Bauhaus University Weimar

Master Thesis

Comparison of Interactive and Non-Interactive advertisement in public display

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Abstract

Now a days, public displays are integrating more in the urban environment, workplaces, supermarkets, bus/train stations, restaurants and more. These displays are vastly used as an advertising medium. Most advertisers use traditional advertising as their common driving business model, which passersby have no control over the contents, and these displays are often ignored because passersby expect uninteresting display contents, which is known as *display Blindness*. On the other hand, a lot is being researched about interactive advertisements in public displays that could boost advertisement effectiveness in the form of introducing new experience to passersby with the help of new sensing technologies. From the researches that have been done so far, no empirical research has been done to compare the effectiveness and behaviors of passersby on interactive and non-interactive advertisement in public displays.

This thesis followed the HCI and Usability Engineering methods to choose, design, and develop three advertisements for *Bauhaus-Walk*, which were non-interactive, body interactive and mobile interactive. Each of them was deployed for one week in the *Weimar tourist information center*, and then the effectiveness of them were compared in between. Three measures of effectiveness were tested: the number of glances of passersby toward display, the number of *Engaged* passersby and the duration of their engagement. Besides that, the user's behaviors were observed and the two main behaviors of passersby were tested, which were the number of *Honeypot effect* and *Landing effect* towards display.

The results indicate that the body interactive advertisement increased the attention level, the number of engagements and also the duration of engagement of the passersby significantly compared to non-interactive advertisement. And along the effectiveness, the number of *Landing* and *Honeypot* effects were also improved. No passersby interacted with the mobile interactive advertisement, and its attention level, number of engagement and users behaviors were not considerable compared to non-interactive advertisement. Based on the field observations of the display, which was situated at sidewalk, a new enhanced version of body interactive advertisement was developed to attract passersby from all display angles. The findings indicate that the enhanced body interactive advertisement significantly raised attention level and engagements than the previous body interaction, but both the *Landing* and the *Honeypot* effects were not remarkable.

I am optimistic that the future of advertising in public is tied with interactive displays. Researchers would use these methods and processes, which were followed in this thesis, to develop innovative interactive advertisement as their leading driving business models.

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1 Background

1.1 Advertisement

Advertisement is everywhere, 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 " *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*". Based on the definition firstly, 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 that it matters to them. It normally has sponsor(s) to launch 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.

1.1.1 History of advertisement

The first paper advertisement was published at 1704 in an american newspaper called *Boston News Letter*, which ad was about houses and lands to be sold[1]. 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[2]. That advertisement brought attention to a wide area of applications 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. 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. From past decades display screens are replacing print advertisements because of the easy reusability of the screen and providing dynamic contents.

1.1.2 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], viewers have no control over the flow of the advertisement.

1.1.3 Online advertising

Online advertising or Internet advertising is a form of advertising that uses email, web, applications, or any other internet application used in mobile or computer that drive direct sales 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 increase online marketing [30] such as, (1) search engine optimization that suggest websites for users, (2) email, (3) video marketing, like YouTube, (4) Blogging , (5) social media, like Facebook, and many other forms.

[1] Paper advertisements: http://infoacrs.com/a/adhistory.html, Last accessed 16th March 2016

[2] 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

1.1.4 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 includes laptop to smart watches, and these technologies try to blend in our environments such as 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. Mark Weiser [3][90] explains as, "*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] such as, (1) ubiquitous access, (2) context awareness, (3) intelligence and (4) natural interaction. 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. 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].

1.1.5 Advertising program

To have an 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 1.1 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 a company. The company should clearly invest on the advertising of certain product. It should be not less to have lower effect, nor too high to risk the company benefits.

3. **Message:**
   The message of the advertising should be very clear, precise and innovative. The message should be generated in a way such that can impact on viewers. It should go through 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

[3]Ubiquitous Computing: http://www.ubiq.com/hypertext/weiser/UbiHome.html

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 many times the advertiser can reach to thes 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 effective was the advertisement for a given 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.

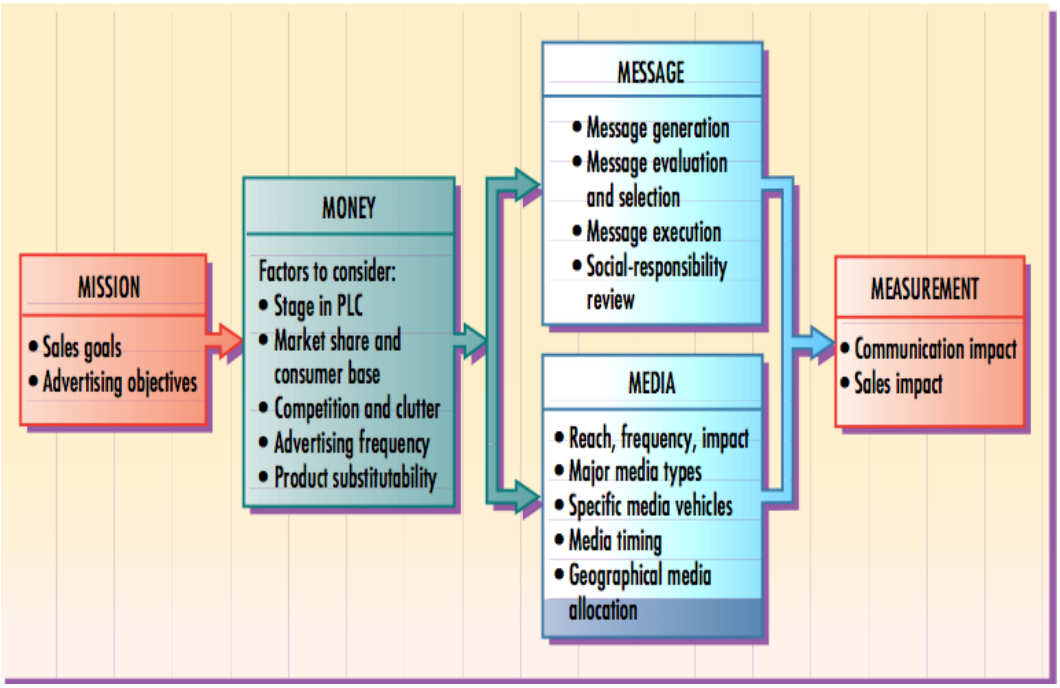

FIGURE 1.1: Advertising Program, [37]

1.1.6 Advertisement performance

Advertisers are interested in *conversion-rate*: "*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 1.2. 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.

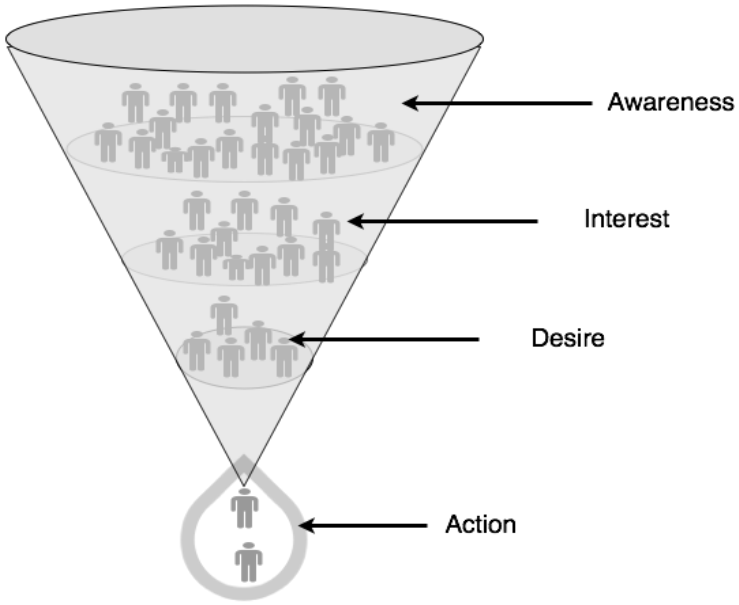

FIGURE 1.2: Conversion Funnel

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 decrease in the next layer, who desire for a product and may read the details and specifications. But not all people, who desire for the product, would buy the product because maybe the person does not have money to buy or there could be other reasons. 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 number of clicks on advertisement to the number of visitors, who make 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.

1.2 Public displays

Displays are increasingly getting cheaper and being used in various locations such as, 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 displays are interactive like purchasing train tickets with a touch capability, and even interactive advertisement displays in which passersby 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.

1.2.1 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*" [4] 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*[5] [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 [6], Greenber and Michael [24]. The study investigated on how people transition from individual interaction to group 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

[4] Hole-In-Space: https://www.youtube.com/watch?v=SyIJJr6Ldg8

[5] 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.

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

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[7]. *Blueboard* [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 [8] and proposed a design on how to share IM[9] 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 passersby via Bluetooth [53]. A most relevant information could be shown to passersby 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.

1.2.2 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, 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 [10]. There are various other companies that until now are working like *printsign* [11], a big company in UK that designs and advertises in big displays for their customers. *Sony Ziris*[12], the company that sells advertising screen, and supports advertising content to be played on their screens. *BBC big screen*[13], 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

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

[8] Large display groupware applications

[9] Internet messaging

[10] 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,lastaccessed:18May2016`

[11] printsigne: `http://www.printsign.co.uk/`, last access 19 May 19, 2016

[12] Sony ziris: `http://pro.sony.com/bbsc/ssr/cat-monitors/`, last accessed 19 May 2016

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

like *taxi TV*[14]. Another world famous out door advertising company are *ClearChannel* [15], and *Dynascan*[16] that advertise in 360 degree big outdoor and indoor screens enabled with content management system that advertisement could be edited and changed. *Kinton*[17] another cylindrical LED screen company that supports for big solutions like advertising, cinema and more.

1.2.3 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*[18] is involved to make interactive advertisement in public display. *MC Donald*[19] allowed passersby 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[20] 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 passersby stop child abuse[21]. Advertisements could be done in various forms and now are in restaurants and bars like Clo Winebar[22] a bar that customers are able to view and select orders from an interactive screen. *pizzaHut* [23] 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[24] that illustrates various examples of projection based interactive advertisement in supermarket, hotels and airports. *JCDecaux*[25] 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.

1.2.4 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 passersby 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 passersby be attracted toward display. When they are attracted toward display how to motivate them toward display to 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

[14]Taxi TV: `http://verifonemedia.com/networks/taxi-media/`

[15]`http://clearchanneloutdoor.com/`

[16] Dynascan: `http://www.dynascanusa.com/products/360-degree-led-video-displays/`

[17]Kinton: `http://www.kinoton.de/de/home.html`

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

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

[20]Hair awareness: `https://www.youtube.com/watch?v=qqd6hgO_AOI` last accessed 20 May 2016

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

[22]17 Awsome bars: `http://walyou.com/bars-and-restaurants-themes-geeks/`, last accessed 19 May 2016

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

[24]Ariztoz: `https://www.youtube.com/watch?v=FH2TON7LRIY`, last accessed: 19 May 2016

[25]JCDecaux: http://www.jcdecaux.com/en/, last accessed 19 May 2016

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. Therefore the responsibility is on displays to be able to provide enough attraction for the passersby 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 Rogeres [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 passersby may glance toward display but necessarily not motivated to interact with the display. There is significant need to understand how to motivate passersby 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* [26] 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*[27] creates innovative advertisements which most of them are full of fantasy.

1.2.5 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 passersby [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 passersby 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 passersby as *image*, *silhouette* and *abstract*.

- **Overlays:**
  Overlays model coul 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

[26] https://www.youtube.com/watch?v=UIHwHqaY3SY, last accessed: 19 May 2016

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

high performance projectors like CLD projector[28]. For example *Jumping Frog* [14]that was projected on surface and by touching it the frog would jump to other surface.

1.2.6 Interaction models

Different interaction models are created as shown below that illustrates how passersby 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 passersby. This was designed to communicate detailed information as it was interactive and passersby 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.

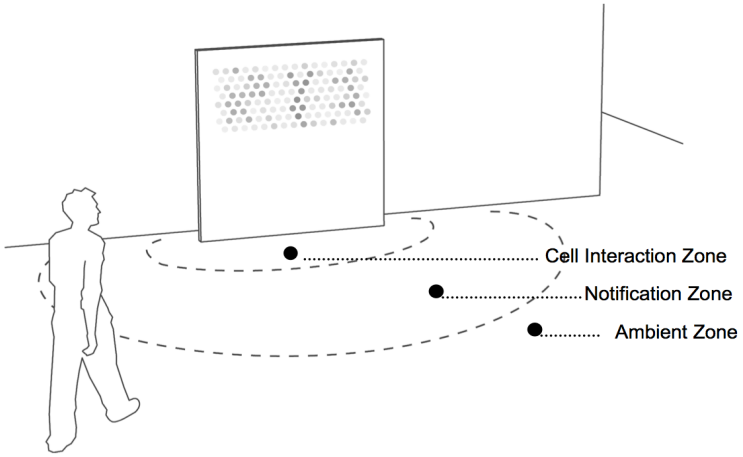

FIGURE 1.3: Three zones of interaction, [76]

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 passersby 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.

[28]LCD projector: `http://www.projectorreviews.com/projector-categories/lcd-projectors/`, last accessed 19 May 2016

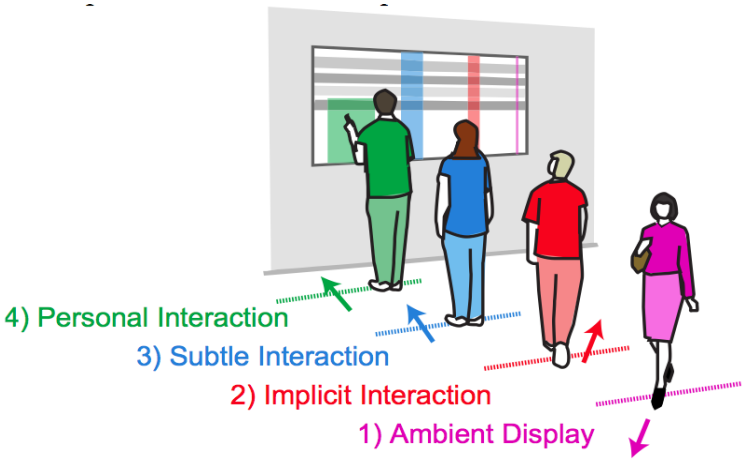

FIGURE 1.4: Four interaction phases, [76]

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 passersby 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.

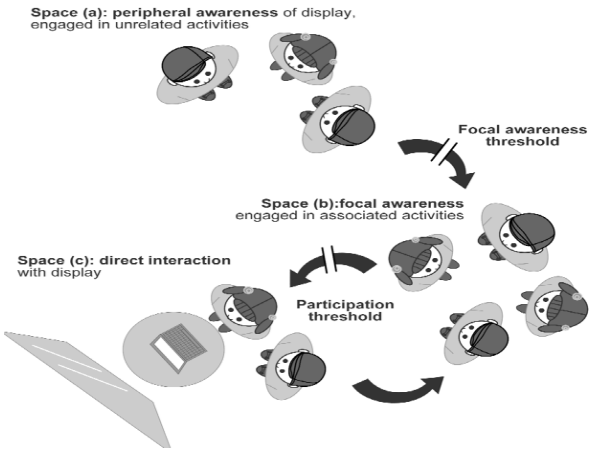

FIGURE 1.5: A diagram of public interaction flow accross thresholds, [15]

3. *Audience funnel* [2] is another design based on public interaction flow model that have several interaction phases. The phases shown in this model are linear processes in which if the first 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.

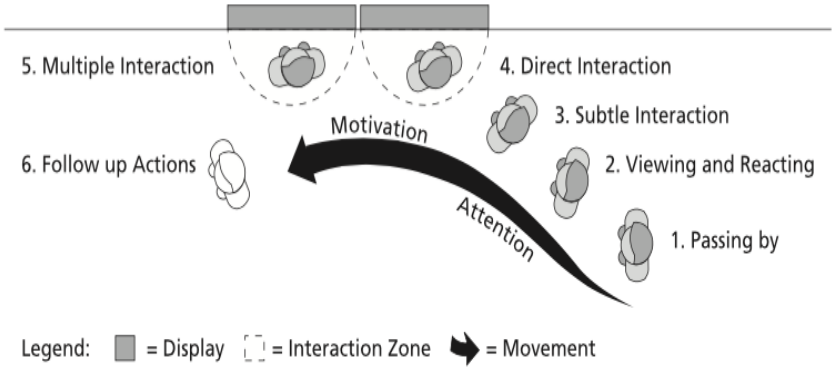

FIGURE 1.6: The Audience Funnel, [2]

1.2.7 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[29] 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 in Television sets and other computer screens, and has almost replaced CRT. It uses Light-modulating properties of liquid crystal[30],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[31].
  - 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.

[29]Ferdinand Brown: `http://www.britannica.com/biography/Ferdinand-Braun`, last accessed 21 May 2016
[30]Liquid Crystal: `https://en.wikipedia.org/wiki/Liquid_crystal`, last access 21 may 2016
[31]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 are being made for different purposes. The sensor that was difficult to use due to many dependencies and higher cost in past, 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[32], 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[33], 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[34]:
      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.
  - **Getures**
    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

[32]Presence: http://www.dictionary.com/browse/presence
[33]Microsoft Kinect: `https://developer.microsoft.com/de-de/windows/kinect`, Last accessed: 1/05/2016 at 13:21:00
[34]Audio sensors: `https://www.sparkfun.com/categories/186`, last accessed 22 may 2016

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.

  - **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.

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Appendices

A

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	(FFMMM)	=== Group	(M)	=== Glanced Male
(M) ==== Male	(F)	=== Glanced Female	(FFMMM)	=== 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 or at phone # 015216967648.

Signature: ----------

FIGURE A.3: Interview consent form

A.4 Interview Color codes

FIGURE A.4: Good Advertisement

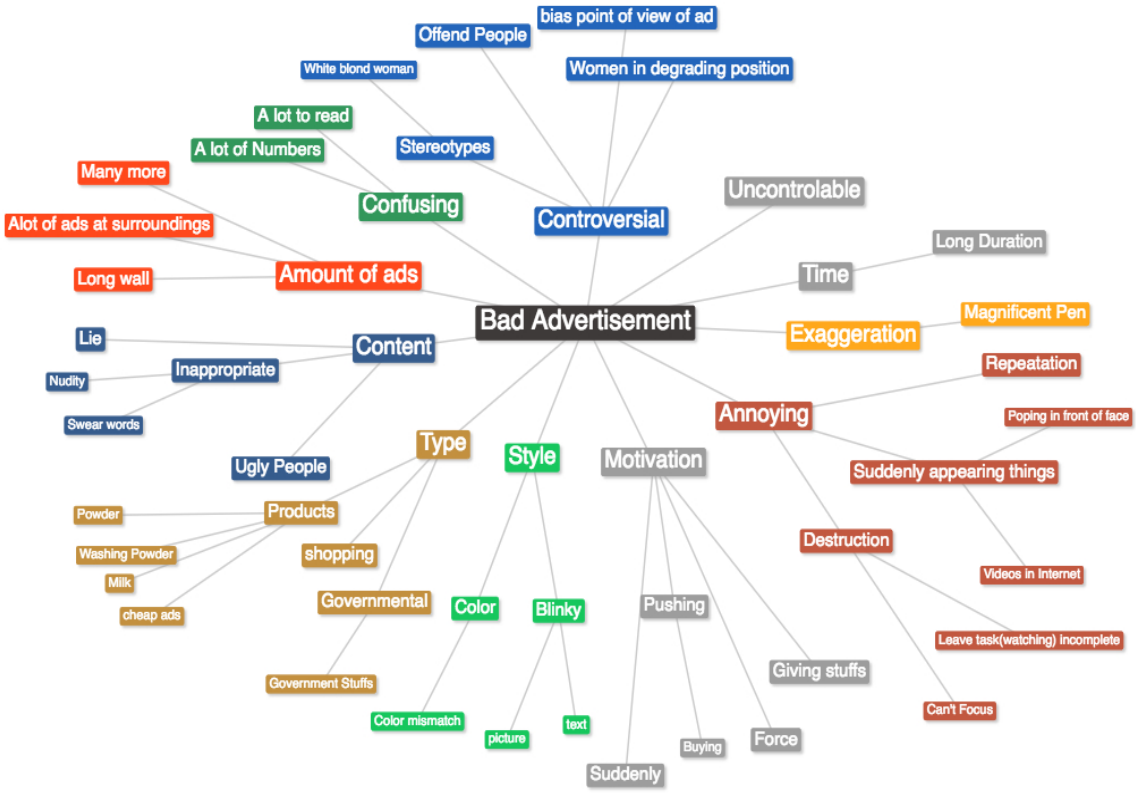

FIGURE A.5: Bad Advertisement

B

Focus Group

B.1 First sketch

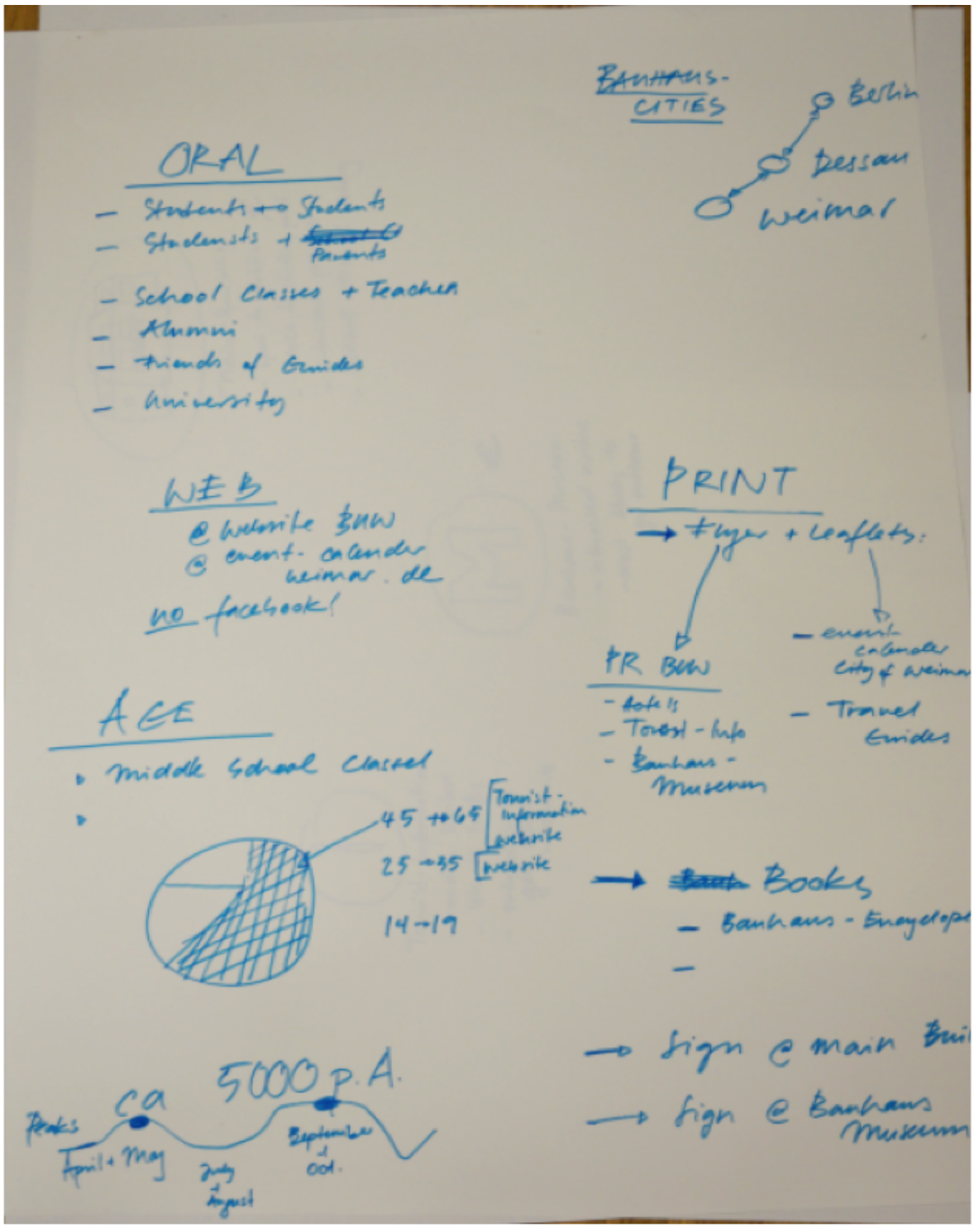

FIGURE B.1: First sketch

B.2 Second sketch

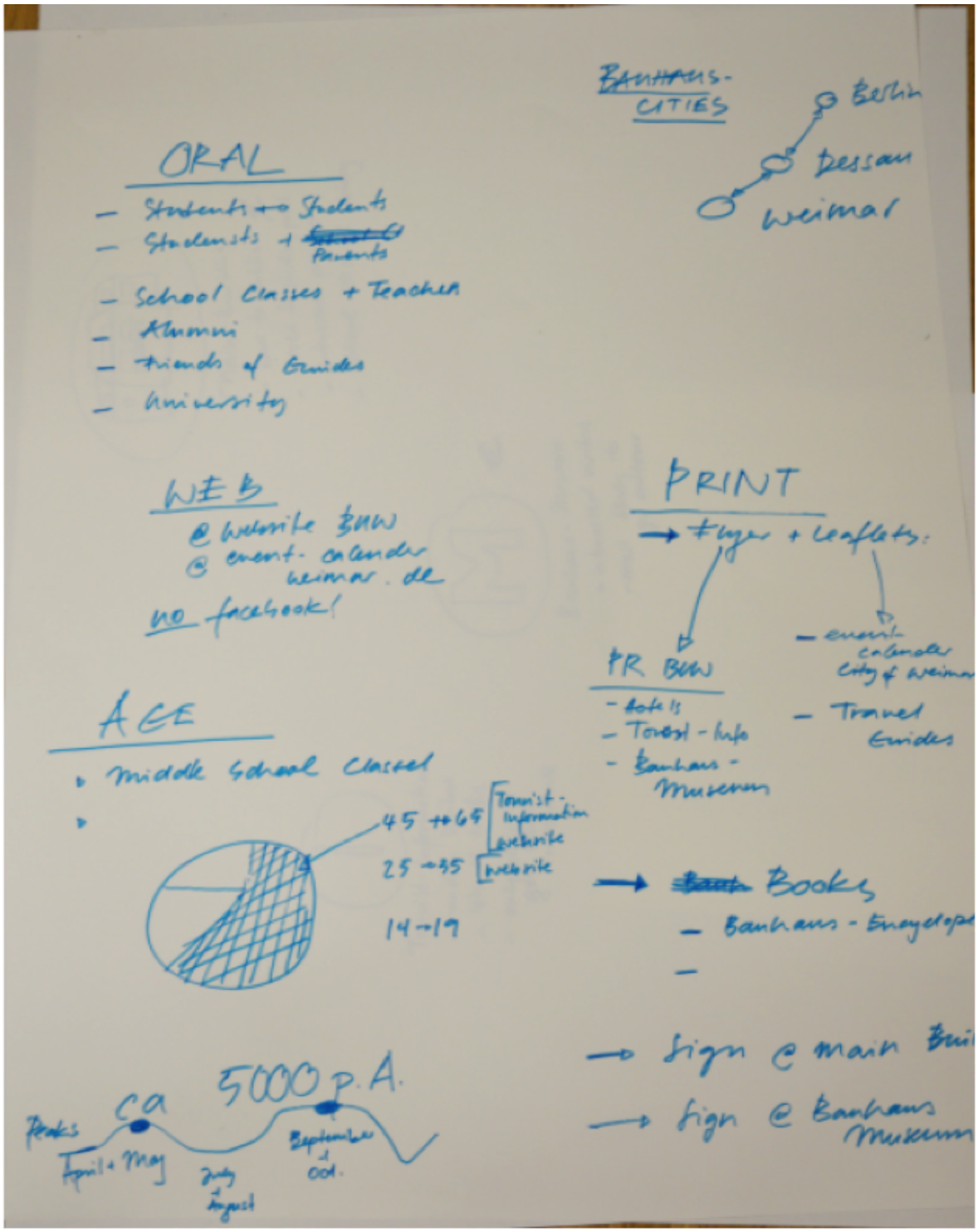

FIGURE B.2: Second sketch

B.3 Third sketch

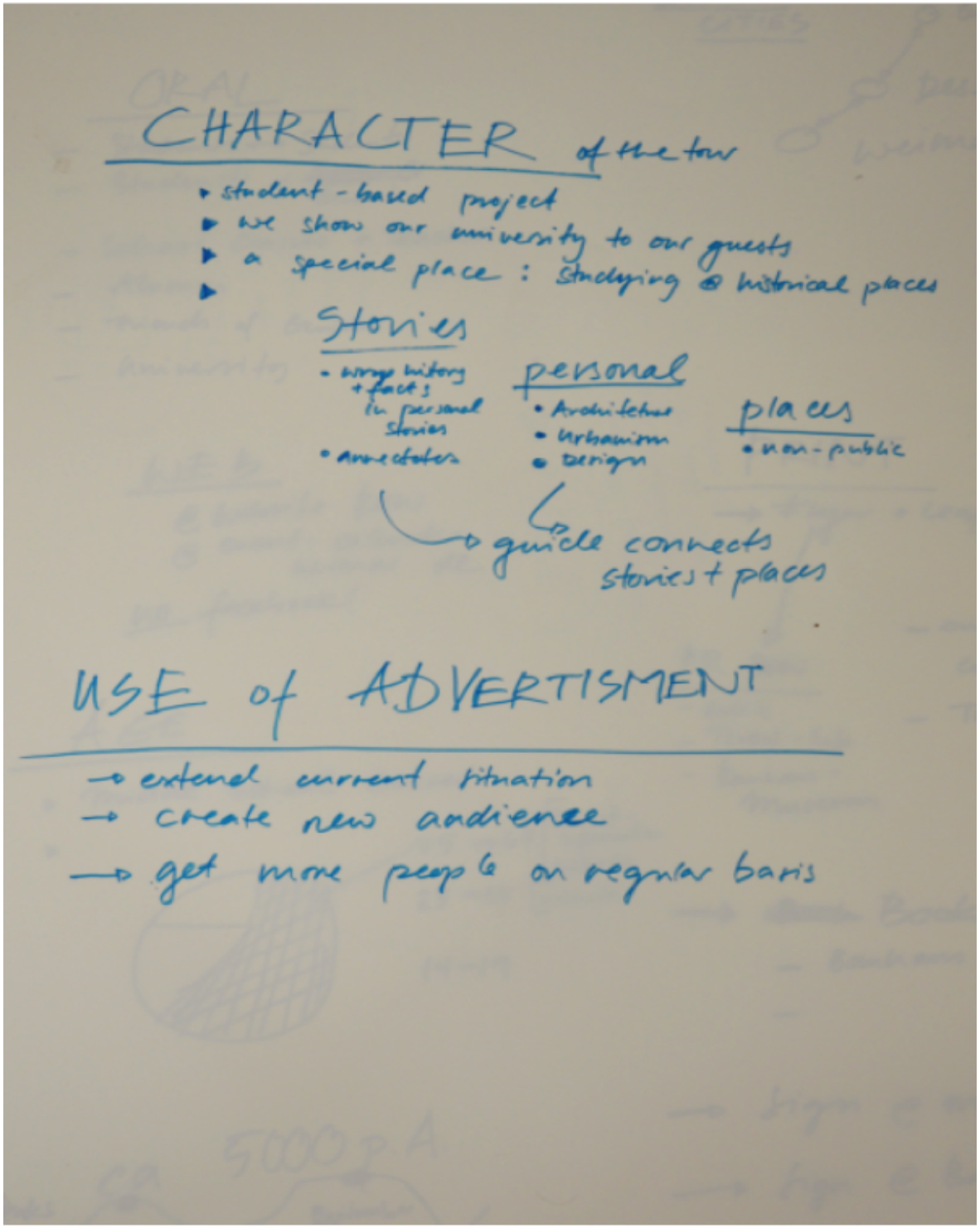

FIGURE B.3: Third sketch

C Low Fidelity

C.1 Coded Interviews

	Like	Dislike	Confusing	Recommendations
Body	• Physical walking / Moving • Funny. • It is a good technique. • Interesting. • I liked obviously the body interactive prototype. • Easy fun and interesting. • Coming near to screen is a very nice. • Fast and easy.	• Understanding the role or task. • Face was not understandable. • The face was so confusing. • I did not know him	• Face character. • Not really sure what you are making. • But it makes people confused in the sense that if it is you then why not your face. • I did not get that the blue picture. • I did not understand that I am on the screen. • I did not know when I saw myself on the screen.	• Show the route that we can follow • There I should be able to choose then it should show me like house of Goethe. • Change some colors. I do not have any other idea. • There could be instructions for that • If there are more colors and good design for the application would be more attractive,
Mobile	• It is good that you visit this place • Interesting. • Mobile was also fine. • I liked the QR code.	• Not enough instructions. • A bit difficult. • Face was not understandable. • Mobile wanted a lot of login to write. • I do not like that the login part, • I do not like the login. • I guess typing the IP address was difficult for me	• I did not understand what to do. • I could not understand what to do with it. • It said visit my houses or locations, but I had no houses. • I did not know how to change the face position.	• It would be also good to show information about the locations I visited. • Some changes you can bring like more information about the houses. • I should not be forced to write my name or other information. The system should automatically get my phone IP address or something else. • I recommend about good fonts and design. • There must be like Do you want to try again after the game is over. • There should be instructions on how to use the face in the mobile.

FIGURE C.1: Interview codes

D

Heigh Fidelity

D.1 Body Interview codes

FIGURE D.1: Body Interview codes

D.2 Mobile Interview codes

FIGURE D.2: Mobile Interview codes

D.3 Pariticipant performance

D.3.1 Body

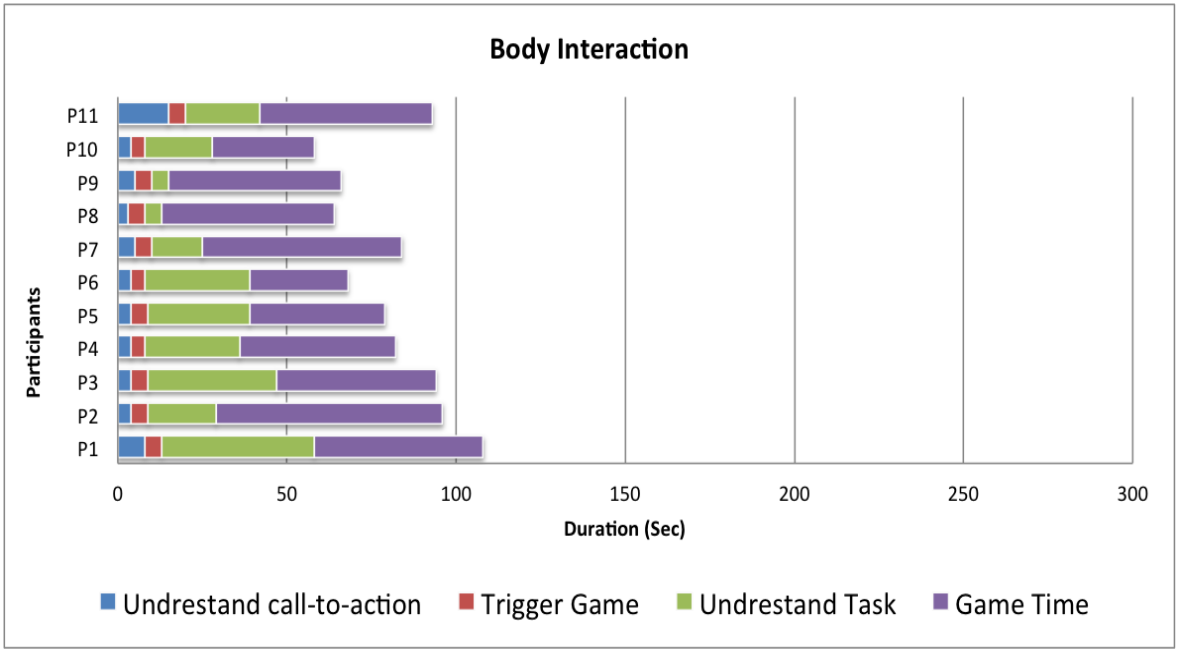

FIGURE D.3: Pariticipant's body performance

D.3.2 Mobile

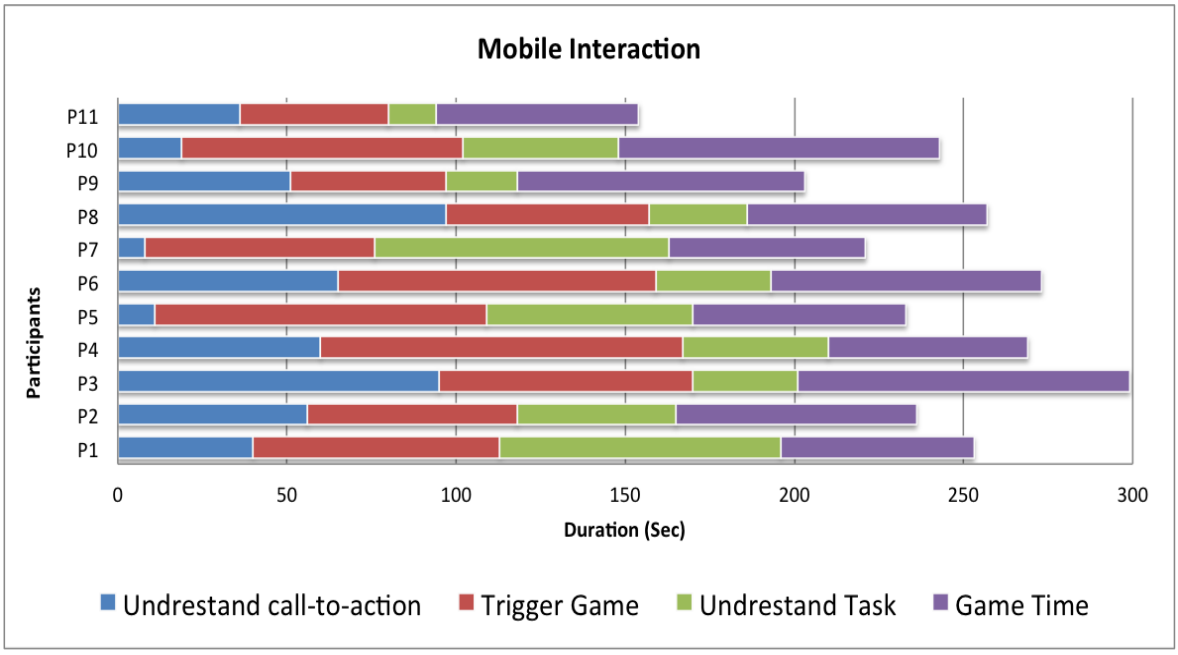

FIGURE D.4: Pariticipant's mobile performance

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			
2-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	10	7	17	Glanced	12	10	22
		Ignored	13	14	27	Ignored	18	23	41
		Total	23	21	44	Total	30	33	63
	14:00—15:00		M	F	Total				
		Glanced	2	3	5				
		Ignored	5	9	14				
		Total	7	12	19				
3-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	2	3	5	Glanced	4	6	10
		Ignored	9	17	26	Ignored	14	27	41
		Total	11	20	31	Total	18	33	51
	15:00—16:00		M	F	Total				
		Glanced	2	3	5				
		Ignored	5	10	15				
		Total	7	13	20				
4-Feb	11:00—12:00		M	F	Total		M	F	Total
		Glanced	3	1	4	Glanced	9	5	14
		Ignored	10	14	24	Ignored	17	26	43
		Total	13	15	28	Total	26	31	57
	14:00-15:00		M	F	Total				
		Glanced	6	4	10				
		Ignored	7	12	19				
		Total	13	16	29				
5-Feb	11:00—12:00		M	F	Total		M	F	Total
		Glanced	7	6	13	Glanced	11	14	25
		Ignored	14	16	30	Ignored	34	39	73
		Total	21	22	43	Total	45	53	98
	15:00 – 16:00		M	F	Total				
		Glanced	4	8	12				
		Ignored	20	23	43				
		Total	24	31	55				
6-Feb	10:00—12:00		M	F	Total		M	F	Total
		Glanced	15	15	30	Glanced	15	15	30
		Ignored	32	38	70	Ignored	32	38	70
		Total	47	53	100	Total	47	53	100
7-Feb	11:00—12:00		M	F	Total		M	F	Total
		Glanced	11	9	20	Glanced	11	9	20
		Ignored	19	28	47	Ignored	19	28	47
		Total	30	37	67	Total	30	37	67

FIGURE E.2: Non-interactive glance counts

E.3 Body Interactive glance count

Date	Timings	Glance counts				Total			
10-Feb	11:00—12:00		M	F	Total		M	F	Total
		Glanced	8	7	15	Glanced	10	8	18
		Ignored	8	8	16	Ignored	12	14	26
		Total	16	15	31	Total	22	22	44
	15:00—16:00		M	F	Total				
		Glanced	2	1	3				
		Ignored	4	6	10				
		Total	6	7	13				
11-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	7	3	10	Glanced	13	11	24
		Ignored	10	13	23	Ignored	18	27	45
		Total	17	16	33	Total	31	38	69
	15:00—16:00		M	F	Total				
		Glanced	6	8	14				
		Ignored	8	14	22				
		Total	14	22	36				
12-Feb	11:00—12:00		M	F	Total		M	F	Total
		Glanced	4	6	10	Glanced	6	11	17
		Ignored	2	10	12	Ignored	7	22	29
		Total	6	16	22	Total	13	33	46
	14:00—15:00		M	F	Total				
		Glanced	2	5	7				
		Ignored	5	12	17				
		Total	7	17	24				
16-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	4	9	13	Glanced	8	12	20
		Ignored	6	7	13	Ignored	9	15	24
		Total	10	16	26	Total	17	27	44
	14:00—15:00		M	F	Total				
		Glanced	4	3	7				
		Ignored	3	8	11				
		Total	7	11	18				
13-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	12	11	23	Glanced	12	11	23
		Ignored	11	15	26	Ignored	11	15	26
		Total	23	26	49	Total	23	26	49
14-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	7	15	22	Glanced	7	15	22
		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		M	F	Total		M	F	Total
		Glanced	2	3	5	Glanced	5	9	14
		Ignored	1	6	7	Ignored	10	22	32
		Total	3	9	12	Total	15	31	46
	14:00—15:00		M	F	Total				
		Glanced	3	6	9				
		Ignored	9	16	25				
		Total	12	22	34				
18-Feb	11:00—12:00		M	F	Total		M	F	Total
		Glanced	1	4	5	Glanced	3	6	9
		Ignored	6	14	20	Ignored	9	20	29
		Total	7	18	25	Total	12	26	38
	14:00—15:00		M	F	Total				
		Glanced	2	2	4				
		Ignored	3	6	9				
		Total	5	8	13				
19-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	2	1	3	Glanced	6	9	15
		Ignored	1	8	9	Ignored	7	24	31
		Total	3	9	12	Total	13	33	46
	14:00—15:00		M	F	Total				
		Glanced	2	3	5				
		Ignored	5	14	19				
		Total	7	17	24				
20-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	13	17	30	Glanced	13	17	30
		Ignored	19	27	46	Ignored	19	27	46
		Total	32	44	76	Total	32	44	76
21-Feb	10:00—11:00		M	F	Total		M	F	Total
		Glanced	5	7	12	Glanced	5	7	12
		Ignored	6	13	19	Ignored	6	13	19
		Total	11	20	31	Total	11	20	31

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
1st Feb	**Observations** • There are many people but no one watch the screen. • **14:20:** A man is reading the screen. • The woman waiting long time in desk watched the advertisement once for 10 sec. • **15:36:** People do not look at advertisement at all. **Comments:** • People lose interest after some pictures popping up.
2nd Feb Cloudy	**Observations:** • **10:28:** an employee noticed and came back to see the content of advertisement for 4 sec. • A man noticed for 15 sec. • **10:43:** 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 • A man is watching screen from information desk location. • **11:21: T**wo couples saw ad completed two times, the woman asked the man to see the ad. • **14:51:** Two people watched the ad two times; they stopped looking when it repeated for the third time. • **12:36:** A group read the advertisement. **Comments:** • People look at the interesting objects in front of the screen.
3rd Feb Cloudy / cold	**Observations** • **14:41:** The weather is sunny and a bit warm. • 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. • **14:46:** an interviewee asked me about the advertisement to give him some more detail, so I showed him the screen. • **15:30:** A woman stood with her phone and glanced. She is talking while standing near screen.
4th Feb weather cloudy cold	**Observations** • **11:14:** 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. • **11:58:** A man reads the entire ad and for second time. He approached after talking receptionist again and asked his friend and laughed. • Another man saw the previous man and saw the screen.
5th Feb Cloudy and warm	**Observations** • **10:52:** A woman looked the advertisement for a while (half). • **11:20:** A woman saw the ad and pulled her husband to see the ad and kept looking for brochure around. • **11:40:** A man came after a while again and fully saw the advertisement. • **11:53:** 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. • **11:51:** A man saw ad while her wife was playing the music with handle. • **15:15:** An employee first time noticed the advertisement while passing the screen. And then walked back to see the content. • **15:35:** 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. **Comments** • 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. • Today there are many people coming inside. • In front of monitor on the table there is an interactive music player that with handle movement music plays. • People are looking things random and want to find something interesting.
6th Feb Partially cloudy Warm	**Observations** • Two men want to see map with advertisement. • **10:40:** A woman looking at the screen. • **10:58:** A man looked the entire ad. **Comments** • Today a lot of people coming inside. • **11:30:** The people are less; no one looks to the screen to read.
7th Feb Warm / cloudy	**Observations** • A man is standing and read the entire ad. • **14:40:** People are very less now. **Comments** • People are coming and the center is very crowded. • A lot of people are playing piano with the handle. • People look for brochures.

FIGURE E.8: Non-Interactive observation notes

E.9 Body Interactive observation notes

Date	Notes
10st Feb Sunny / cold	**Observations** • A boy noticed himself and then showed others that there is a Kinect camera. • **11:44:** A man saw himself and starred for a while and moved out. • **14:23:** 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. • **14:05:** I was working in the screen. • **14:27:** A man saw the screen but did not perceived even his silhouette was projected on the screen. • **14:47:** A man saw himself on the screen, but turned back. • Two couples noticed the screen. • **15:49:** The man noticed and ignored **Comments:** • People are very less. • System got overloaded because of the recording silhouette. • 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.
11th Feb Sunny / cold	**Observations:** • **10:15:** an employee is arranging books in front of the screen. • **10:22:** A woman saw and then ignored to interact. • **10:47:** A man noticed and attempted to start the game, but left quickly less than 2 sec and the game could be started. • **10:59:** 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. • **11:08:** A girl saw herself and then did not approached. • **11:17:** 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. • **11:46:** 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. • **12:52:** Three of the employees tried the system individually, Each had the touch event on the screen. • **14:42:** Two people noticed and approached to the screen, but could not open because they were very close to the screen. • **15:10:** 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.
12th Feb Sunny / cold	**Observations** • **10:10:** A man saw himself but he ignored • **11:26:** A child saw her in the screen and moved toward the screen and smiled. • **11: 40:** Eva Hornecker came; we slightly changed the camera angle toward the entrance. • **14:15:** A man standing beside the screen, accidently triggered the game, because camera was facing to the right side. • A boy is looking the screen from far away • **14:18:** The man noticed the screen after he triggered the game accidently, but then he did not continue and surprisingly came near to the screen and completed a task without noticing. • **14:22:** I showed the advertisement for two people that asked me how it works. • **14: 36:** 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.) • **15:16:** A girl accidently trigged the game. • **15:22:** An old lady noticed herself in screen and moved a bit to confirm but turned away. • **15:27:** A girl noticed herself but did not understand what to do the instruction was not shown because she was beside the screen. **Comments** • Some people see a lot of detail in the posters and brochures and wall in tourist information center.
13th Feb Sunny / warm	**Observations** • **10:00:** The monitor face slightly changed to the entrance. • **10:12:** A man approached but was not able to play with the game because he was close enough to the screen. • **10:25:** A woman noticed and moved a bit to confirm and left. • **10:27:** The above woman saw her again but did not do anything. She was waiting for information desk. • **10:42:** 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. • **10:48:** Two boys came to try the application but application crashed. • **11:32:** A woman accidently stood beside table and triggered the game 3 times and left without noticing it. Because the camera and screen are not in right orientation. • **12:00:** The screen rotated opposite to the entrance. • Two people noticed and looked at screen but did not approach to play. • **13:15:** The system crashed for the second time while I was introducing the system to an employee. **Comments** • 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. • 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. • 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 ?). • People take much more time looking things on the tables, which is in front of the monitor. • People always try to interact with their hand, like raising their hand that could be also the effect of the alert function.

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

	• The employee liked it to be with a keyboard like buttons or different buttons not with body, because body seemed difficult. • Use basic elements that could be easy to understand like handle or moving hand, touch or something other.
14th Feb Cloudy / Rainy and cold	**Observations** • **10:03:** Very less people coming currently. • A person looking at the sides and wall, now interacting with the headphone. • **10:17:** A woman noticed someone else in the screen from information desk. • **10:19:** 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. • **10:22:** Two couples played the game, the girl played most of the tasks. • **10:24:** Another girl did interact when the interaction finished, after a second she left because she lost interest to see the advertisement. • **10:25:** A man stood to see what is going on but did not interact. • **10:30:** Weather became cloudy. • **10:42:** A girl interacted with the screen, but could not play because she was touching the screen. She kept reading and watching the screen. • **10:50:** 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. • **11:00:** The sun is shining on the Kinect camera, makes it difficult for people detection. • **11:33:** A girl saw and told to other girl to play with and did two tasks. And the time passed they left. • Meanwhile another girl noticed them interacting with the screen. • **11:50:** 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. • **12:00:** A man tried to play, his silhouette was projected on the screen, but he did not understood and kept touching screen and when the game time elapsed he left. • **12:02:** A woman triggered the game. She had tried it before with her daughter too she saw the advertisement too. • **12:07:** The employee was curious and tried to trigger but did not do it and saw me. • **12:10:** A woman noticed the screen, but did not approach the screen, and she turned back. • **13:55:** A man came near and triggered the game and did one task but did not continue then left with his two kids. **Comments** • The instruction while playing the game should be visible and clear; the time for game instruction is not enough. • Attraction and engagement rate is higher but people take less time to see the entire ad.
15th Feb Partially cloudy Warm	**Observations** • **11:43:** A man saw himself stood and then left. • **14:18:** A woman approached to screen but did not understand what to do she was touching the screen. • **14:35:** 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. • **15:17:** An old woman noticed herself and pointed for her husband and read the Call-to-Action but she did not approached and laughed.
16th Feb Cloudy / cold	**Observations** • **10:05:** 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. • Another group saw the first group and came to check out what is going on. This group just played with the body silhouette. • **10:22:** A woman saw her in the screen. • **10:42:** A man tried 4 times to got to know the functionality of the system and now he is trying again. • **10:57:** A girl saw herself but did not came in center to Call-to-Action be triggered. • **11:40:** A boy noticed himself and looked strange on the screen. • **11:42:** Another group noticed and triggered the game. • A boy triggered the game and did two tasks but his mother was angry on him and did not allow him to play. • **15:53:** Two boys noticed, triggered and explored the game and saw the advertisement. • The above boy's father also noticed and was looking to the boys interaction. **Comments** • 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. • May be show a circle like alert around small silhouette while playing to drag user attention two or three times. • Alert participants to move back if they are very near to the screen.

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

E.10 Mobile Interactive observation notes

Date	Notes
17st Feb	**Observations** • **10:47:** A man saw by waving his hand but did not continue to approach. • **10:51:** Another man also saw the screen and his silhouette too. • **11:29:** A woman noticed her but did not do anything, probably because of the phone. • **11:30:** Another woman notice again but did not approach. • **14:03:** A kid saw her and then her mother noticed that they are playing with their image. • **14:50:** The employees are arranging the books on the table. • **15:00:** No one has played with the advertisement until now. **Comments:** • 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). • I approached to a person for an interview but he denied and said I do not have any idea how it works. • Most old people do not have a phone, or if they have one, they do not know the functionality to use. • The mobile is a big restriction for old aged and youngsters for interaction.
18th Feb	**Observations:** • **10:00:** Screen orientation changed toward entrance. • **11:56:** A man glanced two times (1st non-intentionally, 2nd time intentionally). • **14:00:** Screen orientation changed opposite to entrance. • **14:05:** Man saw himself when turned him self from front table. But did not interact.. **Comments:** • 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. • It does not make sense interacting with their phones while the monitor is at their hand reach. • Mobile phones should be used for far hand reach and big screens or projection wall. • Because of amount of less people, very less glances were observed and no one has interacted with advertisement.
19th Feb	**Observations** • **10:00:** Monitor positioned back to its original position. • 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. • **14:00:** I interacted with the advertisement many times to drag people attention and the usage and give them some sort of encouragement. • **14:35:** I played once again while 4 people were standing behind me. **Comments:** • Mobile phone takes longer time to operate. • Less glances made to the screen, maybe because of the access information text rendered on top, which blocks full silhouette representation. • 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. • Mobile interaction is very private to one person and does not drive others attention toward the people interacting.
20th Feb	**Observations** • **10:05:** A boy noticed and took his phone out and scanned the QR-Code but his mother called him and left. • **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. • **10:45:** I played in crowd and some of the people around noticed, but no interaction happened. • **11:00:** Many children are playing with the screen using body and jumping up and down. • **11:35:** A man waved on to the screen and came near to the screen, after reading the information text he left. • **13:15:** Two p eople discuss on the application, they are curious about it. **Comments** • Do a survey for mobile usage in public displays in places like tourist information center.
21th Feb	**Observations** • **10:00:** The screen height got reduced and the screen and Kinect is facing diagonal. • **10:46:** A man saw the screen for 3 seconds but did not play. • **10:48:** Another man also noticed but did not approached to play. **Comments** • The diagonal setup of the monitor suites where people see things facing down on the table.

FIGURE E.11: Mobile Interactive observation notes

F

Enhanced body interactive Field Study

F.1 Enhanced Interactive advertisement Glance count

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FIGURE F.1: Enhanced Interactive advertisement Glance count

F.2 Enhanced Interactive observation notes

Date	Notes
8st April Sunny /cloudy	**Observations** • **9:56:** 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. • **10:00:** A woman is playing, and her husband is standing behind to see her playing. • **10:31:** A man triggered the game, and played the game. • **11:08:** The man triggered the game and when advertisement came, he left. • **11:11:** A man accidently triggered the game. • **11:13:** Two girls noticed the screen and are playing together, they were having fun and stop seeing ad. • **11:33:** Two couples noticed themselves from the corner and then started the game and played. • **11:48:** Man triggered the game and is now playing, after that his wife came to interact too. • **14:19:** A man saw and triggered the game. • **14:26:** Old people ignored the screen the woman saw herself and then ignored the screen. • **14:45:** Two groups started the game, but could not play because they were very near and they started touching the screen. • **14:48:** 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. • **14:55:** The woman saw from the information desk. • **15:08:** A man played and after sometimes, he realized that all his friends have left. He was so immersed. **Comments:** • 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. • Most young audience interacts with the screen. • The interaction is memorable, a girl who had already interacted with the system came again and saw the screen and did another interaction. • Participants come very near and cannot see their silhouette. • People tend to bend to navigate back and they learn after they move a bit.
9th April Sunny	**Observations:** • **10:17:** A woman triggered the game while a man standing beside the screen. • **10:21:** A man played with the game, but left it after a while. • **10:28:** A boy noticed and brought his parents to play. • **10:30:** The boy is playing and while standing a man noticed himself. • **11:32:** The man called his wife to see the screen. • **10:34:** A couple was waiting and saw themselves. • **10:36:** A woman saw herself from far and then ignored the screen. • **10:51:** A man triggered the game and he was standing very near, and he starting to touch the screen and he felt bad. • **11:03:** A man triggered the game and called his friends too, they left when they saw the advertisement.
19th April Sunny	**Observations** • The man is looking a lot now he started the game and he is not moving to play the game. **Comments** • 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. • I guess the people that stand still and think could actually reading the map contents.

FIGURE F.2: Enhanced Interactive observation notes

G

Files and folders

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FIGURE G.1: Enhanced Interactive observation notes