Place as adoption moderating factor - usage implications for mobile data services

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Abstract

This paper explores the role of place as potential moderating factor for the usage process of mobile data services. Mobile networked technologies are forming a multimedia mixed environment offering rich applications and services, called Mobile Data Services. But the low diffusion of mobile data services in European societies asks for more investigation in order to explain the users' behaviour within mobile networked environments. Although the last two decades new user adoption models have been proposed, these cannot successfully be applied in the area of mobile applications and services because of their low explanatory power across different contexts. Thus there is a need to introduce new moderating factors to increase the explanatory power of adoption models within mobile networked environments   The results presented here suggest that place influences usage of mobile data services and for that reason there is a need to explore its moderating role in the usage process.

1. Introduction

Although the majority of the European population owned a mobile phone and significant investment is being made throughout the world to bring mobile data services to the marketplace, the use of these services has not spread to the masses since the user population has not achieved yet the critical mass. The disappointing results of mobile data services adoption and use make scholars[1] question the understanding of the adoption and usage process within these new environments. More spécifique [36], [37], [1], [41], [73], [54] and [2] argue that the existing adoption models have limitations which question their generalizability and explanatory power within different contexts.

This study aims to investigate the role of place as a potential moderating factor that influences the mobile data services usage process. Since within different places users have different functional and emotional needs, the characteristics of a place could potentially influence the decision of a user to access mobile data services. The study examines the determinants of place as determined by Tuan [71] and highlights the importance of place in the usage process of mobile data services. The findings stress the moderating role of place that could potentially increase the explanatory power of adoption models within mobile networked environments.

The motivation of this research is both theoretical and practice-based. The findings could contribute towards a better theoretical understanding of the relation and the impact of place in the usage process of mobile data services and also could be used as concepts to simulate and model the usage process of mobile data services using the Brahms tool [13], [57]. On the other hand the findings of this research could assist companies to understand better the real needs of their customers and thus to develop more useful and desirable services. This is in accordance with the major European[2] mobile key actors that they have admit that in order for Europe to become the leader in the mobility market joint and multidisciplinary research in the area of user acceptance process is required [68].

In the following section, I review adoption models inconsistencies and discuss their relevance to mobile data services. Section three presents the theoretical underpinnings of this study for the issue of place. Section four discusses the research methodology adopted in the study, followed by a brief introduction to the case study. The findings and the analysis of the research is shown in section five, and section six discusses the conclusions and anticipated outcomes of this research.

2. ADOPTION THEORIES AND MOBILE DATA SERVICES

Studies in mobile data services adoption and use choose one of the three possible approaches, the

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[1]

http://www.emobility.eu.org/documents/SRA4_051123_Final.pdf

[2] http://www.emobility.eu.org

adoption approach, the diffusion approach, and the domestication approach [49]. Although the widespread adoption of mobile phones makes it more urgent to understand and explain the mobile data services adoption process, its more difficult for applied researchers and industry players to get a general understanding of end-users' adoption and usage behaviour. This can be explained by the introduction of new complex technological environments which call for more complete adoption models. For example, the TAM model was originally developed for studying technology at work. Still most of the later enhancements and modifications to the model are focused on business software applications [37] without considering the impact of mobile networked environments.

Furthermore, human beings are complex creatures and thus researchers find that beyond cognitive and emotional aspects, affective aspect*s* may have independent influence on user attitude against technology [75], [78], [28]. Recent studies [6],[47],[58], [48], [66] and [39], argue that context should be a determinant of intention to use a mobile data service. Shengnan et al. [58] on the other hand developed Context-aware Mobile Multimedia Services, within the SmartRotuaari[3] project recognizing the importance of the context in the adoption decision process. Carlsson [6], studied flexibility regarding place and time as the main factors that constitute benefits and barriers to the use of mobile services while [66] and [47], proposed models to understand the adoption process of multimedia mobile services introducing the constructs of context and the "modalities of mobility". Pedersen et al. [48] concluded that the extrinsic motivations of usefulness are context specific and [39] researched mobile data services adoption by studying end-users multiple roles and identities across contexts. Finally, studies [12], [73] and [28] confirmed that the inclusions of moderating factors could enhance the model's explanatory power. This conclusion was supported by Ling [39] who said that an individual's text messaging use decreases as the user gets older and Karlsen et al. [31] who claimed that the use of text messaging complements voice services for economic reasons.

Many of the studies on acceptance of Information Systems are based on quantitative data and employ methods such as surveys or secondary data reviews ignoring that the

mobility of users within different places is bringing new complexities [1], [2], [41], [48], [73]. Such studies provide only limited explanations of the users' behaviour within these new technological environments. For example, although UTAUT provides great promise to enhance our understanding of the user acceptance [30], yet factors such as place and mobility have not been considered or been tested in many different settings and contexts [52]. I argue that in order to provide rich descriptions of the adoption and usage phenomena within these new environments where users face more complex contexts there is a need to strengthen the generic adoption concept, fig. 3, with more moderating factors.
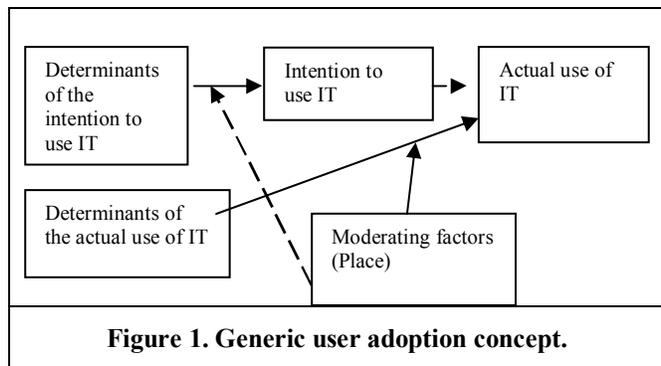
Figure 1. Generic user adoption concept.

According to this concept there are moderating factors that influence the adoption process as well as the usage process of IT. But the data collected during the study as well as the literature review WMDSS[4], suggest that the real problem with commercial mobile data services is not the adoption process itself but the fact that the users who own such a service never or seldom use it. This is due to the fact that the barriers to buy and adopt mobile data services are very low, since they come for free with the mobile phone handsets. More specifically, most of the users adopt the service X when they purchase specific phone handsets which are compatible with the mobile application. But most of the users that adopt the mobile handsets and thus have the intention to use the service X don't become frequent users of the service. This can be explained by the fact that they don't know how to take the service X into use or they don't have the motivation to try to learn how to use this service or after a few times that they tried to use the service they didn't like the experience.

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[3] http://www.rotuaari.net

[4] Worldwide Mobile Data Services Survey http://wmdss.mobiforum.org/2006

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Similar problems with taking services into use have been reported in the [32].

The above discussion highlights the fact that for commercial mobile data services more attention should be paid on the moderating factors that influence usage. But the perspective of mobile technologies leads to the contexts that users experience in their daily lives, increasing our interest for places where interaction occurs. Thus in the remainder of the paper, the key moderator of place will be examined in relation to usage process of mobile data services.

3. THEORETICAL FRAMEWORKS

Place

Scholars tried to analyze the constituent elements of the physical environment describing its nature through the concepts of space and place. Scholars [4], [27], [34], consider space as the physical world and argue that there is a need to differentiate between space as physical location and place as social world. Places are spaces which have meanings, and as Harrison and Dourish [27] argue, we are located in 'space', but we act in 'place' ", like when we are located in a "house" but we live in a "home". Based on [53] who introduced the 'raw materials' of place identity, [3] considers place as space filled with architecture, practices (routine actions people do in particular places) and institutions (social roles and rules that characterise these practices). Yi-Fu Tuan extended and refined the conceptual distinction between space and place and defined places as entities that describe our experience of being in the world, *"incarnate the experience and aspirations of people" [70]*, and invest a physical location or setting with meaning, memories and feelings [71]. In a more recent example [34], he claimed that place is inextricably linked to people and to how they perceive this location in terms of social connections and the presence of others, protocols of behaviour, values and cultural meanings attached to it.

Adopting Yi-Fu Tuan's analysis of the "materials of place", the paper defines place as a complex experiential notion that takes form by the physical, personal, social and cultural dimensions. These dimensions do not exist a priori, but exist in connection with the others leading to and emerging through people's actions and activities within a physical space. This means that in order to understand a place and its

inhabitants we have to take into account the physical attributes (time, location and weather conditions) as well as the personal, the social and the cultural attributes of the place. Tuan also discusses the relationship between time and the experience of place arguing that place exists as it is experienced by people at a certain time, for example a central square in the morning and in the new years eve are different places, and that the more time we spend within a place the more attached and emotionally tied to it we become.

4. RESEARCH METHODOLOGY

The data collection and the analysis phase of the study have been completed and the findings that concern the physical attributes of a place as determined by Tuan are presented in this paper.

This research has adopted an interpretive approach where the reality is socially constructed by human agents [74]. The units of analysis are end users and the data collected are presented in the form of multiple unit of analysis type case study [77]. The "case study" concerns a commercial mobile data services platform (Service X - a pseudonym).

The exploratory nature of the study and the fact that I moved beyond the organizational context made me drew on research methods from various disciplines. Within the study I tried to collect information related to the way users interact with the place in real usage situations. To access different types of information about users' experience I adopted the "combination" method, [5],[7], [11], [14], [25], that combines qualitative methods (interviews, focus groups and observation) with mediated data collection methods. To achieve the objectives I approached the data collection method using qualitative in nature approaches, as elements of Contextual Inquiry method [29], in conjunction with more novel methods such as mobile Probes [21], [55].

Combinations of conventional and established qualitative research methods such as in depth-interviews and focus groups, a piece of ethnographic research namely direct observation as well as media elicitation methods were employed to collect data. The type of interviews is positioned in the middle of the spectrum analyzing distance and engagement of data-gathering methods [44].

I also applied a technique which augments the feedback method allowing the user and the

researcher to be always in contact having synchronous textual communication.

Thirty individuals in total participated in the data collection phase. Initially I recruited twenty seven individuals to participate in the group discussions. Nine of them participated in the media elicitation method. Finally, I recruited three individuals from my social network to participate in the observation phase of the study. The recruitment of the participants was based on specific criteria. Behavioristic characteristics, age, profession, location of residence as well as demographic characteristics were considered in the sample selection. The participants owned a new generation mobile phone with an in built camera and were frequent users of the Service X platform with at least two usage occasions to the platform per week. Three focus groups (nine users per group) were conducted. These group discussions provided more rapid data collection and versatile rich data [7], revealed key themes in the usage of mobile data service and identified and categorised the main locations (physical dimension) where individuals use mobile data services.

Because I created monetary incentives to encourage subject participation in the media elicitation method I decided to work with only three users per group for this data collection phase. I chose these nine participants based mainly on the following characteristics:
-Any usage of the Service X platform, at least two to three times per week to collect at least four photographs for a period of two weeks.
-Permanent residents of the wider area of Athens. Since I am residence of Athens it was easier for me to better understand the users' levels of place attachment with specific places.
-Low entropy users [17], who usually execute routine daily activities within "familiar" places having a strong place attachment with these places. This behaviour characteristic enabled me to identify the in depth feelings and emotions users had for these places.

I asked these nine participants to take pictures of the places and things whenever they used mobile data services. The participants were asked to email the captured photos to a predefined email account. I asked them to annotate the emails with notes. If the users were not available at the time of capture they kept the annotations and emailed the photos later when available. I reviewed the data collected at my email account. Users had

been provided with the MSN service on their mobile devices and every time I received a picture from a user and decided that there were issues of interest then via the MSN service I had a short chat with the user. This "synchronous feedback" method allowed me to identify on the spot, the emotions and experiences of the user. If this was not possible then via email I was asking for clarifications.

Figure 2. A typical example of the photographs

This data collection method minimized the extent to which participants were distracted from their primary tasks since they were able to send the data at a later time, while I had the opportunity to prepare the interviews based on the captured pictures and the annotations sent. After the two weeks period, I had in depth interviews for approximately one – one and a half hour with the nine participants. During the interviews I gathered data that provided insights on how the participants experience the place where they used mobile applications (personal dimension), how social interaction is shaped by the space (social dimension) and how cultural elements influence the place (cultural dimension). The mobile probs, along with the data from the chatting on the MSN were used as inputs to trigger discussion. As every photograph contains details not found through written or verbal means, it becomes an important source for information unattainable otherwise.

After completing the data collection phase, I coded and analyzed the captured pictures and the transcripts that came out from the focus groups and the interviews.

Finally, I evaluated the Service X usage patterns in natural setting by observing three users of Service-X that came from my social network. Recruiting from my social environment I could more easily join them, observe or take photos or audio recording an informal, free-form interview to clarify the participants' actions and motives. The observation phase was conducted during weekends and holidays excluding rushing hours during working periods. I spent two days with each individual, who was aware of the research. Observations were recorded in notes describing the users' behaviours on public transport, in bars,

cafés and shopping centers as well as in streets and squares. Activity sequence graphs during time were constructed based on these notes.

CASES INTRODUCTION

Service X

Service X is a software platform that serves users worldwide providing mobile data services. Service X is trying to differentiate from the competition providing new applications such as e-mail and MSN over mobile phones. The leading wireless service provider in Greece offers Service X within the Greek territory. I chose Service X to conduct this research because as a brand mobile data service it has extent awareness within the population and offers a pool of different success services. Thus it was easier for me to establish samples across diverse groups of users. Also part of the data collection method was based upon the email and MSN applications that Service X provides.

5. ANALYSIS AND DISCUSSION

Place as a moderating factor

The dominant elements of the physical attributes of place appear to be location and time, which they were found to influence or even form in most cases, the behaviour of the users of Service X. Time and Location define the user's options in terms of possible activities offered by the particular occasion the user is found at and preconditions the user's emotional and rational disposition. Through the analysis it became evident that depending on the time of the day namely, the user's daily schedule/routines and the space he is found each time, the propensity and the capacity to use mobile data services varies accordingly.

For the economy of writing I call the environment that surrounds users like a room, as micro-environments and the broader environment like the urban area and the neighborhood as macro-environment. The in depth interviews and the observations explained why these micro and macro environments positively influence the usage of mobile data services.

5.1. The time factor

The study revealed that there are time zones where there is increased use of mobile data services. Noon and early afternoon were found to be the most popular times of the day most subjects engage themselves in Service X usage, either at work (working adults, 25+ years old) or at home (teenagers and students). For all age groups and both genders, morning is associated with work and studies as well as feelings of anxiety and pressure, which does not allow subjects to actively search for information through Service X. This is a result of how closely Service X is perceptually connected with entertainment and mobile access to popular non-professional themes of information, users typically obtain through the web. In fact, taking the time to surf the web for subjects not directly relevant to work or studies presupposes that the user has the time and the mood to look for information that facilitates mainly his leisure and social life. Such services are mostly music downloads, city entertainment guides, e-ticketing, dating and chatting. All the above services were found to be used in a context of a more relaxed and carefree situation, being after school or after work or during one's evening out. Another time span found appropriate to use mobile data services was what was described as 'idle time'; time slots in subjects' daily schedule where users find themselves in the following circumstances:

-Waiting or cueing in establishments such as banks, medical offices, public services, where they are left with little to do besides waiting to be serviced

-Being bored and having nothing to do at that moment: being at home, at mid-day after school or university for students and during the evening after work for adult professionals, usually at their own home, friends' homes or leisure areas such as cafeterias and bars.

-Taking a quick break in the day in between activities: either during the last hours of work or before work actually starts, with the purpose of either killing time or decompressing from work related stress

Vacation time (Christmas time, Easter time, new years eve, summer vacations) was also found to be a typical period for engaging in mobile data services usage.

5.2. The location factor

Varying locations stand for varying opportunities for activities and social interactions of different natures. Respectively, the type and amount of mobile data services usage in each location is bound to be influenced by users' surroundings

and the role they have to play within them on a macro and on a micro environment.

5.2.1. The Macro-environment factor.

The participants claimed that they make heavy use of mobile data services when they are away from their home, within macro-environments that provide rest and leisure times, during weekends and vacation periods.

Users within an urban setting were found to use service X in occasions of stress or boredom, in which the sought benefit from mobile data services was reportedly to take a quick break out of their daily schedule, to relax and escape shortly from their busy routine.

In contrast, usage in rural locations appeared to take place in search of connectivity and accessibility with contemporary developments. Participants claimed that when away from home for long periods tend to use more often Service X to access information as news and stocks and to send mms and emails to their friends. While being in rural locations, users appeared in need to maintain contact with what is taking place in their urban social and political environment, with emphasis placed on remaining in touch with friends and family they are not expected to see for a certain length of time, due to long distance. Therefore, in rural locations the use of mobile data services is more valued as a core communication vehicle, establishing a sense of emotional security for users. This increased usage of mobile data services fulfill the increased demand of users to stay connected with their social environment when away form city something that according to [56] is socially created due to societies' need for constant connectivity. As a user stated " *…when in vacations I need to contact friends more often using multimedia messages…I feel they are away from me and I am trying to show them what I see…".*

Also "Vacation / leisure" places, are far away from the urban centers offering fewer options to their residents for information and entertainment. Within these landscapes the competitors of mobile data services and thus the choices for information are fewer. As a participant stated " *..in my village there are not so much to do….".* In these distanced communities mobile data services enable users to remain in touch with their social network mainly via MMS and email and with the central sources of shared news and entertainment increasing their importance and

usage. A detailed analysis of the findings is presented below.

Mobile data services are mostly related with the search of information and as such, they require a degree of concentration that sets out the need for an indoors, rather relaxed and pressure free environment and situation. Being in a physical space which allows for sitting and some degree of privacy was the prerequisite for all users in order to feel they are able to focus on the mobile data services related information attained or exchanged. Within rural environments the users are influenced by different types of landscapes (forest, park, water, sea and mountain) and for that they get relaxed. This conclusion is advocated by the study of [8], which claims that different landscapes influence on psycho-physiological reactions and more specific sights of nature (mountains, sea, forests etc) resulted in increased psychological benefits.

Also users within these relaxed environments may loose a sense of actual time since inactivity and not being able to interact with others makes the time seem to go by slower. As a user stated "*…during vacations I feel cool… I feel that time pass slowly…*" This is explained by the fact that the subjectivity of time perception influences the way we perceive that the time is stressing when we don't do anything, away from the hectic pace of the daily life during weekends or leisure times.

In fact we do not perceive *time* as such, but changes or events *in* time and their temporal relations [51]. According to [9], what we are measuring, when we measure the duration of an event or interval of time, is in the memory. It is some feature of our memory of the event that allows us to form a belief about its duration due to the "time memory " model of [76].

Previous studies [35], suggested that various psycho-physiological factors have influences on human time perception. Psychological time, which is dependent on the time of day, the sun, the seasons, by thoughts and actions, body temperature and mood, is simply not synchronized with clock time, as manifested by wrist-watches.

Now researchers are beginning to understand the reasons for these subjective distortions of time. Biologists [76] divide our timekeeping abilities into three domains one of which is the "interval timing" through which we consciously perceive the passage of time. When the senses receive stimuli together into a single event (watch and listen TV), the brain asks "when" (time), "where"

(space), "what" (identity), and "why"[22]. Based on these signals a series of pulses are produced by an internal pacemaker; these pulses are collated, counted and then compared to stored representations in order to allow the brain to judge durations and produce time estimations [23].

Recently parts of the brain have been singled out as being specialised for timekeeping. A study [40] revealed that when low demanding activity associated with time perception three small regions in the brain are active while another study[5] claimed that there are critical areas in the brain, basal ganglia, and the parietal lobe, for this time-keeping system. But the basal ganglia have nerve cell that primarily contain the neurotransmitter, dopamine which influence in temporal processing is also well established [43]. Increasing levels of dopamine leads to a speeding up of subjective time and decreasing dopamine leads to a slowing of subjective time [33]. Patients with Parkinson's disease for example [38], have an abnormal reduction in dopamine within the basal ganglia and commonly experience problems with time perception as well as schizophrenics have too much dopamine activity in the brain so their clock is so fast that it feels like the whole world is crazy.

I argue that during leisure or vacation time users are within environments where not much happening. The less stimuli, the relaxed environment and the isolation situations users confront lead them to subconsciously pay attention to the passage of time checking on their interval-timing system [43], affecting their perception of time estimating that time was passed slowly. This situation is advocated by the fact that within relaxed situations dopamine level is lower altering our temporal judgement making time passed slower.

But why does the perception users have that time is passing slower lead them to use more often mobile data services?

The focus groups confirmed that a combination of factors relating to consumer experience, including download speeds, poor menu interfaces and graphics quality, and lack of updated information, serve as barriers to increased use of data services. These factors make users perceive mobile data services as time

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[5]

http://healthlink.mcw.edu/article/983222164.html

consuming services where they have to spend effort and time to access information. Users believe that they need few minutes' time, micro-moments periods, and "private space" to concentrate, introduce effort and use it un-interrupted.

Users of service X are engaged in time consuming activities for which the issue is how well the system is proceeding with tasks that may vary in response time from instantaneous to tens of minutes. Mobile data services response time defines how rapidly the service should respond to requests. This time depends on the download speed, the quality of the network and the familiarity of the user with the Service X.

I define the total time from the moment the user decides to use the service X until the time he ends with it and gets the information as TTU (time to use). TTU is simply the time period between a request and the completion of the request. If I wish to order flowers via my mobile, TTU is the time needed in order the order has been completed. TTU consists of periods during which nothing appears to happen even though the task may be proceeding normally and of periods where the task has the appearance of proceeding normally and there is no reason for concern. Since TTU for a service hasn't a constant value because of the characteristics of the network because of the heavy traffic, the errors and retransmissions what it matters is how users perceive this time period. The study revealed that users of service X based on their experience perceive the service as "time delay" service in contrast with call and sms which they consider them as "instandaneous" processes.

I often found users saying *"I need at least 3-4 minutes to access any service"* ….. The users know *that* service X access may take a while and that there is a possibility, based on the quality of the network, longer delays to happen which can cause dysfunctional behavior. So within their minds users have positioned service X as a time consuming action.

But the main point is how much time the users are considering as acceptable in order to afford the delay in their request. In other words how much time the users are willing to spend from the moments they decide to use service X and start the process until the moment they finally retrieve the information.

I define as TAP, the time affordance period which is the time period users allow before deciding that a task is too time consuming for them. The time affordance period is both

individual and context sensitive and is affected by the sensitivity or urgency of the situation, by the place by individual differences and familiarity. Individuals have different TAPs because they have different levels of patience, different cultures and different expectations of the problems they could encounter. Based on the findings I argue that when the TTU exceeds TAP particularly in emergency situations the user will not initiate service X service at all. Even if the actor is receiving important information unexpected delays that exceed his expectations of the scope of the task will make him terminate the task. It is important for mobile services to provide short TTUs, ensuring to allow users to observe the progress of their tasks.

The ideas of time as indicator of the information-seeking process, the time affordance and the response time were based on Norman's concepts in [46] and [20].

I argue that within urban settings at inconvenient locations and because we're busy and we have no time to stand and relax our TAPs are most of the times shorter or believed that are shorter from the TTU of the service X. Within Rural areas during vacations, users perceive that tine is stretching making them believe that they have enough time to use any mobile data service, in other words they perceive that TTUs are much shorter than TAP leading to usage increase.

5.2.1. The Micro-environment factor.

Participants claimed that they decided to use Service X mainly indoors since the environment and etiquette in indoor places is aimed to make them initiate the usage. The indoor places that the usage of Service X found to be a routine activity are presented below in more details.

A typical place to use Service X for teenagers which appear to use their cell and respectively Service X in between school and during extra curricular activities is within their home. The time teenagers spend at home is characterized by anxiety and some feeling of 'restriction' coming from school related pressure or the need to get out of the control and supervision of parents. As such, the type of Service X usage by teenagers in their homes relates to their need to mentally 'escape' and take a break from the actual setting of their home by engaging themselves in some sort of entertainment such as chatting, downloading music or checking out music news. Home is also as place for using Service X by young adults, yet, not as much as teenagers; in

fact, this age groups shares more of less the same nature of Service X uses with teenagers yet with a slightly different form of motivation, which revolves around the need to use it alternatively to internet either while actively searching for information or browsing just for fun to what is offered by Service X, every other day.

Young adults typically make plans for group entertainment while with their friends, such as booking a restaurant or arranging as weekend out of town. Service X appears to take places at homes of users' friends or partners, mostly when ideas for group activities are going around and users are asked by friends for information which can be retrieved instantly by using Service X, such as weather forecasts, hotel information, hot spots, or even maps. Additionally, the particular occasion of visiting friends offers the opportunity to discuss in a relaxed manner, go over news gossips, sports for which Service X also serves as a pool of ideas and subjects.

Entertainment venues, namely coffee shops, public squares, street bars were mostly met as regular locations of using Service X among teenagers and hardly among adults. As teenagers thrive for the opportunity to gain acceptance and recognition among their peer group, being able to start up a discussion or show off about their latest music download is well facilitated by Service X, which is appears interesting, is interactive and generally wins teenage attention.

For adults, using Service X while being with friends is a signal of a 'bad' company or an indication that the person using Service X is not 'really living the moment' be it either that he is bored or that he chooses to alienate himself from his company. This state violates the essence of adult entertainment, namely to experience things with friends/partners, relax, and actively participate in a discussion with friends. As such using Service X in entertainment values was not observed as a typical behaviour among adults of any age.

Working establishments was not found to be the typical place to use Service X, as the availability of internet in most users' working environments does not justify the use of Service X in the first place. The Internet was found to outflank the benefits of Service X both in terms of the available breadth and depth of information search and retrieval as well as the pertaining costs e.g. typical fees for Service X site entry and downloading is significantly more expensive and limited in choices as opposed to the respective services offered by the web. On top, using Service X at work appears not to be an

acceptable behaviour, as extensive usage of one's mobile phone is not permitted or encouraged in certain working environments.

The analysis and the discussion of the findings are following.
According to the findings, the participants usually used mobile data services within or near buildings, inside cars and around beds, sofa and tables. A close look at the characteristics of these micro-environments exhibits that these environments provided or perceived by the users that they provided certain features, like a feeling of privacy and a feeling of safety. An explanation of how people understand and behave within a place is following.

Human beings understand a place using their sensations (perception), using thinking, remembering, or evaluating the information (cognition) responding to the environmental information that was acquired [24]. Space characteristics as the color, the noise, the furniture arrangement may influence users' perception of space and it can positively influence mood and behavior. Humans initially perceive a place as safe or no, as stable or not and then decide how to respond to the environment they occupy. During the perception process people use spatial features like proximity, salience and permanence to select reference objects and frames in order to schematize the location of figures [72]. After realizing the functional properties of the space they consider the physiological determinants of the place like functionality, ergonomics, life safety, health concerns, security level, visual privacy, acoustic privacy, and aesthetic factors. These determinants affect user's physical comfort and if their psychological and physiological needs and concerns are appropriately met they perceive the environment as successful and decide how to behave within the place taking specific actions for example to use mobile data services.
Mobile user's physiological needs which mainly relate to their human body requirements should be supported by the interior environment that must respond to vision, hearing, privacy, stability and mobility to achieve both comfort and efficiency. The ability of mobile users to perform the task of access into mobile data services within an environment is strongly dependent upon peripheral vision. Thus although the visibility and recognition of the mobile phone are well enough even in darkness, users hesitated to use their mobile in situations where the environment prevented their peripheral vision as in dark spaces.
Hearing on the other hand although is critical because it affects the general capacity to perform other tasks doesn't seem to play an important role in the decision to use mobile data services. Have to mention that all the situations described, were characterized by audibility, intelligibility and low noise annoyance. This can be explained by the fact that we seldom experience situations with increased levels of noise and thus the participants didn't have experiences to offer to this research.
Another crucial determinant in the decision to use mobile data services is the stability that the environment provides to the user. Users were trying to avoid unstable environments as slope of floors, width of walkways etc. choosing elements that supported them in the performance of their task like a stand in the metro.
According to the findings privacy was a central issue when decided to use Service X and thus they tried to make themselves more or less accessible to others. To achieve that, the users were trying to place themselves within spaces that provided to them personal space and territorial ownership. The situational behaviour of users in relation to the space they occupy can be explained using the concept of "Proxemic Zones" as defined by Hall [26] and human territoriality [18]. Territory is called the geographic area that indicates ownership and provides a desired level of privacy. People don't want to sit next to strangers without a protective barrier since they consider it as stressful.
According to Altman [4] and Shu [59] interpersonal distance can be used as an index of information privacy and privacy of other dimensions. I reason that the relationship of interpersonal distance and information privacy needed to operate mobile data services in public places can be described as:
Interpersonal distance necessary for using mobile data services =distance for information privacy to use mobile data services + operating space needed to access mobile data services.

The participants claimed that they need larger interpersonal distance when use service X than when they just use mobile phones to call or send a text. As a participant argued " *I need comfort to have a look at the news..*". I observed that when the users were approached by other persons when using Service X, they were keeping larger distance than usual, to protect

themselves before they could understand the purpose of the approaching person.

In fact users were trying to assure space control in order to secure visual privacy and protect the information they retrieve via service X. The users protect their personal space using their body language and environmental objects as the chair they are sitting or the wall they are laying. According to the findings visual privacy, the ability to limit other's view of oneself is an important issue in the decision to use mobile data services. As a participant stated ".. I don't feel comfort to have others next to me…how can I prevent them from having a look at my mobile?". The users tended to sit and stand near furnishings, and walls to avoid situations in which they weren't aware of who is watching. And although they avoided eye contact and seem to withdraw from the surroundings, they were aware of what happened around. Whenever someone stared at them, even me, they returned the gaze or asked about curiosity, forcing the observer to look elsewhere.

Participants argued that they avoided to use Service X, within crowding situations where population density was high and personal space and territoriality mechanisms function ineffectively, resulting in an excess of undesired external social contact with minimum vision privacy. In an environment also where commuter flow is large, user's personal information is more likely consciously or unconsciously seen by a stranger, the risk of losing control of personal information is perceived high by users. Since privacy can be best understood as a protection against certain kinds of risks as risk of loss of personal information [50], using service X in a public place may facilitate information privacy concerns of a user.

According to Shu [59] people have a sense of information privacy usually higher than that anticipated by others, and they require others to understand and respect such privacy concerns. Thus using Service X in public places may bring with risks of losing control of personal information and involve various levels of information privacy because some services as news, email etc. need users to provide their personal information, such as personal passwords. In contrast, whenever they had a call, they protected their information security or by just lowering the tone of their voice or by using a coded language. A user interviewed said "..*when I have a call in my mobile I decide what to say and how much information to allow…*".

According to the findings the space, the objects and the position of the objects within this space are often very determinative for an action and thus very important for choosing a particular space to access mobile data services. Sommer [65] argued that certain arrangements of people and objects within spaces are more suited to certain activities than others, in terms of certain attitudes (cooperation, competition, usage of mobile data services, or separate action).

Users prefer to use mobile data services within private places or semi-private places where security and privacy is ensured. Newman [45] claimed that spaces as stairwells, elevators or hallways have no transitional semi-private areas since the boundaries between public and private space are sharp. These spaces have constraints, which stop users of mobile data services getting their tasks and goals and for that reason no one of the respondents ever mentioned usage of mobile data services in such spaces.

Objects and things that occupy a place have a certain state and location that allow us to define different functions. Erickson [19] proposes that objects can generate and catalyze interactions: he talks about "evocative objects" that can capture people's attention and encourage interactions. According to [10], people plan their actions based on their understanding of a setting relying on environmental inferences. The position, orientation, and movement of the objects in the environment are an important source of information [20], [16], showing the state of people's interaction with them. For example the objects of tables and the spatial settings outside a caffe give us insights about this topic of space demonstrating a place where people can have a rest, a coffee, perceive time in a slower tempo and have a quick look at the news reading a newspaper or accessing mobile data services.

Sometimes its possible objects and spaces, combined with the activities and conceptions of people to transform spaces. Thus an ordinary part of the street, of the park etc. relatively enclosed and protected with the proper dimension for one person to do the necessary activities and have the visual contact of the passers by, could be transformed and used for resting and thus for accessing mobile data services. Also the physical objects, walls, tables, chairs, sofa etc. offer a spatial organization, segmenting the place into smaller micro-spaces. Whenever these micro-spaces perceived as capable to satisfy the needs and concerns of the

user there is increased possibility the user to use mobile data services. According to Hall [26] fixed-feature spaces allow people to organize activities and are characterized by objects and activities that are related to these spatial arrangements. Socio-petal spaces are those which bring people together and stimulate involvement such as the tables in a café, while socio-fugal spaces keep people apart and promote withdrawal as the railway waiting rooms [26].

Users mainly access Service X both within fixed-feature spaces as their house, their rooms as well as within semi-fixed feature spaces cafes etc. The socio-petal and socio-fugal arrangements of objects within public places, seem to relate to the degree of Service X usage. In Athens the chairs most of the times surround the table, socio-petal place, and those who sit there face each other. There the intimate zone is usually not violated as chair spacing maintains the personal zone and a comfort level for each individual. Thus the user is able to visual observe the personal space and feel more comfort to use Service X.

Within socio-fugal places users position themselves so as not to sit next to a stranger unless there is no other choice as waiting in the metro. In these cases of crowd ness the intimate proxemic zone is violated although there is often a small physical barrier (i.e., arms and backs on chairs) and users accept the situation for short periods of time, though not necessarily without stress. Within these situations they avoid to use mobile data services.

6. Conclusion

The purpose of this paper has been to examine and stress the moderating role of place in the usage process of mobile data services. The study revealed that the built environment impacts behavior of users of mobile data services and that theirs basic situational responses are predictably to the environmental conditions. Users require secure spaces to use mobile data services and thus there are less options of "suitable" spaces to use mobile data services than just to have a call or to text. I argue that space matters and limits the options people have to use mobile data services. Within urban daily settings users confront inconvenient times since they are busy and *have no time to stand or sit and use mobile data services*. In parallel the service X is a unidirectional service meaning that users have to initiate by themselves the access of mobile data services. Calling and texting on the

other hand are bi-directional services since call and sms could be received when someone is everywhere as on the street or on public transport. Based on the above I argue that the physical attributes of a place play crucial role in the usage of mobile data services since they influence the decision to initiate a mobile data service.

Following the findings that presented above and the suggestions from Davis et al.[15], [69] and Szajna [67] that contexts could play an important role in user technology acceptance the paper argues that the study of moderating factors could explain the adoption models' inconsistencies by identifying the situational differences across different contexts.

The paper suggests that research on the moderating role of place is of great value for the case of mobile data services adoption and use. The paper proposes that the adoption models when study mobile data services should complemented with the less studied moderating factor of place as shown in figure 1.

The findings presented here could form a basis for further investigation of adoption and use of mobile data services and development of better theoretical understanding of the relation between place and usage process. I argue that these findings will enable the professionals of the mobile data services market to take into consideration aspects of the context of the users when developing new applications and services.

7. References

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