

ADOPTION PATTERNS OF A MOBILE JURIDICAL KNOWLEDGE BASE

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ABSTRACT

The juridical field is a knowledge-based profession. This study examines adoption patterns of a mobile channel that provided subscribers with access to a well-established juridical knowledge base. Either the existing stationary channel or the new mobile one could be used simultaneously. Data analytics was used for analyzing objective actual use data of the stationary and mobile channels, as recorded by Google Analytics. The findings indicated slow adoption of the mobile channel and suggested complementarity of the stationary and mobile channels, along with trends of growing usage of the mobile channel before and after conventional work hours, and during the weekend. The main finding of this study demonstrates the importance of providing the users with their personal content via the mobile channel.

Keywords: Mobile Internet services, stationary Internet, legal documents, juridical knowledge base.

Introduction

The juridical field is based on written records, including legislation, judicial decisions, briefs, and commentary (Bourdieu, 1987). Juridical computerized knowledge bases have evolved for over fifty years (Bing, 2010), and long before the World-Wide-Web opened for public use in 1993 (Klotz, 2004) these knowledge bases have become indispensable for legal professionals, such as lawyers, judges, legislators, as well as law professors, and their students. Over the last twenty years, the effectiveness of juridical knowledge bases has increased due to online accessibility that enabled the use of such systems via stationary (fixed) personal computers, wherever there was Internet connection available. Furthermore, some juridical knowledge base service providers have developed applications that enabled their subscribers to create their own personalized knowledge base, with functionalities such as saving links to certain documents, and sorting them by folders, adding private comments to documents, and saving their routine queries.

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The emergence of mobile Internet services via cell phones, tablets, and smartphones, has further enhanced the accessibility of juridical knowledge bases, and enabled their use anytime, anywhere. The increase of mobile devices availability and the augmented tendency to browse the Internet through them (Duggan & Rainie, 2012; Smith, 2012) were evident to organizations that provide Web content. However, firms, including juridical knowledge base service providers, had to decide if, and which of, their applications would be modified for mobile consumption. On the one hand, mobile devices enable access to all the content that is available on the stationary devices, so such effort may seem redundant. On the other hand, it may not be convenient to read lengthy legal documents from relatively small screens, or browse through Webpages and links that were designed to be presented on larger screens. Furthermore, the incongruent format may impair critical reading of the content by the users (Eshet-Alkalai & Geri, 2010), and reduce their benefits of using the knowledge base.

Consequently, various organizations, including juridical knowledge base service providers, might have tried to adapt their Websites, in order to provide their customers with a comfortable access to content through mobile devices. However, the development of new mobile interfaces for existing Websites involves reinvestments, additional to those already made for the stationary ones. So far, such investments were not proven as worthy for all sorts of firms, or for every kind of content, since the technology was still new, and the consumers were still in the first stages of adoption.

The purpose of this study is to analyze adoption patterns of a mobile channel. The site was launched in order to give mobile subscribers access to a well-established juridical knowledge base, in addition to the existing stationary channel. The subscribers could use both channels, as well as interchange them or use them simultaneously, at no additional charge. The study examines three perspectives of mobile technology adoption. The first one is the classic dimension of time. It takes time for innovations to diffuse (Rogers, 2003), as people learn about them, try to use them, and continue doing so if the innovation is useful (Karahanna, Straub, & Chervany, 1999). The second perspective relates to the new functionality that the mobile devices enable. Specifically, it is the enhanced ability to use the system anytime due to the mobility of the relatively small devices, and their ability to provide ubiquitous connectivity to the Internet. This perspective examines whether the diurnal (daily) use patterns (Klepeis et al., 2001) of mobile channels are different from those of stationary channels. It also explores if there were changes in the diurnal use patterns of both channels since the mobile channel was launched. The third perspective addresses the users' habits (Polites & Karahanna, 2012), or lock-in, in economics terminology (Shapiro & Varian, 1999), and examines if and how their experience with the stationary interface affected their use and mode of use of the mobile channel.

The methodology of this study is data analytics, and it is based on objective data of the actual use of the stationary and mobile channels, which was recorded by Google Analytics. While this paper focuses on juridical knowledge bases and analyzes one such service, the implications of this study are relevant for similar knowledge base services, as well as other content providers, and may contribute to theory and practice. The main finding of this study indicates the importance of enabling users to use their personalized Website interface for accessing their personal content via the mobile channel, and demonstrates the concepts of habit and lock-in.

Theoretical Background

The theoretical background of this study includes three parts. First, online juridical knowledge bases are reviewed. Then, the concept of diurnal activity patterns is presented, and finally advantages and barriers of mobile internet adoption are described, within the context of this study, which compares access via stationary and mobile channels to a juridical knowledge base. It presents five hypotheses, which are based on the described theoretical background.

Online Juridical Knowledge Bases

The legal industry is a knowledge-based occupation. Therefore, the legal professionals, i.e., judges and lawyers, are expected to be informed in a timely fashion of the latest juridical developments and events. Legal documents are created during legislative procedures and via rulings by courts and legislators. Bing (2010) reviewed the international history of legal information retrieval systems, and examined the national development of such systems in the United States and Europe. He demonstrated how juridical information systems have become a necessity due to the ever-growing volume of relevant documents. Bing suggested that since technological, organizational, and other considerations prevent the establishment of one unified national information system, there should be mechanisms that enable cooperation. Furthermore, Bing proposed that in order to promote pluralism, global cooperation should be sought.

New technologies play an important role in ensuring effective access to legal information by speeding up the process of publication, indexing and distribution. In different parts of the world, researchers in the areas of law and of information technology (IT) dealt with different aspects of the need for online publication of juridical documents, including standards (Murad & Islam, 2012), open access (Poulin, 2012), semantic Web opportunities (Rady, 2012), collaboration, and worldwide free access to legal documentation (Greenleaf & Peruginelli, 2012).

Gray (2010) investigated whether it would be feasible to deliver legal documentation through mobile tablet devices. His research was based on students and faculty members rather than legal professionals. Gray found that academics appeared willing to access juridical content via their mobile devices, although cost and a lack of awareness or availability of legal-specific content at the time was a prohibitive factor in the wider adoption of mobile applications for the legal discipline. Whereas Gray's (2010) study was based on a survey, and observed attitudes of academics, in this study we examined actual use of a juridical knowledge base over a period of one year, via stationary and mobile channels, by all its users, who included professionals (judges, lawyers, and attorneys), and academics (faculty members and law students).

Diurnal Activity Patterns

Studies of Human activity patterns are performed in various fields such as medical sciences, ecology, and sociology (Klepeis et al., 2001). Human behavior follows a routine time pattern that may be observed according to two main time frameworks:

- Day of week patterns, which usually distinguish between work days and weekends.
- Diurnal patterns, which refer to daily activities, such as sleeping, working, eating, and resting. The patterns may also refer to biological measures, e.g., blood pressure.

Recently, social media activity data, from Websites such as Foursquare and Twitter, provided many research opportunities of diurnal patterns (Grinberg, Naaman, Shaw, & Lotan, 2013). In various studies, which were conducted with the purpose of understanding how the ubiquitous availability of the Internet and communication infrastructure influenced the diurnal pattern of Web resources' use,

the researchers reported that the usage was concentrated mostly during work hours (Spennemann, 2007).

Falaki et al. (2010) examined the diurnal patterns of mobile devices usage in order to estimate the battery energy needs. They found that smartphones followed a strong diurnal pattern. Moreover, smartphone usage at night was low, but still extant. The researchers offered two interpretations of the findings. The first one suggested that people who had irregular sleeping hours indeed used their smartphone during the night. The second interpretation proposed that people who woke up in the middle of the night used their devices to check the time, since the screens glow in the dark.

Legal professionals and academics need continuous access to juridical documents such as laws, verdicts, and court decisions. These needs are not restricted to the time spent in the office, or to conventional work hours. Sometimes, it is necessary to access the juridical knowledge base from court, during meetings, and at different times of a day. Thus, it is expected that when they were offered with unlimited access to the juridical knowledge base via mobile devices, their use of such service would grow over time, which leads us to the first hypothesis:

H1: The rate of the mobile channel use for accessing the juridical knowledge base would increase over time.

Moreover, due to the constant availability of the mobile devices, especially smartphones that many people carry with them all the time, users may tend to search for juridical content at unconventional hours. It is expected that in regular work hours the users would mainly use the stationary channel and that in irregular hours, they would gradually increase their use of the mobile channel. Hence, there are two hypotheses:

H2: The diurnal activity patterns of the stationary channel would be different than those of the mobile channel.

H3: The diurnal activity patterns of the mobile channel would change over time, to the extent that the proportion of use in unconventional hours would grow.

These hypotheses are further supported by the theoretical background presented in the following subsection.

Advantages and Barriers of Mobile Internet Adoption

Mobile Internet services have been available around the beginning of the millennium. However, their global adoption, which was based on Wireless Application Protocol (WAP), largely failed. The exception was Japan, where the iMode platform was adapted to the contemporary limitations of mobile phones, such as narrow bandwidth and screens tinier than today (Barnes & Huff, 2003).

Some research regarding the use of the Internet on mobile devices has been focused on differences between the mobile and stationary Web (Chae & Kim, 2003; Church & Smyth, 2008; Cui & Roto, 2008; Kane et al., 2009; Perry, O'Hara, Sellen, Brown, & Harper, 2001). It has been discovered that the major purposes of using mobile Internet have been the news reading, email checking, and information seeking. Although information seeking is practiced in both the mobile and stationary environments, there are differences in usage methods determined by the devices that access the

Web (Halvey, Keane, & Smyth, 2006). Mobile services can provide value such as ubiquity, personalization and flexibility. Moreover, location based services are possible.

Mobile information systems face the barriers referring to small size, tiny screens, uncomfortable keyboards, and connectivity limitations (Barnes & Huff, 2003; Gafni, 2008). If not fully addressed by the developers, these barriers may reduce the degree of adoption success. In order to access Web content through a mobile channel in an appropriate manner, organizations have to develop suitable user interfaces, technically adapted to the characteristics and operating systems of the mobile devices and smartphones. These interfaces need also to be specially designed to fit the mobile screens, due to their small size, touch screen capability, and resolution (Parsons, 2007). Hinman and colleagues (2008) found that mobile Web users access the same content as in the stationary Web, but in a more difficult and time consuming way.

Barth and Heimeshoff (2012) summarized some contradicting studies about the relation between stationary and mobile Internet. Some researchers found complementarity relationships at the subscription level, others agreed on substitutability. Nylander and colleagues (2009) found that users sometimes preferred the mobile Web even when they were in vicinity of a computer. One reason was convenience (no need to boot the computer, while the phone is always ready), and another was laziness preventing users from moving to the room with a computer.

The mobile channel to the juridical knowledge base, which is examined in this study, is a voluntary system. Since the users are not obliged to use this system and arguably may use the stationary channel instead, an increase in the mobile channel usage over time may indicate an increase in the total value of this channel for the users. Companies that develop a mobile channel do not usually include all the options of the stationary channel in the mobile one. The mobile channel of the juridical knowledge base did not provide the subscribers with access to their personal knowledge base within the repository. However, the subscribers could use the Internet browser of their mobile device, and access their personal knowledge base via the stationary channel's interface. The ability to personalize the content, as well as to easily use their own access routines to this content, such as links and queries, is important to subscribers, and creates a lock-in (Shapiro & Varian, 1999) to the stationary channel. It is anticipated that the subscribers would attribute higher priority to the content, and prefer the stationary channel's interface, although it is less convenient to use it via a mobile device. Therefore, we propose two hypotheses:

H4: The adoption rate of the mobile channel would be low, i.e., most of the access to the juridical knowledge base would be through the stationary channel.

H5: A considerable share of the mobile channel visits would be merely used for a quick link to the stationary channel's interface from the subscribers' mobile devices.

Methodology

This research is based on data analytics (Bose, 2009; LaValle et al., 2011; Leventhal, 2010), which is increasingly being used by practitioners and academics to visualize phenomena, and to infer conclusions that support or refute academic theories (Levy & Ramim, 2012), or provide valuable insights for business decisions. As repositories store huge amounts of data, it is important to find ways of learning more from them (Geri & Geri, 2011).

Websites enable organizations to track users' behavior and gain useful knowledge. However, the use of data analytics methods has been somewhat limited, due to the expertise and resources required for applying it, until Google Analytics (Google Inc., 2011) provided a free tool for measuring and analyzing visitor statistics (Clifton, 2012; Pakkala et al., 2012).

This study relies on objective data collected by Google Analytics from the Website of a legal firm, which has been providing online juridical knowledge base services for over 15 years. The firm holds and updates an enormous knowledge base that contains laws, verdicts and other judicial documents, as well as a comprehensive legal literature repository. The customers of the juridical knowledge base services are legal professionals, such as judges, lawyers, attorneys, and legislators, along with law faculty members and their students. The customers subscribe annually to the knowledge base services, on an organizational or an individual basis. The size of the firm's subscriber base is more or less stable, with some degree of growth.

The firm developed two portals that enable access to its knowledge base via two channels:

- A stationary portal, designed for PC computers (fixed or laptops), which was inaugurated in the late 1990's, which was intended to be accessed through the stationary channel;
- A mobile portal designed for mobile devices, such as smartphones and tablets, which was developed at the beginning of 2011, and was accessed via the mobile channel.

Data for this study was collected during a period of one year, from February 2011 until January 2012. Stationary-mobile substitution (i.e., how the proportion of visits has changed over time) is usually analyzed by traffic and/or revenues (ITU, 2012). In this study, channel adoption and usage were analyzed according to the Website traffic, which was measured by visits to each channel. Moreover, in order to find if the channels were used in different manners or situations, data of the access time and the length of the visits were collected. Therefore, the variables collected were number of visits, time and length of visit and number of pages visited, for both channels. All the visitors who used both channels resided in the same geographical area, within the same time zone, and all of them were subscribed to the juridical data base services.

The patterns of the juridical knowledge base visits via the stationary and the mobile channels were compared, and presented graphically, in order to examine the impact of time on the mobile channel adoption, diurnal pattern differences among the channels, and the impact of habit (i.e., lock-in).

Findings

Table 1 summarizes data on the total visits of the juridical knowledge base via stationary and mobile channels during a period of one year, beginning in February 2011, when the mobile channel was launched, and ending on January 31, 2012.

Table 1: Juridical knowledge base visits

	Stationary channel	Mobile channel
Total visits during the examined period	4,300,000	44,000
Average percentage of new visits out of total visits to the Website	11%	42%
Average pages retrieved per visit	7.6	3.7
Average time on site per visit	10:41 minutes	2:18 minutes

The number of visits via the mobile channel was relatively low compared with the stationary one, and constituted only 1% of the total juridical knowledge base visits. Nevertheless, there was a substantial growth in visits via the mobile channel, as seen in Figure 1, which is presented in logarithmic scale. It should be noted that in April and October there were one-week national holidays, and in August the courts were closed for the annual recess.

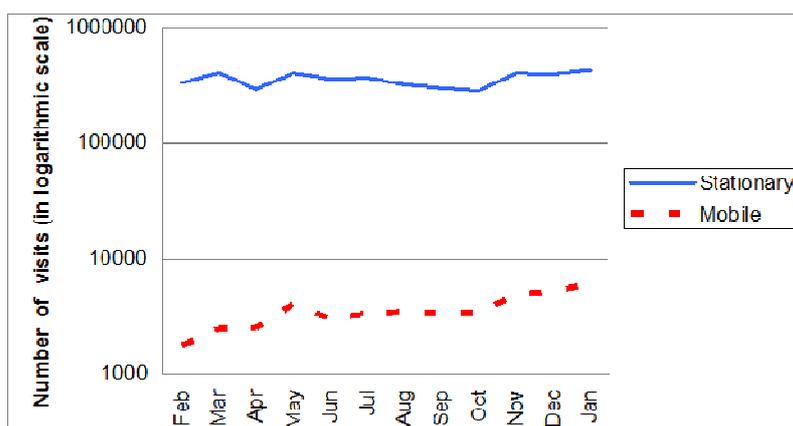


Figure 1: Number of channel visits per month

Table 2 compares stationary and mobile channel visits during the first month of the mobile channel launch (February 2011) with visits in the last month examined in this study (January 2012). The growth by 233% in the number of mobile channel visits was considerable on its own, as well as when compared with the 30% growth of the stationary channel visits during that year.

Table 2: Growth of knowledge base Website visits in one year

First month			Last month			Percentage of channel growth	
Number of visits		Ratio	Number of visits		Ratio		
Stationary	Mobile	Mobile/Stationary	Stationary	Mobile	Mobile/Stationary	Stationary	Mobile
330,000	1,800	0.0055	428,000	6,000	0.014	30%	233%

In order to examine whether there were diurnal pattern differences between the two channels, the percentage of visits during each hour of the day was calculated for each channel, for the whole period (one year). As shown in Figure 2, most of the traffic, in both channels, occurred from 8:00 to 18:00, which are the regular work hours. However, the percentage of mobile channel use before and after work hours, especially during the evening and early night, was greater than the percentage of stationary channel use.

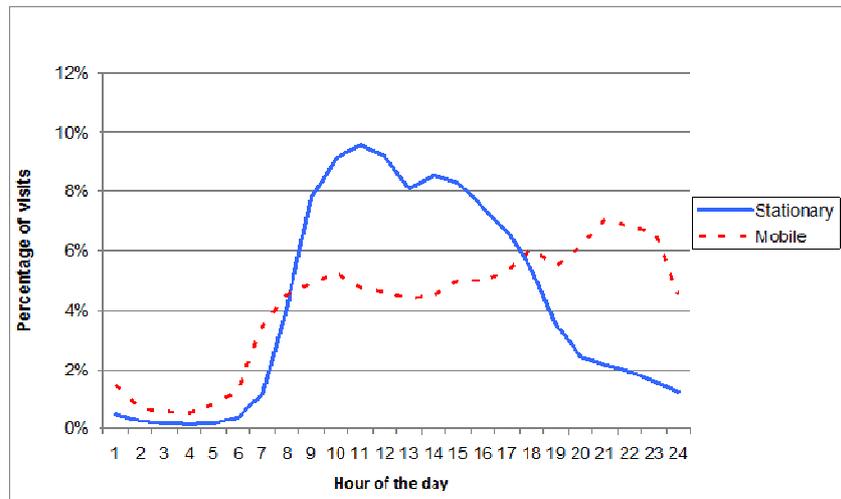


Figure 2: Percentage of visits during each hour of the day for the whole period

The percentage of visits during each hour of the day was calculated separately for each of the twelve examined months, for each one of the channels. The purpose was to find out if there were changes of the diurnal use patterns of the juridical knowledge base during that time. The results of the first and last month are shown in Figures 3 and 4, as they represent the trend of each channel. Figure 3 shows the findings for the stationary channel, which indicate that the daily use pattern of the stationary channel remained the same during the examined year. Conversely, Figure 4 that presents the findings for the mobile channel suggests that there was a trend of increased use of the mobile channel before and after the work hours.

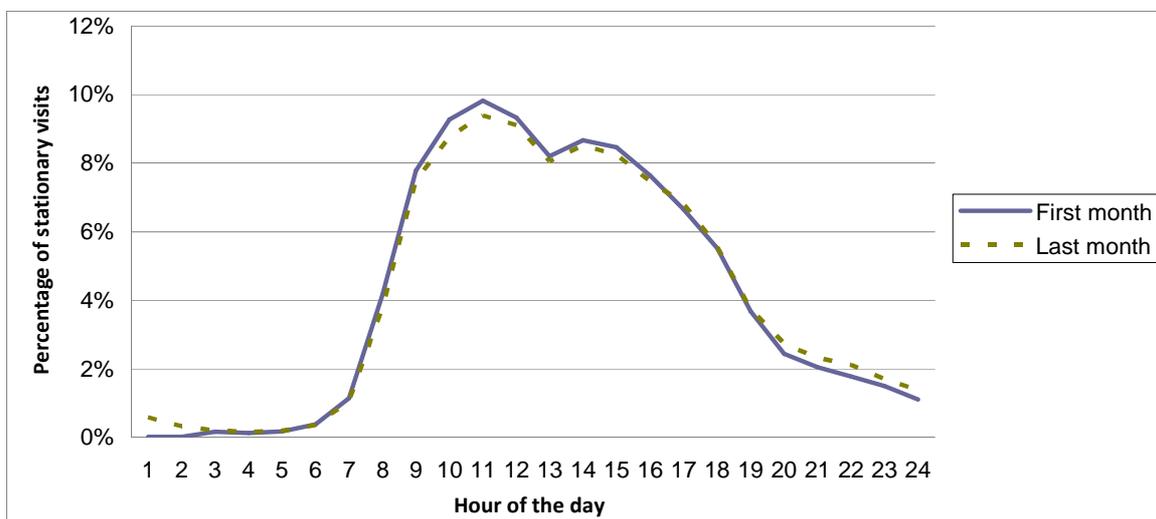


Figure 3: Stationary channel percentage of visits during each hour of the day

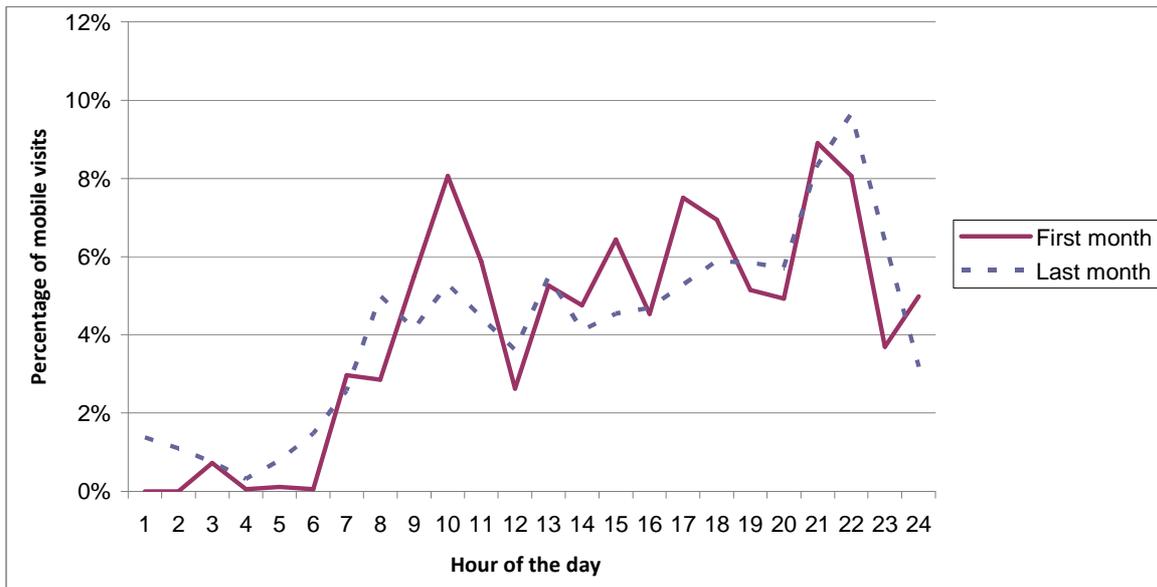


Figure 4: Mobile channel percentage of visits during each hour of the day

Figure 5 compares the distribution of visits in each day of the week via the two channels, and shows that the tendency to use the mobile channel was almost uniform during the five work days of the week (Sunday-Thursday), with a mode of about 16% per day, while on weekends (Friday and Saturday) it was down to about 10% of the weekly day traffic. Similarly, the stationary channel was used homogeneously during the work days (Sunday-Thursday), with nearly 20% of the weekly use in each day, but the reduction of the stationary channel use during the weekend was larger than that of the mobile channel, and was less than 5% on each day of the weekend (Friday and Saturday).

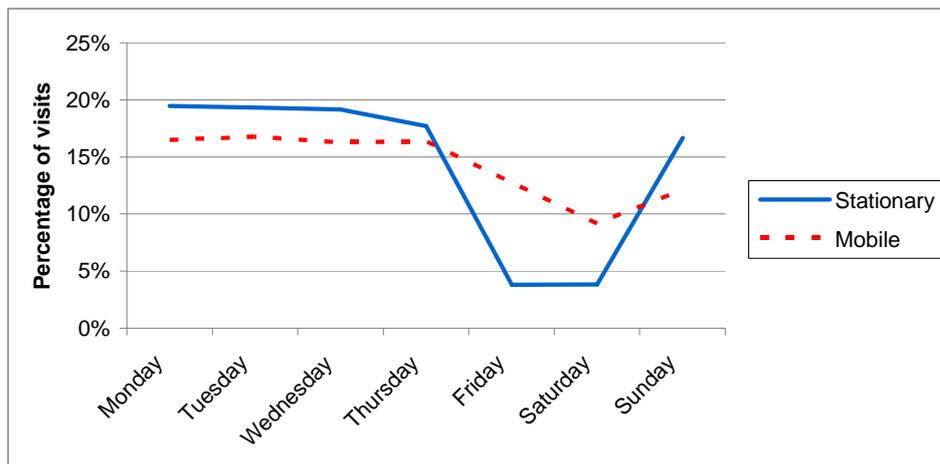


Figure 5: Distribution of visits in each day of the week

As shown in Table 1, on average, the mobile channel was used for shorter sessions (2:18 minutes) than the stationary one (10:41 minutes). Figure 6 presents the distribution of the duration of visits. 21% of the visits through the stationary channel, and 44% of the visits through the mobile channel, lasted less than 10 seconds. Since it was impossible to search the knowledge base in such a short time or retrieve

documents, and these short visits were a major part of the mobile traffic, the nature of the short visits was further investigated. It was found that most of the short visits through the stationary channel were abandoned and the user left the system. However, the investigation of the short visits through the mobile channel revealed that 60% of them (i.e., about 26% of the total mobile channel visits) ended as the subscribers used a link provided by the mobile portal and moved directly to the stationary portal. This finding indicated that these subscribers of the juridical knowledge base have been surfing the Internet on their mobile device, and were using the stationary portal, which was not adapted for the small mobile screens. Furthermore, these subscribers were using their personal knowledge base, which was not available via the mobile portal.

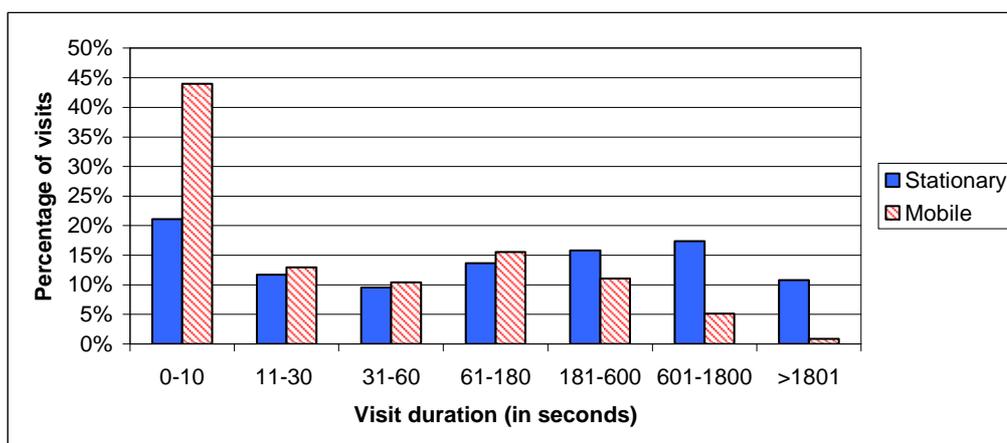


Figure 6: Distribution of the duration of visits

Discussion

The discussion begins with a summary of the results. Hypothesis 1 suggested that the rate of the mobile channel use for accessing the juridical knowledge base would increase over time. It was supported by the findings presented in Figure 1 and Table 2. During one year, the number of visits per month has increased by 233%. However, H4, which proposed that the adoption rate of the mobile channel would be low, and that most of the access to the juridical knowledge base would be through the stationary channel, was also supported, as shown in Tables 1 and 2, and in Figure 1.

The mobile channel handled just about 1% of the total visits of the juridical knowledge base. It may seem insignificant or immaterial, but, since the mobile channel answers needs, which were not provided by the stationary channel, the mobile share was expected to grow. This interpretation is based on the results presented in Figures 2, 3, 4, and 5, and supports H2 that suggested the diurnal activity patterns of the stationary channel would be different than those of the mobile channel. As shown in Figure 4, H3, which suggested that the mobile channel proportion of use in unconventional hours would grow, was also supported, and it further strengthens the expectations of increased use of the mobile channel. Figure 6 shows that 44% of the visits through the mobile channel lasted less than 10 seconds, and as H5 proposed and further investigation revealed, many of these visits were used for a quick link to the stationary channel from the subscribers' mobile devices.

This study probed three perspectives of mobile technology adoption: rate of diffusion over time (Rogers, 2003), and continued use (Karahanna et al., 1999); diurnal pattern (Klepeis et al., 2001) differences of stationary and mobile channels; users' habits (Polites & Karahanna, 2012), and lock-in (Shapiro & Varian, 1999).

As the tendency to work outside the office and after hours has been increasing (Karlsou et al., 2009), together with the nature of legal work that sometimes involves activities outside the office, such as court sessions, the mobile channel provided the subscribers with ubiquitous access to the juridical knowledge base. However, this advantage was somewhat diminished because the subscribers could not access their personal knowledge base within the juridical knowledge base. As the findings show in Figures 2, 3, 4, and 5, the subscribers used the mobile channel mainly when the stationary one was probably not available to them. Furthermore, those who needed their personal knowledge base used their mobile devices to access the stationary channel's interface. These findings demonstrate the lock-in (Shapiro & Varian, 1999) of the users to the stationary channel.

The rate of adoption of the mobile channel perspective has at least two facets. The first one is general, and relates to the use of a mobile Internet services. Many holders of mobile devices, such as smartphones, have not been using most of their functions, including access to Internet services (Smith, 2012). Nevertheless, the general trend showed that these services were being adopted pervasively (Duggan & Rainie, 2012). The second facet relates to the specific system. On the one hand, the subscribers were familiar with the system. On the other hand, it must be emphasized that documents retrieved from the juridical knowledge base were usually very large, sometimes containing hundreds of pages. It was obvious that such documents were hardly readable through tiny mobile screens, and it would be difficult for the subscribers to critically read their content (Eshet-Alkalai & Geri, 2010). The findings support this observation. As shown in Figure 6, the duration of visits via the mobile channel was relatively shorter than those via the stationary channel.

The empirical findings indicate that the mobile channel of the juridical knowledge base would be adopted slowly, and used mainly when the stationary channel was not available. Furthermore, the findings suggest complementarity of the two channels, as demonstrated in Figures 2, 3, 4, and 5 that show the increasing role of the mobile channel before and after conventional work hours, and during the weekend.

The main limitation of this study is generalizability. Since it analyzed the mobile channel of one juridical knowledge base service provider, the applicability of the findings for other juridical knowledge base services, for other domains such as medical knowledge bases, and for other sorts of Websites, should be considered carefully. Notwithstanding, the elaborated analysis, combined with additional supporting information, obtained from the firm about the knowledge base and its subscribers, has provided important insights, which are relevant for Websites with similar characteristics. For example, Websites that enable their users to personalize their interface, and to store their personal content, may learn from the experience of this firm, when considering whether this service, or which parts of the personal content, should be included in their mobile application.

Another limitation is the accuracy of the data retrieved from Google Analytics. For example, Table 1 indicates that the average percentage of new visits out of total visits to the Website is 11% for the stationary channel, and 42% for the mobile one. The term "new visits" was used rather than "new visitors" because Google Analytics identifies the user by the device, and in some of these cases, a single subscriber may use several devices. Furthermore, if users delete cookies from their device,

the next time they visit the Website via the same device they will be counted as new visitors. Nevertheless, the data is adequate for providing accurate trends.

The methodology used in this study was data analytics, and it was based on data collected by Google Analytics. The data used in this study were objective, and measured actual use by the entire subscribers of the juridical knowledge base, over a period of one year. The objective longitudinal data is a major advantage of the study. Nevertheless, other methodologies that rely on subjective data, such as surveys, or interviews of users, may add complementary important perspectives.

Conclusion

The emergence of mobile Internet services, and their rapid adoption following the introduction of smartphones (Duggan & Rainie, 2012; Smith, 2012), has presented organizations with the dilemma which of their Web services and content should be modified for mobile consumption. This study analyzed adoption patterns of a mobile channel that provided subscribers with access to a well-established juridical knowledge base. The subscribers could use either the existing stationary channel, or the new mobile channel, simultaneously. The findings suggest that the stationary and mobile channel complement each other, along with trends of growing usage of the mobile channel before and after conventional work hours and during the weekend.

The main insight emanating from this study is that consumers appreciate the service of maintaining their personal knowledge base within a juridical knowledge base. The ability to save their own content, such as links to documents and comments, as well as using their predefined queries is important for them. Although the study examined a particular system, these conclusions seem to be universal and pertain to all sorts of personalized Website interfaces. Therefore, organizations and knowledge base service providers that contemplate which sort of applications should be offered via their mobile Website should primarily consider providing access to personalized Website interfaces, as well as personal content of the consumers.

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