

Digital Media in Urban Spaces:

A Study Case in Hamburg, Bremen and Rotenburg (Wümme)

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2011
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An Inter-University Master Program From:



University of Bremen



University of Applied Sciences
Bremen



University of Applied Sciences
Bremerhaven



University of the Arts Bremen

Digital Media in Urban Spaces: A Study Case in Hamburg, Bremen and Rotenburg (Wümme)

MASTER THESIS SUBMITTED BY
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TO THE INTER-UNIVERSITY MASTER PROGRAM IN **DIGITAL MEDIA**,
UNIVERSITY OF APPLIED SCIENCES BREMEN
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE - **MASTER OF SCIENCES (MSc) IN DIGITAL MEDIA**

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AUGUST OF 2011
BREMEN - GERMANY

Declaration of Authorship

I, Joatan Preis Dutra, author of this MSc Thesis titled "*Digital Media in Urban Spaces: A Study Case in Hamburg, Bremen and Rotenburg (Wümme)*", confirm that this work submitted for assessment is my own and is expressed in my own words. Any uses made within it of the works of any other author, in any form, are properly acknowledged at their point of use and correctly referenced.

Abstract

Digital media are present in public spaces and are connected to activities of people's routine in a way that cannot be dissociated of the idea of urban spaces anymore. Gadgets, such as parking-lot information booths, vending machines, and public telephones are a part of the city life. This research looks into the urban scenario using the cities of Hamburg, Bremen and Rotenburg (Wümme), in the North of Germany, as sample. A carefully designed empirical research mapped the digital media items in the surrounding areas (a circumference of 250 radius meters) of the City Halls, using GPS trackers to tag and synchronize item's images and locations, merging in on-line maps based on satellite images.

After that approach, the digital media items were categorized under similar characteristics and functions. The discussion of each category allowed the interpretation of the characteristics and the understanding of the role on a contextualized environment. The empirical approach and discussions are supported by a deep theoretical research on communication theory, soft urbanism, mediatization and digital media. As a conclusion, a relation among the population density and the incidence of the digital media was perceived. Furthermore, the intrinsic relation of the digital media and the city is connected in a way that configures an important element on the description of urban scenarios.

Keywords

Digital Media, Urban Space, City, Media Categorization, Mapping.

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Chapter 1 – Introduction

There is no doubt that the technology is present on most part of people's daily life: from digital clocks to the programmed machines that make coffee and bread for the breakfast, electronic devices are also available in different scenarios, such as at home, leisure, work and city environments. The digital components are everywhere. If in the beginning they were announced as emblematic innovations, representing a new era, nowadays the most part of them are barely noticed. Considering the central public spaces on the urban places, which are the epicenter of the governmental, social and economic life; the digital equipment belongs to the people's routine.

Buildings, traffic, advertisements, self-service machines and an intense flux of people: these are certainly some of the most common items that will figure in a rhetorical description of the concept of city or, as a synonym, the urban space. They are a representative cause-effect of the constitution of the cities, characterized by the concentration of services and the flow of the citizen to use those services and, at the same time, to increase the offer to attend this flow demand. In this scenario, the digital equipment – based on computer systems – is not just replacing the traditional analogical services, but offering new alternatives to improve the organization and the fluidity of the urban spaces. These items are increasingly being amalgamated to the city scenario and even turning into an important part on the description and characteristics of a city. However, because of this fusion, they are not always noted or perceived on the day-by-day experience, and it is necessary to look with a conscious effort in order to identify all of them and understand their roles in modern society.

The aim of the present proposal is to look into this scenario, identifying which devices are present on the urban spaces and how it is possible to classify them in order to understand their functions among several types of categories. This study will provide a mapping of the digital media available in urban spaces in selected German cities with different sizes, being possible to compare the collected information, and to extract some conclusions regarding the

occurrence of the digital media. Based on that, the main questions that the present research will try to answer are how the digital media is present in contemporary public urban spaces, and how it is possible to identify, categorize and contextualize them? In addition, some other questions will be answered in this work: is the amount of digital media gadgets in the urban space related to the size of the city? Are they mostly public services or equipment provided for commercial purposes? Are they interactive or just static forms of displaying information?

There are some formulated hypotheses which go before the research itself, and the work development will describe how they can be, or not, related to this topic, based on theoretical references and a carefully developed empirical approach. The first hypothesis is related to the fusion of the digital media in the urban spaces, and the assumption that they are already amalgamated to the scenario in an undissociated way. In other words, it means the attempt to show that the digital media are now part of the urban spaces definition. The second hypothesis is regarding the concentration of the digital media items. The assumption is that they vary in proportion to the population size of cities, which means that in larger cities, the amount of media items found will be bigger than in a smaller one.

This research was developed with two distinct spheres: a theoretical review and an empirical research. After this introductory section, the chapter 2 will present a theoretical review of the concepts of digital media (media, digital and digital media) and urban spaces, also aiming to understand the mediatization process of urban scenarios. In addition, there will be some discussions regarding the roots of the cities' establishment. The intention is to understand the reasons for the surrounding areas of the City Hall having a large concentration of human circulation and activities. Also, this chapter deals with basic concepts on the digital/new media to support the development of categories in which it is possible to group common digital gadgets found in the urban scenario. The discussion follows the rule that, to be considered a digital media item, an equipment must have three layers: a technological (based on binary systems), a social (with some role on the urban environment) and a content (which describes basically the message that is being transmitted and if it can be considered a digital medium).

Chapter 3 shows in details an essentially innovative approach to the digital media in the urban spaces and offers a careful and detailed description of the empirical research and the created methodology for the empirical mapping. Information such as the technology details are going to be explained, such as the GPS tracking, time synchronization for imaging capture, merge of pictures and routes in online maps, and the contextualization of the collected items in satellite generated maps. This chapter also lays on the reliability test applied after the empirical research, in order to create a feasible, correct mapping which will be discussed in the sequence.

Chapter 4 lays on the data analysis of all collected material, being the result of the preparative previous chapters. This chapter is one of the main parts of the present research since it aims to understand the role that the digital media plays on the cities. It is essentially a qualitative approach, but also includes some quantitative speculations and provocations for further work. In this section, all the collected items are divided in the three mentioned layers (technological, social and content) and divided into sub categories such as the possibilities of interaction, models of display, charging of the service or the specific function of the gadget (information display, vending machine, access control, etc.). Chapter 5 concludes with final considerations.

The present work is an invitation to another perspective to observe digital media in urban scenarios. It will offer a careful methodological approach to analyze the digital media role in the urban spaces in an innovative perspective, which involves collecting them as a dissociated item, observing the characteristics and reconnecting the gadgets in their context under a theoretical and interpretative approach. The findings are meaningful and the approach is innovative, reasons enough to believe that the present work will contribute to the understanding of the presence, uses and roles of the digital media in the urban spaces.

Chapter 2 – Background and Theoretical Framework

Digital media are present in the routine of the most part of the people who live in urban centers. It is barely impossible to dissociate the idea of living in a city from the presence of technological items. In addition to personal gadgets – such as mobile phones, digital clocks, computers and GPS devices – there are several other items incrusting the urban scenario, turning the public spaces into an alive and interactive environment, building the city as a medium itself (Christ, W., 2000 apud Struppek, 2006) offering services, information or simply being another commercial option along the streets.

The presence of digital media can be strongly felt in urban societies, especially nowadays with personal gadgets: “[f]rom iPods filling commuters’ ears, the screens scrolling headlines in the elevator at work to proliferating on-the-move tools like cellphones and Blackberry handhelds, media are everywhere in the United States, like much of the rest of the developed world” (“Daily Times - Leading News Resource of Pakistan - Media, media everywhere,” n.d.).

Digital gadgets are an evolution with respect to analogical items, and more and more replace “old media” on everyday tasks. The present research aims to understand the occurrence and the role of digital media in public urban spaces. Before discussing the topic in depth, however, this section starts with the definition of terms that will be used throughout the thesis.

It is not possible to conceptualize *digital media* without a previous deconstruction of this term. One of the simplest definitions of medium (or media – in its plural form) is “*a means by which something is communicated or expressed*” (“definition of medium from Oxford Dictionaries Online,” n.d.). In other words, it can be interpreted as any item that carries some form of communication, such as paper, screen or radio. Media are strong tools in our society and play a strong role in enhancing the communication and expression between people.

An alternative definition by Hoenisch (2005), is that “‘*media*’ includes any medium or object used to communicate a message or a meaning”. McLuhan goes further and defines the medium as the message itself (McLuhan, 1994, p. 7). With those assumptions, the importance of the technological aspect is evident since it determines the way that the message is perceived. It is possible, therefore, to jump to the discussion of the relation between media and urban spaces, as will be detailed later. The way that media are expressed inside the city – its medium – is also an expression of the city itself.

There are several additional definitions of media, mostly gravitating around three main spheres: the *technology* which works as a propagation support, the *social* role of this support, and the *content* that is being transmitted. However, before connecting these thoughts to the digital media itself, some discussions regarding the concept of *digital* are also required.

The original definition of digital is “*relating to or performed with the fingers*” (“WordNet Search - 3.0,” n.d.), which is not directly related to the current usage in the domain of programming and tools based on multiple binary sequences. It also belongs to the cave men and their finger prints, which connects again with McLuhan, when he mentions that “*technological innovations are extensions of human abilities and senses*” (“The Playboy Interview: Marshall McLuhan,” 1969). Currently, this meaning of the word is almost forgotten. The so-called information-era gave a new perspective to the word ‘digital’. It is possible to understand digital as “*[e]xpressed in discrete numerical form, especially for use by a computer or other electronic device*” (“digital - definition by the Free Online Dictionary,” n.d.).

At this point, a reference to the work of the German philosopher and mathematician Wilhelm Leibniz (1647-1716) could also express the digital evolution (Rutt, 2002, p. 91). He developed a mathematical representation system “*that relies upon the ten digits (0, 1, 2, 3, 4, 5, 6, 7, 8 and 9), generated all arithmetical calculations using only two numbers (0 and 1)*” (Mungello, 2009, p. 101). He published his tractate denominated *De progressionem dyadica* in 1679 and it later became the basis of the machine language of the computers.

From this perspective, digital can be understood as the opposite to analogical, but not limited to it. Analogical relates to the scale representation of physical objects; digital is then a transposition, when some analogical information is represented in a discrete mathematical scheme. “*Digital systems do not use continuously variable representational relationships. Instead, they translate all input into binary structures of 0s and 1s, which can be stored, transferred, or manipulated at the level of numbers, or “digits” (so called because etymologically, the words descends from the digits on our hands with which we count out those numbers)*” (Lunenfeld, 2000, p. 15).

Gere (2002, p. 15) also offers a deep discussion on the definition of digital. Among the approaches, he mentions that *“[i]n technical terms it is used to refer to data in the form of discrete elements. Though it could refer to almost any system, numerical, linguistic or otherwise, used to describe phenomena in discrete terms over the last 60 or so years, the word has become synonymous with the technology which has made much of the aforementioned possible, electronic digital binary computers”*. He says that the terms “computer technology” and “digital technology” are often used as synonyms, and “have become interchangeable”. In addition, to reinforce the idea, the author wrote that *“[c]omputers are digital because they manipulate and store data in digital, binary form, zeroes and ones. But, as the above indicates, the term digital has come to mean far more than simply either discrete data or the machines that use such data”*.

Again, Marshal McLuhan argued that the electronic media was a relevant marker on human history, making the society a reflection of the new media technology. Based on McLuhan thoughts, Richard Barbrook pointed: *“During the 1950s, the spread of television had led to the electronic media finally supplanting printing as the dominant extension of man. Although important, this historical moment wasn’t the end of the process of social transformation.”* (2007, p. 72). This reflection is important to reinforce that the new media revolution is a continuous process and its reflections are intrinsically present on several environments of the modern life, including, as a consequence, the urban spaces. *“Technologies not only provide us with new tools for communication and expression, but also provide a new social context for our daily existence”* (Lunenfeld, 2000, p. 2).

The term digital media, which is gaining evidence nowadays, results from the conjunction of these ideas. The concept is commonly translated as new media and understood as phenomena represented by the addition of technologies in order to create and distribute all sorts of contents. It represents a change on the available technologies to distribute information as sound, video, photography and other sort of meaningful data, and also allows the combination and unlimited re-organization and re-distribution of content. *“The digital is more than simply a technical term to describe systems and media dependent on electronic computation, just as the analog, which precede it, describes more than a proportional system of representation”* (Lunenfeld, 2000, p. 15).

Pavlik (2008, p. 8) also defined that *“digital media as the systems of public communication, the systems of content production and distribution, and the computer and networked-based technologies that support and shape them”*, but considering “public” not only the domain of the public, but also the private media production for public consumption. The term digital media could also be understood as a substitution for the original “new media” concepts. *“(…) [F]ield of new media studies (sometimes called “digital studies”) (…)”* (Manovich, 2002, p.

10). The term new media is often used in contrast to the “old” media: the analogical television, the radio and the newspapers. It is not the proposal of this research to discuss the criticisms regarding this denomination, but only to present it as an alternative to define the items that are going to be the focus of the empirical research. In simple words: “*New media are networked and digital*” (Hearn, Tacchi, Foth, & Lennie, 2009, p. 9).

With all that in mind, this research concerns with digital media items as all sorts of equipment or gadgets based on binary computing, interactive or not, updateable or not, being able to display or manipulate any kind of information. This research selected and analyzed only the digital media that can be found in urban public spaces, as suggested by the title.

Finally, it is time to describe the word “urban”. It comes from the Latin word “urbis”, which means “city” (“Latin to English definition of urbs urbis,” n.d.). The way in which urban spaces are organized often varies according to different cultures and geographical settings. Nowadays, it is possible, however, to observe that most of the world's main cities have some aspects in common, as pointed Monkkonen: The city “(...) *is characterized by its nonvisible foundation, a political center around which its citizens have built the physical and institutional bases of modern transportation, welfare, and education.*” (1988, p. xi).

The urban space is the epicenter of the organization and of the identity of the city, and reveals the cultural heritage and costumes of their citizens. “*Historically, cities have been the seats of learning and education, they have been the centers of governmental and administrative organizations, and they have performed the function of religious or cultural rallying points.*” (Hoselitz, 1953, p. 197). Also, it is possible to add the thoughts of Dixon (2004, p. 7): “(...) *urban spaces were among the initial casualties of the Modernist revolution*”.

The present research does not aim to focus on the evolutionary process of cities. In agreement with this definition of urban, the City Hall – and its role as the center of the governmental actions for the city – will be the marker to determinate the covered area for the empirical research, as will be detailed in the next chapter. Also, as mentioned earlier (Dixon, 2004), the public spaces in urban areas are not merely the gap between the buildings. “*Public space should not be understood in a narrowly topological sense, as a physically dimensional place, but as a social configuration comprising practiced and experienced relationships of interaction*” (Coleman & Ross, 2010, p. 22). They represent a sort of stage where several actions take place in different spheres: from public to private interest, from social to economic activities, to mention some. “[C]ity reminds us that urban space is not merely a neutral context for people and for urban structures. Instead, city space functions actively to influence socio-cultural processes, identities and, indeed, the ways in which the city itself is represented” (Cronin & Oakley-Brown, 2010).

The concept of the urban space – which can also be understood as “the city” itself – could be related to two direct meanings. The first, more personal, leads to a specific city and its landmarks and environment. The second, more general, automatically sends the thoughts to the imaginary of the city, which coincides with the concepts previously presented: the agglomeration of buildings, the intense traffic of public and private transportation, the services, commerce and social interaction occurring simultaneously. *“City space is a space of concentration, vis-à-vis the dispersal that characterizes the territory, the countryside”* (Brighenti, 2010, p. 475). The bright lights, the vending machines, the information displays, the communication devices are also immediately introduced to this mental concept of city.

With this in mind, it is almost natural to converge the urban/city idea in the direction of media studies. *“In other words, not only is the city mediated, but new media themselves are ‘urbanized’ and urban media: they are designed on the basis of a model of social relations that is soaked in the urban experience of modernity”* (Brighenti, 2010, p. 473). To reinforce this idea, it is also possible to mention the work of Gaye (2005) which states that *“[i]n the scale of a city, pervasive and locative technologies can open up for new ways of engaging with everyday urban environments by turning existing urban features and infrastructures into physical resources for interaction: the very physicality of the everyday world around us can be exploited as an interface and be filled with new social meaning and aesthetic values”*.

This reference to the aesthetic can be, again, connected to the collective imaginary of the city: the visualization as a place with specific characteristics, and with a specific social function. But on the other hand, observing the references of Gaye (2005) to the interactions – from the man with the city and the city with the man – another relation emerges. This recognition of the city as an element able to communicate – and using its digital gadgets as interfaces for some of those processes – will be introduced in the next section under some perspectives of the mediatization theory.

2.1 – Digital media and urban spaces

There are some possible theoretical approaches to discuss the integration of the media devices in the context of the urban spaces. The concept of *Soft Urbanism* is one approach: *“It addresses the changes of public urban space due to mediatization and develops scenarios for the interplay of the public urban space and the public media domain, for the creation of urban hybrid spaces”* (“Urban Screens 05 - sessions,” 2005).

In the same direction, but closer to the present research, there are the concepts of mediatization. In essence, mediatization deals with the presence of the media in the modern

life in a way that the existence of both is mutually dependent. “*Contemporary society is permeated by the media, to an extent that the media may no longer be conceived of as being separate from cultural and other social institutions*” (Hjarvard, 2008, p. 105).

Several explorations can emerge from this premise: there are social, political, technological implications. For now, it is enough to understand that the medium (in specific the digital medium) is an important part of the urban scenario. This relation is intricate in a way that it is possible to say that the city, itself, can constitute a medium of expression. “*Public space is the city's medium for communication with itself, with the new and unknown, (...). Public space is urban planning's moderator in a city of free players.*” (Christ, W., 2000 apud Struppek, 2006).

On the other hand, Harris (2005, p. 113) assures that, once the definition of media is clear there is no ambiguity in defining the city as a medium itself. “*Media are means by which data can be stored, transmitted and processed: media consist of commands, addresses and data. Cities, as spaces of flows, as nodes, are sites in which these functions are performed – thus they are computers, the latter for Kittler constituting the final or ultimate medium*”. Beyond metaphors or interpretations, it is a fact that the city and the medium suffered a process of amalgamation where it is not possible to separate them anymore.

The digital medium is an intrinsic part of the city, and in some cases it is an irreversible evolution of available services. Hjarvard, in the article *The Mediatization of Society* (2008, p. 106), pointed that “[m]edia are not simply technologies that organizations, parties or individuals can choose to use – or not use – as they see fit. A significant share of the influence media exert arises out of the fact that they have become an integral part of other institutions’ operations (...)”. It is not hard to identify public services which are totally dependent on the digital media to work and communicate with its users. For instance, is it possible to imagine nowadays a ticket machine for public transportation without any display giving immediate feedback regarding the costs and purchase options? Certainly not.

The examples are not limited to vending machines. The flow of the city is also intimately related to the digital media. Every day the exchange of information is becoming more related to the technological gadgets, in the private sphere (by personal items as the mobile phones or tablet PCs) or by items with a collective usage, providing public services and even options with commercial purposes. Digital media are all around and their importance is increased in urban spaces. Digital media not only change the way that people interact with the city, or in the way that the city itself communicates, but are a complementary concept of what can be understood as “city” in the contemporary days.

The mediatization of our society, and consequently of our cities, also affected the way in which humans interact and deal with the media. In its pure concept, “[m]ediatization means a long term process that on a first level consists of a growing number of media and a growing number of functions that media take over for us”. Krotz also describes a second level, in which “(...) media are technologies that are used by people to communicate, and thus mediatization consists of mediatization of communication and communicative actions”. Going further on Krotz thoughts, it is possible to find the explanation of a third level, which reinforces the communication as a basic human activity and one of the bases of the human identity. “Mediatization thus includes a process in which this communicative construction of the social world will change the more we use media. In sum, mediatization must be seen as a long term meta process that includes all these three levels” (2011, p. 10).

In the urban spaces it is not different. The presence of the media – and the digital media – is gradually making digital gadgets part of what is understood as the concept of a city. McLuhan (1994) considered the medium as an extension of the human body; O’Neill (2008, p. 2) adds that the media affects the way in which the humans sense the world around: “When we become adapted to using media in such a way, they become natural to us. We only see what they allow us to see, or touch what they allow us to touch”.

The next pictures (Figure 1) reveal exactly this phenomenon. Both are showing the same location at the Times Square, in New York, in different time locations: the first one was taken in 1905, when it was barely possible to identify facades as commercial spots. In the image from 2008 the profusion of media expressions is evident: advertisements, vending machines, services and information. As will be detailed on the analysis of the collected data during the empirical part of this research, there is a direct relation between the presence of the digital media items and the increase of population on the city. In this example, the presence of time – and the advances of the technology in the same period – can make the difference even more evident.

In fact, in cities placed in a similar cultural and temporal context, it is possible to identify the same situation. To anticipate the discussions, one conclusion emerges already: the mediatization is intrinsically related to the users: the city can be a medium and can have its own expression, but this relation depends on having the receptors for this message. The higher the human concentration, the higher is the presence of digital media in urban places. Or, to be even simpler, mediatization is a complementary concept for urban: “(...) it does mean that an understanding of the importance of media in modern society and culture can no longer rely on models that conceive of media as being separate from society and culture” (Hjarvard, 2008, p. 106).



Figure 1: An example about how the urban media changed from 1905¹ to 2008²,
at Times Square, New York, USA

2.2 – State of the art and related work

The studies of digital media in urban spaces are gaining evidence in the last years. Manovich (“Urban Screens 05 - sessions,” 2005) mentioned that “(l)iving your life in the modern city, you constantly interact with multiple UMI (Urban Media Interface) - from the small screen of a cell phone to a large screen of a public electronic billboard”. The basic guidelines of this research – theoretical references for concepts of media, urban spaces, etc., can be based in the traditional literature of the communication theory – as McLuhan studies as *Understanding media: the extensions of man* (1994), *The Playboy Interview: Marshall McLuhan* (“The Playboy Interview: Marshall McLuhan,” 1969), and *Imaginary futures: from thinking machines to the global village* (Barbrook, 2007).

Some studies in the direction of the already introduced *Soft Urbanism* concept – as the series of lectures presented in the *Urban Screen* conference (“Urban Screens 05 - sessions,” 2005) open the possible exploratory ways: *The politics of public space in the media city*, by Scott McQuire (2006), and the *Urban Screens: Discovering the potential of outdoor screens for urban society*, by Lev Manovich (2006), are relevant references. In addition, the relation of the media and the city, as already presented, deals with some of the mediatization theories, mainly under the thoughts of Krotz (2011) and Hjarvard (2008). McQuire (2008) also offers an important source, more in the direction of the public and private spaces definitions and social life at urban environments. In *The Handbook of New Media*, Lievrouw (2006) also discuss about the public and private spheres, concepts that will help to delimit the covered area of the mapping.

¹ Image retrieved from <http://www.flickr.com/photos/clicksnappy/4604051532/>

² Image retrieved from <https://picasaweb.google.com/lh/photo/zairunFDwn4nXvE7op2a4w>

Graham & Guy (2002) are also a similar reference: they explore how the urban place of the San Francisco city has been appropriated as a strategic site of digital capitalism showing some experiences regarding the contextualized research in the urban spaces. Closer to the digital media equipment, it is possible to get some expertise from de Souza e Silva (2006), who focuses on how new media interfaces change our relationship to space and create new social environments via media art and pervasive games.

In the work *Mediacity* (Graham & Guy, 2002), again, there are important references regarding the relation between media and urban space, and its evolution. In addition, it is possible to mention Eckardt (Eckardt & Bauhaus-Universität Weimar., 2008), who also describes the relation and integration of media and urban spaces. In order to go deeper in the concepts of digital, Creeber (2009) will be also used as reference, going around media definitions and discussion between analogue versus digital. Also the classical work of the mathematician Leibniz (Mungello, 2009, p. 101) is mentioned in the origin of the digital concept. From Pavlik (2008) it is possible to extract the ideas about the transformation of media into digital through technical and user perspectives, and Gere (2002) complements the background dealing with the development of the digital technology and culture.

It is also important to mention the discussions that happened during the *Media Architecture Biennale 2010* (“Mediaarchitecture » Media Architecture Biennale 2010,” 2010): however the presentations were more related to the “intelligent” buildings and the technological and artistic facades based on media experiments, some of the conclusions of this event offer a different point of view of the present research. This contraposition is an interesting point of discussion: while the general site of the event says that “*(m)edia density is not congruent with urban density*”, in the sense of architecture, this postulation will be shown divergent on the development of the present work, regarding the occurrences of the digital media in the urban spaces.

Also some inspirations came from Rawolle and Hess (2000), by the analysis of the media industry, where the authors discussed about media devices and its categorizations. At the end, to help on the understanding of the relation between digital media and solutions to classify the collected items of the empirical research, the thoughts on new media described by Hearn (Hearn et al., 2009, p. 10) will be a representative source.

As it is possible to notice, there are already some published books and other work as papers, articles and other references that can help to consolidate the topic. However, an initial overview in the already published material allows to conclude that the exact focus of the present research represents an innovative aspect that can contribute to the studies of the digital media area in general.

With these references in mind, the thoughts were explored deeper during the development of the following chapters. However, the next section explores some theoretical aspects which are important to fundament, and to lead, the empirical phase of the present research into meaningful results. This section deals with the possibilities of categorizing digital media – or new media, as a synonym – in order to identify which items will constitute the research scope of the empirical research.

2.3 – Categories of digital media

Human brains are pattern matching machines that seek to categorize the information it receives. Categorization belongs to the earlier cognition process and happens at different levels during different phases of the development, helping the organization of the gained information and the construction of the memory processes. *“The ability to categorize underlies much of cognition. It is a way of reducing the load on memory and other cognitive processes”* (Rosch, 1975 apud Hahn & Stoness, 1999, p. 337). The concept of taxonomies, originally from Biology, is another example that helps to understand the important role of categorization.

Categorizing is also an important strategy for marketing positioning. *“Categorization occurs when consumers use their prior knowledge to label, identify, and classify something new”* (Hoyer & Macinnis, 2010, p. 108). As will be seen in the results of the empirical study, a meaningful amount of the collected media items serves commercial purposes, which can open doors to different lines of inquiry. Based on Hoyer & Macinnis (2010, p. 109) thoughts, it is possible to say that, in a certain way, the categorization influences the expectations; in other words, once some object or service is identified as belonging to a category, the common inherent characteristics of this category are immediately expected. The lack of some expected feature can lead to frustration, whereas unexpected features can promote satisfaction and even not be perceived.

Transposing this concept to a practical example in the scope of the present research, it is possible to mention public paid telephones. They are immediately recognized as a voice-based communication device. However, some of the available public telephones also offer a touchable sensitive screen with internet navigation services. The user who immediately recognizes it can be positively surprised by this “new” service. Another possible reaction could be failing to recognize this service as internet support, instead possibly identifying it as an advertisement feature.

Back to Hoyer & Macinnis (2010, p. 109) considerations, categorization can be seen as psychological process that has implications in several spheres such as:

- **Interferences:** "If we see a product as a member of a category, we may infer that the product has features or attributes typical of that category".
- **Elaboration:** "Categorization influences how much we think about something". In other words, it means that one tends to think more about products or objects that are not easily connected to one specific category.
- **Evaluation:** "Categorization influences how we feel about an object, also known as our affect toward it".
- **Consideration and choice:** "Whether and how we label an offering affects whether we will consider buying".
- **Satisfaction:** "Categorization has important implications for consumers' expectations and satisfaction".

For the present research, the idea of organizing media items into categories allows for a better understanding of their roles in urban spaces. The performed categorization, when digital media items were grouped together, is a key element of this work. Some principles of the new media definition, already discussed, must be highlighted again: it is important to keep in mind that the concepts of digital media and new media represent, in this case, synonyms.

Going further, the new media can also be characterized by having three layers: the technology, the social and the content (Hearn et al., 2009, p. 10). Parker (1998, p. 2195) refines the technological layer in two distinct spheres: "*Technology is closely related to science and to engineering*". In the first group, science, all human aspects are included: "*(...) the inherent properties of space, matter, energy, and their interactions*". The second group, engineering, refers to the technical aspects: "*Engineering is the application of objective knowledge to the creation of plans, designs, and means for achieving desired objectives*".

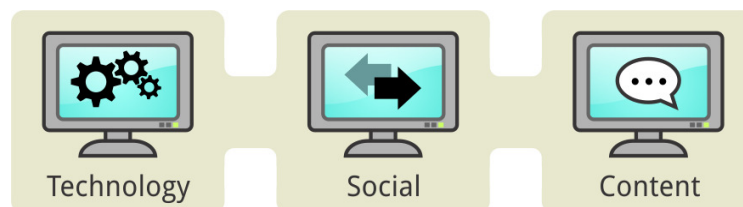


Figure 2: The three digital media layers

Since the definition explains the technology itself (Parker, 1998, p. 2195), one conclusion is that the engineering and the scientific aspects, which can be comparable to the technological and social layers proposed by Hearn (Hearn et al., 2009), characterize the items as

technological tools. The third layer, the content, is responsible to differentiate the whole spectrum of devices from the ones that can be considered as digital media.

Assuming this premise it is possible to develop some deeper considerations regarding the categorization process for the preset research. At first, it is clear that all the items must be included on the three mentioned layers simultaneously, in order to be considered relevant to the mapping. As a consequence, collected “digital medium item” can be classified by inherent characteristics into the three layers, as will be detailed in the following.

First, the technological layer will contain the material aspects – the gadget itself and its components and “*any other technical knowledge required in its operation*” (Hearn et al., 2009, p. 10). This perspective can be further refined into two main categories: the interfaces that are available in the collected items, such as screens, microphones, cameras and other features, and the various possibilities to interact with them. “*(...) [D]igital media offer us a significant increase in our opportunity to manipulate and intervene in media. These multiple opportunities are often referred to as the interactive potential of new media*” (Lister, 2006, p. 19). In other words, the interfaces are the parts of the systems that users interact with (D. L. Stone & D. Stone, 2005). Interaction can be accomplished through touchable screens, buttons or other features. Also, it compiles the way that the information is displayed to the user, even when the interactions (the input of new information) are not available from the user perspective.

The second layer, the social, is related to the function of the device in a context. “*The social layer simply pertains to the people, their relationships, and the social and cultural contexts of use*” (Hearn et al., 2009, p. 10). The function of a specific item in the public urban space, the cost of using determinate item, or even the “owner” of the service and the equipment can be described inside the social role. From this perspective, there are other possible sub categories: the costs related to the operation of digital media gadgets (are they providing a free service or are they charging directly by the use?), the owner of the item (do they belong to a public company or to a commercial institution?), the durability of the item (is it a permanent service or is it occupying a public space for a fixed period related or not to a specific action or event?).

The third observed layer is related to the content and determines what is being communicated, consumed or exchanged through the device. “*It is the third layer that makes these technologies media (...)*” (Hearn et al., 2009, p. 10). In this layer it is possible to identify the services, the kind of information offered and its flow. In other words, categories such as the kind of content (multimedia, text, video, photo, other) and even the types of services (informative, control, commercial, financial, etc.) emerge from the content layer. The intrinsic

relation of the technology and content could, eventually, blur this distinction. For this reason, the way the content flows (static, manually updated or automatically updated on-line) is, sometimes, mixed to the content itself. *"Analog media tend towards being fixed, where digital media tend towards a permanent state of flux"* (Lister, 2006, p. 16).

To summarize, it is possible to say that the digital media items, in this case the elements which are spread and amalgamated in urban spaces, must have three main characteristics to be considered as a valid item in the empirical research: their system must be based on a binary code, they have to figure in the urban space with a social purpose and, in addition, they must communicate some content.

Going further, there will be several items collected with these characteristics, as will be detailed in the empirical part, but it is also necessary to understand their composition in a deeper way in order to extract similarities and differences which allow discussing about their function on urban scenarios. Categorizing the collected items offers the possibility to organize and to evaluate roles that the different digital media items are playing in the observed context.

Back to the layers which are present in all digital media items, as already described, the *Figure 3* explains in a summary the categories in which the collected items were grouped. The secondary layers emerged from the definition of the main layers and the observation during the empirical research. A clear connection will emerge during the discussion about the items found in the empirical study. However, some ideas can be discussed now.

As an example, it is possible to mention the technological field: in this topic, which kind of questions could emerge as a general observation? The operating system, the interfaces, the energy source, the material used to build the hardware, the softwares which are running on the device, the language used to program it, the possible interactions with the gadget and so on. In the specific context of this research, the idea is not to offer a deeper dissection of all the items found, but to organize them by characteristics which are relevant to the scope. What, why, where, how and other questions were applied to reveal the purposes and uses of the items, allowing a generalization and, as a consequence, the categorization of the elements.

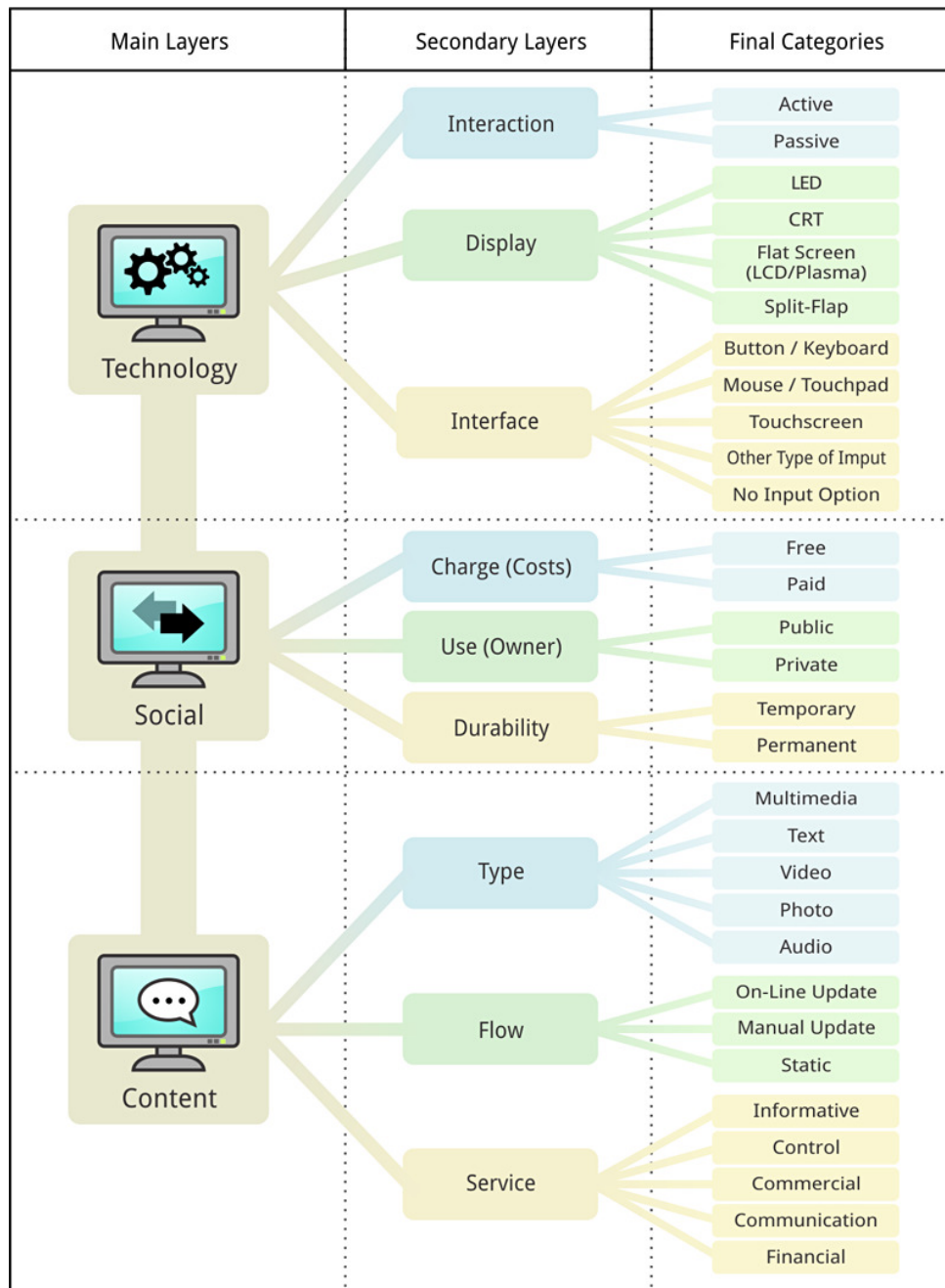


Figure 3: Categories for digital media in urban spaces

These categories are not restrictive and they also do not pretend to be definitive. The following chapter will explain the empirical research and will use the explained categorization to identify the items which were collected. In technology, there are three essential fields: interaction, display and interface. In the first one, the observations are made from the user perspective. Can the user interact, adding or changing information or values, or does the device expects the user to play a passive role as the final receptor of the message? The display category classified which types of screens are being used by the collected items to show their content. Again, some categories are emerging from this observation, regarding the diversity of the adopted screens (LED, CRT, LCD, etc.). The third main characteristic is related to the

input interface, that is, if the device accepts input, which methods are available to users? Screens that are sensitive to touch, or buttons, or keyboards; mouse, touchpads or roller tracks are some applied categories.

In the next main layer, the social function of the digital media items is discussed. Charge, use and durability are the secondary layers observed. Charge relates to the direct cost to use the specific item. In this case, indirectly applied charges, such as the fee for transportation covering the timetables on the bus/tram stops or taxes paying for touristic info gadgets, are not being used as criteria. Use, in this case, is related to the owner of the item: if it belongs to a private institution or to a public one. The durability deals with the duration of the specific item: it is a permanent device or if it was installed as a temporary service for a specific period or event.

The third main layer deals with the content and reveals the information as type, flow and service. Type is the name used to characterize the form of the content: multimedia, text, video, photo and audio. Flow refers to the way in which the information is updated: if it can be updated on-line (on-the-fly, in this case), manually updated, or if the displayed information on the device is static, just changing (if so) for pre-defined messages with no need to further update. Service regards to the objective of the content itself: informative, control, commercial, communication or financial. In the informative category are included the screens displaying information regarding services or other origins with a non-commercial objective. Control refers, as the name itself suggests, the controlling of entrances, checking and other items where some sort of identification or data input is required in order to process a service for the specific user. Commercial are the items with selling or advertisement purposes. Communication is the category in which telephones and other gadgets able to connect people are included. Finally, financial is almost a derivation of the commercial services, but configures a specific category since the monetary transaction involved does not necessary involves a commercial purpose.

Going further, the categorization will permit the discussions on the digital media roles on the urban space. For now, it is enough to understand that all the collected items have the three mentioned main layers (technology, social and content) and, for each of them, can be added to groups by use, service, durability and other sub categories introduced above.

Chapter 3 – Mapping the Digital Media

The digital media are part of the urban scenarios, as mentioned and detailed in the previous chapters. Based on that, it is simple to imagine that these items are easily visible while walking through urban spaces. The answer, however, is not so simple. After getting used to the presence of digital media items and how they are amalgamated into urban spaces, their observation requires a conscious effort. The first part of the empirical research, which will be explained in details in this section, provides an accurate identification of all the elements in a selected area (explained in a further section of this research), collecting media items in a map of images.

As an empirical approach, the mapping follows some general rules for its structure. “(...) [*E*]mpirical work goes beyond 'mere' observation and description, and it is inextricably intertwined with explaining nature and making predictions about it” (Simon, 2003, p. 5). It involves also the formulation of hypotheses or thinking up explanations about the nature or the rules which are beyond the researched scope. According to Shuttleworth and Blakstad (2010), the empirical research also can be defined as “*research based on experimentation or observation (evidence)*”. The authors also mention that research conducts to the formulation of hypotheses, but also make clear that tests are required in the investigation in order to assure the reliability of data.

In the present research, one of the objectives is to collect, by photos, the presence of digital media items placed on delimited urban areas. This phase also reflects another postulate of the empirical research, which says that it “*includes only knowledge obtained from data resulting first-hand observations, either by you or by someone else*” (Simon, 2003, p. 6).

Once with the collected data from the field, the second empirical part is to organize and group the items in meaningful categories, facilitating the studies of the similarities, differences and also understanding their role in the urban scenario. To do so, a reliability test was applied,

when some subjects were invited to evaluate the captured images and point their characteristics. The process for both parts will be explained in the following sub-sections.

3.1 – Methodology of the mapping

The mapping and tagging of the digital media on public spaces was developed by an exploratory field research, which allowed the direct contact with the objects, gadgets and equipment to be mapped, observing its usage, but also getting accurate numbers of their incidence. *“Although field research can be used to collect quantitative data - for example, noting the number of interactions of various specific types within a field setting - typically, field research is qualitative”* (Babbie, 2008, p. 314).

This exploration took in consideration the foundations of the grounded theory. *“Essentially, grounded theory is the attempt to derive theories from an analysis of the patterns, themes, and common categories discovered in observational data”* (Babbie, 2008, p. 324). It means that, as already mentioned, just an agreement about digital media was taken into consideration before the collecting data on the field: the perspective categorization and the way to combine them in an appropriate way to study and evaluate will be defined based on the collected data. *“Grounded theory emphasizes research procedures. In particular, systematic coding is important for achieving validity and reliability in the data analysis. Because of this somewhat positivistic view of data, grounded theorists are quite open to the use of qualitative studies in conjunctions with quantitative ones”* (Babbie, 2008, p. 325).

Once the covered targets were planned, a physical mapping was held by observing, finding and tagging digital media devices on public spaces. Afterward, a proper reflection and analysis took place for the categorization part, as illustrated later on *Figure 12* at the section 3.3 of this chapter.

3.2 – Covered area

The idea was to use the same type of landmark in three different cities, distinguished by their population and area sizes. It is possible to find a variety of classifications; regarding this research the chosen scale is divided in *Metropolis* (huge city, 1 to 10 Mio. inhabitants), *City* (medium city, 100.000 to 1 Mio. inhabitants) and *Town* (small city, 10.000 to 100.000 inhabitants) (Jakobson / Prakash 1974 apud Heineberg, 2006, p. 28), represented by Hamburg, Bremen and Rotenburg (Wümme) respectively.

It is important to point that the chosen cities are situated in the same region of the country, in this case the northern region of Germany, which makes the comparison more accurate, because they belong to the same region and went through similar development processes. Using cities from different regions or countries could make the social and cultural aspects interfere with the collected data.

The chosen epicenter landmark for the covered area is the City Hall (*Rathaus* in German) because of its political and administration importance over the city, as already mentioned in the definitions of urban space.

The latitude and longitude coordinates of each *Rathaus* was taken as the starting reference point, and around it a circle with radius of 250 meters was virtually drawn, covering an area of approximately 0.196 Km² (according with the formula $A = \pi \times r^2$) with 1570 meters of circumference in each chosen city. Inside this circle area, every street was mapped, chasing the digital media interferences on the public spaces.



Figure 4: Map with the chosen German cities' positions in highlight

3.2.1 – The chosen cities data

After the area was defined (a 250m radius circumference, taking the City Hall as center), the external research started with a printed version of the area map (see figures 5, 6 and 7). Every public space inside the circle – streets, squares, etc., was visited. Below are the population/area data of the chosen cities.

- **Hamburg** = 1.770.000 inhabitants, with 755 km² of area, and population density of 2.344,37 people per km² (“Economic Indicators Hamburg - HWF, Hamburg Business Development Corporation,” n.d.);
- **Bremen** = 547.769 inhabitants, with 325 km² of area, and population density of 1.686,44 people per km² (“Bremen - Politics + state,” n.d.);
- **Rotenburg (Wümme)** = 22.093 inhabitants, with 99.01 km² of area, and population density of 223,17 people per km² (“Landkreis Rotenburg (Wümme) - NLS,” n.d.).

The population density it is an important aspect of the chosen cities since it shows the intensity of land use by its population. In other words, the density is able to provide a quick overview of the occupation, allowing a more accurate perspective of the urban scenario than, for example, the absolute number of inhabitants of a city.

“The intensity of land use is the amount of economic activity that takes place on a unit of land. (...). The general definition of population density is simply [population ÷ land area]” (McDonald & McMillen, 2011, pp. 120-121) also explained that there are many other ways to measure land-use intensity. “For example, employment per acre, buildings heights, and floor-area ratios are all readily available measures. The most important measure of land-use intensity is population density”.

For the current research, the population density data will take the entire population and area of each of the chosen cities.

3.2.2 – Map Areas

- **Hamburg** - Rathaus coordinates (lat,long): 53.550552, 9.992591

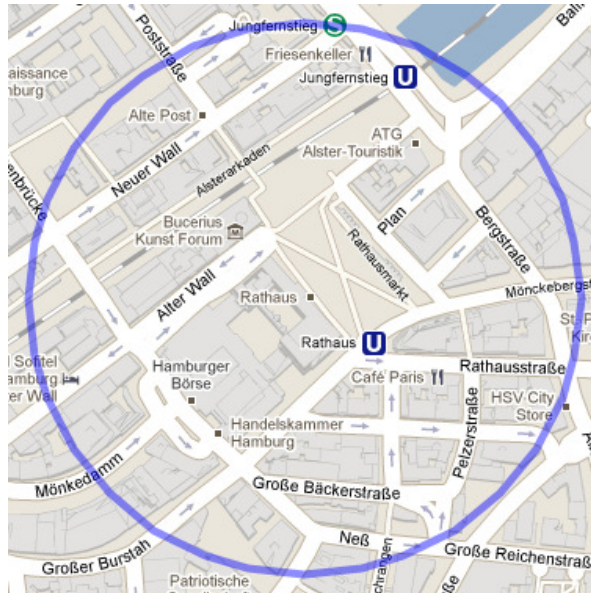


Figure 5: Circle area of 250m radius, with the Hamburger “Rathaus”(City Hall) as center³

- **Bremen** - Rathaus coordinates (lat,long): 53.075807, 8.807924

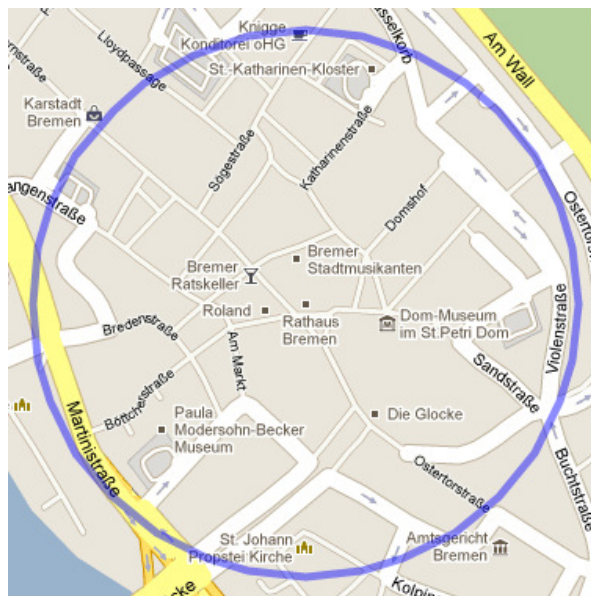


Figure 6: Circle area of 250m radius, with the Bremer “Rathaus” as center⁴

³ Link for the circled map area of Hamburg :

<http://maps.google.com/maps?q=http://www.nearby.org.uk/google/circle.kml.php%3Fradius%3D250meters%26lat%3D53.550552%26long%3D9.992591%26geomColor%3Dff0000ff>

⁴ Link for the circled map area of Bremen :

http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=http://www.nearby.org.uk/google/circle.kml.php%3Fradius%3D250meters%26lat%3D53.075807%26long%3D8.807924%26geomColor%3Dff0000ff&sl=53.075936,8.808321&sspn=0.000928,0.002411&ie=UTF8&z=16

- **Rotenburg (Wümme)** – Rathaus coordinates (lat,long): 53.109291, 9.399104

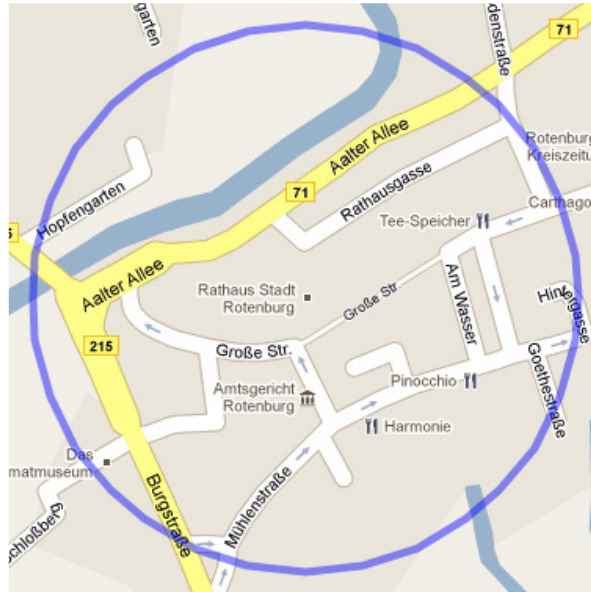


Figure 7: Circle area of 250m radius, with the Rotenburger “Rathaus” as center⁵

3.3 – Collecting the data

The first part started with the observation, and followed by a walking through every street in the selected area. Only public spaces were visited. Private spaces, such as shopping centers, galleries or even public buildings as libraries were not visited. All digital media interferences were identified with digital photographs and tagged with the help of a GPS smartphone running Android Operating System⁶. Both devices had the exact same date/hour set to be able to correlate their information.

The mobile phone featured with a GPS used an application named “My Tracks”⁷ that can trace the coordinates of the walked path. During the way, all the digital media items were observed by visual localization and photographed: it means a careful observation of all the equipment that represented a digital media device. The only used filter for the visual selection was the concept already mentioned of the digital media: if the equipment uses, somehow, a binary code as source.

⁵ Link for the circled map area of Rotenburg (Wümme) :

<http://maps.google.com/maps?q=http://www.nearby.org.uk/google/circle.kml.php%3Fradius%3D250meters%26lat%3D53.109291%26long%3D9.399104%26geomColor%3Dff0000ff>

⁶ <http://www.android.com/>

⁷ <http://mytracks.appspot.com/>



Figure 8: Tracked path example in Bremen, made with 'MyTracks' App

Once the identified object fits into the mentioned role, two pictures were taken: one general, in order to contextualize the object on the urban scenario and another one closer, trying to capture as much as possible the details in order to permit a proper analysis. These two pictures were combined in one photo file, as explained on the schema below.

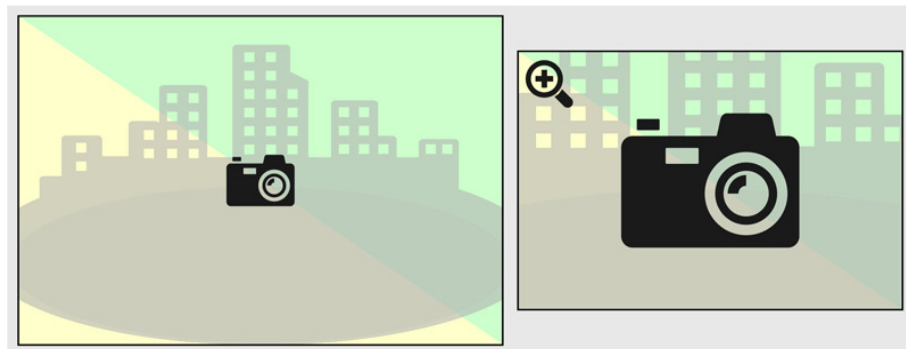


Figure 9: Photo Schema - divided in general view and zoom/detail perspectives, regarding the mapped medium

After covering the area entirely, the collected data were transferred back to a computer, where the pictures were downloaded and the *Photo Schema* of the mapping was applied.

Figure 10 shows a real example using the mentioned *Photo Schema*, where it is possible to see the device (in this case a touristic interactive panel) placed on the square, and a detailed picture showing its content and navigation.

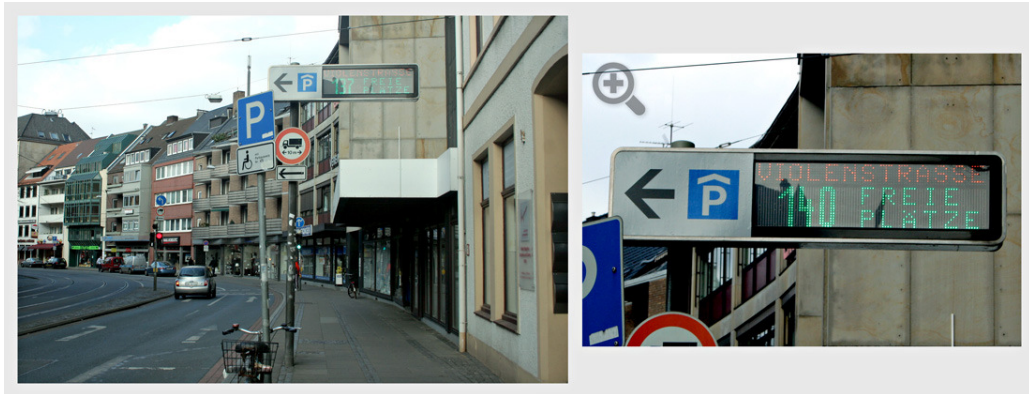


Figure 10: Applied example of Photo Schema

After this step, the tracked walking path was exported and applied into a map, where it was synchronized with the selected photos, taking into consideration the original time where each photo was taken. Through the use of the software named “GeoSetter”⁸, both sets of data were merged: the edited pictures and the path, allowing to have the images inserted into their exact localization, saving the coordinates (longitude, latitude) on each photo file. The modern resources of satellite view also allow having a better contextualization of each element.

With this resource, it is possible to have an accurate overview of where every mapped item is placed on the map. Also it allowed recording the coordinates on each picture. The result of this synchronization can be seen on the next figure, being afterwards exported to the online service “Google Maps”⁹, in order to open its visualization to the public.

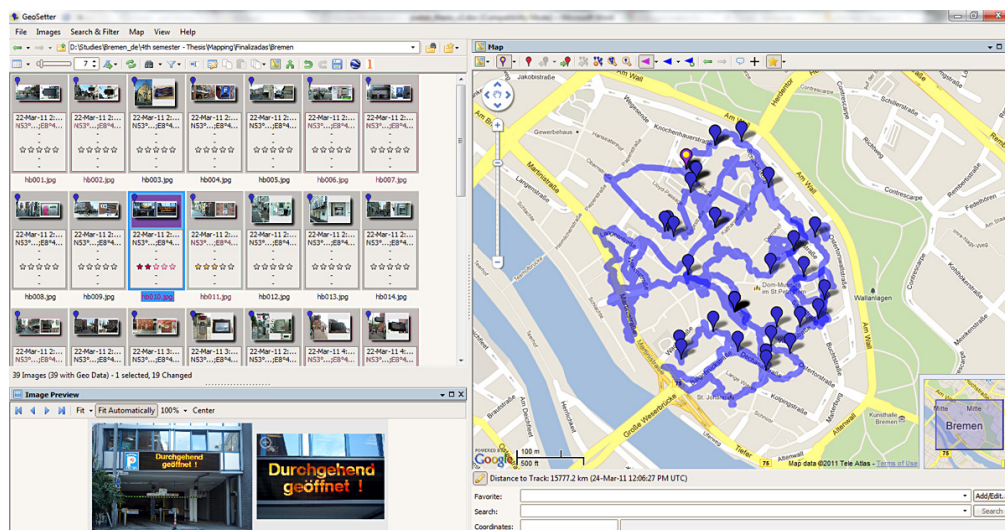


Figure 11: Mapping result visualized at the ‘GeoSetter’, placed in Bremen

⁸ <http://www.geosetter.de/en/>

⁹ <http://maps.google.com/>

The next image shows the info-graphic regarding the chosen mapping strategy, as described in this section, showing all the followed steps and final outcome.

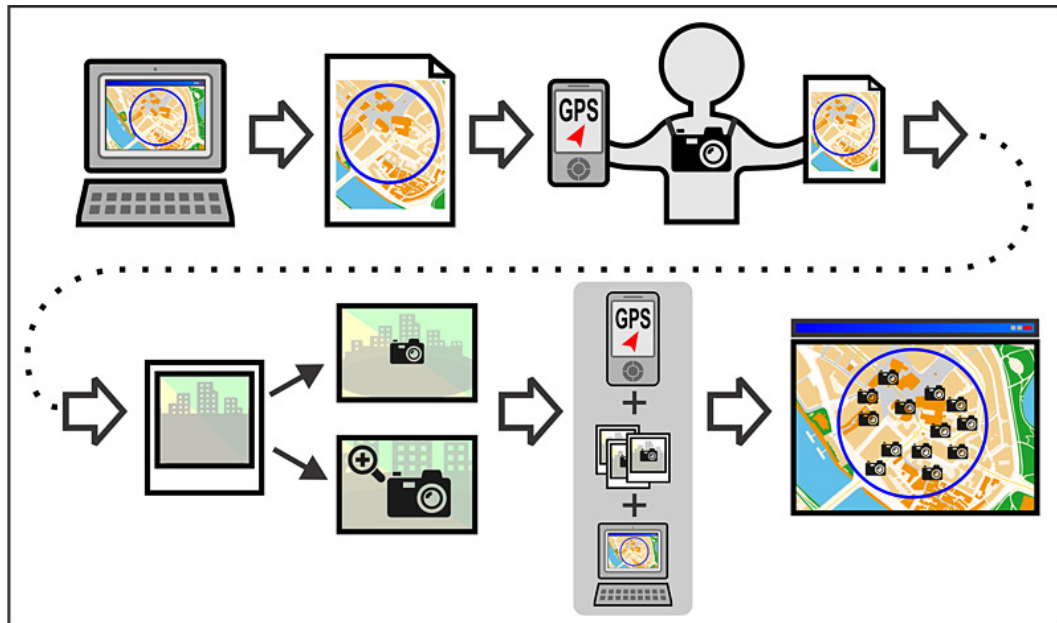


Figure 12: Methodology schema of the mapping

3.4 – Collected items

After following the pre-defined methodology and criteria for the mapping, the aggregated result of the collected items can be seen in the *Table 1*. It shows the total number of the mapped digital items, with no categorization applied yet.

City	Population	Population Density	Mapped Digital Media
Hamburg	1.770.000	2.344,37 /km ²	71
Bremen	547.769	1.685,44 /km ²	58
Rotenburg (Wümme)	22.093	223,13 /km ²	7
Total of items:			136

Table 1: Number of mapped digital media items among the selected cities


Once the photos were taken and treated as mentioned earlier, and merged with each coordinates, the mapping result was exported for “Google Maps”, combined with the images in high-resolution, hosted in a private server¹⁰. These maps allow a complete visualization of each mapped item on its original location and background scenario where each medium was placed.

¹⁰ The high-resolution images are hosted at <http://www.mutacao.com.br/digital-media-mapping/>, the personal server of this research’s author. This directory is not open for the public view, just the direct image links are available for each created map at *Google Maps*, listed in this section.

The collected results can be accessed at the links below:

- **Hamburg¹¹**
71 mapped digital media items, in 68 photos, available for visualization in the following link:
<http://maps.google.com/maps/ms?msid=218005543139613051182.0004a939e3357e8367c1f&msa=0>
- **Bremen¹²**
58 mapped digital media items, in 52 photos, available for visualization in the following link:
<http://maps.google.com/maps/ms?msid=218005543139613051182.0004a9386cd40fcdf4bce&msa=0>
- **Rotenburg (Wümme)¹³**
7 mapped digital media items, available for visualization in the following link:
<http://maps.google.com/maps/ms?msid=218005543139613051182.0004a93b436dbd236e39a&msa=0>

When the map is accessed, the images are automatically downloaded by the Google Maps (the download time varies according to the internet connection quality).

When an item (showed with the icon: ) is clicked, a thumbnail image appears with 242 pixels as width, with a link to a higher resolution image, and with the coordinate's information.

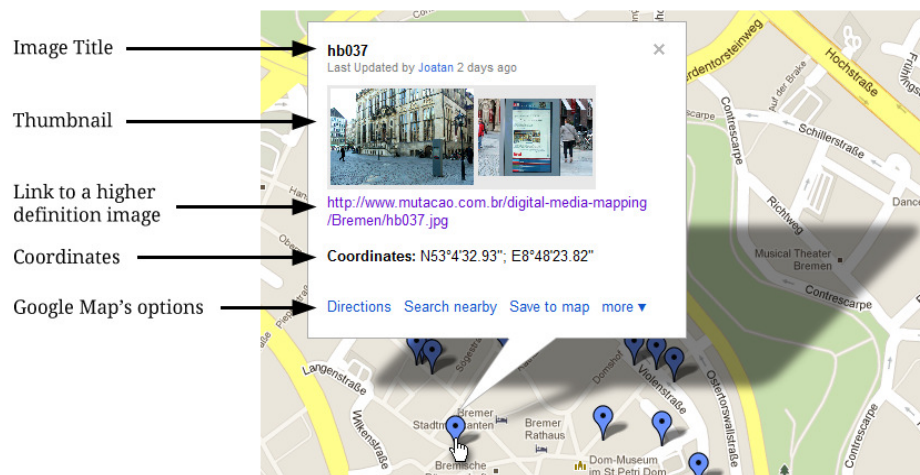


Figure 13: Elements of each mapped item displayed at Google Maps

In order to access each respective high-resolution image, below the thumbnail and above the coordinates there is a direct link for the image which can be accessed and downloaded. The images in high-resolution have 3416 width x 1307 height for the horizontal format, and 2804 width x 1914 height for the vertical format.

¹¹ Mapping date: 30th March 2011.

¹² Mapping dates: 23rd and 24th March 2011. Revised on 6th August 2011.

¹³ Mapping date: 13th April 2011.

This organization itself offers a rich set of data to understand the occurrence of the digital media on the urban spaces and will be discussed in the next chapter. The adopted technological resources and methods allow an almost live experience on visualizing the elements in their contexts, once the pictures are precisely located and it is possible, virtually, to repeat the routes used during the collection of the information. Based on it, the empirical research will be the base of several analyses, but also can encourage other researchers to observe the data under different approaches.

3.5 – Categorizing the collected data

Once the first phase of the empirical research was done, it was necessary to deal with the 136 items found, spread on the observed areas of the three cities, in order to extract meaningful information from the data. To achieve the necessary organization – not considering the geographical location and even the city where the item was collected – another step in the current research was started: the identification of common and different characteristics of the items, applied to the already mentioned categories, in order to facilitate the comprehension of their roles on the urban space.

It is clear that by observing the images, some answers could emerge as obvious, based on the categories explained in details before. As example, one can consider an electronic timetable in a bus/tram stop, as the next figure.



Figure 14: An example of an electronic transport timetable

Since it is based on binary code, it has a social function and transmits content, it configures a collectable item for the research. Observing under the suggested categories, it is possible to say that the user cannot interact with the item (so, it is passive), it uses a monochromatic device to display the information and has no option for data input (from the user perspective). In the social sphere, it is free of charge, permanently installed by a public operator. Regarding the content, the service is merely informative, formatted as text, being on-line updated, according to the flow of the trams and buses connected to a central.

This sample reflects the model of categorization aimed for all the collected items, but it cannot be simply based on the researcher's opinion. Some acceptable scientific methods were applied to categorize the items in a reliable way.

3.5.1 – Testing the categories

In order to assure the reliability of the categorization of the collected digital media items, the *intercoder reliability* (Neuendorf, 2002, p. 142) standards were applied. The idea behind it is to have different individuals observing the same samples in order to categorize them and check the reliability among the samples. This process provided an accurate identification of the digital media elements and guaranteed a precise foundation for the analysis.

3.5.1.2 – The coders

The subjects, also called coders, received training regarding the pre-defined categorizations and how the workflow of the collection was performed. For this test only master students of the *Digital Media Master Program* of Bremen¹⁴ were selected, due to their previous understanding of and familiarity with digital media concepts, which makes the preparation for the test shorter and simpler than if applied for subjects who are not familiar with this topic.

The idea of the test was to verify, confirm and modify the created categories for digital media in urban spaces, which should count with a certain sensibility regarding this topic.

Coder / Tester	Background Area	Sex / Age
1	Journalism / Digital Media	Female / 35
2	Multimedia Communication / Digital Media	Male / 30
3	Product Designer / Digital Media	Female / 30
4	Designer / Digital Media	Male / 25
5	Designer / Digital Media	Female / 26

Table 2: Coders/Testers

¹⁴ <http://www.digitale-medien-bremen.de/en>

3.5.2 – The test

The test used two different media: one printed categories-template (see *Figure 15*) and one computer with a selection of images (cited at *Table 3*). This selection just contained enough images to cover all the categories. The repeated collected media (for instance, electronic transport timetable) appeared only once in this selection, but their total number was used for the final data analysis.

3.5.2.1 - The categories-template

Each category listed in section 2.3 received its own code. The codes were divided in 3 main fields, represented by the letters ‘T’ (technology), ‘S’ (social) and ‘C’ (content). A secondary level was represented by a number – following the top-down order of *Figure 15*, and a third-and-final level represented by letters in alphabetic order.

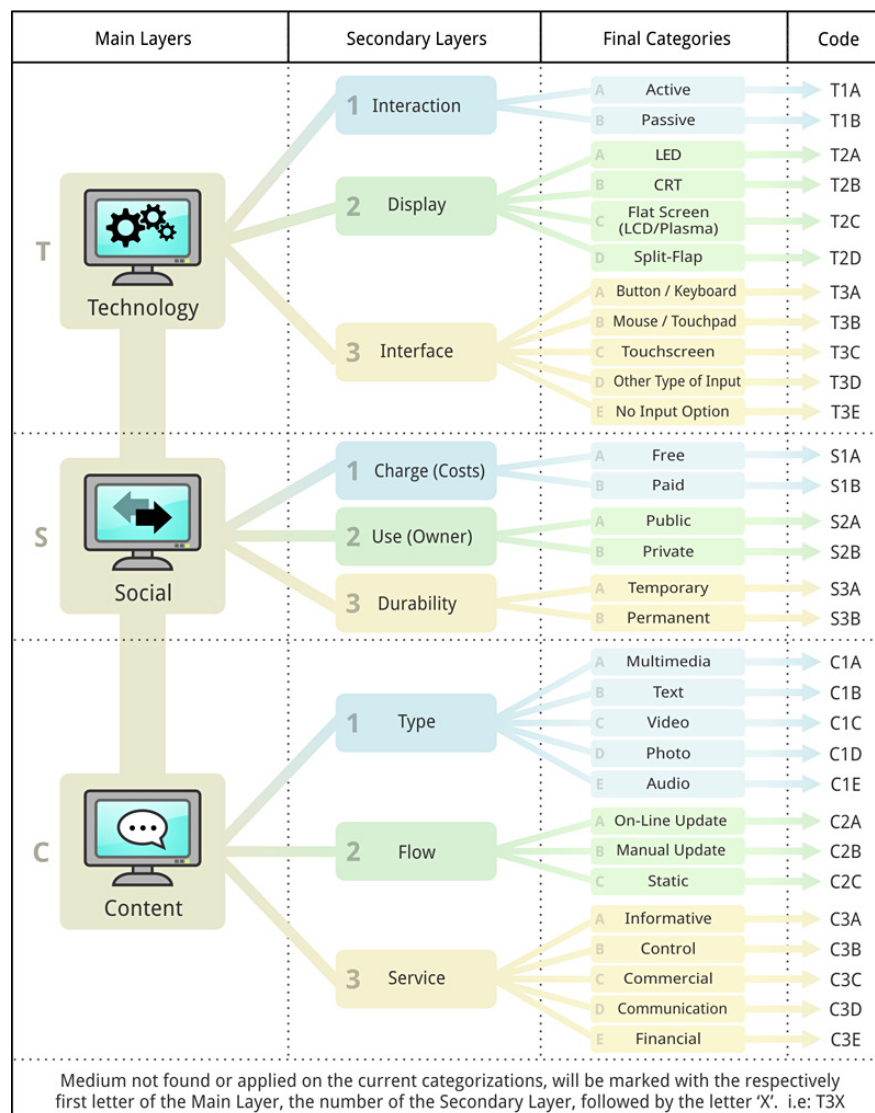


Figure 15: Categories-template

3.5.2.2 - The selection of the mapped items

The reason to do a selection of images was to avoid the repetition and fatigue of the coders. The goal was to check the categories and not all taken photographs. The coders had the option to visualize the image in a larger format and in the created maps displayed before at section 3.4 of this research. They could also view the entire map itself, where the context position could also be analyzed.

The mapped images followed the name structure: the city name where the picture was collected and a number. The name of the city was represented by the respective car license plate of every city, in this case it was HH (Hamburg), HB (Bremen) and ROW (Rotenburg-Wümme), followed by a number.

3.5.2.3 - Test workflow

The test followed by the coder having the printed categories-template in hands, and watching a selected picture on the computer screen. After analyzing the image, the coder pointed what categories could fit better for the selected image, giving its respective codes. After finished with one image, the process was repeated for the next one, until all selections were covered. For every image showed there was an additional explanation about the medium itself. For instance, if it changes the screen, or displays a video. If an image could not be applied for a listed category, the coder had the option to include the letter “X” on the place of last character of the given code(s) (as stated at the bottom of *Figure 15*).

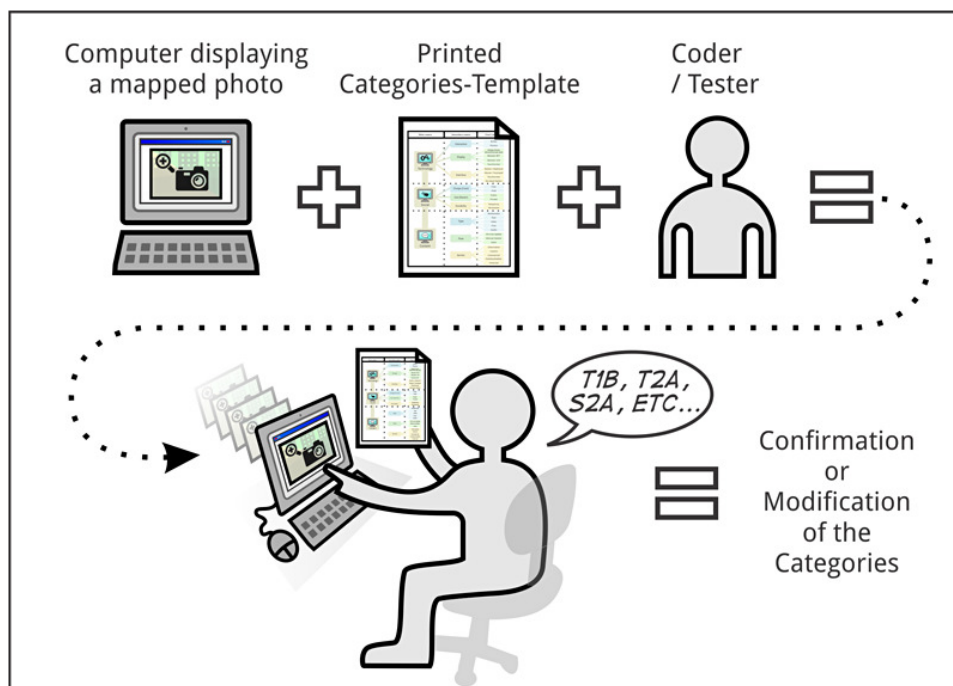


Figure 16: How the coders' test was applied.

This method made it possible to apply the test in an agile way, where the coder could check the image on the screen and the categories template at the same time. The test workflow is illustrated on the next figure.

The codes were given by audio, and wrote on paper by the person who applied the test on the coders. One example regarding the collected code, could be for the image “hb001”¹⁵ (Figure 14), which got the codes: T1B (Technology → Interaction → Passive), T2A (Technology → Display → LED), S1A (Social → Charge → Free), S2A (Social → Owner → Public), S3B (Social → Durability → Permanent), C1A (Content → Type → Text), C2A (Content → Flow → On-Line Updated) and C3A (Content → Service → Informative).

3.6 – Evaluating the test

The tests were applied individually with each of the coders. Each one took approximately 25 minutes to observe all the images, considering all the three layers for each one. The coders received a compact sample of the collected data, as already mentioned, and the results were replicated in identical items. For example, all the electronic timetables installed in bus/tram stops were considered to be in the same categories as the one which was observed during the test.

One of the main observations regarding the process was the similarity on the answers. Considering that this is not a quantitative research – as mentioned before, just an alternative to assure the reliability of the primary data collected – there is no need to specify the percentage of coincidence or ambiguity. The final results are expressing the categories in which each item was most frequently mentioned.

Overall, the understanding of the categories did not offered major difficulties since all the testers were aware of the terminology and the context in which the categories were applied. The results will be presented in the next chapter, together with a discussion related to each one of the items. The initial discussions will consider the classification revealed during the tests, but the main idea is to offer an interpretation of the items, using the groups only in order to organize the thoughts and clarify the similarities in technology, content or the social role.

The selected images and code results of the test, follows next on the *Table 3*.

¹⁵ URL for this image on the map:

<http://maps.google.com/maps/ms?msa=0&msid=218005543139613051182.0004a9386cd40fcd4bce&ie=UTF8&ll=53.077283,8.80846&spn=0.008985,0.026157&z=16&iwloc=0004a9387064d08cbc73e>

Image	File name	Chosen Codes and Link for a higher resolution
	hb002	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E http://www.mutacao.com.br/digital-media-mapping/Bremen/hb002.jpg
	hb009	C1B, C2A, C3A, S1A, S2B, S3B, T1B, T2A, T3E http://www.mutacao.com.br/digital-media-mapping/Bremen/hb009.jpg
	hb036	C1B, C2B, C3C, S1A, S2B, S3B, T1B, T2A, T3E http://www.mutacao.com.br/digital-media-mapping/Bremen/hb036.jpg
	hh004	C1A, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh004.jpg
	hh014	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh014.jpg
	hb037	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E http://www.mutacao.com.br/digital-media-mapping/Bremen/hb037.jpg
	hh051	C1B, C2B, C3A, S1A, S2A, S3B, T1B, T2A, T3E http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh051.jpg
	hb018	C1A, C2A, C3D, S1B, S2A, S3B, T1A, T2C, T3C http://www.mutacao.com.br/digital-media-mapping/Bremen/hb018.jpg
	hb019	C1A, C2B, C3D, C1B, S2A, S3B, T1A, T2C, T3A http://www.mutacao.com.br/digital-media-mapping/Bremen/hb019.jpg
	hb008	C1B, C2C, C3D, S1B, S2A, S3B, T1A, T2C, T3A http://www.mutacao.com.br/digital-media-mapping/Bremen/hb008.jpg
	hh011	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh011.jpg

	hh036	C1A, C2B, C3C, S1B, S2A, S3B, T1A, T2C, T3A http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh036.jpg
	hh040	C1A, C2B, C3E, S1A, S2B, S3B, T1A, T2B, T3A http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh040.jpg
	row005	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2D, T3E http://www.mutacao.com.br/digital-media-mapping/Rotenburg-Wuemme/row005.jpg
	hh018	C1B, C2A, C3C, S1A, S2B, S3B, T1B, T2D, T3E http://www.mutacao.com.br/digital-media-mapping/Hamburg/hh018.jpg
	hb040	C1B, C2C, C3B, S1B, S2B, S3B, T1A, T2B, T3A http://www.mutacao.com.br/digital-media-mapping/Bremen/hb040.jpg
	hb044	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3D http://www.mutacao.com.br/digital-media-mapping/Bremen/hb044.jpg
Total: 17 images		

Table 3: Selected images

After the test was completed and evaluated, the final categorization was applied to all the 136 found items. This categorization is available at the appendix of this research (Table 17).

Chapter 4 – Data Interpretation

The urban space is associated to the concentration of services, commerce, political and administrative institutions, but as a consequence of this concentration, it is also characterized by the intense flow of people. It belongs to a cyclic relation of cause and consequence. However, the concentration on the urban centers related by the organization of the cities around the production – one effect of the industrial revolution in the 19th century – was drastically changed after the middle of the 20th century.

According with the ideas of Fotsch (2007, p. 4), the development of the communication improved the velocity and safety on the high speed transportation, moving the production of goods to the external areas of the city. *“Since the 1980’s, cities have gone through yet another major transformation: improved transportation and communication have allowed the global decentralization of production and centralization of business services in a few large cities (...).”* The author describes this process in a global scale, but the same situation can be observed in a small scale – such as the cities. With the transfer of the production’s places, the work force moved closer to the labor places and changed the characteristics of the city to a scenario closer to what can be noticed nowadays.

As a consequence of the mentioned process, the cities started to be the scenario of another flow: the cars and the public transportation, connecting the people who live outside of the urban perimeter but who still need the services that are concentrated around the central area, such as financial, commercial, educational, governmental and other kind of services and institutions. These services, on the other hand, must be available quickly and easily to attend the growing demand and are, in several situations, replaced by the self-services machines, representing a large amount of the collected digital media items on the present research.

The urban tram and bus tickets – which in the specific case of Germany are mostly available for purchase inside the vehicle itself, in automatic machines – can be an example of an automation process that happened also in other areas. The following quote is regarding an

extensive study and projection of the job market in the United States, for the period between 2006 and 2016, and reveals a very precise sample for the present research: *“Despite a growing and more mobile population who will likely travel more frequently, newer automated reservation and ticketing operations will speed transaction time and reduce the need for more workers to handle the expected higher volume of business. Most train station and airports now have self-service ticket printing machines, or kiosks, which enable passengers to make reservations, purchase tickets, and check-in for train rides and flights themselves”* (U.S. Department of Labor, 2008, p. 581).

The following sections will describe the collected data, applied in the already mentioned digital media categories in which the items were divided, displayed in tables with the number of collected items inside their respective secondary layer and its further classification on the respective categories, distinguished among the cities and total amount. One by one, it will be possible to offer a precise understanding on the empirical collected data, and the role that the digital media are playing in the urban space of the selected cities. There will be two different approaches: the first is concerning the qualitative aspects of the data collected, and the second is about the quantitative aspects, offering comparisons and numeric observations about the data.

4.1 – Qualitative overview - Types of collected items

Once the collected items were categorized and organized, as was explained in the section 3.5, it was necessary to perform a deeper analysis on the material in order to capture the details and to extract meaning from them. This interpretation, a qualitative approach, aims to contextualize the digital media gadgets on the urban scenarios, not only providing the geo-localization of the items, but also to discourse about their functions, technologies involved, and even their history. To reinforce, *“[q]ualitative studies are presented, similarly, in terms of systematics of interviewing, observation, and textual research, including issues of data collection and data analysis”* (Jensen, 2002, p. 207).

4.1.1 – The technological layer

The technological layer of the digital media was already explained in the section 2.3. Just to reinforce the idea, it is important to say that the existence of a binary system in the background was the *sine qua non* condition of the collecting process. Based on it, some secondary layers emerged – in this case: the interaction, the display and the interfaces, with some more specific final categories inside each one of them, aiming to group the items by similarities.

4.1.1.1 – Interaction

The term interaction can be simply defined as “*a mutual or reciprocal action or influence*” (“interaction - definition by the Free Online Dictionary,” n.d.). In addition, “*(...)the term is widely used, and its meaning varies for each discipline. Originally, the term interaction was derived from the Latin "inter - between" and "agere - acting", and it has been used in sociology to describe the two-way communication between two or more people (human-human interaction)*” (Schroth, 2008, p. 18). Back to the digital media scope, the interaction, in this case, is related to the way in which the users are interacting with the technological gadget (as is explored as Human-Computer interaction field). However, the main factor to define this category is concerning the two-way effect.

In the amplitude of this research, to be considered interactive, the relation of the digital media item with the user must imply the sharing of some kind of message among each other: it could be done by any kind of medium (voice input, buttons or even inserting a magnetic card, etc., as will be discussed later). To summarize, the gadget must display some kind of information, but also, simultaneously, it must be able to receive data input from the user.

Looking on the collected data from the cities, the *Table 4* reveals a relative equilibrium on the interactive and non-interactive items. In Bremen, the number is even equal (29 interactive and 29 non-interactive) and in Rotenburg, three and four, respectively. The number of interactive digital media items is more substantial in Hamburg (41), if compared to the non-interactive (30). The presence of vending machines, financial services, communication gadgets and control structures are representative in this context.

Layer T1: Technology → Interaction		
City	Categories	
	Active (T1A)	Passive (T1B)
Hamburg	41	30
Bremen	29	29
Rotenburg (Wümme)	3	4
Total	73	63

Table 4: Number of collected items inside the secondary layer T1 (Interaction)

In the non-interactive gadgets (defined as passive, inside the technological layer and interaction characteristics) the main item in both large cities (Hamburg and Bremen) are the electronic timetables available in the bus and trams stops. It is important to mention that this service is frequent in European countries – and also a relevant characteristic of the urban transportation in Germany – but not as common in developing countries. The expressive number of available electronic timetables could be also a reflection of the cities’ urban planning strategies, as “*Bremen in north Germany was the first major city to pedestrianize its*

centre in the early 1960s, and the trams remains the only vehicles in major shopping streets" (White, 2008, p. 92). Other items can be considered more international, such as the temperature and time displayed in digital clocks, being two of the four items found in Rotenburg and included in this category.



Figure 17: Concentrated area with several electronic timetables

4.1.1.2 – Display

It is possible to display digital information through different media – voice, for example – but the visual appeal is evident in the urban spaces and all sort of images are part of the scenario of the cities. With the digital media devices identified during this research it was not different. All of the found items have a visual screen and for this reason, “screen” was classified as an important characteristic, being divided into sub categories according to the type of screen/display used to transmit the content.

In general, on the urban scenarios there are basically four technologies for screen displays. Two common ones are CRT screens (Cathode Ray Tube) and flat LCD (Liquid Cristal Display)/Plasma screens. A third one, LED (Light-Emitting Diode), is used normally in monochrome, which emits light in small dots in response to an electric current (Antoniadis, n.d.). One example is the digital clocks on streets. *“For several years, from the late 1960s to the mid 1970s, the emerging market was in numeric LED displays, driven at first by calculators, then by wristwatches, following Hamilton Watch Corporation's introduction of the Pulsar digital watch in 1972”* (Schubert, 2006, p. 9). But these technologies did not extinguish a very popular prior one: the nostalgic split-flap display, common in the most part of the airports, train stations and so on, until the beginning of the new century (Daniel, 2006). Despite of analog display, the split-flap technology is feed in a digital way, and therefore it is

included as a category of digital media, where it is correct to assume that “[t]here are not many forms of purely analog communication still in common use today” (Straubhaar, LaRose, & Davenport, 2011, p. 5).

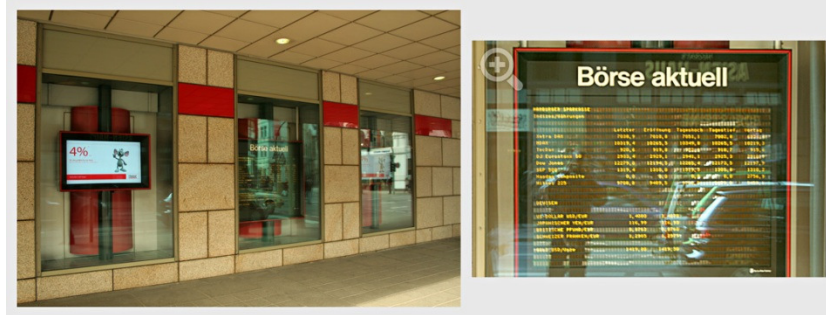


Figure 18: Analogue screen with digital updated content using Split-flap

It is not in the scope of this research to discuss the resolution or quality of the screens, but to offer an overview on the way the media are being displayed. At first it is necessary to understand that the displays are also a reflection of the evolutionary process of the technology. Gadgets and machines that are functioning for a long period tend to be constituted by monochromatic LCD screens or even by larger CRT display structures. It is also inevitable to make a relation to the complexity of the information and the quality/technology of the displays: textual information can be efficiently displayed by LEDs and also by the split-flap. Videos and other multimedia contents require higher resolutions and high luminescence factors in order to be visible under day light on public spaces.

Layer T2: Technology → Display				
City	Categories			
	LED (T2A)	CRT (T2B)	Flat Screen (T2C)	Split-Flap (T2D)
Hamburg	8	3	56	4
Bremen	22	6	30	0
Rotenburg (Wümme)	2	0	4	1
Total	32	9	90	5

Table 5: Number of collected items inside the secondary layer T2 (Display)

The numbers found inside each group after the categorization tests can reflect this evolutionary process. It is clear that the split-flaps are not in the top of the list anymore and the displays for only text contents are mostly using LEDs. The RCT monitors – both color and monochromatic – are being replaced by the flat screens (either plasma or LCD), including in this case, even the small displays of the telephones or the parking lot systems. It is evident that the flat screens are the majority in the urban scenarios and it can be characterized as a tendency.

The gadgets with commercial purpose must offer an effective multimedia appeal in order to sell. The services must compete with the visual pollution information. The interactive gadgets are incorporating the interfaces in their own screen (touchscreen) as will be observed in the sequence. Even the financial and public services are aiming for modernization and adopting modern and more complex displays to present their contents: *“New advertising strategies constantly improved ways of addressing the audience in public space. Currently, there is a growing interest in exploring the potential of non-commercial uses of the screening infrastructure”* (“Urban Screens 05 - sessions,” 2005).

4.1.1.3 – Interface

As discussed in the section 4.1.1.1, there are two kinds of digital media items on the urban places. Some are just displaying the contents without allowing any kind of interaction and some which are able to process input information from the users, sometimes with more than one interface option. On the streets, the research reveals that the types of interfaces are offering different options of interaction to their users. Personal computers, mobile phones and other sort of items belonging to the modern routine have the interaction performed with mouse, touchpads and keyboards as interfaces. For the present research, the icons, graphics, windows, and all the other items frequently analyzed under the Graphical User Interface are immaterial (Bhatt, 2003). In this layer, just the essential concept of the word will be adopted: *“The point of interaction or communication between a computer and any other entity, such as a printer or human operator”* (“interface - definition by the Free Online Dictionary,” n.d.).

Considering this definition and situation, there are other solutions adopted on the urban scenarios. The most common is the interaction based on buttons, activating functions that are being explained through a display. This feature is used in 61 of the collected items: a number that represents almost 85% of the total, considering just the gadgets that are offering input options. The buttons and numeric keyboards, mainly, are the interface to communicate with several kinds of media and services, completing the gadgets which are equipped with LED, LCDs and CTR screens.

Most recently, the touchscreens started to gain more visibility on the streets. *“The touchscreen is the display monitor with which the user can directly interact with the computer system by touching the screen. These devices do not make use of the keyboard and the mouse for inputting the data in the computer system”* (Balagurusamy, 2009, p. 67). However, the research under the idea of a sensitive screen is not new and the first publications relating successful developments have more than 45 years (Johnson, 1965). The large scale production and its popularization, especially through the mobile phones, happened in the last 10 years.

Notwithstanding, some other digital media items collected during the empirical research have different input options. The access control devices, or even some financial services, just allow a further interaction through keyboards, buttons or sensitive screens after a previous recognition through magnetic cards. In this case, they combine different interfaces, requiring more than one data input in order to process the desired service.

In *Table 6*, it is possible to observe the final counting on the interface categories. Also, following the table, *Figure 19* shows a traditional interface operated through buttons, in a self-service machine for selling post stamps.

Layer T3 : Technology → Interface					
City	Categories				
	Button / Keyboard (T3A)	Mouse / Touchpad (T3B)	Touchscreen (T3C)	Other Type of Input (T3D)	No Input Option (T3E)
Hamburg	34	0	3	4	30
Bremen	24	0	4	1	29
Rotenburg (Wümme)	3	0	0	0	4
Total	61	0	7	5	63

Table 6: Number of collected items inside the secondary layer T3(Interface)

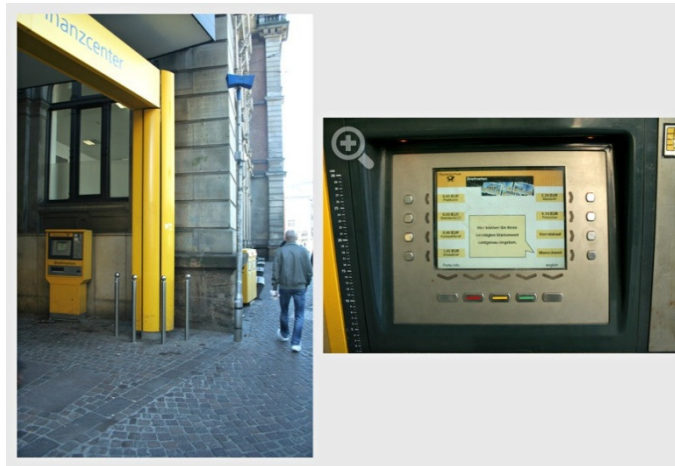


Figure 19: Vending machine presenting an interface with interaction by button

4.1.2 – The social layer

According to Gere (2002, p. 14), “[t]he concurrent development of science, media and capital under the aegis of digital technology produces a kind of fast-forward effect in which everything appears to take place at an accelerated rate and to produce dramatic change in a very short time”. These effects can be perceived in several spheres of the day-by-day life – or even happened in a dimension when the fundamental forces of the capitalism and the communication systems are under changes. “But there is an important difference between these earlier analogue phenomena and the new digital means of controlling how one

consumes media content. The former were subordinate to the mainstream media, such as records, radio and television, which still determined in general how their content was consumed, whereas the new technologies are fundamentally altering our relation to media in a profound and radical way” (Gere, 2002).

This introduction aims to provide an idea of the magnitude that the analysis of the media in a social context can acquire. However, for the present categorization, this range is simplified and deals with some more superficial categories, more related to answering the questions about who is the owner, how much it cost to use it and how long the item will stay in the streets.

4.1.2.1 – Charge

Regarding the charging, the concept is quite evident. Free services – such as information expressed in simple text – are operated without direct charge to the users. The indirect costs – as the bus/tram tickets which help to cover the costs of the maintenance and installation of electronic devices (as timetables, ticket machines), or even the sponsor advertisement which pays for the installation of clocks and thermometers for the public – are not considered in this categorization. The rule is simple: if the machine can offer the service – or the object, connection, place, and so on – just after the introduction of a payment source, it is considered paid (i.e.: paid telephones and vending machines).

Layer S1: Social → Charge (Costs)		
City	Categories	
	Free (S1A)	Paid (S1B)
Hamburg	43	28
Bremen	36	22
Rotenburg (Wümme)	4	3
Total	83	53

Table 8: Number of collected items inside the secondary layer S1(Charge)

The free information and advertisement gadgets are more often found in Hamburg than in the other two cities. In Bremen, the difference between the number of free and paid digital media is not as large as in Hamburg. In Rotenburg, the numbers are balanced.

4.1.2.2 – Use

This category deals with the use of the public devices, and their respective “owners”. All the collected items, by definition of the scope, are installed in public urban places and, as a consequence, can be accessed/used according with the characteristics and specifications by all the population. The concept of private and public in this case refers to the institution,

company or entity responsible to the installation of the collected item: in other words, its owner. *"One of the most common usages equates public with governmental"* (Bozeman, 2004, p. xi).

Public services – as the information related to bus and trams – were considered public items: it was not the matter to discuss the formal regulation of the companies, that is, if public-private partnerships were involved. On the other hand, banks were considered all private.

Layer S2: Social → Use (Owner)		
City	Categories	
	Public (S2A)	Private (S2B)
Hamburg	35	36
Bremen	33	25
Rotenburg (Wümme)	3	4
Total	71	65

Table 9: Number of collected items inside the secondary layer S2 (Use)

Public and private items of digital media can be considered in balance in the urban spaces of the three researched cities. Just in Bremen there is a tendency to more public elements. A simple explanation can be connected to the usage of the places in the surrounding area of the City Hall. As was mentioned before, the circulation of cars in the Bremer city center is limited and the citizens mostly move in trams and buses. On the other hand, the existence of parking lots inside the limited area of the other two cities helps to explain the most intense occurrence of private digital media machines.

4.1.2.3 – Durability

One characteristic of the digital interfaces, in comparison with the analogical structures, is the possibility to replace the content without changing the hardware. That could be one of the most plausible explanations for founding 123 permanent items in comparison to only 13 temporary elements. The necessary investments – still elevated – on placing digital devices instead of analogical ones (i.e.: advertisements, information displays, etc.) also helps to understand the reason that the screens and other structures are permanently placed.

Among the permanent researched items, one curiosity can be mentioned. A touristic totem¹⁶ (Figure 20) installed in the *Marktplatz* of Bremen, a few meters in front of the City Hall, was registered and, later, included in the permanent items. In the revision round of the mapping, checking the found media, the totem had been removed. It was an internet based device, with

¹⁶ Photo “hb037”, available at

<http://maps.google.com/maps/ms?msa=0&msid=218005543139613051182.0004a9386cd40fcdf4bce&ie=UTF8&ll=53.076509,8.80846&spn=0.008998,0.026157&z=16&vpsrc=0&iwloc=0004a9387064d2052032d>

a touchscreen, with an initial screen displaying touristic information about the city, but also allowing the navigation under other several topics, with updated information. Considering that this device was installed for several months before (at least 3 years), the testers categorized the element as permanent.

Layer S3: Social → Durability		
City	Categories	
	Temporary (S3A)	Permanent (S3B)
Hamburg	7	64
Bremen	5	53
Rotenburg (Wümme)	1	6
Total	13	123

Table 10: Number of collected items inside the secondary layer S3 (Durability)

Regarding the temporary digital media items, they are mostly configured by small screens, in which changeable information can be stored and displayed. However the hardware itself is a permanent piece – as a final good – his disposition on the public space can chance according to a specific need or situation.



Figure 20: Touristic totem placed at the Bremer Marketplatz

4.1.3 – The content layer

The content can also be interpreted as the message to be transmitted. It is not the objective of this research to detail or to criticize the communication models. Assuming the importance to elucidate the adopted concept to define this layer, the content will be interpreted under the Shannon and Weaver's model (Steinberg, 2007, p. 53): from an information source, a message is transferred by a transmitter through a channel in order to achieve a receptor. In the scope of the present work, the channel is the digital collected item, and the content is the layer which transforms the technological item into a medium.

In other words, to be classified as a digital media – or new media –, the item must transmit content to the user. This content could be a simple number or complex multimedia information, just mentioning two different examples among several available options. During the mapping process, several items spread around the city were noted but not considered to be included on the research scope since they did not transmit any kind of information from the citizen perspective. Surveillance cameras were among the most common examples, where the information is captured, transmitted, received, completing the communication process, but the citizen which is using the public space is not the receptor of this message.

There are three main sub layers observed inside the content sphere. Type is related to the format of the transmitted message: if it is text based, video, image or structured in multimedia format. The way which the information floats is also included in the content layer. On the one hand it is strongly related to the technology, on the other hand it is determinant to configure the message itself, as already explained under some McLuhan (1994) thoughts. In the end, the offered service will be explored: it is the chance to observe in a deeper way in which sectors the digital media are being applied with most profusion, according to the researched areas in Hamburg, Bremen and Rotenburg (Wümme).

4.1.3.1 – Type

Text, photos, videos, audios and the combination of these elements in multimedia structures are the most common forms to transmit information, making it feasible to be interpreted by the users in the urban spaces. In the urban scenarios there is a clear preference for two types of formats: the text (89) and the combined media (46), known as multimedia. “*A generally accepted definition of multimedia is the combination of two or more different media types (...)*” (Turner et al., 2004, p. 8). If on the one hand the association of multiple formats of information can be considered as a possible trend, two observations can be extracted of the researched numbers: the first one is that simple information (as timetables, temperature, etc.) is still fulfilling the needs of users. The second one is how the multimedia structures are noted as a strongly present support for commercial purposes: the animations and/or screen transitions tend to capture the attention more effectively than a static image.

Regarding the sound – however it is a complementary source of information in several routines of the city, not necessarily related to the digital media – it does not configure a priority media: the city has a “voice” itself, constituted by the addition of the urban noises, and the sound-based medium should compete with this interference (or will be turning into an interference itself, from another point of view). The same rule can be applied for the videos, which will require fully attention to achieve the desired level of communication. The

multimedia items can be decoded in several manners at the same time, empowering the attention span process and, as consequence, the comprehension of the message.

In addition, the spread of the technology in the urban scenarios configures, in itself, another reason to the migration of content from text-based support into multimedia structures. The information is being associated with commercial purposes, turning the digital media items also in multi-content structures. Once the same hardware can display different contents, the costs can be dissolved among the transmitters of the message: it is a combination of technology and economical arrangements that could change even more the urban scenarios into live mosaics of multimedia screens.

Layer C1: Content → Type					
City	Categories				
	Multimedia (C1A)	Text (C1B)	Video (C1C)	Photo (C1D)	Audio (C1E)
Hamburg	24	46	1	0	0
Bremen	21	37	0	0	0
Rotenburg (Wümme)	1	6	0	0	0
Total	46	89	1	0	0

Table 11: Number of collected items inside the secondary layer C1 (Type)

4.1.3.2 – Flow

Information flow is vital for life itself: cells are carrying information through the body; clouds can carry information on the weather changes (Barwise & Seligman, 1997). There is almost 15 years since Barwise and Seligman discussed about the changes taking into consideration the technological perspective: *“Individuals and companies are discovering that many transactions that used to require the movement of people and goods, often at great expense, may now be accomplished by the click of a mouse. Information can travel at the speed of light; people and goods cannot. The result is no less than a reshaping of our shrinking planet as cultural and commercial boundaries are transformed, for better or worse, by the increasing volume the information flow”* (1997, p. 4). The idea of a replacement of the services and the change of the relations was clear even during the emerging period of the so-called “information highway”.

In a local sphere, the same happened during the development of this technological replacement, the digital media – which is replacing not only sellers or finance agents, but also the need of personal interactions regarding the information retrieval – is a reality. Considering that the way the information flows through those gadgets can also reveal the role that they are playing in the cities. As flow, in this case, it is also implicit the idea of actualization and the possibility of changing the contents. In this case, three categories were created to describe this

flux: on-line update, referring to the gadgets that can be actualized on the flow, receiving information from other computers, systems, machines or even the environment; manual update, for the ones which require direct human interference to be updated and, finally, the digital media gadgets that are using static information. In this case, it does not mean that the content is permanent and fixed, but it means that it must be previously programmed and requires a technical interference in case of any kind of change.

During the mapping, 52 items with static information were found: phones, vending parking lot machines are among the examples where the user will receive only pre-recorded information. A similar number – 55 items – can be updated in a manual way: advertisements, digital clocks (which required a manual update on the turning into the summer time, for example) and even some self-service machines (as banks), which can mix the actualization: if on the one hand they run the personal information of the client directly connected to the servers of the institution, the services and the screen sequences (including advertisements) are pre-programmed and must be changed manually.

Layer C2: Content → Flow			
City	Categories		
	On-Line Update (C2A)	Manual Update (C2B)	Static (C2C)
Hamburg	11	26	34
Bremen	18	25	15
Rotenburg (Wümme)	0	4	3
Total	29	55	52

Table 12: Number of collected items inside the secondary layer C2 (Flow)

The 29 items which are offering the actualization on the fly are mostly using the Internet, independently of the type of connection: “*telephone service connection (sometimes referred to as POTS, or plain old telephone service); Digital Subscriber Line (DSL); T1 and T3 connections; cable; satellite; and wireless*” (Schneider, Evans, & Pinard, 2008, p. 18). There is not necessarily a relation among the flow of information and the complexity of the media or the content displayed. Complex interactive systems can emulate interactive contents running on local hosts. Also, simple information displays can run real time information updated through complex systems of control and distribution in order to offer to user the precise content, as the timetables on the bus/tram stops.

4.1.3.3 – Service

The observation of the offered services through the digital media in the urban spaces constitutes one of the most interesting findings of the present research. It offers the chance for a careful look on the technological gadgets spread in public spaces, and the elaboration of some thoughts that were not found in the consulted literature. Different from the previous

analyses, this section will also come with a reflection regarding the three most common type items (Transport, Communication and Access Control), besides the categorization.

The names of the categories tried to be self-explanatory. In addition, some details are already mentioned on the section 2.3. Just to refresh the concepts: the informative layer refers to the act of transmitting information, a simple text or more complex media as offering tips and data as time, temperature and so on; control is related to identification and access control to a place or service; commercial involves all the advertisements, vending machines and similar; the telephones, with or without internet, are the most representative example of the communication category. Finally, financial is related to the banks and other money transaction services, such as payment of bills or money transfer from one account to another. The *Table 13* shows the numbers of the items collected during the mapping in the three cities.

Layer C3: Content → Service					
City	Categories				
	Informative (C3A)	Control (C3B)	Commercial (C3C)	Communication (C3D)	Financial (C3E)
Hamburg	12	13	39	5	2
Bremen	22	7	14	13	2
Rotenburg (Wümme)	3	0	2	2	0
Total	37	20	55	20	4

Table 13: Number of collected items inside the secondary layer C3 (Service)

A) Transport

In the beginning of this chapter some discussions were made regarding the importance of the transports and the communication to configure the urban scenarios. To reinforce the idea, it is possible to observe some thoughts of Garber and Hoel (2009, p. 3), when the authors are introducing the idea: *“For as long as the human race has existed, transportation has played a significant role by facilitating trade, commerce, conquest, and social interaction, while consuming a considerable portion of time and resources. The primary need for transportation has been economic, involving personal travels in search of food or work, travel for the exchange of goods and commodities, explorations, personal fulfillment, and the improvement of a society or a nation”*.

In addition, it is already clear that the urban centers represent the concentration of services, financial, commercial and governmental institutions, making this area also an important point of convergence for the inhabitants in a city. With these characteristics in mind it cannot be considered a surprise the large amount of digital media items found during the research: generalizing the services which are related to the transportation – public or private – there were 59 items among the 136 collected. It can be considered as a reflection of the modern

city, which “(...) is as much a place of settlement and mooring as it is an environment of flows and circulation, in which mobility is essential (Urry, 2007; Canzler et al., 2009)” (Brighenti, 2010, p. 474).

Inside the transportation area, there are several types of items (from different service categories: as information, control, commercial) with different functions: places to park cars and the indication of free spots, vending tickets machines and even the availability of “open / close” garages’ signs are among the examples. Also the timetables in the bus/tram stops: a characteristic present in the German cities, where the public transportation has a relevant role in the movement of the people. Also an alternative transport offer, such as a machine used to rent a bike, is among the offered services.

Transportation								Total per City
City	Garages			Time- tables	Vending Machines			
	Access Control	Available Parking Spots Number	Open- Closed Status		Street Parking Tickets	Public Transportation Tickets	Bike Renting	
Hamburg	2	3	0	5	19	1	1	31
Bremen	3	2	4	12	5	0	0	26
Rotenburg	0	0	1	0	1	0	0	2
Total per Type	5	5	5	17	25	1	1	
Total Absolute	59 (43,38% of 136 items)							

Table 14: Collected transportation data

More than a general characteristic of the cities, the machines related to the transportation issues constitute an important item on the image of the urban spaces; and the mechanization is not a new characteristic. “The first parking meter, invented by a fellow named Carl C. Magee, was introduced in Oklahoma City in 1935” (“New York Retires Last Mechanical Parking Meter - New York Times,” n.d.). The same service took some years to be installed in Germany and it was not necessarily related to the size of the city or the urban concentration, in that time. The first automatic parking meter installed in Germany, was on 4th January 1954 at the city of Duisburg. In 2002 they started being replaced by a solar-power model (“Ihre Zeit ist abgelaufen - einestages,” n.d.), present in 72% of the mapped parking machines’ items in the present research. Regarding the timetables, “[t]he first electronic timetable information systems were established in the late eighties of the last century” (Müller-Hannemann, Schulz, Wagner, & Zaroliagis, 2007, p. 67). Before the electronic version, the information screens to inform the free places to park (Parking Guidance and Information systems)– and even the direction to take in order to find the free spots – started to work in Germany in the early 1970s, in the city of Aachen (Bonsall & Palmer, 2004, p. 3).



Figure 21: Some types of transportation items: timetable, parking ticket, bike renting, transport ticket, parking spots number and parking status, respectively.

The popularization of the services (and their modernization and changing into digital media structures) can be, however, related to the use of the urban space and the surrounding areas. In Bremen, for example, there are more timetables for trams and buses than vending machines for parking tickets (in a circumference of 250 radius meters around the City Hall). Based on it, even without knowing the city, it is possible to conclude that the flux of private vehicles in Bremen is not so intense – or allowed – in the researched area. In Hamburg, the area around of the City Hall has, probably, less public transportation on the surface and more options to park the vehicles in the same scenario.

This kind of interpretation can lead to several other conclusions and even some speculations regarding the use of the urban space, but the matter of this work is not to promote the discussion in this direction. As main conclusion on these evaluations is that the digital media plays a two-way role in the urban scenarios: on the one hand, its occurrence is based on the needs of the people and the way that the city is organized to provide these services. On the other hand, it helps to reveal the habits, the policies and even the concentration of people on the urban areas.

B) Communication

There is an intrinsic relation regarding the transportation and communication, as previously discussed: when faster and efficient communication means started to operate, longer and faster the goods and people started to be transported. But the importance of the communication is not strictly to this sphere, especially in a period denominated “the information era” (Aksoy & DeNardis, 2008). Regarding the interpersonal communication sphere, the telephones are one of the most popular tools of communication. Even in a period when the rates of mobile telephones are achieving numbers that are larger than the population itself, there are still spaces for public telephones in the urban spaces as a part of the city’s

structures. *“In the year 2000, there were an estimated 500 million mobile phone users worldwide. Today, there are about 3.3 billion users”* (Samkange-Zeeb & Blettner, 2008).

There is an evident change since, *“[i]n 1889, William Gray patented a coin-operated telephone”* (Reilly, 2003, p. 252) and the first public equipment was installed in the same year in Connecticut, USA. One news article published in 2010 at the CNN website gives a quick overview about this transformation (*“Pay phones: The search for an endangered species - CNN,”* n.d.), when describes the reaction of a 12 year old person observing a telephone inside a cabinet: *“Recently a child around 12 years old saw the telephone then starred at it for about a minute, looked at me and said, 'How does it work?' he said. 'It occurred to me that they had never seen a rotary dial phone before.'”*.

Paid Telephones				
City	Simple Model	With Animated Screen	With Internet Services	Total Per City
Hamburg	0	3	2	5
Bremen	3	7	3	13
Rotenburg	2	0	0	2
Total per Type	5	8	5	
Total Absolute	18 (13,23% of 136 items)			

Table 15: Collected communication data

There are no more rotary dial telephones on the researched areas of Hamburg, Bremen and Rotenburg, but the models found also are not always the same. Among the 18 payphones spread in the three cities, there are basically three different types: the simple one, just able to make calls through the introduction of coins; an intermediary model, with an animated screen that changes the content in a cyclic presentation, offering information on how to make the calls or access some services through the telephone; and a third one which is an extension of a simple “calling device”. It is powered with a touchscreen display and has full access to the Internet, allowing the use of browsers, chats and e-mail services.

The following images show examples of the three models of paid telephones found during the mapping process.



Figure 22: Types of telephones: simple model, other with animated screen and other with internet, respectively.

The addition of the Internet services to pay phones leads to an immediate relation with smartphones: also empowered with expanded connectivity services. This addition of services, however, could not be enough to maintain the pay phones alive on the streets in the future. The telecommunication companies allege that they are not profitable anymore (“7.30 Report - 20/02/2006: Telstra to cut number of pay phones,” n.d.). The tendency is that they could survive longer in spaces where the flux of tourists is representative and in arrival/departure stations, but it is impossible to assure that the cabinets and similar will be present with the same intensity in the urban space in the next years.

C) Access Control

The devices to assure the physical access control are among the most commonly found items of the digital media mapping. These devices are separated into three main types of services, but mainly with a financial (collecting payments) or a security reason as background: bank entrance, parking lot controller and building entrance.



Figure 23: Types of access control: bank, building and parking lots, respectively

For the banks, the control is regulated by a personal bank card, which when inserted in the proper place, opens the door. In the parking lots (garages) the control usually is made by a temporary card, which the user gets in the entrance, and after paying the correct amount for the used service, the control is done on the exit by using again the same temporary card. For the buildings, the control can be automatic, just typing a personal code on the entrance door, or ringing the electronic “bell”, calling someone from inside who can open the door. It is normal to have cameras for the solicitor’s identification.

These technologies are not quite new, if it is considered that the “(...) *security issues had been addressed in some early time-sharing computer systems from the 1960s, the discipline of computer security began to progress rapidly in the early 1970s*” (Ferraiolo, Kuhn, & Chandramouli, 2003, p. 6). Checking the collected results at the next table, the majority of access control resources are being used for building controls, replacing the old “intercom”.

Access Control				
City	Buildings	Banks	Parking Lots	Total Per City
Hamburg	7	4	2	13
Bremen	3	1	3	7
Rotenburg	0	0	0	0
Total per Type	10	5	5	
Total Absolute	20 (14,70% of 136 items)			

Table 16: Collected access control data

The transportation's consequences from the population movement towards the urban centers were already discussed along this chapter. The occurrence of the digital media items on the access control category can also be connected to this flux, represented by the parking lots control. However, the gadgets are not limited to the transportation sphere and the security issues can also be considered as a factor of stimuli for its incidence. Half of the found items are media gadgets installed in the public spaces to control the access to private or reserved buildings: they work as a barrier between the public space and privacy areas (even if they are operating public services). Security reasons are also among the possible interferences: to access financial facilities it is necessary, sometimes, to insert magnetic cards (which contain identification data) in order to access the facilities.

4.2 – Quantitative approach

Since the inception of the first ideas regarding the approach of this research on the digital media in urban spaces, a quantitative approach was out of scope. *“Quantitative studies are covered both in terms of their basic categories and operations, and with reference to the different relevance of surveys, experiments, and content analyses”* (Jensen, 2002, p. 207). The premise was to observe, to map and to discuss the found items and elements, following the proposed limitations regarding the chosen cities (Hamburg, Bremen and Rotenburg) and the observed area (a circumference with 250 meters radius around the City Hall) – as explained in details in the section 3.2.2. This is perfectly feasible for qualitative analyses, but not representative enough – considering the scenario of the whole country – to sustain quantitative evaluations in a vast way. For this reason, this section does not aim to determinate strong evidence regarding this topic, but works as a provocation for prospective studies, being an indication of the exploration possibilities.

One of the hypotheses, presented subjectively during the introduction section, suggested that the occurrence of digital media in the urban spaces could be related to the population of the city. A “cause and effect” postulation: the more people live in a city, the larger will be the

number of digital media items around its City hall. This premise is not wrong, considering the absolute numbers of the items: 71 in Hamburg, 58 in Bremen and 7 in Rotenburg (Wümme), but the discrepancy started when the population of the cities were analyzed: there was not a balance among the data. Observing the comparison of Hamburg and Bremen, for example: with 547.769 inhabitants, Bremen has 30,94% of the 1.700.000 inhabitants of Hamburg; In the same time, the 58 digital media items found on the urban spaces were significantly representative if compared to the 71 items collected in Hamburg (Bremen had 81,89% of the amount found in Hamburg). The situation was repeated (*Figures 25 and 26*) when Rotenburg was compared to Bremen and Hamburg.

This discrepancy leads to new questions and the investigation reveals another important factor on the equation, and opens several new possible discussions and interpretations: the demographic density. *"Population density is one of the main characteristics in the urban analysis"* (Alegria & University of Southern California, 2006, p. 185). In addition, *"[p]hysical density is a numerical measure of the concentration of individuals or physical structures within a given geographical unit. It is and objective, quantitative and neutral spatial indicator"* (Ng, 2008, p. 3). Just as complementary information, it is interesting to know that *"Germany is far more crowded than the United States. Its population density is more than eight times greater"* (Fishbein, 1996, p. 8). Fishbein express the data using the relation in miles, not in kilometers, but it is still possible to observe the difference between the two countries. In Germany, the density is 588 people per square mile, and in the USA, this number is 71 people per square mile.

The calculation of the population density of the observed cities took in consideration the their whole territory, since the researched area is the political concentration of the services and other items, as mentioned several times before, to serve the entire population of the political area. From the equation, the results – calculated in inhabitants per square kilometers – pointed to: Hamburg with 2.377,37 people per km²; Bremen with 1.685,44 people per km² and Rotenburg (Wümme) with 223,13. Once these new numbers were compared with the amount of the digital media items collected, a new panorama could be observed.

It is possible to affirm that, in the researched cities there is equilibrium among the population density and the occurrence of the digital media in the urban spaces. The more densely populated is the territory, the more intense is the presence of digital media in its urban scenarios. The variation does not exceed approximately 10%. Explaining the second and third columns of the *Figures 24, 25 and 26* it is possible to see that:

- Bremen has 71% of the population density of Hamburg, and 81,89% of the amount of digital media items;
- Rotenburg (Wümme) has 9,5% of the population density of Hamburg, and 9,85% of the amount of digital media items;
- Rotenburg (Wümme) has 13,24% of the population density of Bremen, and 12,86% of the amount of digital media items.

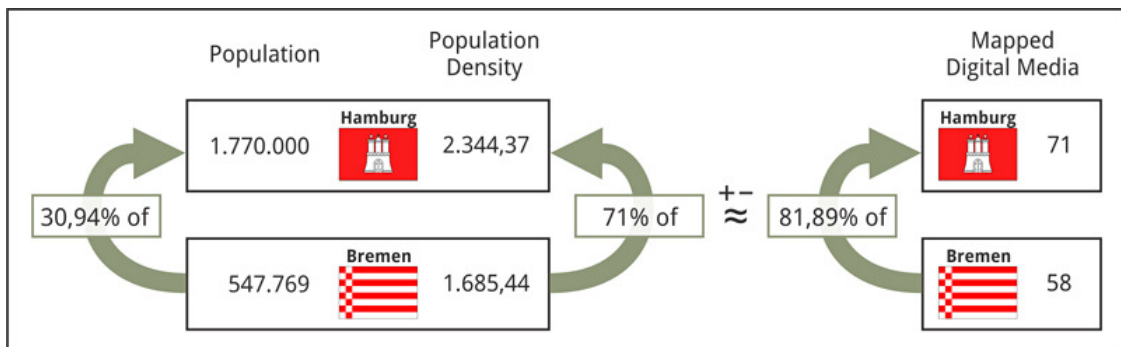


Figure 24: Density and items comparison between Hamburg and Bremen

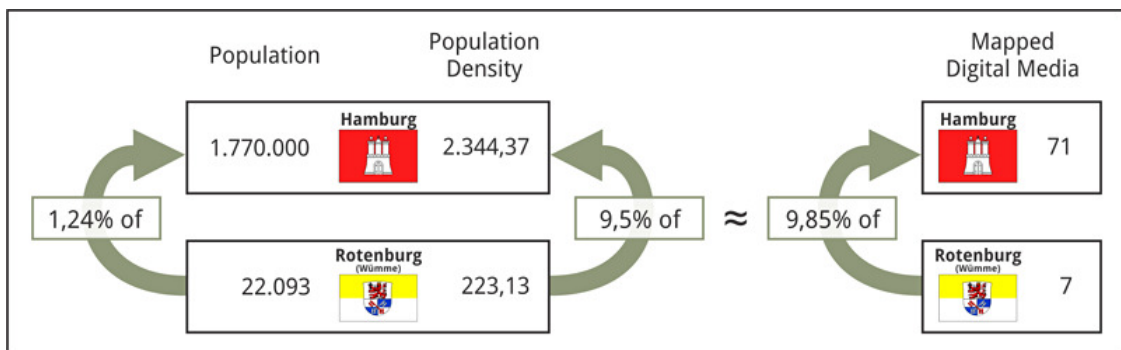


Figure 25: Density and items comparison between Hamburg and Rotenburg (Wümme)

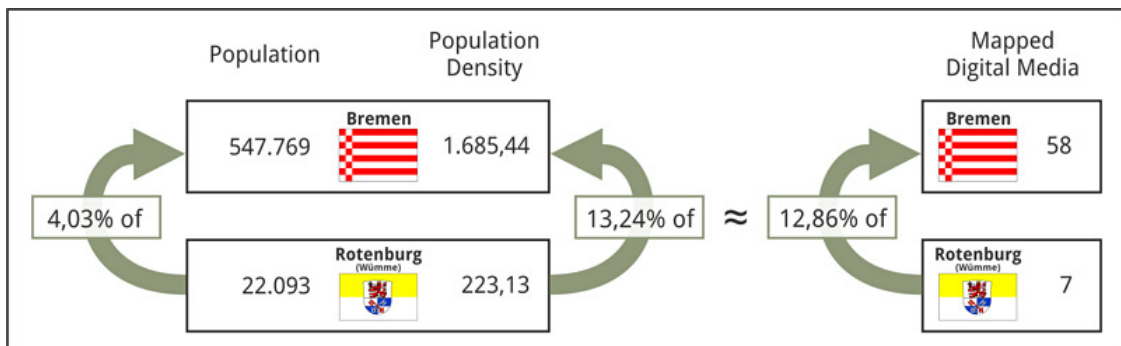


Figure 26: Density and items comparison between Bremen and Rotenburg (Wümme)

The comparisons reveal a fair equilibrium among the elements and the density, but also are the starting point to more questions regarding the mathematical evidences. As a consequence,

some topics on the characteristics of the city were again explored to support this research result. The density is not only a numerical expression of the relation of population and area, but also an intrinsic relation with the way that the urban space was occupied and is used. *“Among the results of density is the tendency of the urbanite to orient himself according to the visual cues”* (Hannerz, 1980, p. 62). This assertion leads directly to the perception of the urban spaces, already discussed, and in which the presence of the digital media plays an important role. *“In the urban environment, the perception of density has been found associated with the built form and certain urban features”* (Ng, 2008, p. 13).

Ng quotes a work published by Rapoport (1975 apud Ng, 2008, p. 13), detailing this perception of the urban environment: *“a list of environmental cues, which are thought to have effects on perceived density; these hypothesized factors include building height-to-space ratio, building height, space openness, space complexity, the number of people, the number of street signs, traffic, light level, naturalness of the environment, and the rhythm of activity”*.

Considering that in 1975 the digital media was not a discussed issue in terms of public spaces, it is not wrong to assume that it will be certainly included as a key visual element in a contemporary review. From this, a bridge can be constructed, reinforcing the concepts of mediatization previously discussed. The media is part of the city and it is connected in a way in which the dissociation is not possible. The digital media items are a representative icon of the population density and its occurrence is intrinsically connected to the perception of the urban spaces. Its occurrence does not configure only just an important part of the voice of the city, but it can be understood as the proper expression of what means an urban space.

Chapter 5 – Final Considerations

The idea of “technology” has for a long time been associated with the future. In the so-called *information era*, computers are everywhere and sometimes it is almost impossible to dissociate them from the routine of the people who live in urban centers. The concept of the city itself has already aggregated the presence of the digital in its image: it is almost impossible to imagine a central urban area without the presence of electronic information displays, colorful screens with advertisements popping up, and the everyday most common self-service machines. The process of mediatization is clear, and the data flow happens all the time, making the city being understood as a medium itself. The digital gadgets are amalgamated into the city scenario and can even be understood as the interfaces of the city itself.

“While media interfaces are commonly depicted as iconic symbols of the digital age, behind this image is a complex intersection of social practices and technical infrastructures (see Beer 2008). As interfaces embed themselves in the everyday, increasingly they ‘define our perceptions of the space we inhabit, as well as the type of interaction with other people with whom we might connect’ (de Souza e Silva 2006: 261). Pervasive and locational interfaces do a number of things: they help organize social connections, they retrieve information and feed it to our senses, and forge new relations with our lived environments” (Gane & Beer, 2008, p. 76).

However, nowadays a simple walk in the urban centers is not enough to observe the presence and the role of the digital media. The fusion of the binary-based gadgets into public spaces is consolidated in a way that only a conscious effort can reveal its dimension and depth. That was the observation offered by the present research: the development of a relation among theory and practical approaches, discussing media concepts, agreements on digital definition and even playing with classical literature in the communication theory to elucidate this modern phenomenon.

There were two distinct phases on the development of this research, a theoretical approach and a detailed empirical research, but the results convert to similar conclusions. The idea of the presence of the media on the construction of the imaginary of the urban spaces is one of the strongest statements that can be extracted from the present research. On the one hand, the digital media gadgets were installed in the city empowering the offer of services to an increasing demand of people. On the other hand, the concentration of these services and facilities in the urban spaces are responsible for the intensification of the people's flow in this area. Concepts of urban, city and some notions about how the cities were built – around the governmental structures, surrounded by economical, educational, financial and other sort of services – were also observed carefully.

From these observations some needs also emerge. To explain the role of the digital media in the urban spaces it is necessary to evaluate their function under different perspectives. Once it is understood that the media is configured by different layers – a technological (in this case, mandatorily based on binary systems), a social, and the content. Actually, it is important to reinforce the importance of the content: it is the idea of work as a support to transmit some information between one transmitter and one receptor that constitutes the gadget as a media item. Observing these layers, it was possible to develop several categories to group the digital media items and, with this clear division, discuss and understand the role of each one on the urban scenario.

With clear definitions on what constitutes or not a digital medium item, the next step was the empirical research. This phase can be considered one of the more detailed and innovative aspects of the present research, when the methodology of capturing images of the items and merging them with modern mapping systems based on geo-location allowed the maintenance of the original context where the item was mapped. The maps with the results of the present research are now on-line and available to the public, full of details and connected to the original placement and environment of media items. This data can allow the construction of new interpretations or even constitute the picture of a specific moment to be compared with further developments in the area.

The accurate development of the methodology allows also the expansion of the research to different scenarios in further developments of this topic. The method can be applied in different cities in Europe, or other continents, allowing meaningful observations and deep discussions regarding the role of the digital media in the urban scenarios. As a speculative provocation, it also can help to understand the differences on the uses of the urban spaces in different cities or a multicultural comparison on the results. But it is a suggestion for future developments.

Back to the already achieved results, it is important to emphasize that the qualitative observations reveal interesting results, already mentioned on the development of each categorization section, always connecting the empirical results with a theoretical perspective. Regarding the technology, the replacement of the analogical displays, fed by computer systems, is one of the most evident analyses, also because of the improvement on the quantity, size and presence of digital flat screens for multiple uses. These hardware structures can be the support of different content, easily replaced by feeding the supportive system, without the need to change the medium itself. For that reason, digital media tend to be permanent, reinforcing the idea of their presence on the urban spaces' descriptions.

Among the mapped items, the relation between communication and transport is one of the most curious. The amount of digital media dedicated to organize people's flow is meaningful, but this specific characteristic is intrinsically related to the transportation policies and urban organization of the cities. When the surrounding areas of the City Hall are mostly dedicated to the pedestrian, the information regarding public transportation plays an important role. In contrast, if cars are allowed to circulate in the surrounding areas, parking lots and ticket vending machines numbers are more impressive. In this case there are still several gadgets spread on the cities, but there is also a tendency to observe their replacement by mobile services along the years: however it is a suggestion for another further development.

Access control is another common digital media use in the urban spaces and its presence normally works as a barrier among distinct uses: public and private, free or charged. They also have an intrinsic relation to the identification needs and financial matters. Following the intense flow of information based on the internet, the services tend to be automatically updated: services running on the fly and efficiently replacing any human command to show updated information. However, there is still a significant amount of gadgets that need to be reprogrammed to change their contents.

Among these are the advertisement contents, which are not disposed with an isolated purpose anymore. Frequently, the commercial information is permeated by services information. An example is the presence of several pay phones, which have not just a monochromatic screen with the basic instructions, but more elaborated information displayed in colorful screens running in loop. Still regarding the pay phones, it is clear the shrinking on their occurrence and their need: mobile phones and the everyday more complete worldwide supportive connections are pushing the pay phones to a marginal role in the cities. Some of the telephones found can even be considered as a curious emulation of smartphones. Working with coins as payment, they are empowered with large sensitive monitors allowing Internet navigation: an attempt to follow the evolution on the communication sphere.

In addition, the present research found some quantitative impressions. As mentioned, the studied sample was not large enough to assure that the found relations are a constant and can be applied to other cities or places, but the quantitative results still deserve some credit among these final considerations. The number of items found increases from city to city according to the population: more populated cities have more digital media items. But the relation among the absolute numbers does not offer any balance or constancy. It is another factor which can give some clues on the digital media occurrence: the population density. Among the three researched cities – Hamburg, Bremen and Rotenburg (Wümme) – there is a meaningful equilibrium between the relation on the number of the mapped items and the demographic density. This finding can constitute an interesting starting point for further developments and considering the accuracy of the methods, could configure a constant relation for further studies.

To summarize, among several interpretations already presented, there was some clear conclusions that can be extracted from the present research:

- Media must transmit content: the definition of digital media is not only related to gadgets based on binary system. To be defined as a digital media item, the gadget has to transmit a content from the users' point of view (the user must receive a message).
- The presence of the digital media on the city is "natural": the digital media gadgets are intrinsically connected to the city and they are not easily perceived. It is necessary to look carefully into the urban scenario to identify their presence and functions.
- Digital medium is amalgamated to the concept of urban: the presence of the digital media in the cities is consolidated and constitutes in itself a part of the definition of the urban scenarios.
- Technologies used in digital media gadgets are substituting analogical structures and enlarging the scope of services: digital media items are normally permanent, considering the costs and structure of the hardware. On the other hand, the contents are more flexible and the same structure can have more than one function, such as information and advertisement, for example.
- Types of digital media vary according to the city: there is not a pattern for the digital media items collected during the empirical research; the number of telephones, access control machines, etc. is not proportional to the population. The variation is related to the use of the space in the City Hall's surrounding area.

- Some digital media items tend to disappear: the digital media gadgets are installed in order to empower the offer of the services in an increasing flow of people scenario. Once the services are not in demand by the users – as the payphones, replaced by the use of the cell phones – they tend to disappear of the urban scenarios.
- There are more digital media in the biggest cities: The number of the digital media items is more expressive in the biggest cities, but the relation does not follow a balance with the relative number of inhabitants. There is a more expressive relation with the population density.

Overall, the development of the present research has more interpretative than numeric data to offer, but it does not decrease its value. The conclusions and reflections are offering an accurate observation on the actual state of the selected cities and help to understand the close relation of the digital media and urban life, even when people do not perceive its presence as an innovation anymore, but just as another service offer, part of the expectations and needs during the flow on the cities.

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Appendix

Complete applied mapping categorizations

Here follows the complete categorized mapping of the digital media items.

The original mapping maps, with photo and locations, can be access at:

- **Hamburg (HH)**
71 mapped digital media items, in 68 photos, available at:
<http://maps.google.com/maps/ms?msid=218005543139613051182.0004a939e3357e8367c1f&msa=0>
- **Bremen (HB)**
58 mapped digital media items, in 52 photos, available at:
<http://maps.google.com/maps/ms?msid=218005543139613051182.0004a9386cd40fcd4bce&msa=0>
- **Rotenburg (Wümme) (ROW)**
7 mapped digital media items, available at:
<http://maps.google.com/maps/ms?msid=218005543139613051182.0004a93b436dbd236e39a&msa=0>

Photo Name	Applied Categorizations' Codes
HB001	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB002	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB003	C1B, C2B, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB004	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB005	C1B, C2A, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB006	C1B, C2C, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HB007	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3C
HB008	C1B, C2C, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HB009	C1B, C2A, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB010	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB011	C1A, C2B, C3D, S1B, S2A, S3B, T1A, T2C, T3A

HB012	C1A, C2B, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HB013	C1A, C2B, C3E, S1A, S2B, S3B, T1A, T2B, T3A
HB014	C1A, C2B, C3E, S1A, S2B, S3B, T1A, T2B, T3A
HB015	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB016	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB017	C1A, C2B, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HB018	C1A, C2A, C3D, S1B, S2A, S3B, T1A, T2C, T3C
HB019	C1A, C2B, C3D, C1B, S2A, S3B, T1A, T2C, T3A
HB020	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB021	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB022	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB023	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB024	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB025	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB026	C1A, C2A, C3D, S1B, S2A, S3B, T1A, T2C, T3C
HB027	C1B, C2C, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HB028	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HB029	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB030	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HB031	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HB032	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HB033	C1A, C2B, C3C, S1B, S2A, S3B, T1A, T2B, T3A
HB034	C1A, C2A-B, C3D, S1B, S2A, S3B, T1A, T2C, T3A-C
HB035	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HB036	C1B, C2B, C3C, S1A, S2B, S3B, T1B, T2A, T3E
HB037	C1B, C2A, C3A, S1A, S3B, S3B, T1B, T2A, T3E
HB038	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB039	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HB040	C1B, C2C, C3B, S1B, S2B, S3B, T1A, T2B, T3A
HB041	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2B, T3A
HB042	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2B, T3A
HB043	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2B, T3A
HB044	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3D
HB045	C1A, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HB046	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HB047	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HB048	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HB049	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HB050	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E

HB051	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HB052	C1B, C2C, C3B, S1B, S2B, S3B, T1A, T2C, T3A
HH001	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH002	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
HH003	C1A, C2A, C3D, S1B, S2A, S3B, T1A, T2C, T3C
HH004	C1A, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH005	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH006	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HH007	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH008	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH009	C1B, C2C, C3B, S1B, S2B, S3B, T1A, T2C, T3D
HH010	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH011	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH012	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH013	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH014	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH015	C1A, C2B, C3E, S1A, S2B, S3B, T1A, T2B, T3A
HH016	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH017	C1A, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH018	C1B, C2A, C3C, S1A, S2B, S3B, T1B, T2D, T3E
HH019	C1A, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH020	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH021	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH022	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH023	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HH024	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH025	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3D
HH026	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH027	C1A, C2B, C3C, S1B, S2A, S3B, T1A, T2C, T3C
HH028	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH029	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3D
HH030	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3D
HH031	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH032	C1A, C2B, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HH033	C1A, C2B, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HH034	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH035	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HH036	C1A, C2B, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH037	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E

HH038	C1A, C2A, C3D, S1B, S2A, S3B, T1A, T2C, T3C
HH039	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HH040	C1A, C2B, C3E, S1A, S2B, S3B, T1A, T2B, T3A
HH041	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH042	C1B, C2C, C3A, S1A, S2B, S3B, T1B, T2C, T3E
HH043	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH044	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH045	C1A, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH046	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH047	C1A, C2B, C3D, S1B, S2A, S3B, T1A, T2C, T3A
HH048	C1A, C3B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH049	C1A, C3B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH050	C1A, C3B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH051	C1B, C2B, C3A, S1A, S2A, S3B, T1B, T2A, T3E
HH052	C1B, C2A, C3A, S1A, S2A, S3B, T1B, T2D, T3E
HH053	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH054	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH055	C1B, C2C, C3B, S1B, S2B, S3B, T1A, T2C, T3A
HH056	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH057	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH058	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH059	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH060	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH061	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH062	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
HH063	C1C, C2B, C3C, S1A, S2B, S3B, T1B, T2C, T3E
HH064	C1B, C2B, C3C, S1A, S2B, S3B, T1B, T2A, T3E
HH065	C1B, C2C, C3A, S1A, S2B, S3B, T1B, T2C, T3E
HH066	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
HH067	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
HH068	C1B, C2C, C3B, S1A, S2B, S3B, T1A, T2C, T3A
ROW001	C1A, C2B, C3C, S1A, S2B, S3A, T1B, T2C, T3E
ROW002	C1B, C2C, C3D, S1B, S2A, S3B, T1A, T2C, T3A
ROW003	C1B, C2C, C3C, S1B, S2A, S3B, T1A, T2C, T3A
ROW004	C1B, C2C, C3D, S1B, S2A, S3B, T1A, T2C, T3A
ROW005	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2D, T3E
ROW006	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E
ROW007	C1B, C2B, C3A, S1A, S2B, S3B, T1B, T2A, T3E

Table 17: Complete applied mapping categorizations



An Inter-University Master Program From:



University of Bremen



University of Applied Sciences
Bremen



University of Applied Sciences
Bremerhaven



Hochschule für Künste
University of the Arts
Bremen

University of the Arts Bremen

Digital Media in Urban Spaces: A Study Case in Hamburg, Bremen and Rotenburg (Wümme)

MASTER THESIS SUBMITTED BY
JOATAN PREIS DUTRA

TO THE INTER-UNIVERSITY MASTER PROGRAM IN **DIGITAL MEDIA**,
UNIVERSITY OF APPLIED SCIENCES BREMEN
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE - **MASTER OF SCIENCES (MSc) IN DIGITAL MEDIA**

SUPERVISORS:
PROF. DR. ANDREAS BREITER, UNIVERSITY OF BREMEN
PROF. DR. CHARLIE GERE, LANCASTER UNIVERSITY

AUGUST OF 2011
BREMEN – GERMANY