MOBILE TAGGING IN THE GERMAN MARKET: A COMPARATIVE STUDY ON USER AND NON-USER CHARACTERISTICS

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Abstract

Mobile tags can contain short texts, phone numbers or even digital business cards to be decoded with camera equipped mobile devices. Most common is the use of these special types of 2D barcodes to encode links to mobile web pages: the user can scan the code and open the web page without a cumbersome keyboard input. There are numerous examples of mobile tagging in commercial or public areas already. However, today mobile tagging is still a niche application and far away from being used as standard feature on a regular basis by mobile users in Germany and other countries. This study presents an empirical investigation of mobile tagging users and non-users in the German market to explore usage determinants and reasons of the adoption or rejection of this new technology. From the study results, recommendations for supporting a broader diffusion as well as applying mobile tagging appropriately are derived.

Key Words: *Mobile Tagging, QR Codes, Mobile Services, Mobile Media, Mobile Technologies, Technology Adoption*

JEL Classification: L80, L82, L84, L86

1. INTRODUCTION

Mobile tagging can be used to make mobile web access easier overcoming some of the limitations of mobile devices like cumbersome keypad input. At this, links to web pages can be encoded in this special type of barcode providing access to web pages without the necessity of cumbersome data input via tiny touch or key pads. Despite the obvious advantages of using mobile tagging and a high level of acceptance reported for countries like Japan (WhatJapanThinks, 2009), it is less

popular in western countries. In Germany for example, a study carried out in 2009 revealed an awareness level of round about 50 percent and a usage rate of just about 25 percent among Internet users whose mobile devices would meet all technical requirements (Urban&Leisen, 2010:4). A subsequent study in 2010 states a usage rate of about 62 percent (Urban, 2011:31) but corresponding to an Internet user-based survey setting. Comparing diffusion rates within different countries or over time could be seen as a potential indicator for this new technology. However, the diffusion rate on its own does not provide an answer to the question why some mobile subscribers are using mobile tagging whilst others are not, understanding the determinants of the user acceptance.

Researchers investigated a wide set of behavioral issues influencing end-users acceptance and usage behavior. At this, exploratory foci ranged from analyzing perceived usefulness, ease of use, enjoyment in use (Bruner&Kumar, 2005; Wang et al. 2006), trust (Lee, 2005) or individual influences (Lu et al. 2005; Massey et al. 2005). Anyhow, there is no scientific contribution on possible causes of use and non-use of mobile tagging by now. To fill this gap, we conducted an exemplary study in Germany, empirically investigating perception differences of users and non-users of mobile tagging. The paper will start with an outline of the functionalities and characteristics of mobile tagging in the next section. Thereafter, section 3 explains the methodology of the empirical study and some results will be discussed before summing up our findings in section 4 giving managerial recommendations.

## 2. MOBILE TAGGING FUNCTIONALITY AND CHARACTERISTICS

2.1. Functionality and advantages of mobile tagging

Mobile tagging refers to the process of barcode decoding with camera-equipped mobile devices, accessing information embedded in the tag. Mobile tags are a subset of two-dimensional (2D) barcodes which can be readout using a mobile device (e.g. DataMatrix, Aztec Code, ShotCode, BeeTagg, Quick Response (QR) Code). Compared to traditional one-dimensional (1D) barcodes they have a higher capacity and an improved robustness. Applying mobile tagging requires a reader software on the mobile device. Here, just a few devices do have a pre-installed mobile tag reader and most devices require a manual download and installation of this software. The type of reader software determines the variety of mobile tags to be decoded and provides the user interface for tag decoding and information usage. At this, most of the reader software applications support QR codes. This type of code is widespread in Asia and, particularly in Japan where the QR code standard was developed by Denso Wave in 1994 and where the first mobile

device with a pre-installed reader software was already introduced in 2002 (Dou&Li, 2008). By now, QR codes are also getting quite common in Europe and are spreading to the US as well (Ebling&Ramón, 2010).

Even though the technical characteristics and methods of data encoding differ slightly, the general application of mobile tagging is characterized by a similar processing flow as shown in Fig. 1: (1) activation of a barcode reader software on the mobile device, (2) scanning the barcode by the cameraphone (3) automatic code detection and data decoding by the reader software, (4) presentation of the decoded information and options for its utilization (Ohbuchi et al. 2004).

Figure–1: **Mobile tagging processing flow**
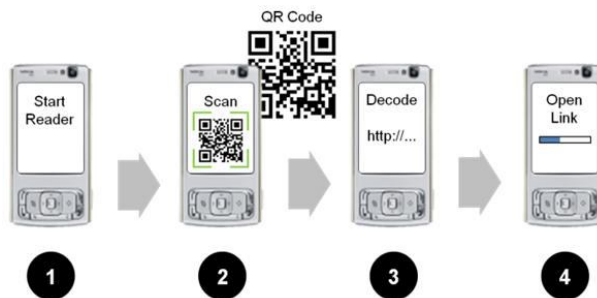
Mobile tags can contain information like short texts, telephone numbers, preformatted short messages (SMS), email addresses, electronic business cards (.vcf) or web addresses. At this, encoding of URLs to provide access to mobile optimized web pages is most popular. Accessing the website via scanning the mobile tag keeps the user from typing in the URL via tiny keypads, making mobile web access more convenient. This applies particularly to "deep links", i.e. hyperlinks that point the user directly to an inner page of the website instead of referring to the website's homepage. These deep links can provide efficient access to relevant information in mobile contexts but are typically characterized by a large number of characters, making their input via mobile devices even worse.

2.2. Application and diffusion of mobile tagging

Mobile tags are a simple and inexpensive method of linking the physical world to the virtual. Mobile tags can be printed on physical objects like ads, products or other prints such as newspapers and magazines to provide a convenient and immediate access to additional information. Such tags can be used in a variety of applications in mobile commerce such as advertizing, marketing, trading, product information tracking and checking, security, customer or product verification and payment (Gao, 2007). Mobile tagging not only delivers value via the embedded

information but also by means of a convenience value, which has been shown to trigger consumer interaction (Dou&Li, 2008). However, users have to install a reader software first for the most part, to take advantage of those benefits. This might constitute a considerable usage barrier (Ebling&Ramón, 2010), and the willingness of installing the software may depends on the extent to which attractive use cases of mobile tagging are available to the user.

From a research perspective, mobile tagging can be characterized as an innovation due to its novelty for many markets and individuals. Mobile users who are getting aware or are confronted with this new technology for the first time have to decide whether adopting or rejecting this new technology. Concerning this matter, Rogers (2003) defined various factors influencing individual adoption decisions within the context of adoption and diffusion of information technology (IT) innovations. At this, the relative advantage, compatibility, trialability, observability as well as complexity of the innovation have been identified as relevant innovation characteristics influencing individual adoption (Rogers, 2003:221f.). The impact of these factors directly depends on the individual perceptions and assessability. As described above, the usage of mobile tagging implies some advantages to access the web in mobile contexts.

Anyhow, the beneficial aspects of mobile tagging are partially hard to assess for non-users and the use of mobile tags and the reader software may appear complex if seen for the first time. As well, it has to be kept in mind that (potential) users generally come in contact with mobile tagging for the first time by recognizing a 2D barcode. There might be a short application note as well (e.g. with an invitation to download a reader software) but, users are not able to fully assess the innovation or to reduce uncertainty on the functionality and application options by purely inspecting the image of the barcode. Users can reduce this uncertainties via own usage experiences or by transferring external knowledge from others like family or friends, who already have used mobile tagging. But, even if one can utilize own or external experience knowledge some aspects are still not assessable. For example, the potential user can just hardly estimate which information is encoded within the mobile tag or what kind of data is transferred between mobile devices and servers when processing the code.

The perceived attributes of an innovation may depend on the product's characteristics but are also influenced by the subject's attitude towards an innovation. Considering the discussion above, it can be assumed, that users of mobile tagging are tech-savvy and generally more confident with new and innovative technologies than non-users. To get a deeper understanding and being

able to compare the differences and important aspects between user's and non-users' perceptions on mobile tagging we conducted an empirical study. The approach of this study as well as the results will be described in the next section.

3. EMPIRICAL STUDY ON MOBILE TAGGING

3.1 Methodology and general results

The empirical study on the perceptions differences of mobile tagging users and non-users was carried out in 2011 in Germany. 349 respondents participated via online and paper-based questionnaires. The average age of the respondents was 33.0 years and we had a quite equivalent number of female and male respondents. The questionnaire comprised some general questions on user demographics and use of mobile applications as well as 68 items on different aspects of the respondents' perception of mobile tagging. The study has some limitations concerning representativeness because we could not fully control the age factor appropriate to the general proportion of the mobile device owners within the German population. As well, it also has to be considered that the respondents who participated all voluntarily might had some interest in the topic thus influencing the results of the study. The following section presents some selected results but is ongoing work prior to a more comprehensive analysis (exploratory or confirmatory statistics).

Regarding the results on smartphone ownership, 46 percent of the respondents stated to have a smartphone what constitutes a quite high level comparing to the actual diffusion of smartphones in Germany what was estimated to be around 23 percent on that time (Block, 2011). Anyhow, 70 percent reported to be able to access the Internet via their mobile devices at which 44 percent actually made use of that option. Regarding our main point of interest, mobile tagging, 66 percent of all respondents have already recognized a mobile tag. However, only 52 percent of the respondents do know the function of such a tag and just about 18 percent indicated to have already used mobile tagging. At this, the proportion of mobile tagging users is considerably higher among the group of smartphone owners. This is plausible, as these devices are more likely to support mobile tagging than traditional feature phones. Respondents who already had used mobile tagging are classified as "mobile tagging users" in the following sections, independently from the frequency of usage. However, Table 1 reveals that the proportion of users that are frequently using mobile tagging in Germany is still quite low today.

Table–1:   **Usage and usage frequency of mobile tagging (MT)**

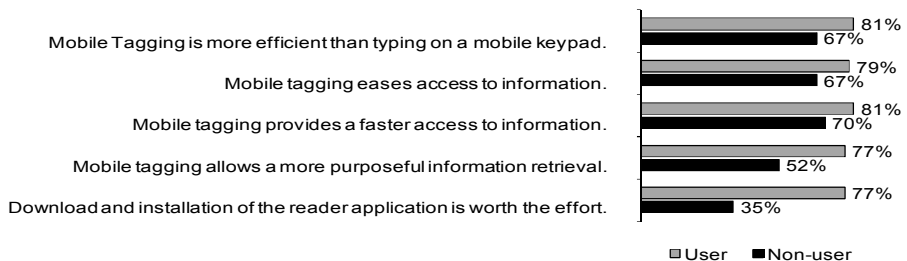| Basis	Functionality of MT is known	MT has already been used	I use mobile tagging …		
			… several times a week	… at least once a month*	… less often
All respondents	52,2%	17,8%	1,4%	6,3%	10,3%
Smartphone users	66,3%	30,0%	3,1%	13,1%	15,6%
MT users	—	—	8,1%	35,5%	58,1%

*Within "… at least once a month" weekly usage is included as well.

3.2 Results on the differences between users and non-users

Within section 2 some aspects on the functionalities and characteristics of mobile tagging relevant for its adoption have been discussed: (1) perceived benefits, (2) uncertainty regarding functionality and application, (3) attitudes toward innovations in general. The following section presents some selected results with respect to the differences between users and non-users within these three areas.

The advantages of mobile tagging are generally seen from users and non-users as well (Fig. 2). At this, both groups widely account mobile tagging to be more efficient than typing on a mobile keypad as well as providing a more direct and faster access to information. Non-users are less convinced that mobile tagging really eases the access to information what tend to confirm the assumption, that the mobile tagging processing flow could appear quite complex for non-users. Current non-users of mobile tagging rather do not believe that the necessary download of the reader application is worth the effort. This tends to confirm our assumption, that the precondition to download and install a reader software constitutes a considerable usage barrier.

Figure–2:   **Perceived benefits of mobile tagging**

Mobile Tagging is more efficient than typing on a mobile keypad. — 81% / 67%
Mobile tagging eases access to information. — 79% / 67%
Mobile tagging provides a faster access to information. — 81% / 70%
Mobile tagging allows a more purposeful information retrieval. — 77% / 52%
Download and installation of the reader application is worth the effort. — 77% / 35%

☐ User   ■ Non-user

Scale: 1 =fully disagree, ..., 5 =fully agree
Percentage: portion of agreement 4 and 5.

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Regarding the results of the interviewed users and non-users the far most differences can be seen within the questions on the perception of functionality and application of mobile tagging (Fig. 3). Here, a high level of uncertainty on functional aspects of mobile tagging is revealed among the group of non-users. Considering the point of view of the users, it can be seen that the actual use can change these perceptions. In this regard, it has to be assumed that own experiences cannot or just hardly be compensated by external knowledge (e.g. usage instructions or usage experiences of others).

Figure–3:   **Perceptions on mobile tagging functionality and applications**
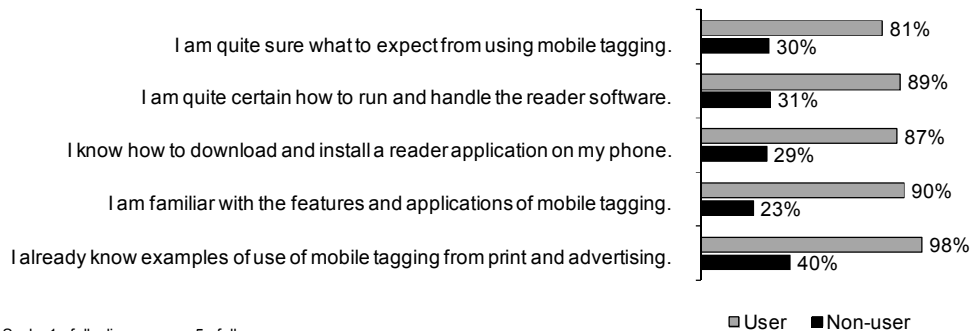
Scale: 1 = fully disagree, ..., 5 = fully agree
Percentage: portion of agreement 4 and 5.

A reduction of uncertainty by the transfer of usage experiences from others might be a general problem in an early stage of an innovation with a relatively low level of diffusion. However, even in such an early stage the availability of experience knowledge may depend on the community and the social network of the adopter. According to Rogers it is possible to identify different categories of adopters according to their attitudes, e.g. their degree of innovativeness (Rogers, 2003:282f.). Within our study we did not aim at categorizing or validating these adopter categories but we investigated whether or not the respondents had some knowledge of the perception of mobile tagging from others. As expected, the statements differ strongly between users and non-users. While the majority of mobile tagging users stated to have heard that mobile tagging is a useful and easy to use application that is worth downloading the reader software, most of the non-users were lacking that kind of knowledge transfer (Fig. 4).

Figure–4:   **Transfer of external knowledge about mobile tagging**

Scale: 1 =fully disagree, ..., 5 =fully agree
Percentage: portion of agreement 4 and 5.
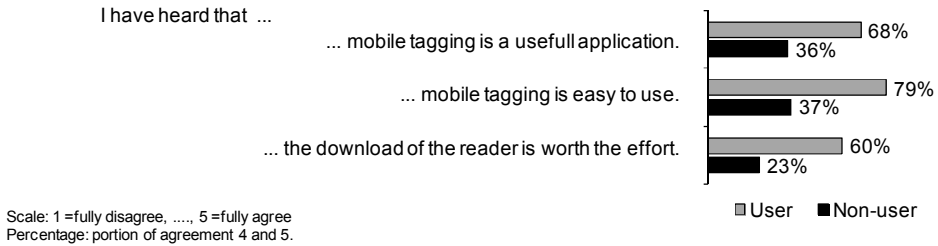
Finally, differences in the general interest towards innovations were identified: Users turned out to be more interested on new mobile features and applications thus being more "tech-savvy" as expected (Fig. 5). Non-users stated to be more cautious with the use of new mobile technologies and applications. As well, they agreed to a much higher level to the statement that it is better to wait until new applications prove to be trustworthy. This observation is consistent with our assumption that non-users might be less risk tolerant. It also tends to support Rogers classification of adopters in those subjects who adopt an innovation at an early stage and those who prefer to wait for a further diffusion of the innovation.

Figure–5:   **Attitudes towards innovative mobile applications**

Scale: 1 =fully disagree, ..., 5 =fully agree
Percentage: portion of agreement 4 and 5.
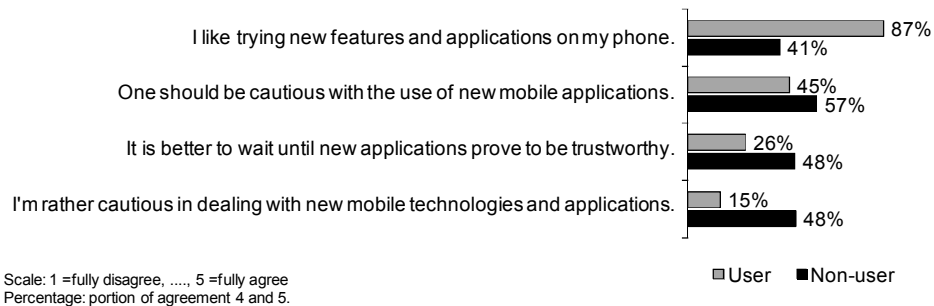
4. CONCLUSION

Mobile users in Germany are already aware of the advantages of mobile tagging. But, the level of diffusion and the frequency of usage of this innovative mobile application is still low. Non-users are still not convinced that the usefulness of mobile tagging justifies the download and installation of a reader software. They are also characterized by a high level of uncertainty regarding the functionalities

and the areas of applications of mobile tagging. Users of mobile tagging are characterized by higher levels of innovativeness, risk tolerance and exchange of experiences. However, the study also indicates that positive user experiences do not reach the group of the non-users automatically. These findings indicate that there might be some engagement required for bringing forward the diffusion of mobile tagging within the German market. Here, approaches could be (1) increasing to proportion of mobile devices with preinstalled reader software, (2) clarifying the benefit from using a mobile tag or use incentives to stimulate usage, and (3) putting more efforts in demonstrating and explaining the application of mobile tagging to reduce the perceived complexity and risks and to reach potential target groups beyond the "early adopters".

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