it really depends on what is the main goal behind a particular advertisement, and the *conversion rate* is measured by the number of people who performed the action divided by total number of visitors. Occasionally *conversion rate* is measured in Internet advertising with various metrics like, CPM, CPC, CPA and more, see page 11. To understand the motive behind the conversion like what made them converted is an important question to ask. If we tackle those questions then we can create effective and efficient advertisements. Those main reasons are the level of attention, motivations, involvement and emotions of people with the advertising product [84].

*Attention:* “*Attention is the process that, at a given moment, enhances some information and inhibits other information. The enhancement enables us to select some information for further processing, and the inhibition enables us to set some information aside.*”[8]. Higher attention would increase the high recall of advertisement too [97], and it is the first phase that can make the user to be involved.

*Motivation:* To be motivated means *to be moved to do something*[55]. The motivation is an important thing after a person has been attracted toward display. The motivation can be achieved by many factors described in this paper [51]. (1) Making passers-by be curious about the screen. (2) Challenging passers-by by a game or bringing some sort of fantasy in application. In the design of body and mobile interaction models, the above factors were taken in considerations.

*Involvement:* Involvement describes the relationship of audience to a product and the strength can define effectiveness of the advertisement. Engagement is a form of involvement with the product. Technologies are there that can measure involvement like the attention level or duration of interaction with a product.

*Emotion:* “*Emotions is an affective state of consciousness in which joy, sorrow, fear, hate, or the like, is experienced, as distinguished from cognitive and volitional states of consciousness.*”[34]. These emotions always can influence users to change their attitude and how they think about a product or service. Tracking user emotions on advertisements could be adjusted in real time.

## 1.3 Research Questions

The *Conversion rate* for Bauhaus-walk advertisement would be that, how many people participated in the walk after the advertisement campaign. But in this thesis, I do not measure the *Conversion rate*, because it is possible that people maybe converted from other unknown reasons like a friend might tell or an existing advertising campaign had influence on people. To measure *Conversion rate* precisely the only solution is to take small interviews of each individual that joint the walk. This is a time consuming process and should be continued for long time to track all the people who were exactly affected by one of advertisement campaign.

The advertisement performance like, attention, motivation, engagement, and emotions can influence the *conversion-rate*. Therefor it would be more appropriate to compares these important aspects between interactive and non-interactive advertisement, rather than comparing the *conversion-rate* itself. The below lists the main research questions that need to be find out for interactive and non-interactive advertisement.

- Which method is better to attract passers-by's attention?
- How is the attention level in interactive (body and mobile) and non-interactive advertisement?
- How many passers-by are engaged in interactive (body and mobile) and non-interactive advertisement?
- What are passers-by behavior toward interactive (body and mobile) and non-interactive advertisement?

## 1.4 Procedures

The main purpose of the thesis is the comparison of Non-interactive and Interactive advertisement in the domain of attracting attention, engagement and passers-by behaviors. But it would have not been compared unless the well functional and meaningful advertisement applications were not developed and evaluated.

Therefore, first, this thesis researches on advertisement in general to find out what are the people interests and expectations from public display. And how could the existing advertisement be changed in a way that people would like and pay attention.

Second, it investigates on attraction attention phase for public display advertisement. This helps to find out which of suitable methods attract passers-by attention toward the screen.

Third, it conducts user studies and focus groups to find out what make suitable advertisements that fits *Bauhaus-Walk* theme. Two advertisements are interactive and one is non-interactive advertisement. Two of interactive advertisements consist of body interaction and mobile interaction.

Fourth, it evaluates the low-fidelity and high fidelity of the interactive advertisement applications (mobile and body). It explores that which of these interactive modalities perform better and how the participants give feedback about their usage in public space.

Finally, it conducts a comparative study on non-interactive advertisement with interactive advertisement (body and phone), which was installed in tourist Information center. The comparison was on advertisement performance and passers-by behaviors.

And based on the result and findings, it proposes new enhanced interactive advertisement technique. And compares it with the previous advertisements techniques.

## 1.5 Methodology

Evaluations of public displays are in fact very complicated process and researchers use different methodologies to answer their research questions. This thesis performed empirical research and used a user-centered design approach in general. The research started by doing

a requirement analysis of public display advertisements by conducting interviews and indirect observations in University Mensa. Another requirement analysis as a focus group was conducted on deciding an appropriate advertisements (non-interactive, body interactive and mobile interactive) for *Bauhaus-Walk*. The paper prototypes of advertisements were evaluated by conducting a formative study, which helped the design process and revealed early usability issues. When the actual advertisement applications were developed then a summative and a comparative studies were carried to see how well the design meets the usability requirements for each prototype. The final versions of advertisements were deployed in public context to perform field studies. The field studies involved direct and indirect observations with a set of interviews of passers-by. The field studies assisted to compare the advertisement's performance and passers-by behaviors. And finally another short field study was conducted on an enhanced version of advertisement.

### 1.5.1 Prototypes

In this thesis advertisement prototypes were created in each stage like, low-fidelity prototype, high fidelity prototype and the enhanced version of high fidelity prototype. Each of the prototypes had their different versions and the final versions were selected for the evaluation. Dependent on the phase and purpose of prototype they were tested in lab and also on field. Excessive efforts had been done to assure the similarities of low-fi and high-fi prototypes. And at the same time these prototypes should be robust and comply with technologies.

### 1.5.2 Evaluations

Before even starting evaluations, many questions arise like where to deploy the evaluations, what hardware shortcoming I have, are there other moderators to help me and so on. During the thesis work, different stages of evaluations have been completed like there were some evaluations that required only indoor in a controlled environment and some others required outdoor to get real data from public. The Low-fi and High-fi prototypes were evaluated in lab to do usability testing and do performance measuring, and the actual comparison of the advertisements (interactive and non-interactive) were done on field.

The lab evaluations were fairly easily managed. But for the onsite field evaluations I had to deal with the many responsible personals to fix a date and location. During the evaluation process in public, privacy issue was an important factor that I had to be clear about therefor I avoided taking pictures or video recordings unless if there were their permission. Kinect color silhouette recordings were used to hide identity of people.

Different methods of data gathering were used. They were interviewing people, taking onsite notes and performing observations of the passers-by behaviors, capturing system logs and recording Kinect depth images and taking some pictures.

## 1.6 Research context

The research was carried out under Human Computer Interaction department in Bauhaus University Weimar over the course of one and half semester period. The advertisement prototype

was officially made for *Bauhaus-Walk*<sup>5</sup> program and the main location that the comparison happened was in *Weimar Tourist information center*<sup>6</sup>.

## 1.7 Thesis outline

The thesis document is divided in to four main sections to make the thesis more readable and understandable. See bellow table.

TABLE 1.1: Thesis Outline

Sections	Chapters
Introduction	#1: Introduction
	#2: Background
Pre Advertisement Comparison	#3: Attention Attraction
	#4: Advertisement Decision
	#5: Advertisement Low-Fi evaluation
	#6: Advertisement Development
	#7: Advertisement High-Fi Evaluation
	#8: Comparison of Interactive and Non-Interactive Advertisement
	#9: Design and evaluation of ExtendedInteractive Advertisement
Conclusion And Appendices	#10: Conclusion
	References
	Appendices

- **Chapter 2:** This chapter discusses in-depth on various related issues like Advertisement, how it began, why is it influential, what is pervasive advertising, what are the common metaphors, in the second part of this chapter, it discusses on Public displays, the history of it, what are common technologies, what are they mostly used for, how engaging, attention and motivation methods are being used, what are the interaction techniques and how these displays could be evaluated.
- **Chapter 3:** This chapter focuses on advertisement to figure out what public really expect from advertisement in public displays and qualitatively summarizes good and bad advertisement, then this chapter discusses on various methods of attention level in public displays and proposes three different methods and evaluates them to chose the best one, the decision of this method will be used in further studies.
- **Chapter 4:** This chapter goes through the process that how and why the advertisement for Bauhaus-Walk was selected.
- **Chapter 5:** This chapter is the paper prototype evaluation, this chapter discusses on how the paper prototype was created for interactive advertisement public display and what were the results and findings from the participants.
- **Chapter 6:** This chapter explains all the functionality and requirements of the applications, what technologies and hardware were being used and how to get the system running.

<sup>5</sup><https://www.uni-weimar.de/en/university/profile/bauhausatelier/bauhaus-walk/>, last accessed 4 jun 2016

<sup>6</sup><http://www.weimar-touristinformation.de/?gclid=CKylhf7Xxc0CFSSz0wodqh0NUg>, last accessed 5 jun 2016

- **chapter 7:** This chapter conducts an advertisement high-fi evaluation and compares body interaction with mobile interaction techniques.
- **chapter 8:** This chapter makes the main goal of the thesis which is the comparison of non-interactive and interactive advertisement, the chapter explains about the study design along with data gathering techniques and how the data were evaluated and compared.
- **Chapter 9:** This chapter is an extension of the previous chapter and discusses the issues with the body interaction and how the body interaction could be enhanced to perform better in current existing public display setup, The chapter discusses on design study and how the experiment was conducted and how the results were compared with the older version of body interaction.
- **Chapter 10:** This chapter concludes and summarizes all the results and findings of this thesis and discusses the potential areas to focus in future.

# 2

## **Background**

## 2.1 Advertising

Advertisement is everywhere and it is meant to provide the audience information about the product or service. The advertisers want to gain the planned goals and effects from the specific target audience. It is a mean of mass communication that is created to alter the audience's behavior and attitude [67]. In particular Kotler and Keller [85] defined the advertisement as below.

### Definition: Advertising

*Advertising is any paid form of non-personal presentation and promotion of ideas, goods, or services by an identified sponsor. Advertisers include not only business firms but also charitable, nonprofit, and government agencies*

So based on the definition above, advertisement is non-personal meaning it is meant to a group of people or target groups. Secondly it should represent an idea or basically it should have something to deliver for the people which matters to the audience. It normally has sponsor(s) to launch it somewhere for example on TV, Radio or print a poster version outdoor. The way message is being delivered has been changing at every era of development as discussed below.

### 2.1.1 History of advertisement

The first paper advertisement was published at 1704 in an American newspaper called Boston News Letter, which was about houses and lands to be sold<sup>1</sup>. After that a lot of business started to do their advertisements in newspapers, posters and banners. The first television advertisement was shown at 1941 on an American TV<sup>2</sup>, this ad brought attention to a wide area of application and big business industries toward advertisement. As a result the budgets raised much higher for advertisements and later advertisement entered the World Wide Web. Online advertising has evolved now to multi-billion dollar industry. Now because of the emerging new technologies and advancements, advertisements are in our smart phone applications, smart TV sets, tablet PCs and many other smart devices. And from past decades display screens are replacing print advertisements because of the easy reusability of the screen and convenient usage of them and providing dynamic contents.

### 2.1.2 Traditional Advertising

Traditional advertising is a form of advertising that uses the media to send commercial messages to the mass audience or viewers. The media can be in any form like TV, Newspaper, Radio, public displays, bill boards and more. Traditional advertising is “the presentation of content is linear and the consumer is passively exposed to product information” [42], user has no control over the flow of the advertisement.

### 2.1.3 Online advertising

Online advertising or Internet advertising is a form of advertising that uses email, web, applications, or any internet application used in mobile or computer, which drive direct sales

<sup>1</sup>Paper advertisements: <http://infoacrs.com/a/adhistory.html>, Last accessed 16th March 2016

<sup>2</sup>First TV ad: <http://www.openculture.com/2013/08/watch-the-first-commercial-ever-shown-on-american-tv-1941.html>, Last accessed 16th March 2016

via electronic commerce [27]. As PWC [33] researched on online advertising and stated that there are two trends that give online advertising this boost, (1) increase in webpages, and (2) development in targeted advertising format. Beside that there are a lot of other ways to boost online marketing [30], (1) search engine optimization, to suggest websites for users, (2) email, (3) video marketing, like YouTube, (4) Blogging , (5) social media, like Facebook, and many other forms.

#### 2.1.4 Pervasive Advertising

Currently computers play important role in life because it is becoming nearly common and found everywhere. These computers do not have to be necessarily like traditional computers to have keyboard and mouse. It could be from our laptop to a smart watch or even smart pen and these technologies try blend in our environments like displays, sensor, security cameras, fridge, washing machine and more. As a result we have ubiquitous computing environment that is supported by underlying technologies like Internet, middleware and microprocessors, as explained by Mark Weiser<sup>3</sup> [90] “*Ubiquitous computing is the method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user*”. The term pervasive computing is also used instead of ubiquitous [72]. It is constructed from basic elements [86] (1) ubiquitous access, (2) context awareness, (3) intelligence and (4) natural interaction. And when an advertisement is made with the help of pervasive computing then it is called “*pervasive advertising*”. This form of advertising would really help to improve advertisement in general because of the powerful properties of the pervasive computing like ubiquitous feature that computing is integrated seamlessly in environment and it disappears. Mark Weiser’s [74] another central statement was “*The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it*”. Based on above explanation, “*Pervasive advertising is the use of pervasive computing technologies for advertising purposes.*”[84].

#### 2.1.5 Advertising program

To have and effective and efficient advertising, most big advertising industries follow an advertising program after they have defined the target market and buyer motives. The advertising program is also called as *5Ms* [37], because it is composed of five steps (1)*Mission*,(2)*Money*,(3) *Message*,(4)*Media*,(5) *Measurement*, Figure 2.1 shows these steps.

##### 1. Mission:

Advertising mission (goal) should come from prior decisions on targeted market and location. This goal can be achieved by a fixed communication process in fix duration between advertiser and audience. There are three advertising goals (1) *Informative Advertising*, it is the early advertising stage, which aims to inform target audience about a product which was not in market before. (2) *Persuasive Advertising*, this happens when there are several competitors of the same product. The advertiser persuades people that their product is the best than others. And (3) *Reminder Advertising*, the need of this type is when a product has been in market from long time like *Coca-Cola* and then there is a need to remind people about that product.

##### 2. Money:

Decision on advertising budget is very essential for future of company. The company

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<sup>3</sup>Ubiquitous Computing: <http://www.ubiq.com/hypertext/weiser/UbiHome.html>

should clearly invest on the advertising of certain product. It should be not less to have lower effect and not too high to risk the company benefits.

### 3. Message:

The message of the advertising should be very clear and innovative. The message should be generated in a way that can impact on viewers. It should go from four stages, (1) message generation, (2) message evaluation and selection, (3) message execution and (4) social responsibility review.

### 4. Media:

The media selection is important because it can help to expose an advertisement message with the number of desired times to the target audience. The number of exposures of advertisement can define the number of awareness of audience about product. And the effect of exposure depends on, (1)*reach*, how much can the advertiser reach to users, through internet, banners, TV and so on. (2) *Frequency*, how many times that advertisement is going to be shown on those locations, (3) *Impact*, the qualitative value of exposure on audience.

### 5. Measurement:

The last step is to measure how the advertisement was effective for a defined goal, location, and target audience within a specific duration of time. The measurement will state the level of achievements and what got accomplished and what not.

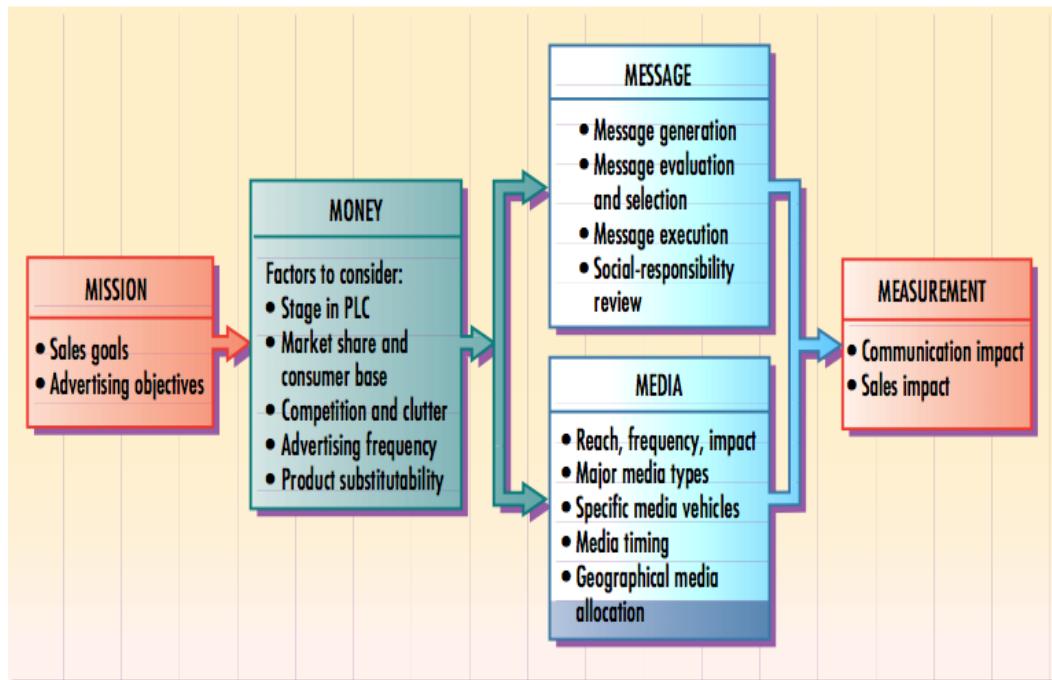


FIGURE 2.1: Advertising Program, [37]

#### 2.1.6 Advertisement performance

Every advertiser is interested in *conversion-rate*, it is “*the percentage of visitors who take a desired action.*”[58]. The desired action is to visit a webpage, buy a product, play a game, or any action, which is defined by the advertiser. *conversion-rate* is very important for advertiser to see the efficiency of their advertisements and how to utilize it for mass visitors that could

be more effective. In e-commerce, advertisers track user's each step or click, they track users from search engines to webpages, from webpages to contacts, from contacts to subscribers and from subscribers to *Actions* purchase or download of an application. With the help of a technique called *conversion-funnel* [22], all the journey of visitors are described in a funnel like shape, as Saad Kamal [21] describes the conversion funnel in Google Analytics, see figure. 2.2 the funnel is composed of four layers, (1) Awareness or attention, (2) interest, (3) Desire and (4) Action, and visitors would have to take these steps to reach the final goal which is purchase of a product.

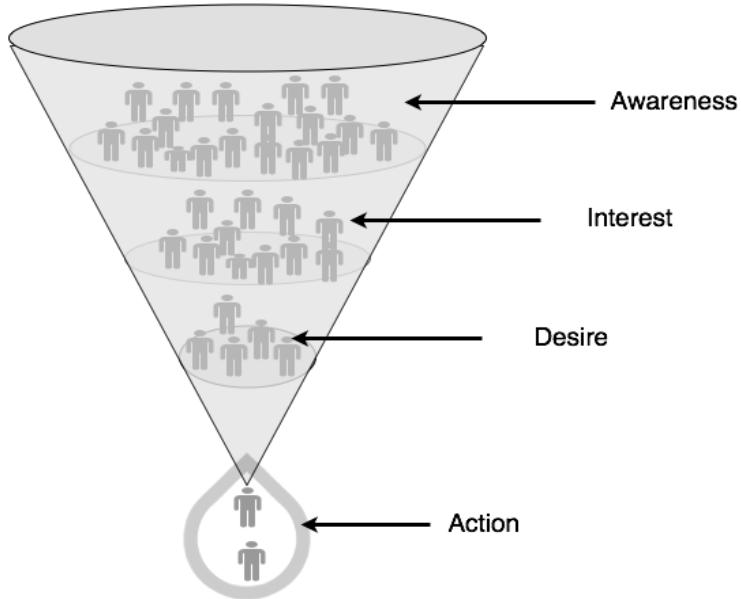


FIGURE 2.2: Conversion Funnel

The funnel shape shows the decrease of visitors in each layer of funnel because most visitors may be aware but not interested, and people who are interested are subset of the first layer of funnel. Not all interested people desire to buy a product, so people get decrease in the next layer who desire for a product and may read the details and specifications. But not all people who desire to buy the product because maybe the person does not have money to buy or there could be other reasons. And finally very few people fit to buy the product and reach the final layer of funnel (purchase). Advertisers can aim different visitors at different layers of *conversion-funnel*, and based on analysis of the funnel advertisers can define where exactly the advertising effort should be invested, [25]

The conversion ratio is defined by *click-through rate* (CTR) metric. It is the ratio of the number of clicks on advertisement to the number of visitors who makes impression (see the advertisement) [22]. Advertisers optimize their pages, by analyzing that which sections, links of web pages can result in to higher CTR. To compute the *conversion rates* the below metrics are used.

- CPM (Cost Per Thousand)

It is a benchmarking metric in advertising to calculate the cost of an online advertisement, which is defined by showing an ad to thousand of viewers. Advertisers would be charged per impression (thousand of viewers).

- CPC (Cost per Click)

The advertiser is charged when a viewer clicks on the advertisement message or link. Occasionally it is found in search engines, and famous websites.

- CPA (Cost per Action)

Advertisers will be charged if the viewer performs any form of action like click, register, subscribe, fill a form or any other.

## 2.2 Public displays

Displays are increasingly getting cheaper and being used in various locations like restaurants, hotels, sport stadiums, homes and now in public space like shop windows, supermarkets, airport and streets and roads. Most of these displays show advertisement in which dynamic or static contents are being shown. Few of displays are interactive like purchasing train tickets with a touch capability, and even interactive advertisement displays in which passers-by can be engaged and play game. This section discusses on the history of public displays, novel applications of displays, display's sensing technologies, attracting attention methods and interaction design of displays. This section also discusses on how to evaluate the public displays in great detail.

### 2.2.1 History of public display research

Various researches have been done from the past three decades and are still continuing until today on public displays. The first research was conducted in 1980 called the “*Hole-in-Space*”<sup>4</sup> that connected New York and Los Angeles one side-walk with a live video and sound system. People at both ends could hear and see each other. In this research common behavior and interactions of people were explored and other similar researches had also been done.

Different sized displays were also designed to fit working area and space for various tasks. Mark Weiser illustrated in his paper “*Computer for 21th century*” [50], in which he present tabs, pads, and boards devices which could be used as a personal use. He also showed large scale displays equivalent to blackboard for public use and demonstrated that how can these technologies be integrated as ubiquitous and be adjustable based on user demands and context.

Another research on situated displays that projects content based on location. For-example *FLUMP*<sup>5</sup> [29], was designed to research and illustrate the effectiveness and adaptability of ubiquitous computing systems. Many researches also conducted to design wearable displays like Meme tags and group tags [14] that by wearing the displays participants could share ideas and opinions called “memes-succinct” among themselves. Through large displays called “community Mirrors” these memetics exchanges were visualized live for conference audience. Another “Name tags or thinking Tag” from IBM [26] that could show the name of the person when facing another person and also display relevant information on who is viewing the tag.

Furthermore, ambient displays were also researched. For-example the *Waterlamp and the pinwheels* used *ambientRoom* of Ishii and ullmer [5], in which they showed how tangible bits could connect the cyberspace and physical environment like foreground and background of human activities. The room was kind of augmented space using light, sound and airflow and water movement. Another was *office plant#1* [28], which was an exploration of a technological object adapted to the office ecology. Another was *Information Percolator* [16], an ambient display designed to show expressions placed within decorative objects<sup>6</sup>, Greenber and Michael [24]. The study investigated on how people transition from individual interaction to group

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<sup>4</sup>Hole-In-Space: <https://www.youtube.com/watch?v=SyIJJr6Ldg8>

<sup>5</sup>flexible ubiquitous monitor project: <http://research.cs.ncl.ac.uk/cabernet/www.laas.research.ec.org/cabernet/workshops/radicals/1996/papers/flump-finney.html>, last accessed May 15, 2016.

<sup>6</sup>Information Percolator : <https://www.youtube.com/watch?v=9LGQWhCePc8>, last accessed:16 May 2016

work with the use of PDAs and shared displays and based on this they introduced SharedNotes system and illustrated how people can switch to different modes.

Encouraging social interaction was another important aspect for public displays in which researchers like Chew and leclerc [19] focused conversations in a conference setting using display called *Sparks*. It was “*an ambient social networking and communication facilitation interface*” this had interactive features on information related to elements presented in the space. Another interactive display designed for hospital *AwareMedia* [56], which facilitated social, spatial, and temporal awareness and supported coordination at an operation ward. Gesture based interactions with ambient display was researched by Daniel Vogel [63] that developed interaction framework for sharable, and interactive public ambient displays<sup>7</sup>. *Blue-board* [71], which was developed at IBM Research center, was a display system for groups to exchange information in a walk-by situation. *IM here* [48] by Elaine M.Haung that researched on LDGAs<sup>8</sup> and proposed a design on how to share IM<sup>9</sup> on large displays by using mobile phone that helped to be an awareness and communication tool.

At end of 2000s mobile phones became popular and common among people and was also a good mean of interaction with displays. *C-Blink* [64] that used mobile phone display, which was used as light source that sent various hue color to a camera from which the camera would detect and encode information and present on large display. Another approach was the use of Flashlight of phones as a pointing device as Shirazi and winkler [81] described the design of public-private display with flashlight simple interaction. Other features of phone like Bluetooth, Infrared were also used as an interaction mean with display (e.g., [73, 82]).

Consequently advertising also became a focus for researchers. As Krüger and Müller illustrated their design of how to recognize passers-by via Bluetooth [53]. A most relevant information could be shown to passers-by based on their staying duration and whether they read the content or not. *BlueScreen* [32] which selected and displayed adverts in response to detected users in the audience, stepping more further it gave users choice of changing and reforming the content shown on display. *Prospero project* [54] that developed a display framework that could be configurable and controlled in public. *RunWithUs* [41] a social sport application that motivated people to do sport and share their progress. *Digifieds* [31] another plateform that users could post ads in public displays.

### 2.2.2 Auto-active displays

Beside hundreds of researches on public displays in universities, there are other displays that were and are made by private advertisement industries. Most of these displays are auto-active or non-interactive and they are situated in train station, airports, malls, restaurants and various locations mainly for advertisement purposes. *zipper*[89]at year 1928 made LED display at the front corner of the New York Times building, which was showing current headlines. In Olympic 1979 the very first large display was deployed, which had video enabled<sup>10</sup>. There are various other companies that until now are working like *printsign*<sup>11</sup>, a big company in UK that designs and advertises in big displays for their customers. *Sony Ziris*<sup>12</sup>, the company that sells advertising screen, and supports advertising content to be played on their screens.

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<sup>7</sup>Interactive Public ambient display: <https://www.youtube.com/watch?v=aFl71SPeYto>, last accessed: 16 May 2016

<sup>8</sup>Large display groupware applications

<sup>9</sup>Internet messaging

<sup>10</sup>Olympic glory a short history of Olympic games timing. London in August 2012 <http://www.runnersworld.com/olympics/a-short-history-of-the-olympic-games>, last accessed: 18May2016

<sup>11</sup>printsigne: <http://www.printsign.co.uk/>, last access 19 May 19, 2016

<sup>12</sup>Sony ziris: <http://pro.sony.com/bbsc/ssr/cat-monitors/>, last accessed 19 May 2016

*BBC big screen*<sup>13</sup>, which started at 2013 by installing many of their big screens and shows BBC big live events. People who travel by taxi can watch on going advertising and news on go like *taxis TV*<sup>14</sup>. Another world famous out door advertising company are *ClearChannel*<sup>15</sup>, and *Dynascan*<sup>16</sup> that advertise in 360 degree big outdoor and indoor screens enabled with content management system that advertisement could be edited and changed. *Kinton*<sup>17</sup> another cylindrical LED screen company that supports for big solutions like advertising, cinema and more.

### 2.2.3 Interactive displays

Beside auto-active displays, there are a lot of interactive outdoor and indoor displays that is made by private companies too. For example *CocaCola*<sup>18</sup> is involved to make interactive advertisement in public display. *MC Donald*<sup>19</sup> allowed passers-by to connect to the advertisement board and play game and by winning get a coupon number from which he/she could get something for free from MC shop. Other public awareness interactive ads are also there like *Interactive Hair-raising awareness*<sup>20</sup> an interactive ad that was installed in train station and used ultra-sonic sensor to detect the arrival of train and the model hair was beautifully blown up. Another was an interactive billboard that to let passers-by stop child abuse<sup>21</sup>. Advertisements could be done in various forms and now are in restaurants and bars like *Clo Winebar*<sup>22</sup> a bar that customers are able to view and select orders from an interactive screen. *pizzaHut*<sup>23</sup> an interactive display that allows customers to design their own pizza and order through it. Floor and wall projected interactive advertisement are also common like *Aristoz*<sup>24</sup> that illustrates various examples of projection based interactive advertisement in supermarket, hotels and airports. *JCDecaux*<sup>25</sup> a France famous advertisement company is booming in innovative outdoor and indoor advertisement. Many more interactive advertisements are out there in public that brings joys and engaging experience to audience.

### 2.2.4 Engagement with displays

There is not a single application which would claim to be perfect in situations because it could be good for a specific domain but would lack a lot of things from other perspectives. It also applies for public displays that are another mean of communication of passers-by and is more complex than other single user device. There are many layers of complexities that needs to be addressed when dealing with public display, for-example how passers-by be attracted toward display. When they are attracted toward display how to motivate them toward display to

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<sup>13</sup>BBC big screens: <http://www.bbc.co.uk/blogs/aboutthebbc/entries/ea215929-b57e-3bb9-8d01-e0433f93fd62>, last accessed 19 May 2016

<sup>14</sup>Taxi TV: <http://verifonmedia.com/networks/taxi-media/>

<sup>15</sup><http://clearchanneloutdoor.com/>

<sup>16</sup>Dynascan: <http://www.dynascanusa.com/products/360-degree-led-video-displays/>

<sup>17</sup>Kinton: <http://www.kinton.de/de/home.html>

<sup>18</sup>Coca Cola Interactive: <https://mg337group10.wordpress.com/2015/04/04/coca-cola-and-interactive-advertising/>, last accessed 19 May 2016

<sup>19</sup>MC Donald Interactive Ad: <http://en.nolapeles.com/2011/06/16/mc-donalds-interactive-ad/>, last accessed 19 may 2016

<sup>20</sup>Hair awareness: [https://www.youtube.com/watch?v=qqd6hg0\\_AOI](https://www.youtube.com/watch?v=qqd6hg0_AOI) last accessed 20 May 2016

<sup>21</sup>Child Abuse: <https://www.dramafever.com/news/powerful-billboard-lets-you-stop-child-abuse-/>, last accessed: 14 May 2016

<sup>22</sup>17 Awsome bars: <http://walyou.com/bars-and-restaurants-themes-geeks/>, last accessed 19 May 2016

<sup>23</sup>PizzaHut: <http://www.fastcocreate.com/3027282/pizza-huts-interactive-touch-table-could-be\coming-to-a-restaurant-near-you>, last accessed 19 May 2016

<sup>24</sup>Aristoz: <https://www.youtube.com/watch?v=FH2T0N7LRIY>, last accessed: 19 May 2016

<sup>25</sup>JCDecaux: <http://www.jcdecaux.com/en/>, last accessed 19 May 2016

come near and interact. And how to design a better interaction medium for the users at that situation. These are all issues that need to be worked on. As Müller et al [1] illustrated a model of different interaction phases in which he called it *Audience Funnel*, as he describes there are many stages until users actually interact with the advertisement. Attention and motivation will eventually lead to interaction and these stages follow each other if the first step fail the rest would not happen, so there is certain thresholds that people should exceed to transition from one mode to other.

## Attention

Most devices that are being used has an owner and the owner is aware of the device and pays attention to it, for example the owner of mobile phone pays attention to phone to do certain task. But public displays do not have an owner or in other words everyone can use them if higher attention is given to them. Therefor the responsibility is on displays to be able to provide enough attraction for the passers-by to be engaged. Various models of attracting attention have been developed and proposed, like Itti and Baldi [75] made the bottom-up attention model meaning that the attention could be attracted if a strong external stimuli happen. The model shows various representation of input image like color and orientation that human brain cells are capable of interpreting them and based on input images the model predicts which area of the picture could have more attention. The model is also equipped with top-down approach meaning that the brain knows or has experience to certain regions of input image before shifting attention. Florian Alt [84] stated from previous researches that the attention could be gained by behavioral urgencies and honeypot effect has also strong impact on attracting attention.

Behavioral urgencies models can predict how much a specific external stimulus can gain attention of someone. For example Franconeri and Simons [80] stated that “*Attention capture is often operationally defined as speeded search performance when an otherwise nonpredictive stimulus happens to be the target of a visual search. That is, if a stimulus captures attention, it should be searched with priority even when it is irrelevant to the task*”. Beside this may other things captures attention like sudden appearance of object [9].

*Honeypot effect* is described by Brignull and Rogers [15] that when ever a bunch of people gather around a display automatically other people are being attracted toward the display. They observed this effect in a party in which they had an interactive system installed called *Opinionizer*. It was a shared display in which people could type their opinion with keyboard and the opinions were visualized on to the display. By doing this people started to notice the messages and most importantly the people involved with display built an awareness of people around toward display.

## Motivation

To be motivated means *to be moved to do something*[55]. Motivation is another big challenge for public displays because passers-by may glance toward display but necessarily not motivated to interact with the display. There is significant need to understand how to motivate passers-by toward display as Thomas [51] describes activities that motivates “*An activity is said to be intrinsically motivated if people engage in it “for its own sake,” if they do not engage in the activity in order to receive some external reward such as money or status. I will use the words “fun,” “interesting,” “captivating,” “appealing,” and “intrinsically motivating,” all more or less interchangeably,*” he states that challenge, fantasy and curiosity could be categories of motivation instructions.

Challenge is a driving force for motivation, Florian alt [84] summarizes *Flow*[52] that is state of mind in one sentence by saying “*is a state of mind where the user is fully immersed in an activity while feeling energized and focused. Simply said, flow can be achieved in a channel between too little challenge (leading to boredom) and too much challenge (leading to anxiety).*”. So there should be balance between challenges, and to change interaction to a challenge the end goal should not be clear for participants.

Curiosity happens when something is not so clear and people tend to find what is actually happening. Some may feel insecure to or shy because of social context. Therefore proper explorative behavior is required to overcome these insecurities [55]. To increase curiosity the application should send to the participant a sense of incompleteness and at the mean time should also show how to over come that incompleteness through the use of that application [84].

Fantasy is another deriving factor to motivate people toward display. If something imaginary or unrealistic is shown people gives more attention, now with the increasing technologies and computer capabilities, virtual reality, augmented reality and others sensing technologies these fake environments can be built [60]. *BigBoard*<sup>26</sup> which was installed in a bus station and was showing the video of the side of the bus station and meanwhile was augmenting some fairies coming from sky and approach the participants. *JCDecaux*<sup>27</sup> creates innovative advertisements which most of them are full of fantasy.

### 2.2.5 Metaphors

Advertisements are posted in various forms and there are different mental models categorized by J. Müller [1] which are Posters, windows, mirrors and overlays.

- **Posters:**

Ghosting and peter[6] defines poster as like this, “*A poster is any piece of printed paper designed to be attached to a wall or vertical surface*”. These poster do contain texts, graphics or combination of both. They necessarily do not have to be paper based they could be digital posters that with the use of media a more dynamic contents could be shown. Most of these digital posters show traditional advertising contents that is often ignored by passers-by [49]. But by integrating sensing technologies these posters could be interactive too to increase the user engagement.

- **Windows:**

There are advertisements shown at windows facing outside the shop. This type of mental model gives the viewers some sort of clue of a virtual location. The window model has two sides *the local* and *remote* sides. The window model interconnects both sides together. For example *Hole-in-Space*[83], which there were two big screens installed in two major cities and live video and audio streams was available for public to communicate.

- **Mirrors:**

Mirrors are reflective surfaces. Displays with mirror model show the reflection of the passers-by and allow encouraging them for more direct interactions. This is normally done by projecting silhouette representation for example J.Müller [11] experimented by mirroring three representations of passers-by as *image*, *silhouette* and *abstract*.

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<sup>26</sup> <https://www.youtube.com/watch?v=UIHwHqaY3SY>, last accessed: 19 May 2016

<sup>27</sup> JCDecaux Innovative ads: <https://www.youtube.com/watch?v=Gw0Gfp5LVgQ>, last accessed 19 May 2016

- **Overlays:**

Overlays model could have various shapes and are not bounded to the fixed frame and size like screens or mirrors. It could be glass door or a part of a window or a whole wall. The fact is that they can integrate with environment. Normally these are done by using high performance projectors like CLD projector<sup>28</sup>. For example *Jumping Frog* [14] that was projected on surface and by touching it the frog would jump to other surface.

### 2.2.6 Interaction models

Different interaction models are created as shown below that illustrates how passers-by would behave and react at certain regions (zones) toward display. How groups of audience can form and what could be their next step for interaction.

1. Hallo.Wall [77, 76], which was a context-dependent display reflecting Identity and proximity of passers-by. This was designed to communicate detailed information as it was interactive and passers-by could communicate through RFID and WaveLAN technologies. The interaction was in a “distance-dependent Semantic manner” meaning that based on different distances various interactions were offered. The interaction model consisted three zones ambient zone, notification zone, and cell interaction zone as can be seen in below picture.

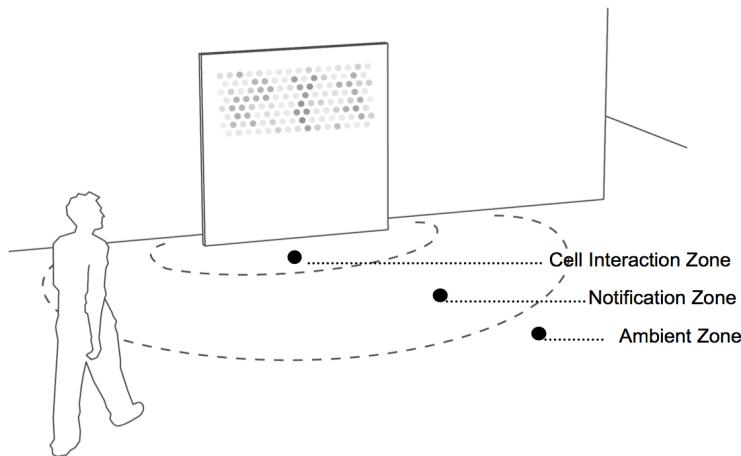


FIGURE 2.3: Three zones of interaction, [76]

*Ambient Zone* is outside the sensing area where people cannot be tracked or sensed. In this mode the display shows some information and content independent to the people. *Notification Zone* is the place where is under sensor range and the sensors can detect people and show particular light pattern on the display. *Cell Interaction Zone* is the zone, where the passers-by are very near to the screen and can start interacting with display.

D. Vogel [63] used the same interaction design and enhanced it in a way that could support transition of implicit to explicit interaction with both personal and public information. He introduced *Implicit*, *Subtle* and *Personal* interaction zones that has smooth transitions in between. See the diagram below.

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<sup>28</sup>LCD projector: <http://www.projectorreviews.com/projector-categories/lcd-projectors/>, last accessed 19 May 2016

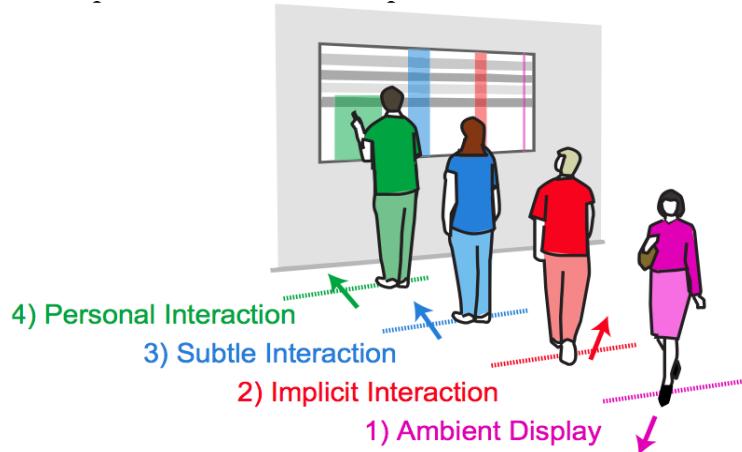


FIGURE 2.4: Four interaction phases, [76]

*Implicit interaction phase* is the phase where the system detects the person's position and projects notification when user passes. In this phase it could also presents a kind of representation of the person so that the passers-by can see the reaction to be convinced to enter the subtle interaction phase. The *Subtle mode* activates when user give implicit hints like stopping by screen. In this mode a detailed notification or state is shown in which user can start interacting with the content and multiple users can interact too. But when exploring more personal content then the users moves closer to the screen to enable *Personal interaction phase*, in this phase the user is very close to the screen and the interaction could be done by touching the screen and exploring more personal contents.

2. Another interaction model designed by Brignull and Rogers [15] conceptualized an interaction model based on their observation they had done on *Opinionizer* system in a lunch party. They divided the space around display in three categories as space (A) *Peripheral awareness*, space (B) *Focal awareness* and space(c) *Direct interaction*. And illustrated how people switch between these spaces by crossing some thresholds. This model is limited to the interaction medium because one keyboard was used and other phases like implicate and explicit interactions are not considered. The model is made to be in an environment that people are somehow familiar with each other that remove social embarrassments and as a result people can interact freely with the system instead of ignoring it.

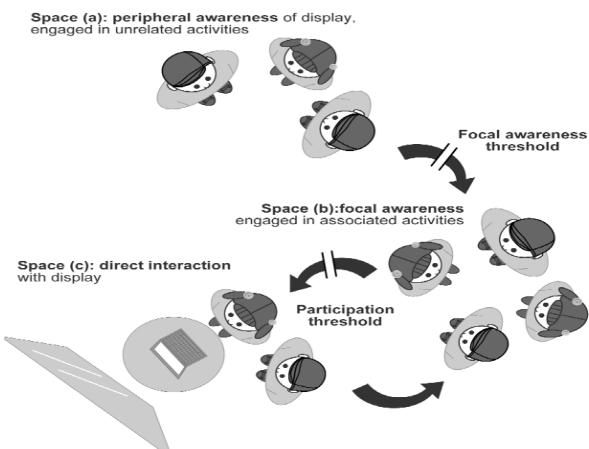


FIGURE 2.5: A diagram of public interaction flow accross thresholds, [15]

3. *Audience funnel* [2] is another design based on public interaction flow model that have several interaction phases. The phases shown in this model is a linear process in which first should happen then next could happen. These phases are *Passing by*, *Viewing / Reacting*, *Subtle interaction*, *Direct interaction*, *Multiple interaction*, and *Follow-up actions* as shown in below diagram. This type of model is very interesting for advertising applications.

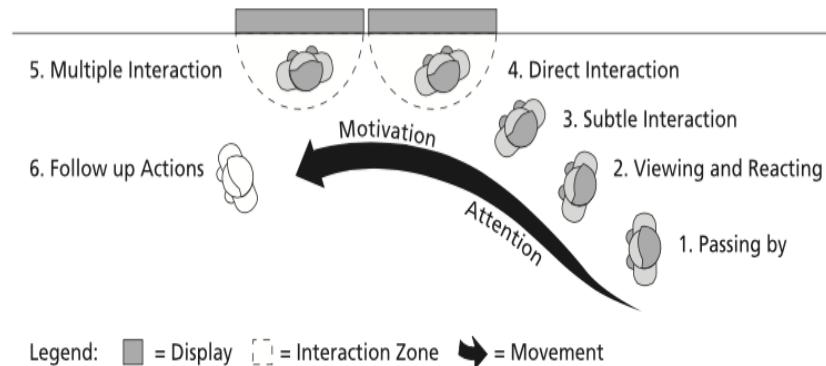


FIGURE 2.6: The Audience Funnel, [2]

### 2.2.7 Technologies

The driving force for all these designs and concepts and advancements are the technologies behind them. Without the use to advanced technologies it would have not been possible to implement and evaluate the prototypes and interaction designs. This section explores various technologies used for different purposes as listed below.

- Displays:

Currently four technologies are used in displays

- CRT (Cathode Ray Tube), invented by German physicist Ferdinand Braun<sup>29</sup> in 1897. It has three electronic guns (Red, Green, Blue phosphor dots) and high-speed electrons from these guns hit the flat fluorescent screen line by line by and as a result the image is created on the screen.
- LCD (Liquid crystal display), which is widely used in Television sets and other computer screens, and has almost replaced CRT. It uses Light-modulating properties of liquid crystal<sup>30</sup>, which does not shot light rays to show images.
- PDP (Plasma display panels), unlike LCD display is free of distortions if seen from sides. It uses tiny neon light for each pixels in the screen and that illuminates the pixels and is designed to display both analog and digital computer inputs<sup>31</sup>.
- OLED (Organic Light-Emitting Diode) this technology uses light emitting diodes that allow higher resolution and screen size. It is one of the expensive displays and has wide viewing angle and has better power consumption.
- There are various other display technologies used for different purposes and screen sizes as listed below.

<sup>29</sup>Ferdinand Brown: <http://www.britannica.com/biography/Ferdinand-Braun>, last accessed 21 May 2016

<sup>30</sup>Liquid Crystal: [https://en.wikipedia.org/wiki/Liquid\\_crystal](https://en.wikipedia.org/wiki/Liquid_crystal), last access 21 may 2016

<sup>31</sup>PDP: <http://whatis.techtarget.com/definition/plasma-display>, last accessed 20 may 2016

- \* E Ink (Electronic paper)
  - \* PDP (Plasma display panel)
  - \* ELD (Electroluminescent display)
  - \* DMS (Digital microshutter)
  - \* ...
- Sensors:
 

Now technologies are highly advancing and day-by-day new sensors for different purposes are being made. The sensor that in past was difficult to use due to many dependencies and higher cost, is now easy to use with very limited requirements and less price. Sensors are listed based on their purposes as below.

    - **Presense**
    - Presence is the state or fact of being present as with others or in a place<sup>32</sup>, there are sensors that can sense if someone is at the proximity or vicinity of the display and can even sense how far the person is in meter or centimeter in relation to display.
    - \* Cameras:
 

Now there are many cheap and powerful cameras that has built-in integrated firmware that does Human tracking so easy. For example Microsoft Kinect Camera<sup>33</sup>, which comes in two versions Kinect xbox360(V1) and Kinect One (V2). These cameras can sense the location and orientation of the person. Other cameras could also be used to manual computer vision tracking applications.
    - \* Audio sensors<sup>34</sup>:
 

The use of microphones allows us to track sound frequencies. The distance of a device can be estimated from the source sounds originating from.
    - \* Bluetooth:
 

Devices that have Bluetooth functionality can be another medium of detection and interaction with displays.
    - \* IR (Infrared):
 

This could be used to sense the people around as it was used in *MemeTags* [14].
    - \* RFID (Radio-Frequency Identification):
 

RFID serves the same as bar code it can be attached at backside of card. This technology could be used to sense if there is someone near display.
  - **Body position and Posture** Body position can be detected with pressure sensors installed on the ground floor this would accurately detect the exact coordinate. Beside that camera can also detect exact position like Kinect camera. Body posture is the orientation of body where actually the body is facing to; this can be detected using 3D Camera or motion tracking.
  - **Gestures** Gesture gives more control to the system while interaction, it could be used for manipulating some objects on the screen or control elements, there are many technologies that recognize gestures, like touch screens, accelerometer, and most widely used now is the use of camera in which the user hand or eye or different body posture can be used as some sort of gestures.

<sup>32</sup>Presence: <http://www.dictionary.com/browse/presence>

<sup>33</sup>Microsoft Kinect: <https://developer.microsoft.com/de-de/windows/kinect>, Last accessed: 1/05/2016 at 13:21:00

<sup>34</sup>Audio sensors: <https://www.sparkfun.com/categories/186>, last accessed 22 may 2016

- **Touch** There are various touch technologies available, the use of touch technology evolved from smart phone like iPhone, and spread to screens, Now mobile screen can support multi-touch and screens beside multi-touch can even support multi-user multi touch, touch could be sensed by the display directly or by IR camera that uses computer vision software to track users finger.
- WiFi WiFi allows computers, smartphones, tablets or other personal smart devices to connect to private LAN (Local Area Network) or Internet, the use of this technology has become very frequent and almost all handheld devices has the capability to connect, By using this technology people can connect to public displays and interact by using some applications or web controllers.

3

**Attraction attention**

### 3.1 Introduction

Increasingly, displays are now being installed in most of the locations and most of these displays are full of advertisements and passers-by often try ignoring because of various reasons like, first is “*information overload*” that happens on people at some environmental setups, when they enter at place where too much information is delivered and needs to be processed by a single person, and when that is beyond the person capability then they simply ignore them, as Milgram [39] investigated on information overload stated in his paper that “*the concept of overload. This term, drawn from systems analysis, refers to a system's inability to process inputs from the environment because there are too many inputs for the system to cope with, or because successive inputs come so fast that input A cannot be processed when input B is presented*”, therefor there are priorities for each input and low priorities are disregarded, for example, disregarding of low priorities inputs is called “*Banner Blindness*” in the web, Burke et al [40] showed with an experiment using eye-tracking that people tend to ignore banners mostly and have very few number of recalls of the banner contents.

The second reason of ignoring is, that people expect unrelated or uninteresting contents, Huang et al, also investigated and explained that most public displays are ignored and get little glances [38]. Jörg müller and his fellow colleague [49] investigated on similar effect called “*Display Blindness*” they conducted the experiment in university context with two displays first, the iDisplay, that showed information for students, was looked at more often than the other (MobiDiC), that showed coupons for shops.

This chapter focuses on the comparative study of attracting attention methods with a traditional advertisement in public display and explains the study design and findings, this comparative study was conducted in university Mensa, meanwhile this chapter explains the feedbacks and opinions of people about advertisement in general, whom were interviewed during the study. The purpose of conducting this study was to find out appropriate attracting attention method for interactive advertisement, which are discussed on other chapters.

### 3.2 Attention

Every moment we spend alone, with friends in the crowd, in the concert or party our attention keeps tracks of us and make us aware of the environment and we react differently for different stimuli. “*Attention is the process that, at a given moment, enhances some information and inhibits other information. The enhancement enables us to select some information for further processing, and the inhibition enables us to set some information aside.*”[8]. Attention is influenced by two different processes (Top-Down & Bottom-Up) [75, 8]. Top-Down process happens when the user has prior awareness (goal) about where to put his/her attention. And Bottom-Up process happens when the users have no prior awareness and suddenly by an external stimuli move or change their attention toward something. People walking by do not have any knowledge or awareness about Interactive advertisements nor the researchers tend to speak about them. At this situation I believe that the attraction of attention should be a Bottom-Up process for the users to drag them to the screens.

The appearance of objects suddenly or moving objects on the screen or contrasting color can capture attention quicker. Yantis and Jonides (1984) demonstrated that the detection of a target in visual search was markedly enhanced when the target was presented abruptly[9]. And the type of contrast change on an object, influence priority in visual search, “*Both the sudden appearance of an object and sudden changes in existing object features influence priority in visual search.*”[7]

Elaine M. Huang, Anna Koster, and Jan Borchers have researched and discussed on “*When Does the Public Really Look at Public Displays?*”[10], in this paper they argued that glancing and attention at large displays is complex and is dependent on many factors like Brevity of glances, Positioning of displays, Content format and dynamics, Catching the eye, Display size, this paper provided some recommendations for each of the mentioned factors.

### 3.3 Approaches

As discussed earlier that Interactive advertisement would need to first attract the passers-by. Three different attracting attention techniques were made that were interactive, and I compared them with non-interactive (traditional) advertisement to observe how many of passers-by were being attracted.

John Hardy and his colleague [36] classified the attention level in three categories, (1) Glance, (2) Ignore and (3) Watch.

- **Glance:** This happens when the passer-by apparently turn his/her head and stares the screen for less than 3 seconds.
- **Ignore:** This is when the person completely does not look or turn his/her head while passing by the screen.
- **Watch:** This is when the person stares the screen for more than 3 second.

#### 3.3.1 Prototypes

Three interactive attracting attention method prototypes were developed and their screen backgrounds were set to black.

First, was the *Following eye* shown in figure 3.1 these eyes suddenly pop-up when a person passers-by the screen and follows the person by moving its eyeball. The idea behind this is to check if people would react if something abruptly appear on the screen and starts to follow people, This example has very limited movement it is only constraint with limited eye space, but big object with high contrast.

Second, was the *Firework* shown in figure 3.1, it shows different colored and sized firework animation, The application will show a random firework for each person on the scene, there are three blocks of fireworks for three persons, the movement of the person changes the location of the firework. In this example there is more object movement and color changes with high contrast.

Third, was the *silhouette presentation* shown in Figure ??, which shows the augmented colored representation of people passing by the screen, the idea is derived from Jorg Müller [11], who has investigated that how passers-by notice the interactivity of the public display by showing different representations of body like Mirrored (1) “*user silhouettes*”, (2) “*avatar-like*”representations and (3) “*real user Image*”, in that paper they concluded that mirroring user image is much more effective to attract users and understand the interactivity of the display, but because of privacy policy and because of social attitude like may be someone does not like to be shown on the screen, only Mirrored silhouettes.



FIGURE 3.1: Attraction attention methods

Non-interactive advertisement prototype was a traditional style advertisement in which five pages, were in loop in a slideshow, the advertisement pages consisted of pictures and mostly texts about some events in Weimar, the sequence of pages of the slideshow were fixed and would switch from one page to other within about each 15 seconds.



FIGURE 3.2: Traditional Advertising display

### 3.3.2 Hypothesis

- **H0:** Silhouette representation method and traditional advertising attract same number of passers-by.
- **H1:** Silhouette representation method attracts more passers-by than traditional advertising.

## 3.4 Study design

At the beginning, the idea was to conduct some experiments in the lab and investigate about the attention, like doing gaze tracking. But it did not suited well for the real life display scenario in which an already situated display was advertising. Therefor I conducted the study on the field, which was a nice opportunity to compare my attracting attention methods with the traditional advertising.

### 3.4.1 Participants

Participants were random from university students or employees, mostly consisted of students and teachers, the participants were observed that passed in front of the display, The participants who passed from the backside of the display were not taken in consideration. None of the participants knew about the attracting attention conditions in advance.

### 3.4.2 Location

The study was conducted in university Mensa, this location was an ideal location because many students, teachers and university employees go for having lunch and taking coffee breaks and the Mensa gets crowded. 14-inch display, which was previously used for advertisement in Mensa by Kasseturm<sup>1</sup>, was used to deploy our methods.

### 3.4.3 Procedures

The study was conducted for four continues days, and each day only one method was displayed on the screen for two hours at 14:00 o'clock, The first day of the study was the passive mode of the screen, where traditional advertisement was displayed and the next three days were the interactive mode of the screen, where the attracting attention methods were shown. One person was responsible for observing and noting the glances made by the passers-by and also noting interesting behavior of people toward the screen. The other person was responsible to take interviews from the passers-by that glanced at the screen and get more feedbacks of the advertisement in general.

### 3.4.4 Data gathering

Data gathering consisted of direct observation of passers-by from 14:00 – 16:00 for each individual day and interviews were taken which was recorded.

## Observation

Observation was used to count the number of glances the passers-by make at the screen while pass from the front of the screen. A small pilot study was conducted for the observer to find an appropriate location in the Mensa setup to be able to count people and glances without being noticed by passers-by.

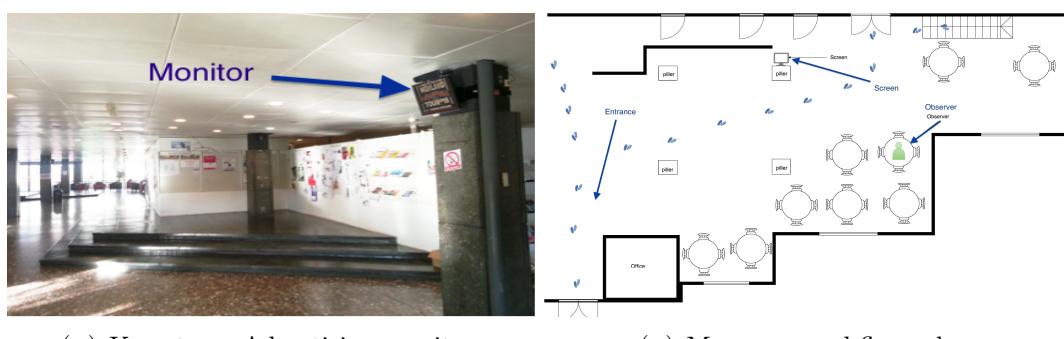


FIGURE 3.3: University Mensa

<sup>1</sup>Kasseturm: <http://www.kasseturm.de/>, last accessed: 26 May 2016

A sheet was provided to the observer to note each 5 min time stamp for two hours, specific letters were defined to detect glanced and ignored events of Male, Female, Unknown gender, group and individuals, to see the sheet refer to Appendix A.1.

As stated before that observer did one small pilot study to locate a good location and be able to count and note in the sheet, beside that, he was told to write notes when he observes something interesting during the period.



(A) Hamid Sabri as an observer. (B) Observer is taking notes on the data sheet.

FIGURE 3.4: Observation method

## Interviews

During all four day of the observations, 16 interviews were taken from people inside Mensa to get general opinion about advertisement and people preferences what they like and what they avoid about advertisement. Responders were asked to sign the consent form because the interviews were voice recorded for later analyzing. Each interview took around 6 minute in average. All interviews were transcribed separately for further data analyzing.

See A.3 for consent form, and A.2 for interview questionnaire.

## 3.5 Findings

The findings are categorized as below.

### 3.5.1 Observation findings

Observational data for attention level of passers-by was collected and summarized as below.

TABLE 3.1: Cross tabulation of deployment and attention level

Methods	Glanced (%)	ignored (%)	Total
<b>Traditional</b>	9 (7.6%)	109 (92.3%)	118
<b>Silhouette</b>	22 (15.82%)	117 (84.7%)	139
<b>Following eye</b>	10 (12.98%)	67 (87%)	77
<b>Firework</b>	6 (10.1%)	53 (89%)	59

As can be seen from the table above, Silhouette attention attraction technique received the highest number of glances 22 out of 139 compared to other techniques, Following eye

technique was the second most attracted technique probably because of its contrasting color and funny.

To find the statistical significant difference between traditional screen and these three methods Chi-squared test was applied as below.

TABLE 3.2: Cross tabulation of Following and traditional attention level

Method	Glanced	ignored	Total
Traditional	9	109	118
Following eye	10	67	77
<b>Total</b>	19	176	195

Performing the ch-squared test on above table,  $\chi^2(1, N=195)=1.522$ ,  $p > .05$  ( $p=.21$ ), it suggests that there is no significant difference to attract passers-by between following-eye method and traditional screen

TABLE 3.3: Cross tabulation of Firework and traditional attention level

Method	Glanced	Ignored	Total
Traditional	9	109	118
Firework	6	53	59
<b>Total</b>	15	162	177

After the ch-squared test,  $\chi^2(1, N=177)=0.328$ ,  $p > .05$  ( $p=.56$ ) suggests that there is no significant difference to attract passers-by between Firework method and traditional screen.

TABLE 3.4: Cross tabulation of Silhouette and traditional attention level

Method	Glanced	ignored	Total
Traditional	9	109	118
Silhouette	22	117	139
<b>Total</b>	31	226	257

After performing the ch-squared test,  $\chi^2(1, N=257)=4.046$ ,  $p < .05$  ( $p=.04$ ), it suggests that Silhouette representation attracts more passers-by than traditional advertising screen. Based on this finding,  $H_0$  is rejected because the attention level of traditional advertising and interactive silhouette presentation are not the same, silhouette presentation attracts statistically more passers-by than traditional, as a result H1 is accepted.

### 3.5.2 Interview Findings

Interview transcripts were individually coded to generalize the responder's opinions on the advertisements. I created two main sections from the interviews that what makes a Good Advertisement, and what makes a Bad Advertisement and related all responses to these sections a lot of codes were analyzed and grouped together to make sub sections and sub-sub-sections.

## Good Advertisement

A lot of categories have been found after coding the interviews the chart in Appendix A.4, show all the categories and sub categories with the correspondent code from the interviews and even some codes were directly also placed as a category instance. The below list describes some of the important categories retrieved from the diagram in Appendix A.4

### 1. Content

Responders like to have more funny contents than any other strict informational advertisement; As responders replied like this, “*just make it funny like make a joke or something but something in a very good one that is really difficult*”, “*it should be very not very serious?*”, “*Yeah mostly I like funny things that the main concept is shown in different way like in funny things*”, “*I like advertisement that are somehow have humor*”.

At the same time responders would like to see some useful, true, sensible facts and main idea of advertisement; “*an offer if it is clearly mentions that okay that you save this much or you get this or that, that is like a clear message*”, “*You have to focus on the main things that will happen in the event which will attract people will come*.”

Furthermore, contents of advertisement should be small and understandable; “*the advertisement should be clear too*”, “*when you have too many numbers and too much to read then it is confusing*” “*Add some pictures based on the advertisement what do you want to show.*”, “*Not many text in advertisement*”, “*Have a good design, not too crowded with information*”, “*Well defined subject, and shorter contents, because we don't like reading long things usually no body likes to read*”.

Another important thing was context Based contents, the users liked to see things related to their surroundings; “*if I am standing near a shopping center it should tell me that what kind of shops are there and what I could buy from there*.” “*It should show movies of the actor I like*”.

### 2. Creativity

People like to see very new and creative things happening in advertisement; “*something that catches your attention in a way that you haven't seen before*”, “*like seeing something out of ordinary*” . Introducing new ideas, artistic; “*as I am musician you know kind of creative person I like if it something special inside not it is just like for example if it is advertisement of milk* ”, “*Which can be something un-expectable probably also* ”, “*in general I would say yes as long it gets creative*”

### 3. Style

The style of advertisement plays key role in terms of color and size as stated by responders; “*may be should be more should be more colorful*”, “*my eyes are attracted to so hard things unless there is something big enough things*”, “*Use the bright color.*” , “*You have to be clever in using colors okay because color mismatch does not attract the eyes*”, “*when it is really just like an art like you have a picture you some impression or illusion*”.

### 4. Location

Responders like to see advertisement while they are on the way, they don't get annoyed if advertisements comes on their way and some probably take a look to them too, but heavily they do not like advertisement while they are at home or watching program in TV or Internet, “*I think the street is better*”

### 5. Interactivity

Some liked to have some sort of interactivity to experience like playing games; “*it is*

*good like if you have a game, it would better to have a preview of the game on the screen or just like something like even people could interact with it like get an experience of the game”, “if the screen will also be interactive so you can interact with the something you are advertising.”*

## 6. Mean

Different means were mentioned like larger screen, sound, banners for good influential advertisement.

## 7. Motivation

One of the responder pointed that the advertisement should motivate users in a natural way and should be from unbiased point of view; *“I prefer to buy in a natural way. The company should know who are using their product the power users who that have a lot of influence you know if you have good connections with the guitarists who have like actually like you know people listen to his opinion I think you have to reach out to the guitarist but once you know the guitarist is gaining something from that guitar maker then I don’t trust that company, It should be like completely unbiased, I think that is the kind of advertisement I listen to.”*

Others suggest that advertisement must motivate for healthy diet and sport; *“if it reminds me to do stuff like do more sport or eat healthier or anything that has a good purpose”*.

## 8. Other categories

Many other categories were also extracted for a good advertisement like Goal of advertisement, Audience, Purpose and motivation, for more detail see Appendix A.4

## Bad Advertisement

The below categories were derived from the interviews that make an advertisement feel or look bad, and we should avoid using them in advertisements.

### 1. Style

There exist different styles that advertisement makers follow but texts or photos are blinking; *“try not to use anything would be blinking okay because that is really annoying okay because even so if you are not looking at it is still effecting”*. Using of mismatched colors in advertisement is certainly a bad idea; *“color mismatch does not attract the eyes”*.

### 2. Annoyance

Most of the responders felt annoyed by almost all advertisements because they contain some sort of similar features like repetitions; *“it should not be like repeating itself over and over and over again”*, *“I like advertisement apart from watching it again and again”*, *“Hmm if I see the same advertisement again and again that is annoying.”*

Other feature is destruction, which does not allow a person on focusing on something; *“Not just like something popping up in front of your face”*, *“for example in middle of the serial or a movie that i am watching and an advertisement that is I don’t like because it makes me destructed now I just can’t focus on things for view minutes you have to leave what ever you were”*

### 3. Motivation

Advertisement in general motivate people in their own way to attract customers, which people make not like it, for example sudden appearance of something in the screen or

what users do not like to see but they are forced to see; “*usually you are forced to see them because you are watching something or doing something and suddenly it comes and it disturbs you*”, “*it is trying to convince me of something only for to consume or buy and then I mean I don’t want*”

#### 4. Content

Some advertisements exaggerate on their products or even say lie; “*it is like magnificent thing and nice pen okay and then it is just a pen, okay*”, “*They are all lies. Showing inappropriate content are heavily disliked;*” “*whenever I go and access the Internet okay A lot of advertisement comes to my face and most of them are inappropriate. Stuffs like that I don’t like them at all for example some perfume ad which would the a woman in a very degrading position or for example mocking someone believe or something just to catch the attention that is probably to offend people that is what would annoy me a lot. The use of ugly and old people is also not welcomed.*”

#### 5. Duration

Long lasting advertisement are always boring and waste of time, most of the responders said that they would prefer short advertisements.

#### 6. Other categories

Many other categories are also extracted from the interviews like location, Confusing advertisement, Controversial ads, amount of ads and types of ads that were not liked by responders. For more information refere to Appendix A.5

### 3.6 Conclusion

As a result this research takes all the considerations and concerns about the nature of traditional advertisement and what the passers-by think that could be good for the advertisement in terms of attractiveness, content and many other factors described in this chapter. A good advertisement from people points of view is an advertisement that provides most relevant content to the theme and environment, is short and precise, should have creativity and some kind of interactivity. Many other negatives aspects should be avoided like having a bad style, being annoying and putting non-context contents.

Regarding the attracting attention, among other techniques the silhouette representation statistically attract more passers-by because of a higher number of glances, and also based on the findings of J. Müller[11] silhouette representation is a well accepted presentation of people that can be interesting, joyful and obviously more attractive. This technique would be used for attracting attention for coming interactive advertisement both for (mobile and body).

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## Appendices

## Attracting attention

### A.1 Glance count sheet

#### Glance Count sheet

Date: .....  
 Location: .....  
 Observer: .....

Hour: minute			
:00			
:05			
:10			
:15			
:20			
:25			
:30			
:35			
:40			
:45			
:50			
:55			
:00			
:05			
:10			
:15			
:20			
:25			
:30			
:35			
:40			
:45			
:50			
:55			

#### Findings:

	Male	Female
Glances		
Ignored		
Total		

#### Symbols:

(F) === Female  
 (M) === Male

(FFMMMM)  
 (E)

== Group  
 === Glanced Female

(M)  
 (EFMMMM)

== Glanced Male  
 === Glanced Group

FIGURE A.1: Glance count sheet

## A.2 Interview Questionnaire

TABLE A.2: Questions

---

No.	Research Questions
1	Do you like advertisement on displays?
2	Which kind of advertisement do you like?
3	What is that makes advertisement annoying or interested for you?
4	What attracted you toward the screen?
5	What do you think about this type of technique?
6	Do yo have any other recommendations?
7	What do you know about Interactive Advertisement?
8	What is your expectation about interactive advertisement?

---

### A.3 Interview consent form

Date: / /

Bauhaus-Universität Weimar

## Human Computer Interaction Questionnaire Consent Form

This is a study of attention attraction toward screen, conducted by **Hasibullah Sahibzada** because of his thesis research on Interactive Advertisement Vs. Traditional Advertisement. The purpose of this study is to help improve advertisement using existing technology. You are being requested to **answer** the questions in the interview and at the same time being **audio recorded** to assist us in the study.

The identities of all people who participate will remain anonymous and will be kept confidential. Identifiable data will be stored securely in a password protected computer account. Your participation is entirely voluntary and you may quite at any time from the study.

#### Contact Information About the Project

If you have any concerns about your rights as a research subject, you may contact directly Hasibullah Sahibzada at [Hasibullah.sahibzada@uni-weimar.de](mailto:Hasibullah.sahibzada@uni-weimar.de) or at phone # 015216967648.

Signature: -----

FIGURE A.3: Interview consent form

## A.4 Interview Color codes



FIGURE A.4: Good Advertisement

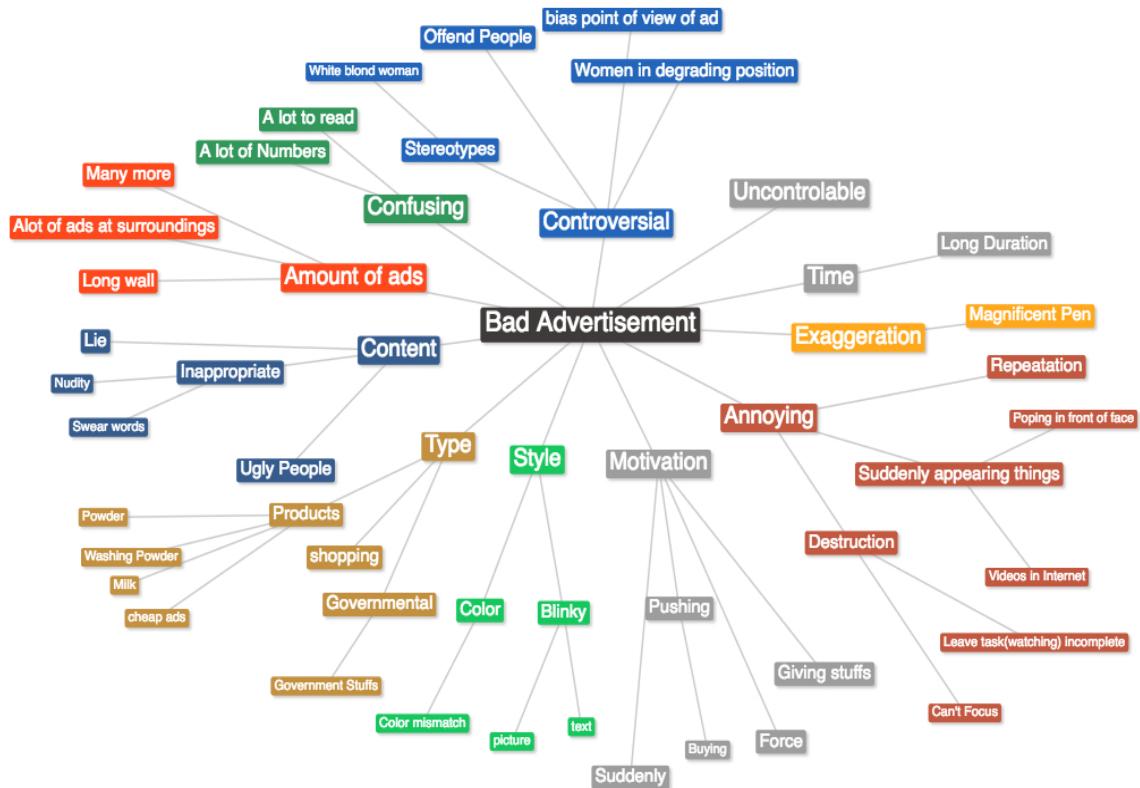


FIGURE A.5: Bad Advertisement

$\mathcal{B}$

## Focus Group

### B.1 First sketch

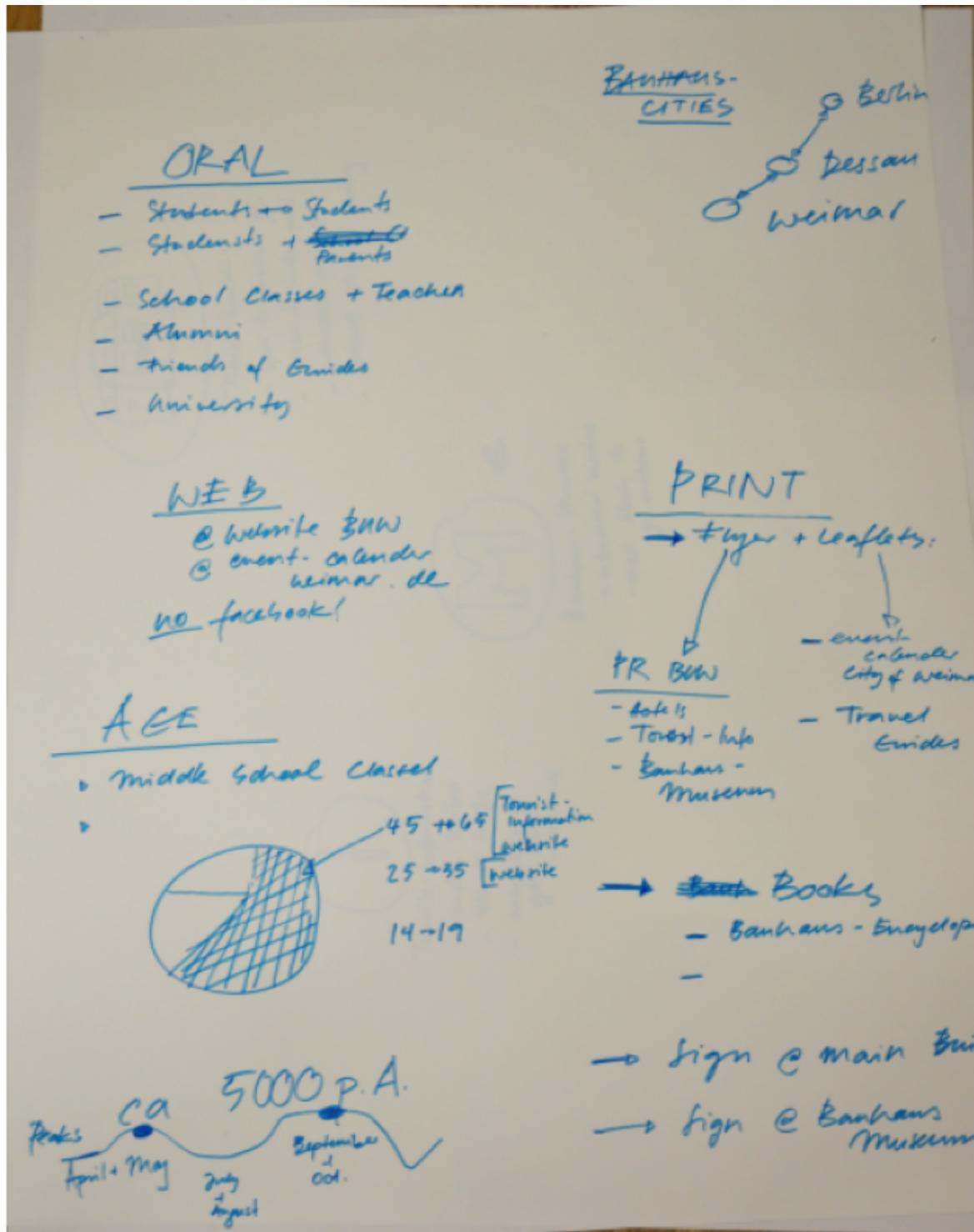


FIGURE B.1: First sketch

## B.2 Second sketch

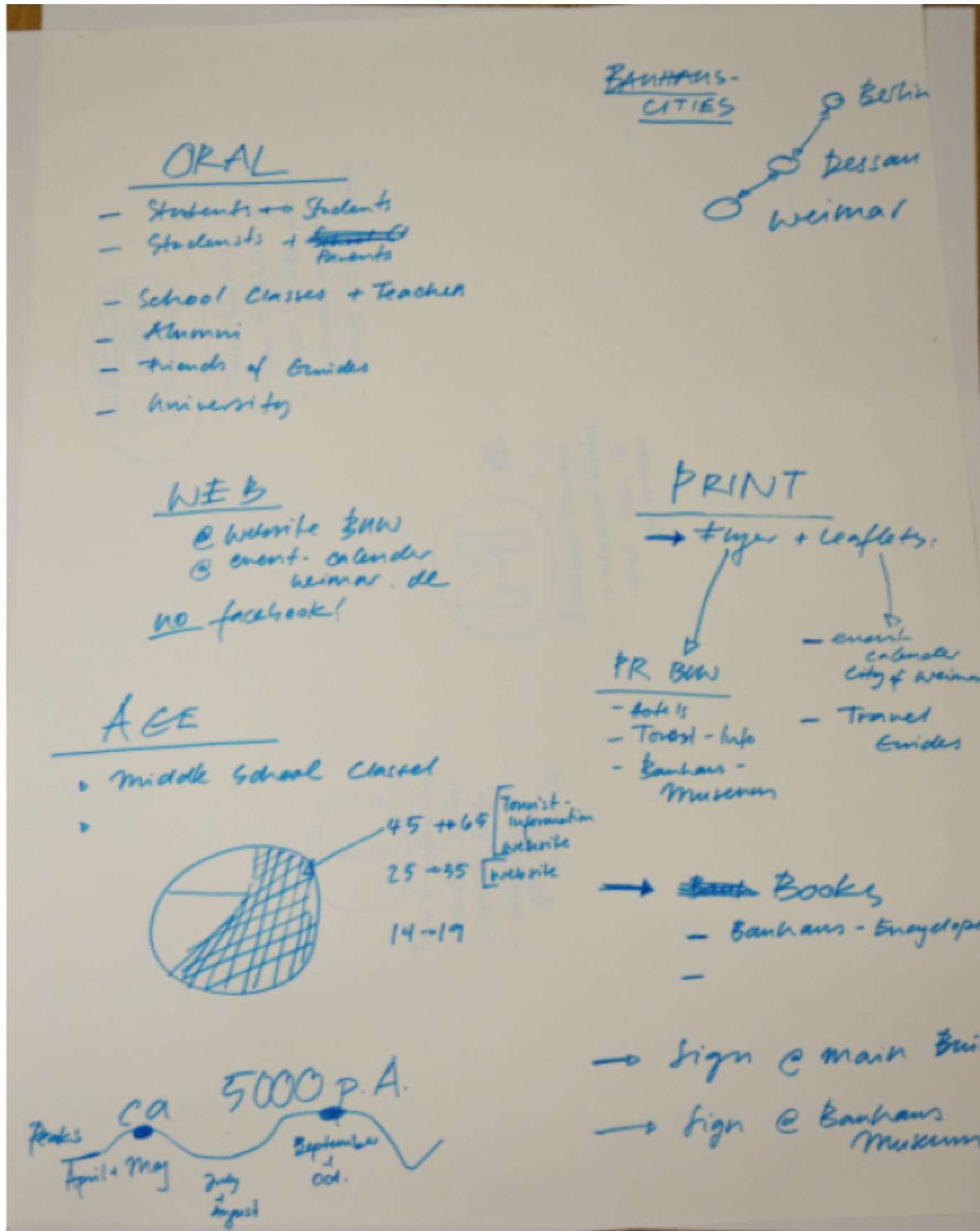


FIGURE B.2: Second sketch

### B.3 Third sketch

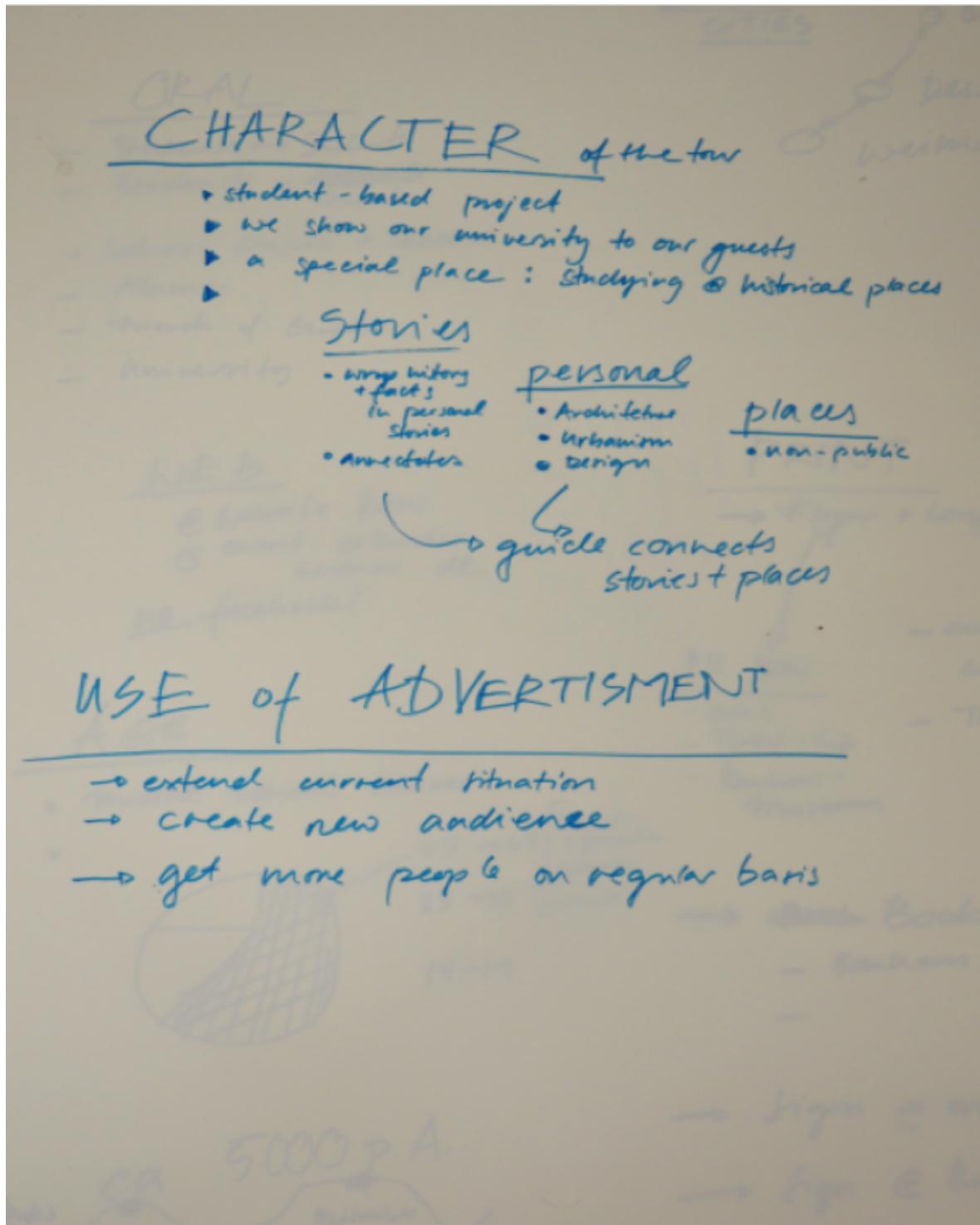


FIGURE B.3: Third sketch



## C.1 Coded Interviews

	<b>Like</b>	<b>Dislike</b>	<b>Confusing</b>	<b>Recommendations</b>
<b>Body</b>	<ul style="list-style-type: none"> <li>• Physical walking / Moving</li> <li>• Funny.</li> <li>• It is a good technique.</li> <li>• Interesting.</li> <li>• I liked obviously the body interactive prototype.</li> <li>• Easy fun and interesting.</li> <li>• Coming near to screen is a very nice.</li> <li>• Fast and easy.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding the role or task.</li> <li>• Face was not understandable.</li> <li>• The face was so confusing.</li> <li>• I did not know him</li> </ul>	<ul style="list-style-type: none"> <li>• Face character.</li> <li>• Not really sure what you are making.</li> <li>• But it makes people confused in the sense that if it is you then why not your face.</li> <li>• I did not get that the blue picture.</li> <li>• I did not understand that I am on the screen.</li> <li>• I did not know when I saw myself on the screen.</li> </ul>	<ul style="list-style-type: none"> <li>• Show the route that we can follow</li> <li>• There I should be able to choose then it should show me like house of Goethe.</li> <li>• Change some colors. I do not have any other idea.</li> <li>• There could be instructions for that</li> <li>• If there are more colors and good design for the application would be more attractive,</li> </ul>
<b>Mobile</b>	<ul style="list-style-type: none"> <li>• It is good that you visit this place</li> <li>• Interesting.</li> <li>• Mobile was also fine.</li> <li>• I liked the QR code.</li> </ul>	<ul style="list-style-type: none"> <li>• Not enough instructions.</li> <li>• A bit difficult.</li> <li>• Face was not understandable.</li> <li>• Mobile wanted a lot of login to write.</li> <li>• I do not like that the login part.</li> <li>• I do not like the login.</li> <li>• I guess typing the IP address was difficult for me</li> </ul>	<ul style="list-style-type: none"> <li>• I did not understand what to do.</li> <li>• I could not understand what to do with it.</li> <li>• It said visit my houses or locations, but I had no houses.</li> <li>• I did not know how to change the face position.</li> </ul>	<ul style="list-style-type: none"> <li>• It would be also good to show information about the locations I visited.</li> <li>• Some changes you can bring like more information about the houses.</li> <li>• I should not be forced to write my name or other information. The system should automatically get my phone IP address or something else.</li> <li>• I recommend about good fonts and design.</li> <li>• There must be like Do you want to try again after the game is over.</li> <li>• There should be instructions on how to use the face in the mobile.</li> </ul>

FIGURE C.1: Interview codes

$\mathcal{D}$

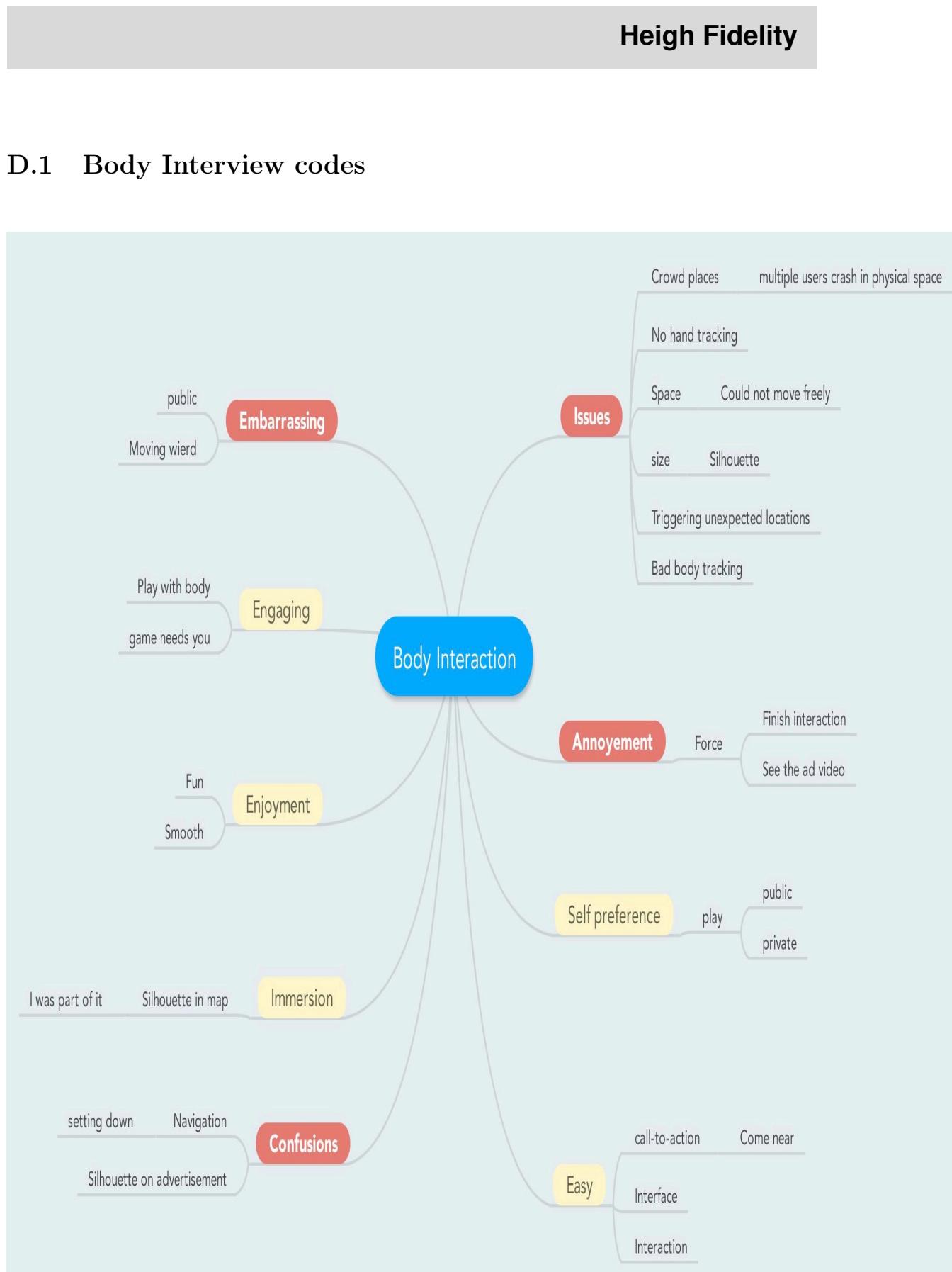


FIGURE D.1: Body Interview codes

## D.2 Mobile Interview codes



FIGURE D.2: Mobile Interview codes

### D.3 Participant performance

#### D.3.1 Body

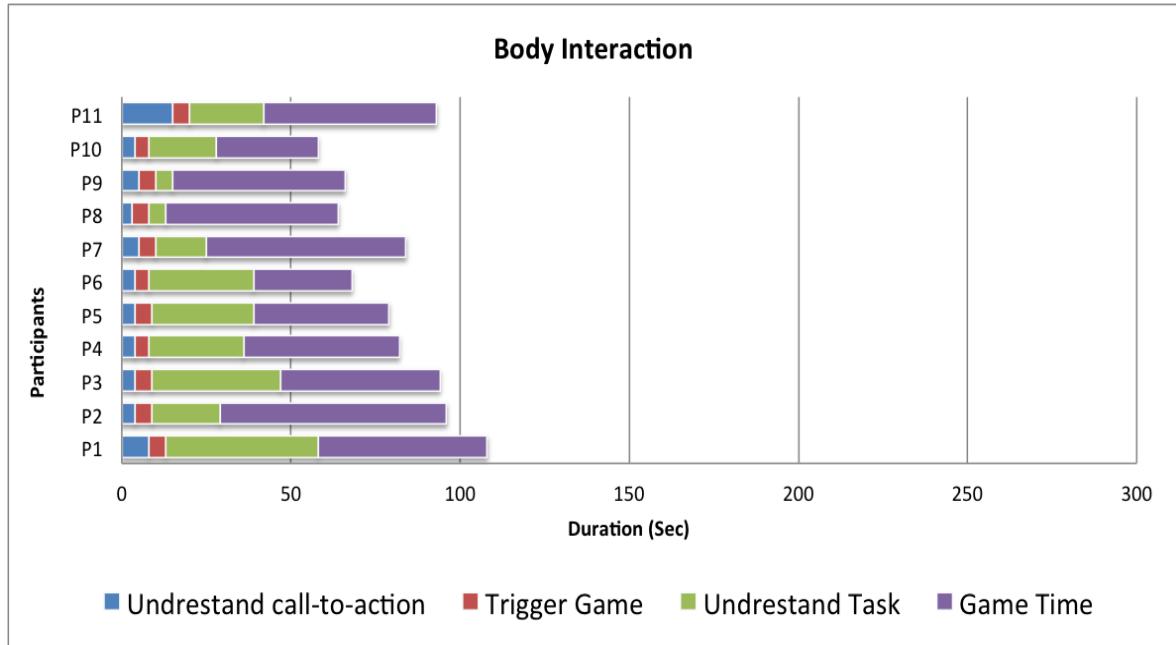


FIGURE D.3: Pariticipant's body performance

#### D.3.2 Mobile

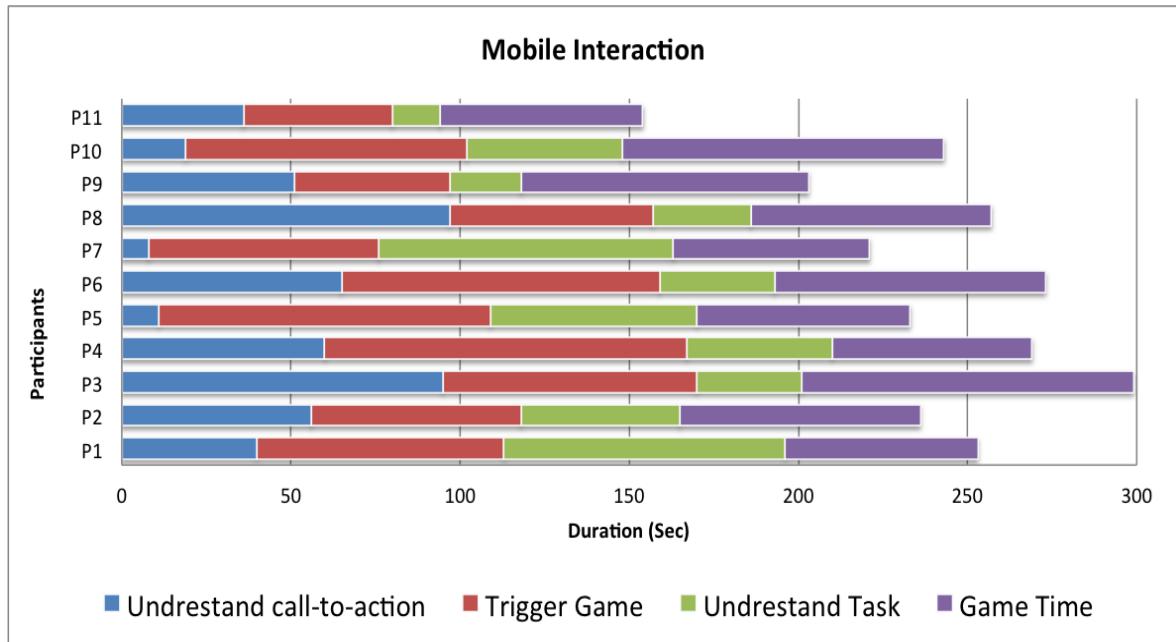


FIGURE D.4: Pariticipant's mobile performance

$\mathcal{E}$

## Field Study

### E.1 Interview Questionnaire

#### **Non-Interactive questionnaire**

(German version)

1. Um was handelte es sich bei der Werbung?
2. Würden Sie am Bauhaus-Spaziergang teilnehmen?
3. Hat Ihnen diese Art der Werbung gefallen? Bitte begründen Sie Ihre Antwort.
4. Haben Sie weitere Anmerkungen oder Verbesserungsvorschläge?

(English version)

1. What was the advertisement about?
2. Would like to take a tour with Bauhaus-Walk program?
3. Did you like this technique of advertisement? Why? Or Why not?
4. Do you have any other feedback and comments?

#### **Body interactive questionnaire**

(German version)

1. Haben Sie gesehen sich auf dem Display?
2. Wie haben Sie sich zum ersten Mal gesehen?
3. Um was handelte es sich bei der Werbung?
4. Würden Sie am Bauhaus-Spaziergang teilnehmen?
5. Hat Ihnen diese Art der Werbung gefallen? Bitte begründen Sie Ihre Antwort.
6. Haben Sie weitere Anmerkungen oder Verbesserungsvorschläge?

(English version)

1. Did you see yourself in the screen?
2. How did you see yourself at first time?
3. What was the advertisement about?
4. Do you want to take part in Bauhaus-Walk?
5. Do you like this kind of advertisement?
6. Do you have any other feedback and comments?

#### **Mobile interactive questionnaire**

(German version)

1. Um was handelte es sich bei der Werbung?
2. Möchten Sie Ihr Mobiltelefon für die Interaktion zu nutzen, warum / warum nicht?
3. Würden Sie am Bauhaus-Spaziergang teilnehmen?
4. Hat Ihnen diese Art der Werbung gefallen? Bitte begründen Sie Ihre Antwort.
5. Haben Sie weitere Anmerkungen oder Verbesserungsvorschläge?

(English version)

1. What was the advertisement about?
2. Do you like to use your mobile phone for interaction why/why not?
3. Would like to take a tour with Bauhaus-Walk program?
4. Did you like this technique of advertisement? Why? Or Why not?
5. Do you have any other feedback and comments?

FIGURE E.1: Interview questions for all conditions.

## E.2 Non-Interactive glance count

Date	Timings	Glance counts				Total			
			M	F	Total		M	F	Total
2-Feb	10:00— 11:00	Glanced	10	7	17				
		Ignored	13	14	27				
	14:00— 15:00	Total	23	21	44				
		Glanced	2	3	5				
3-Feb	10:00— 11:00	Ignored	5	9	14				
		Total	7	12	19				
	15:00— 16:00	Glanced	2	3	5				
		Ignored	5	10	15				
4-Feb	11:00— 12:00	Total	7	13	20				
		Glanced	3	1	4				
	14:00- 15:00	Ignored	10	14	24				
		Total	13	15	28				
5-Feb	11:00— 12:00	Glanced	7	6	13				
		Ignored	14	16	30				
	15:00 – 16:00	Total	21	22	43				
		Glanced	4	8	12				
6-Feb	10:00— 12:00	Ignored	20	23	43				
		Total	24	31	55				
	11:00— 12:00	Glanced	15	15	30				
		Ignored	32	38	70				
7-Feb	11:00— 12:00	Total	47	53	100				
		Glanced	11	9	20				
	11:00— 12:00	Ignored	19	28	47				
		Total	30	37	67				

FIGURE E.2: Non-interactive glance counts

### E.3 Body Interactive glance count

Date	Timings	Glance counts				Total			
			M	F	Total		M	F	Total
10-Feb	11:00— 12:00	Glanced	8	7	15	Glanced	10	8	18
		Ignored	8	8	16	Ignored	12	14	26
	15:00— 16:00	Total	16	15	31	Total	22	22	44
		Glanced	2	1	3	Glanced	13	11	24
11-Feb	10:00— 11:00	Ignored	4	6	10	Ignored	18	27	45
		Total	6	7	13	Total	31	38	69
	15:00— 16:00	Glanced	7	3	10	Glanced	6	8	14
		Ignored	10	13	23	Ignored	8	14	22
12-Feb	11:00— 12:00	Total	17	16	33	Total	14	22	36
		Glanced	4	6	10	Glanced	2	10	12
	14:00— 15:00	Ignored	2	10	12	Ignored	5	12	17
		Total	6	16	22	Total	7	17	24
16-Feb	10:00— 11:00	Glanced	4	9	13	Glanced	4	9	13
		Ignored	6	7	13	Ignored	6	7	13
	14:00— 15:00	Total	10	16	26	Total	10	16	26
		Glanced	4	3	7	Glanced	4	3	7
13-Feb	10:00— 11:00	Ignored	3	8	11	Ignored	3	8	11
		Total	7	11	18	Total	7	11	18
	10:00— 11:00	Glanced	12	11	23	Glanced	12	11	23
		Ignored	11	15	26	Ignored	11	15	26
14-Feb	10:00— 11:00	Total	23	26	49	Total	23	26	49
		Glanced	7	15	22	Glanced	7	15	22
	10:00— 11:00	Ignored	12	14	26	Ignored	12	14	26
		Total	19	29	48	Total	19	29	48

FIGURE E.3: Body interactive glance counts

## E.4 Body Interactive glance count

Date	Timings	Glance counts	Total																																
17-Feb	11:00—12:00	<table border="1"> <thead> <tr> <th></th><th>M</th><th>F</th><th>Total</th></tr> </thead> <tbody> <tr> <td>Glanced</td><td>2</td><td>3</td><td>5</td></tr> <tr> <td>Ignored</td><td>1</td><td>6</td><td>7</td></tr> <tr> <td>Total</td><td>3</td><td>9</td><td>12</td></tr> </tbody> </table>		M	F	Total	Glanced	2	3	5	Ignored	1	6	7	Total	3	9	12	<table border="1"> <thead> <tr> <th></th><th>M</th><th>F</th><th>Total</th></tr> </thead> <tbody> <tr> <td>Glanced</td><td>5</td><td>9</td><td>14</td></tr> <tr> <td>Ignored</td><td>10</td><td>22</td><td>32</td></tr> <tr> <td>Total</td><td>15</td><td>31</td><td>46</td></tr> </tbody> </table>		M	F	Total	Glanced	5	9	14	Ignored	10	22	32	Total	15	31	46
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Glanced	2	3	5																																
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FIGURE E.4: Mobile interactive glance counts

## E.5 Non-Interactive interview code



FIGURE E.5: Non-Interactive interview code

## E.6 Body Interactive interview code



FIGURE E.6: Body Interactive interview code

## E.7 Mobile Interactive interview code



FIGURE E.7: Mobile Interactive interview code

## E.8 Non-Interactive observation notes

Date	Notes
1 <sup>st</sup> Feb	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• There are many people but no one watch the screen.</li> <li>• <b>14:20:</b> A man is reading the screen.</li> <li>• The woman waiting long time in desk watched the advertisement once for 10 sec.</li> <li>• <b>15:36:</b> People do not look at advertisement at all.</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>• People lose interest after some pictures popping up.</li> </ul>
2 <sup>nd</sup> Feb Cloudy	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• <b>10:28:</b> an employee noticed and came back to see the content of advertisement for 4 sec.</li> <li>• A man noticed for 15 sec.</li> <li>• <b>10:43:</b> A man busy with his phone in front of the screen is waiting for his friend. He started reading the advertisement and came near, he is curious about Kinect Camera. 14 sec</li> <li>• A man is watching screen from information desk location.</li> <li>• <b>11:21:</b> Two couples saw ad completed two times, the woman asked the man to see the ad.</li> <li>• <b>14:51:</b> Two people watched the ad two times; they stopped looking when it repeated for the third time.</li> <li>• <b>12:36:</b> A group read the advertisement.</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>• People look at the interesting objects in front of the screen.</li> </ul>
3 <sup>rd</sup> Feb Cloudy / cold	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• <b>14:41:</b> The weather is sunny and a bit warm.</li> <li>• Asked the employee, how many people come per day? She replied that around 100-120 people from which some come to get information and some only see around.</li> <li>• <b>14:46:</b> an interviewee asked me about the advertisement to give him some more detail, so I showed him the screen.</li> <li>• <b>15:30:</b> A woman stood with her phone and glanced. She is talking while standing near screen.</li> </ul>
4 <sup>th</sup> Feb weather cloudy cold	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• <b>11:14:</b> An employee is standing to see ad for one time complete. She came again to see advertisement she is reading the content. She came to ask me about the price and I approached to take her interview, but she refused to sign in the consent form and she left.</li> <li>• <b>11:58:</b> A man reads the entire ad and for second time. He approached after talking receptionist again and asked his friend and laughed.</li> <li>• Another man saw the previous man and saw the screen.</li> </ul>
5 <sup>th</sup> Feb Cloudy and warm	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• <b>10:52:</b> A woman looked the advertisement for a while (half).</li> <li>• <b>11:20:</b> A woman saw the ad and pulled her husband to see the ad and kept looking for brochure around.</li> <li>• <b>11:40:</b> A man came after a while again and fully saw the advertisement.</li> <li>• <b>11:53:</b> The man saw the ad and came closer to ad and looked for complete and then the friend came also and joint to read for two times. They also asked about ticket from help desk.</li> <li>• <b>11:51:</b> A man saw ad while his wife was playing the music with handle.</li> <li>• <b>15:15:</b> An employee first time noticed the advertisement while passing the screen. And then walked back to see the content.</li> <li>• <b>15:35:</b> A couple see ad and standing to see more about the city from the screen. And later they asked about the Bauhaus Atelier from help desk.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>• Normally people come in couple, ones ask questions from information Desk while the other looks around, and finishes when questions or work is done by the first person.</li> <li>• Today there are many people coming inside.</li> <li>• In front of monitor on the table there is an interactive music player that with handle movement music plays.</li> <li>• People are looking things random and want to find something interesting.</li> </ul>
6 <sup>th</sup> Feb Partially cloudy Warm	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• Two men want to see map with advertisement.</li> <li>• <b>10:40:</b> A woman looking at the screen.</li> <li>• <b>10:58:</b> A man looked the entire ad.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>• Today a lot of people coming inside.</li> <li>• <b>11:30:</b> The people are less; no one looks to the screen to read.</li> </ul>
7 <sup>th</sup> Feb Warm / cloudy	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• A man is standing and read the entire ad.</li> <li>• <b>14:40:</b> People are very less now.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>• People are coming and the center is very crowded.</li> <li>• A lot of people are playing piano with the handle.</li> <li>• People look for brochures.</li> </ul>

FIGURE E.8: Non-Interactive observation notes

## E.9 Body Interactive observation notes

Date	Notes
10 <sup>th</sup> Feb Sunny / cold	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>A boy noticed himself and then showed others that there is a Kinect camera.</li> <li><b>11:44:</b> A man saw himself and starred for a while and moved out.</li> <li><b>14:23:</b> Two office employees passed by screen and saw themselves on the screen and the first woman told and pointed on the screen and showed his partner.</li> <li><b>14:05:</b> I was working in the screen.</li> <li><b>14:27:</b> A man saw the screen but did not perceive even his silhouette was projected on the screen.</li> <li><b>14:47:</b> A man saw himself on the screen, but turned back.</li> <li>Two couples noticed the screen.</li> <li><b>15:49:</b> The man noticed and ignored</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>People are very less.</li> <li>System got overloaded because of the recording silhouette.</li> <li>The reason people do not notice is because it is at corner of desk and people tend to change their head orientation toward the table, which has items.</li> </ul>
11 <sup>th</sup> Feb Sunny / cold	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li><b>10:15:</b> an employee is arranging books in front of the screen.</li> <li><b>10:22:</b> A woman saw and then ignored to interact.</li> <li><b>10:47:</b> A man noticed and attempted to start the game, but left quickly less than 2 sec and the game could be started.</li> <li><b>10:59:</b> Three young boys saw the Kinect and stood for a while beside the screen, and did not understand how it works because they were out of camera range and Kinect could not project their silhouette.</li> <li><b>11:08:</b> A girl saw herself and then did not approach.</li> <li><b>11:17:</b> A couple noticed themselves from back side of the table in the screen, to confirm if actually they were, they started waving to see the feedback, then both of them came near to screen, the boy started the game by coming more closer and completed one task, but left because he was called by her friend to leave for city tour.</li> <li><b>11:46:</b> A man noticed and then stood in front of the screen but did not proceed to trigger the game, instead he called his child to play. The girl triggered the game but she was standing very close to the screen and camera could not track her, she saw the alert message to raise her hand and so she did, but nothing happened because she was close. Then she tried to touch the screen on the locations that were blinking in the game. But nothing happened she got frustrated and left.</li> <li><b>12:52:</b> Three of the employees tried the system individually, Each had the touch event on the screen.</li> <li><b>14:42:</b> Two people noticed and approached to the screen, but could not open because they were very close to the screen.</li> <li><b>15:10:</b> An employee started the game but did not know how to work because she could not see her silhouette. She started to touch the screen thinking that it is touch.</li> </ul> <p><b>Observations</b></p> <ul style="list-style-type: none"> <li><b>10:10:</b> A man saw himself but he ignored</li> <li><b>11:26:</b> A child saw her in the screen and moved toward the screen and smiled.</li> <li><b>11:40:</b> Eva Hornecker came; we slightly changed the camera angle toward the entrance.</li> <li><b>14:15:</b> A man standing beside the screen, accidentally triggered the game, because camera was facing to the right side.</li> <li>A boy is looking the screen from far away</li> <li><b>14:18:</b> The man noticed the screen after he triggered the game accidentally, but then he did not continue and surprisingly came near to the screen and completed a task without noticing.</li> <li><b>14:22:</b> I showed the advertisement for two people that asked me how it works.</li> <li><b>14:36:</b> A man saw the screen and stood for a while and seemed he read the Call-to-Action text but he did not approach and then left the screen. (I wanted to know the reason by taking interview but he did not participate because of the city tour he had at that time.)</li> <li><b>15:16:</b> A girl accidentally triggered the game.</li> <li><b>15:22:</b> An old lady noticed herself in screen and moved a bit to confirm but turned away.</li> <li><b>15:27:</b> A girl noticed herself but did not understand what to do the instruction was not shown because she was beside the screen.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>Some people see a lot of detail in the posters and brochures and wall in tourist information center.</li> </ul>
12 <sup>th</sup> Feb Sunny / cold	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li><b>10:00:</b> The monitor face slightly changed to the entrance.</li> <li><b>10:12:</b> A man approached but was not able to play with the game because he was close enough to the screen.</li> <li><b>10:25:</b> A woman noticed and moved a bit to confirm and left.</li> <li><b>10:27:</b> The above woman saw her again but did not do anything. She was waiting for information desk.</li> <li><b>10:42:</b> Two couples tried to interact, the girl started interacting and the boy kept looking the girl's interaction, the boy left because of a work the girl continued to do a task. And then left.</li> <li><b>10:48:</b> Two boys came to try the application but application crashed.</li> <li><b>11:32:</b> A woman accidentally stood beside table and triggered the game 3 times and left without noticing it. Because the camera and screen are not in right orientation.</li> <li><b>12:00:</b> The screen rotated opposite to the entrance.</li> <li>Two people noticed and looked at screen but did not approach to play.</li> <li><b>13:15:</b> The system crashed for the second time while I was introducing the system to an employee.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>People wait at information desk and their first priority is to get their job done, and interaction with the game comes in their least priority.</li> <li>Path way is a problem for people in order to use the body interaction, because people do not want to block others way by interacting.</li> <li>Application should not be at side of information desk. People avoid these sides, because they might feel to be noticed or asked questions (may I help you?).</li> <li>People take much more time looking things on the tables, which is in front of the monitor.</li> <li>People always try to interact with their hand, like raising their hand that could be also the effect of the alert function.</li> </ul>
13 <sup>th</sup> Feb Sunny / warm	

FIGURE E.9: Body Interactive observation notes (1)

	<ul style="list-style-type: none"> <li>The employee liked it to be with a keyboard like buttons or different buttons not with body, because body seemed difficult.</li> <li>Use basic elements that could be easy to understand like handle or moving hand, touch or something other.</li> </ul>
<b>14<sup>th</sup> Feb</b> <b>Cloudy /</b> <b>Rainy and cold</b>	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li><b>10:03:</b> Very less people coming currently.</li> <li>A person looking at the sides and wall, now interacting with the headphone.</li> <li><b>10:17:</b> A woman noticed someone else in the screen from information desk.</li> <li><b>10:19:</b> A girl noticed herself others also saw it, and pointed to the screen meanwhile another boy noticed from her pointing and went near to the screen and triggered the game and left because he was called by his friend.</li> <li><b>10:22:</b> Two couples played the game, the girl played most of the tasks.</li> <li><b>10:24:</b> Another girl did interact when the interaction finished, after a second she left because she lost interest to see the advertisement.</li> <li><b>10:25:</b> A man stood to see what is going on but did not interact.</li> <li><b>10:30:</b> Weather became cloudy.</li> <li><b>10:42:</b> A girl interacted with the screen, but could not play because she was touching the screen. She kept reading and watching the screen.</li> <li><b>10:50:</b> A woman triggered the game but did not succeed to play, she understood that she could play with body, but could not because of the space, which was occupied by other person.</li> <li><b>11:00:</b> The sun is shining on the Kinect camera, makes it difficult for people detection.</li> <li><b>11:33:</b> A girl saw and told to other girl to play with and did two tasks. And the time passed they left.</li> <li>Meanwhile another girl noticed them interacting with the screen.</li> <li><b>11:50:</b> A boy noticed himself and wanted to interact, his sister held him up to be visible for the screen, he asked his father to show him how the system works, His sister triggered the game and did two tasks and when got over they left did not completely saw advertisement.</li> <li><b>12:00:</b> A man tried to play, his silhouette was projected on the screen, but he did not understand and kept touching screen and when the game time elapsed he left.</li> <li><b>12:02:</b> A woman triggered the game. She had tried it before with her daughter too she saw the advertisement too.</li> <li><b>12:07:</b> The employee was curious and tried to trigger but did not do it and saw me.</li> <li><b>12:10:</b> A woman noticed the screen, but did not approach the screen, and she turned back.</li> <li><b>13:55:</b> A man came near and triggered the game and did one task but did not continue then left with his two kids.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>The instruction while playing the game should be visible and clear; the time for game instruction is not enough.</li> <li>Attraction and engagement rate is higher but people take less time to see the entire ad.</li> </ul>
<b>15<sup>th</sup> Feb</b> <b>Partially cloudy</b> <b>Warm</b>	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li><b>11:43:</b> A man saw himself stood and then left.</li> <li><b>14:18:</b> A woman approached to screen but did not understand what to do she was touching the screen.</li> <li><b>14:35:</b> A man noticed the screen, triggered the game and explored some locations by moving his body, but was not interested and left with his two kids.</li> <li><b>15:17:</b> An old woman noticed herself and pointed for her husband and read the Call-to-Action but she did not approached and laughed.</li> </ul>
<b>16<sup>th</sup> Feb</b> <b>Cloudy /</b> <b>cold</b>	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li><b>10:05:</b> A group of students noticed and then explored locations, a participant tried to lean down to reach to the objects then she learnt by moving her body.</li> <li>Another group saw the first group and came to check out what is going on. This group just played with the body silhouette.</li> <li><b>10:22:</b> A woman saw her in the screen.</li> <li><b>10:42:</b> A man tried 4 times to get to know the functionality of the system and now he is trying again.</li> <li><b>10:57:</b> A girl saw herself but did not come in center to Call-to-Action be triggered.</li> <li><b>11:40:</b> A boy noticed himself and looked strange on the screen.</li> <li><b>11:42:</b> Another group noticed and triggered the game.</li> <li>A boy triggered the game and did two tasks but his mother was angry on him and did not allow him to play.</li> <li><b>15:53:</b> Two boys noticed, triggered and explored the game and saw the advertisement.</li> <li>The above boy's father also noticed and was looking to the boys interaction.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>With small sized screen, it is good not to show a whole group because they do not seem to fit in the screen and physical area.</li> <li>May be show a circle like alert around small silhouette while playing to drag user attention two or three times.</li> <li>Alert participants to move back if they are very near to the screen.</li> </ul>

FIGURE E.10: Body Interactive observation notes (2)

## E.10 Mobile Interactive observation notes

Date	Notes
17 <sup>th</sup> Feb	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• 10:47: A man saw by waving his hand but did not continue to approach.</li> <li>• 10:51: Another man also saw the screen and his silhouette too.</li> <li>• 11:29: A woman noticed her but did not do anything, probably because of the phone.</li> <li>• 11:30: Another woman notice again but did not approach.</li> <li>• 14:03: A kid saw her and then her mother noticed that they are playing with their image.</li> <li>• 14:50: The employees are arranging the books on the table.</li> <li>• 15:00: No one has played with the advertisement until now.</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>• Because of the books and other items on the table people look down most of the time, which drives their attention away from other things, placed up (screen).</li> <li>• I approached to a person for an interview but he denied and said I do not have any idea how it works.</li> <li>• Most old people do not have a phone, or if they have one, they do not know the functionality to use.</li> <li>• The mobile is a big restriction for old aged and youngsters for interaction.</li> </ul>
18 <sup>th</sup> Feb	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• 10:00: Screen orientation changed toward entrance.</li> <li>• 11:56: A man glanced two times (1<sup>st</sup> non-intentionally, 2<sup>nd</sup> time intentionally).</li> <li>• 14:00: Screen orientation changed opposite to entrance.</li> <li>• 14:05: Man saw himself when turned him self from front table. But did not interact..</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>• For mobile maybe people do not prefer to stand and interact, It is better to give people enough time somewhere to sit and make decision to interact with their phones.</li> <li>• It does not make sense interacting with their phones while the monitor is at their hand reach.</li> <li>• Mobile phones should be used for far hand reach and big screens or projection wall.</li> <li>• Because of amount of less people, very less glances were observed and no one has interacted with advertisement.</li> </ul>
19 <sup>th</sup> Feb	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• 10:00: Monitor positioned back to its original position.</li> <li>• A woman noticed the screen, and read the information text on the screen, but could not interact because she had an old Nokia phone, which was not compatible to operate. She was one of the guide tour who had seen the body interaction too.</li> <li>• 14:00: I interacted with the advertisement many times to drag people attention and the usage and give them some sort of encouragement.</li> <li>• 14:35: I played once again while 4 people were standing behind me.</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>• Mobile phone takes longer time to operate.</li> <li>• Less glances made to the screen, maybe because of the access information text rendered on top, which blocks full silhouette representation.</li> <li>• In tourist information people tend to get information as quick as possible; to restrict the advertisement with mobile phone, which consumes time, would not be a good choice.</li> <li>• Mobile interaction is very private to one person and does not drive others attention toward the people interacting.</li> </ul>
20 <sup>th</sup> Feb	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• 10:05: A boy noticed and took his phone out and scanned the QR-Code but his mother called him and left.</li> <li>• 10:25: A girl and a boy are seeing their body and having fun many times, just playing with their silhouette. Which drove their mothers attention too.</li> <li>• 10:45: I played in crowd and some of the people around noticed, but no interaction happened.</li> <li>• 11:00: Many children are playing with the screen using body and jumping up and down.</li> <li>• 11:35: A man waved on to the screen and came near to the screen, after reading the information text he left.</li> <li>• 13:15: Two people discuss on the application, they are curious about it.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>• Do a survey for mobile usage in public displays in places like tourist information center.</li> </ul>
21 <sup>th</sup> Feb	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• 10:00: The screen height got reduced and the screen and Kinect is facing diagonal.</li> <li>• 10:46: A man saw the screen for 3 seconds but did not play.</li> <li>• 10:48: Another man also noticed but did not approached to play.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>• The diagonal setup of the monitor suites where people see things facing down on the table.</li> </ul>

FIGURE E.11: Mobile Interactive observation notes



## Enhanced body interactive Field Study

### F.1 Enhanced Interactive advertisement Glance count

Date	Timings	Glance counts			Total				
			M	F	Total		M		
8-Apr	10:00—11:00	Glanced	7	9	16		20	18	38
		Ignored	4	10	14		13	21	34
		Total	11	19	30		33	39	72
	15:00—16:00	Glanced	13	9	22				
		Ignored	9	11	20				
		Total	22	20	42				
9-Apr	10:00—11:00	Glanced	8	10	18		16	20	36
		Ignored	10	13	23		19	22	41
		Total	18	23	41		35	42	77
	14:00—15:00	Glanced	8	10	18				
		Ignored	9	9	18				
		Total	17	19	36				
10-Apr	10:00—11:00	Glanced	7	6	13		16	25	41
		Ignored	3	8	11		16	19	35
		Total	10	14	24		32	44	76
	11:00—12:00	Glanced	9	19	28				
		Ignored	13	11	24				
		Total	22	30	52				

FIGURE F.1: Enhanced Interactive advertisement Glance count

## F.2 Enhanced Interactive observation notes

Date	Notes
8 <sup>th</sup> April Sunny /cloudy	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• <b>9:56:</b> A man tried to trigger the game, he really liked the system and he played two times, and he later explained to other of his friends.</li> <li>• <b>10:00:</b> A woman is playing, and her husband is standing behind to see her playing.</li> <li>• <b>10:31:</b> A man triggered the game, and played the game.</li> <li>• <b>11:08:</b> The man triggered the game and when advertisement came, he left.</li> <li>• <b>11:11:</b> A man accidentally triggered the game.</li> <li>• <b>11:13:</b> Two girls noticed the screen and are playing together, they were having fun and stop seeing ad.</li> <li>• <b>11:33:</b> Two couples noticed themselves from the corner and then started the game and played.</li> <li>• <b>11:48:</b> Man triggered the game and is now playing, after that his wife came to interact too.</li> <li>• <b>14:19:</b> A man saw and triggered the game.</li> <li>• <b>14:26:</b> Old people ignored the screen the woman saw herself and then ignored the screen.</li> <li>• <b>14:45:</b> Two groups started the game, but could not play because they were very near and they started touching the screen.</li> <li>• <b>14:48:</b> Two people played, the woman cloud not but the man did play two or three tasks, he came again when ad finished to play it was interesting for him and then he came for the third time.</li> <li>• <b>14:55:</b> The woman saw from the information desk.</li> <li>• <b>15:08:</b> A man played and after sometimes, he realized that all his friends have left. He was so immersed.</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>• If people are more targeted to a direction or work, then there is very little glance, but if they are looking around in the center then there is possibility of glancing toward the screen.</li> <li>• Most young audience interacts with the screen.</li> <li>• The interaction is memorable, a girl who had already interacted with the system came again and saw the screen and did another interaction.</li> <li>• Participants come very near and cannot see their silhouette.</li> <li>• People tend to bend to navigate back and they learn after they move a bit.</li> </ul>
9 <sup>th</sup> April Sunny	<p><b>Observations:</b></p> <ul style="list-style-type: none"> <li>• <b>10:17:</b> A woman triggered the game while a man standing beside the screen.</li> <li>• <b>10:21:</b> A man played with the game, but left it after a while.</li> <li>• <b>10:28:</b> A boy noticed and brought his parents to play.</li> <li>• <b>10:30:</b> The boy is playing and while standing a man noticed himself.</li> <li>• <b>11:32:</b> The man called his wife to see the screen.</li> <li>• <b>10:34:</b> A couple was waiting and saw themselves.</li> <li>• <b>10:36:</b> A woman saw herself from far and then ignored the screen.</li> <li>• <b>10:51:</b> A man triggered the game and he was standing very near, and he starting to touch the screen and he felt bad.</li> <li>• <b>11:03:</b> A man triggered the game and called his friends too, they left when they saw the advertisement.</li> </ul>
19 <sup>th</sup> April Sunny	<p><b>Observations</b></p> <ul style="list-style-type: none"> <li>• The man is looking a lot now he started the game and he is not moving to play the game.</li> </ul> <p><b>Comments</b></p> <ul style="list-style-type: none"> <li>• Some participants only stare the screen and not doing any physical activity like moving even the silhouette is projected on the screen. They think a lot and when nothing happens suddenly the move away and do not see the screen afterward.</li> <li>• I guess the people that stand still and think could actually reading the map contents.</li> </ul>

FIGURE F.2: Enhanced Interactive observation notes