2014 47th Hawaii International Conference on System Science

Investigating Location-Based Services From A Business Model Perspective

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Abstract

New business models in the field of Location-Based Services (LBS) emerge as frequently as they perish. Even though the amount of existing literature addressing LBS is quite large, research attempts to approach LBS from a business model perspective are scarce. This study aims to close this gap by identifying components and characteristics of viable LBS business models from a German market perspective. The underlying research reveals seventeen core components of LBS Business Models through a qualitative approach. In addition to an improved scientific understanding of the mechanisms of LBS business models, this work equips practitioners with an LBS tailored business model framework.

1. Introduction

Digital technology has seen a recent convergence of computers, communication and media devices, and has been moving towards miniaturization and decentralization ever since its emergence. While hardware has increasingly moved from remote centers to more sophisticated handheld devices, software and new applications focus more and more on individual niches rather than on mass markets [29]. This evolution, combined with the continuous improvements of wireless and positioning technologies and a new potential user base, has enabled a new type of mobile service, Location-Based Services (LBS), which provide location data and related information across telecommunication networks by integrating wireless and positioning technology [25], [29].

This study understands LBS as the many sorts of network-based mobile information services that account for and result from the positional information of a mobile device to provide value-added services to the user depending on their geographic context and individual preferences [9], [16], [33]. LBS deserve to be a research focus for many reasons, particularly since these services might enable the digital transition of human knowledge about space, where other fundamental information artifacts such as personality, matter, energy, and time have already been re-developed for digital mass distribution [26]. In particular for the personalization of mobile services, location signifies a key variable [38]. By means of the integration of identity, time and location, new levels and forms of value creation can be attained [39].

Nowadays, as the number of users of various technically advanced and ubiquitous mobile devices is growing more rapidly than ever before [14], this potential of LBS is becoming more and more obvious and LBS are attracting a great deal of attention from various stakeholders in the mobile business [13]. Nevertheless, the number of successful LBS continues to lag behind expectations, not only in Germany [15], but also worldwide [27], [9], [35]. The fact that LBS are falling short of expectations can be attributed to a lack of user acceptance on the one hand [1], [24], [35] and to inadequate business models on the part of service providers on the other [9]. While many papers focus on the user perspective [1], [35], the present study concentrates on the service providers and their corresponding business models. One reason for the lack of research on business models for LBS [26] is that there are only a few successful advancements in the LBS markets which can be analyzed. Moreover, successful entrepreneurs in the LBS arena are protective of their intellectual property and are therefore not willing to reveal the sources of their competitive advantage. This study aims to close this gap by providing a holistic framework for LBS business models through qualitative expert interviews. This paper thus asks: What are the fundamental elements from which LBS business models are composed?

2. Theoretical Background

2.1 Location-based services

Thus far, there is no established definition of, or common terminology about, LBS [36]: 'Location-aware services', 'mobile location services', and 'wireless location services' are used synonymously when referring to LBS [25]. Küpper [22] argues that the plethora of different definitions and terms

978-1-4799-2504-9/14 $31.00 © 2014 IEEE
DOI 10.1109/HICSS.2014.152

regarding LBS originates from the fact that LBS arose in different communities and are therefore viewed from various interdisciplinary perspectives. The telecommunications industry and the ubiquitous computing field played two very different roles in the development and establishment of LBS and each has contributed its own vocabulary and definition [22], [32]. For the scope of this paper, LBS are defined as any kinds of network-based, mobile information services that account for and result from the positional information from a mobile device to provide value added services to the user, depending on their geographic context and individual preferences [9], [16], [33].

Service	Applications	Required Quality of service
Person-oriented		
Information services	Finder applications (e.g., route, location, store, restaurant, gas station, and parking)	Location accuracy to within a tenth of a meter, response time of a few seconds or less, need for high reliability (98-99%)
Navigation services	Dynamic navigation guidance Voice-enabled route description	Location accuracy of a few meters, response time of a few seconds or less, need for very high reliability (100%)
Entertainment	Location-based games (treasure hunts) Social services (dating)	Location accuracy to within a tenth , response time of a few seconds or less, need for high reliability (98-99%)
Emergency support	Roadside assistance Search and rescue missions Police, medical ambulance & fire response	Location accuracy to within a tenth , response time of a few seconds or less, need for very high reliability (100%)
Transaction services	Location-based advertising (coupons, alerts, promotions) Location-based billing (toll, service, goods)	Location accuracy of a few meters, response time of a minute, need for high reliability (98-99%)
Device oriented		
Find & Tracking services/ Supply chain Management	People tracking (children, friends, personnel) Object tracking (car, fleet, material)	Location accuracy of a few meters, response time of a few seconds or less, need for very high reliability (goal: 100%)

Table 1: Classification of location-based services based on [10], [9], [20], [11], [30]

The ability to locate mobile devices and to use their spatial data to provide value-added services to the smartphone user has opened a wide spectrum of business opportunities. Every day, new LBS with new characteristics are developed and marketed. Meanwhile, there are many schemes and groupings which divide LBS into specific categories, but there is as yet no one common classification framework for LBS [2]. Different approaches to systemizing and classifying LBS include classification according to properties referring to the application area or type of value-added service, the functional characteristics of LBS, and the markets targeted. Table 1 provides a breakdown of these major areas of LBS, separated by person and device orientation, along with a listing of typical applications and the required quality of service to be employed in each area. Since novel LBS are being developed and published every day, this table should be regarded as a snapshot of today's world with new LBS likely to occur in the future.

2.2 LBS business models

The advancements in the mobile sector have generated new business models and have led to increased scientific interest in this particular research field. In general, the concept of the business model is not new, but it is still relatively young [23] and remains theoretically underdeveloped [37]. Business model definitions differ in their focus, e.g. on product architecture, value proposition, business logic revenue sources or organizational architecture. Considering various research approaches and definitions, this paper follows the definition put forward by Bouwman et al [3], as it neatly incorporates a wide array of different understandings into one: “A business model is a blueprint for a service to be delivered, describing the service definition and the intended value for the target group, the sources of revenue, and providing an architecture for the service delivery, including a description of the resources required, and the organizational and financial arrangements between the involved business actors, including a description of their roles and the division of costs and revenues over the business actors”. The economic particularities of mobile business models arise from a unique set of characteristics such as mobility, network interdependencies and network effects [3], [6].

Previous work identifies key challenges and business models linked from a marketers perspective without explicitly defining the business model concept identified [9]. By concentrating on current challenges for LBS in the marketing domain, financial and organizational elements of such business models are revealed. However, a holistic framework, representing not only mobile marketing but also the remaining areas

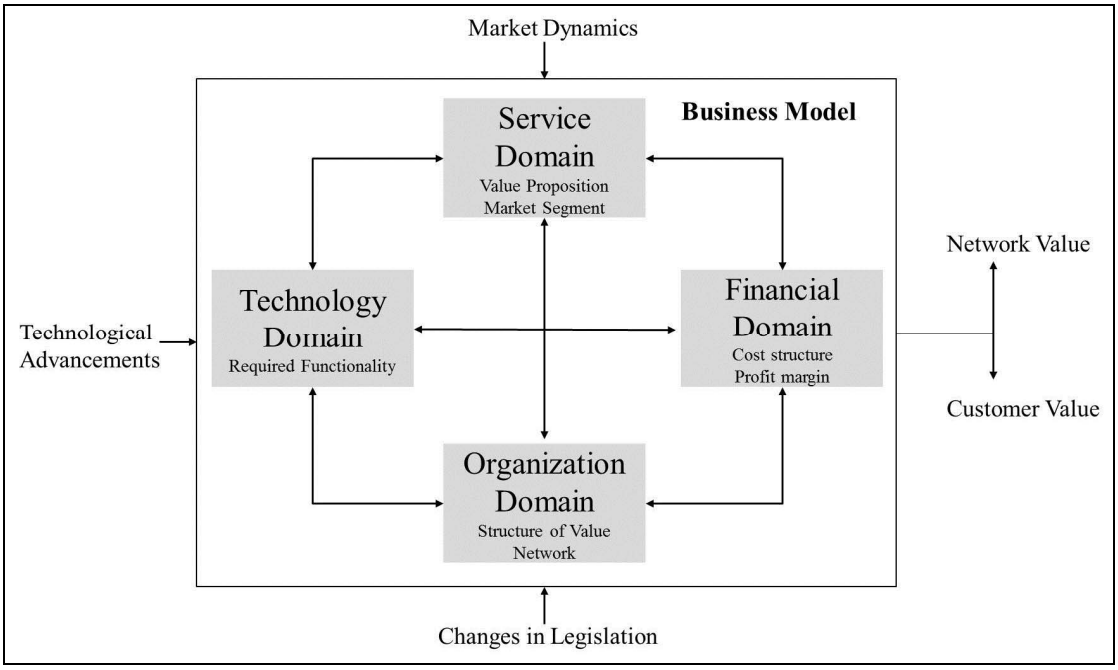

Figure 1: The STOF Model [3]

of LBS business models, remains to be established. Furthermore it is unclear whether these results can be transferred to the German market.

Comparing electronic business models in an extensive literature review, Bouwman et al [3] synthesize their findings into a generic model. The authors assign business model components to the four basic domains, namely by service, technology, organization, and finance (STOF, see Figure 1). All of these domains are in constant interaction with each other and are influenced by external factors such as market dynamics, legislation and technological innovation. The STOF provides an opportunity to analyze business models and to compare them by analysis of the four domains and the components which constitute these domains. However, it remains unclear how this model is applicable and beneficial for describing the special category of LBS. Additionally, advancements that may potentially have transformed the business environment, such as the introduction of Long Term Evolution (LTE), are not captured in the already mature model.

So far, the application of the STOF model to mobile services appears to be promising, as DeReuver and Haaker [27] show. They provide an analysis of design issues that are critical in developing viable business models for context-aware services. By using the STOF model to structure their findings, they point out challenges, such as generating the trust of users in the service, securing privacy, and pricing strategy. Even though LBS are a subset of context-aware mobile services, they still possess a distinct set of characteristics [20]. In contrast to services that users might already be familiar with from the fixed internet (e.g. e-mail or games), the tracking of user location data represents a feature that users are not yet well acquainted with [28]. Hence, LBS deserve a particular research focus [34], since these services might enable the digital transition of human knowledge about space, just as other fundamental information types such as personality, matter, energy, and time have already been reinvented for digital mass distribution [26].

Consequently, due to its distinctive characteristics, this category is of special interest for the study of the respective business models. The empirical part of this paper aims to reveal to what extent the STOF model is suitable for representing LBS and how much it needs to be adapted to comply with LBS-specific characteristics.

3. Research Methodology

Due to the predominant unfamiliarity of LBS business models and the lack of substantive research in this field, a qualitative approach was chosen as the most suitable way to explore components and characteristics of viable business models for LBS from a German perspective [5], [17]. With the objective of gathering sufficient information to shed light on LBS business models from a provider's perspective, the cross-sectional form of a qualitative

interview was chosen [4]. Interviews are particularly appropriate for exploratory, theory building studies [7], [12] and for elaborating on complex issues with open-ended questions, which can be easily followed-up if necessary [17].

Given the fact that the community with specific knowledge of LBS and their business models is rather small, the expert interview, as a subset of semi-structured interviews, was chosen [8]. Since the aim of the study is to compare and combine expert knowledge from different domains in the LBS business model field to derive components of viable LBS business models, expert interviews as a standalone data source are sufficient [12]. The semi-structured character of expert interviews is achieved by partly standardized questions, which are used to guide the interviewees. Considering the implications of the theoretical research context of LBS and its business models, guideline questions were derived from Bouwman et al [3] definition of mobile business models (see section 2). To ensure comprehensiveness and completeness, the interview guideline was pre-tested with academics and practitioners. All questions were individually adapted to the interviewee's specific expertise, their business background, and their time available [17]. The working definition of LBS was presented to the interviewee to ensure a common understanding of the interview topic.

The sample included a set of eight experts, with diverse educational and occupational backgrounds [4]. These interviewees were purposely sampled according to their knowledge of the LBS business field to guarantee a diverse, multifaceted and relevant sample [4]. An overview of the experts is given in table 2.

The average interview lasted 41 minutes, while the interview length varied between 33 and 52 minutes. The interviews were conducted in German, which ensured fluency and reduced language barriers, given that the interviewer and the vast majority of respondents are German natives. With the prior consent of the experts questioned, the interviews were recorded in full and subsequently transcribed according to [21]. In accordance with the objective of this work, the Grounded Theory approach was chosen to analyze the data. The coding process hence followed [31]. The qualitative research software "Dedoose" facilitated the breakdown of texts and the coding process. In addition, the mind mapping software "FreeMind" was used to visualize the relations of categories and subcategories. The analysis began by open coding, in which all the interview transcripts were broken down, examined, compared, conceptualized and categorized.

Interviewee	Occupation	LBS experience
Expert 1	C-Level consultant, e-commerce	3 years
Expert 2	Co-founder of software application for trade show/ event industry	4-5 years
Expert 3	Founder/ CEO of social gaming applications & service provider of recruiting games	2 years
Expert 4	Product manager for mobile devices at international online service company	3 years
Expert 5	Key account manager at international online streaming service	3 years
Expert 6	Founder/ CEO of software provider for mobile services	4 years
Expert 7	Co-Founder of online marketing & information service (head of product & finance)	1 year
Expert 8	Co-Founder of online marketing & information service (head of marketing & sales)	1 year

Table 2: Overview of expert characteristics

This analytical process allowed the identification of potential concepts and their dimensions. The codes derived from the open coding were labeled according to their underlying events or objects. During the coding process, all codes and their relation were constantly reviewed and adapted. Memos helped to either define selected labels for codes or to take note of issues which needed further clarification [31]. By using axial coding, the codes were 'put back together' by linking them to each other, to their contexts, causes and interactions. These categories were subsequently related to their sub-categories [31]. To minimize the linguistic bias, interviews were not translated and therefore have been coded in German. In a last step, the core categories and subordinate categories were translated into English with several cross checks. With the increasing densification of the categories' and subcategories' relationships, 17 key categories were derived. These core categories, the subcategories they contain and their relationships are described and analyzed in the next section.

4. Findings

For reasons of clarity and comprehensibility, the 17 core categories and their interrelations are elaborated and assigned to broad contextual areas.

The four domains of Bouwman's STOF model (section 2.2) prove to be flexible and holistic enough to place and interrelate all the core categories, and were chosen for this reason. Since some categories are eclectic, this categorization was not always decisive. Interrelations and overlaps will be noted in the following section. An overview of all the core categories placed and the corresponding domains can be found in figure 2.

4.1 Service Domain: Values proposed, Value-creating characteristics, Target group and Application area

As summarized in the service domain, the experts identified proposed values, value-creating characteristics, target groups and different application areas as belonging to the LBS business model.

All experts agreed that LBS need and possess additional value to be marketed: "[…] location is only relevant if it includes an intrinsic value for the consumer" (expert 3). According to the interviewees, LBS attain value primarily by saving resources and reducing complexity through automated integration of location. Moreover, the interviewees highlighted a new value of presence in the digital world that gradually reduced location value in the offline reality: "In an ideal world, if you always knew what there is around you, e.g. where you get what you want or where you could save money, the importance of main roads and location would gradually lose value completely" (expert 7). From an advertising perspective, LBS create value by granting a direct and accurate targeted access to potential clients, which is provided when the application areas of LBS are presented. In short, LBS propose value in many different areas and one single service usually combines a plethora of different value propositions for different target groups.

The benefit of using LBS derives from certain value-creating elements which the experts identified as another component of LBS business models. In particular, an "[…] obvious benefit" is crucial for providing valuable services (expert 1). Linked to this, LBS data needs to be new to the consumer to create value for them. In the daily routine, location information is already known and therefore, the use of LBS services provides no value. For some LBS, a value creating factor is the size of the user-base, which may allow providers to either generate value through interactions or to send out information to as many people as possible. Moreover, valuable interactions through LBS are only possible if access to other functionalities, services or media is granted.

Because of their ubiquitous nature, LBS allow almost everyone to be part of a potential target group: "One can actually use it anywhere because people move and things are in motion. The fact that we are moving makes the environment change and thereby Mobile Location-Based Services can respond to this." (expert 3). When identifying the actual target groups, the experts distinguished between whether the target audience is willing to pay for the service or whether the targeted segment is characterized by "[…] a high expectancy that [the LBS services] are free or extremely inexpensive" (expert 8). The latter are end-users, which can be targeted in mass-market segments or special-interest niche groups. Business clients are more willing to pay to use LBS, e.g. for geo-tagging to conduct their businesses more efficiently, to facilitate interaction with clients or as end-user tools for marketing, sales etc.

These target groups make use of LBS in various application areas, which are derived as a final component of the Service Domain. LBS provide use in emergency situations, private security, assistance with logistical problems for businesses or individuals, or in entertainment. Navigation was frequently identified as an application area, especially in the context of tourism or traffic. Nevertheless, other information services were noted by most of the experts: in the retail area, in the hospitality area, in the real estate area and in the area of education. Local interactions are another area of the application of LBS, which involves interactions between end-users, such as flirting and opening up conversations with friends, or between end-users and businesses or public services, such as making reservations or buying or selling an item. Of all application areas in the retail information segment "[…] the connection of online and offline shopping surroundings" is considered to have a great deal of potential (expert 1). These areas are generally consistent with our own elaboration of a classifications scheme (see section 2).

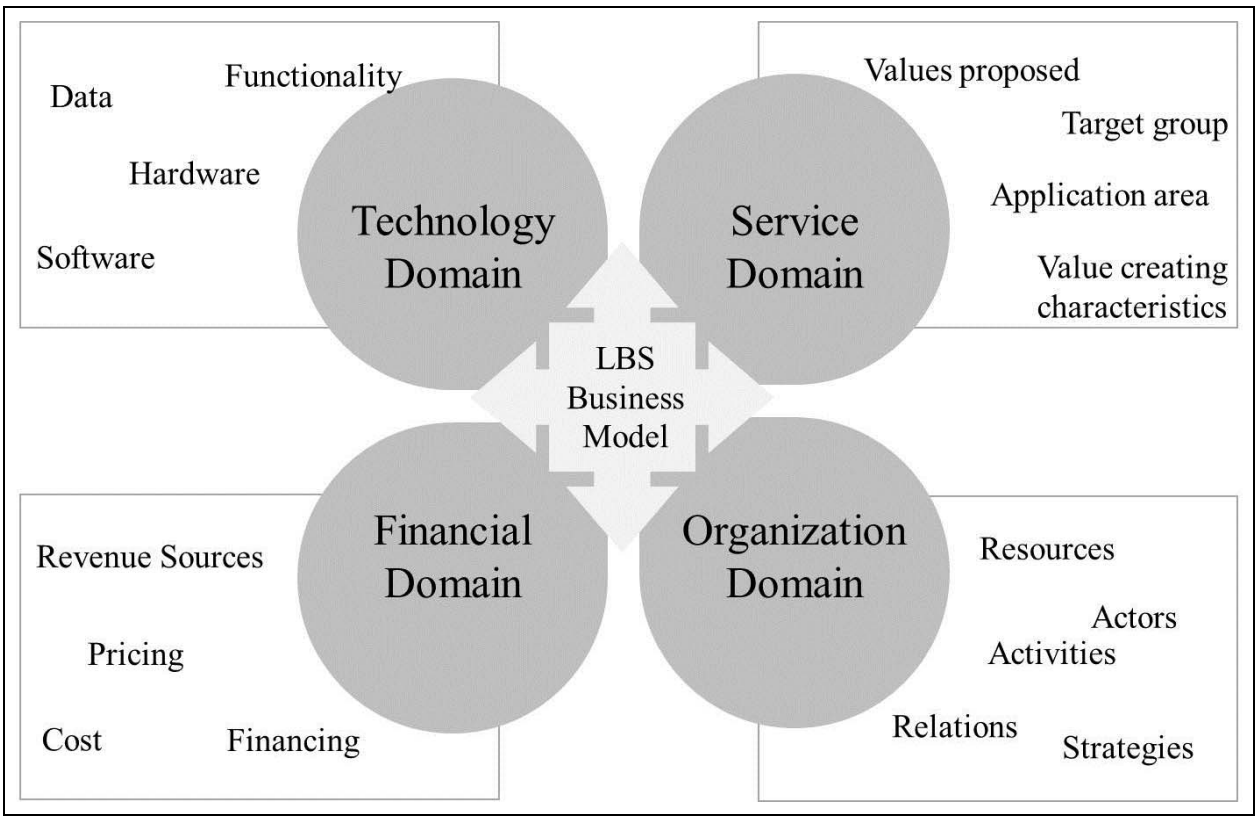

Figure 2: Core categories assigned to the domains of the STOF Model

4.2 Technology Domain: Data, Functionality, Hardware and Software

The interview analysis revealed that the Technology Domain is composed of data, functionality, hardware and software components.

An important component in the Technology Domain is digital data, since most LBS depend on additional information. As noted by the experts, the underlying technologies of LBS need to support the ongoing process of digitalization, data actualization and the reactivation of useful but inactive big data. Big data in particular is regarded as a promising source of information: "The use of these data sets […] can, in conjunction with the location data, transform dead data into vivid data, just like transforming Latin into a spoken language" (expert 1).

Among other considerations, the functionality component needs to provide solutions for managing and using big data sets. Data security in this context is of central interest: "Again and again there are cases where portals are hacked and all the user data is stolen. Of course this is an important point." (expert 4). Even though data privacy measures restrict the freedom of conceptualizing and developing LBS, LBS technology has to assure privacy protection, a transparent processing of data in line with existing rules and regulations. Fundamental functionalities obviously include the location and data transmission functions which ultimately enable LBS. The locating functionality needs to be precise, since "[…] the problem of data accuracy." (expert 6) is ever present. Another functional prerequisite of data transmission is a satisfactory communication or broadcast speed.

With respect to the hardware component, the interviewees frequently mentioned the mobile device and its characteristics. Experts mentioned that LBS could work even better if technical limitations of mobile devices, such as small screen sizes, limited battery life and data capacity were addressed. Generally, the locating function requires several hardware components: LTE chips are another hardware component that will increase in importance as faster LTE connections are established as a new standard in the future.

Alongside the experts' statements about various hardware devices, they named several software components and characteristics - software which equips the particular smartphone brands are of crucial importance. The LBS application needs "[…] to be adapted" to each standard in order to be displayed in various application (app) stores. The latter is also a costly decision, which needs to be considered when looking at financial components (expert 5).

4.3 Organization Domain: Actors, Activities, Relations, Resources and Strategies

The actors, or shareholders and stakeholders, are included in the LBS business model, and directly or indirectly take part in the realization of the service. The interviews revealed the following key players as essential: LBS hosts, clients, infrastructure providers, investors and the government. To start with, experts have named two types of LBS hosts, the ones where LBS is simply an integrated function of a subordinated, separate business model, an "[…] add-on-service" (expert 1), and others where the business models are based mainly on LBS technology.

In each case, both types of LBS providers would need the same resources to conceptualize, design, market and maintain LBS. The experts refer to time, partners, money or infrastructure as possible competitive advantages. After all, the business idea needs to be adapted to the given technological infrastructure and to the market's maturity.

As indicated in the preceding section, mobile device producers, mobile network operators, and data providers provide the technological infrastructure. Relations with mobile phone producers are considered important because, besides enabling users to use LBS with their devices, they control the platforms through which LBS are brought to the end-users, the app-stores and so on. Data providers are other significant market players. Since LBS hosts can integrate data digitalization processes into their own businesses and let business clients or end-users provide location data, these can be seen as alternatives for getting data to the LBS hosts (expert 7). Mobile network operators provide the greatest share of infrastructure and one expert referred to them as "[…] the bull neck" (expert 7). The four German network operators do not impose rules on LBS hosts and are considered good cooperation partners, since the LBS hosts could use their resources. The operators are furthermore differentiated from the remaining three, since they are the only parties offering the LBS.

All experts mentioned cooperation as a strategy to market an LBS. In addition to network operators, LBS hosts might be able to partner up with smartphone producers, companies, investors, and with other LBS or mobile service providers to share expertise, infrastructure, network facilities or other resources. Today these potential cooperations are undergoing development, and there is a need for more communications between the key players: "[…] people who develop LBS and brands and companies do not operate in a vacuum […] there is communication between them" (expert 1). A reason for this, mentioned as a value creating element, is trust, which is considered essential for cooperation between the different actors: "[…] good experiences between location-based services hosts [and partners] are necessary, but even then you have to achieve noticeable success to cause them to consider LBS as a new marketing or communication channel" (expert 4). In light of this constellation of power, one expert in particular emphasizes the potential of cooperation between mobile service hosts: "I think that the interaction and mutual support in the creative [LBS] community are still in the initial stages" (expert 1). The financial perspective on the various cooperation-constellations will be examined in the next section.

4.4 Financial Domain: Cost, Financing, Pricing and Revenue Sources

To complete the LBS business model framework, costs, financing, pricing and revenue sources were derived and assigned to the domain of finance. Since "it is all about monetizing, i.e. making money from your offer" (expert 4), this domain is of high importance to the business concept.

To realize LBS, several cost components must be addressed. As expert 3 highlights, producing the LBS is not all that costly: "You can create interesting solutions with relatively little money" (expert 3). What is considered a major cost factor in a more advanced stage of LBS is relevant content (expert 6). As described in the Technology Domain there is either the possibly to collect and process data in an elaborate process or to buy it. Additionally, marketing activities come at a great cost, especially for business clients "[…] because local means canvassing from door to door, being on-site and an expensive sales process" (expert 7). Furthermore, many costs are related to the technical infrastructure of LBS: providers need to pay for servers to save and store the LBS information.

The possible collaboration constellations presented in the Organization Domain hinted at various sources of financing. Institutionalized means of financing consist of drawing money from venture capital or bank loans. Micro-financing might be a less conventional form of financing: "[…] crowd funding pays for ideas. This is a young concept, but why should it not work for LBS?" (expert 1). Small financial contributions could be sourced from users or from supporters in the mobile community. One expert mentioned other sources of financing within a firm's existing business model, which remains separate from the location-aware service: "Many

LBS still have a traditional website which helps with financing the LBS" (expert 8).

The sources of revenue are just as versatile as the ways to finance LBS. Revenue can come from the end-user paying for the app, or indirectly through advertisement: "The app is not directly pouring money into our coffers, but is simply a marketing tool" (expert 3). Another source of revenue is subscription models, which are mainly used for special-interest niche markets (expert 5). "[…] premium models, where the client starts out for free but has to pay later on" for extended services are an alternative source of revenue (expert 7). In some cases, the LBS do not generate any revenue, but simply complement a primary service as a functional add-on (expert 1). Here, revenues are earned through subordinate business models.

The pricing component describes what can be charged for the offered service. Even though the willingness to pay for mobile services is higher than other Internet services, all experts came to the conclusion that there is "[…] a very high expectation that [LBS] are free or very cheap" (expert 8).

To summarize, this chapter identified and presented the components and characteristics of LBS business models in context. It was shown that LBS business models are quite flexible and, as one expert states: "It is still to be tested. I do not have the feeling that all LBS are financially stable, that all have a functional system and organization, that they have formed a symbiosis with their clients and that everybody is happy and making profit. The market is not mature, yet" (expert 4).

5. Discussion

By grouping the components of LBS business models according to their relations to the four domains of the STOF model, the framework suggested by [3] generally coincides with this study's results. However, there are some differences that arise from the different prioritizations that the experts give different components in comparison to other categories of mobile services.

A central component of LBS is value-creating elements. According to the experts, it is especially important that the potential users are aware of the benefits of using the LBS, and they come to accept the service through expertise, routine and trust. Since LBS offer multiple value propositions, the experts named the application area as an additional component for LBS development. In these application areas, LBS can potentially create value for different target groups. Within these application areas, the interviewees emphasized the retail sector as highly promising for tailored LBS information services. These two components, value creating-elements and application area, were derived from the answers of the experts and can be added to the generic STOF model in order to make it more tailored and hence more applicable to LBS. This is in line with the findings from [27] which examined these components also for the general category of context-aware services.

In the Technology Domain, data played an essential role for the experts. Collecting, digitalizing and preparing the data used in LBS are considered essential technological components which are necessary to the provision of LBS. Furthermore, the technological provision of the highest possible data security is another important factor in the success of the service. Some experts hint that a precise positioning technology is crucial to LBS, and that technologies such as NFC could solve existing deficiencies in the near future. This element of accuracy was shown to be of special importance for LBS opposed to the study of business models of general context aware services [27].

In the Organizational Domain the experts prioritize collaboration and cooperation between different organizations in general, and especially between business clients and LBS host. Collaboration and cooperation creates an additional category that was not revealed by the study of [9] into LBS in the marketing field. Moreover, the political actors are seen as important for imposing rules for data security and to educate citizens about technological advances.

In the Financial Domain, all experts agree that end-users lack the willingness to pay and therefore revenue sources need to be sought in business clients or collaborations. In general, financing, pricing and revenue sources for LBS are as yet not clearly defined. Moreover, the experts suggest alternative models such as micro financing and payments as suitable for LBS. Another particularity of LBS in the Financial Domain is that there are more models which do not generate revenue through the service, but instead through the revenue sources of subordinated business models.

Altogether it could be said that the expert interviews support the four dimensions of the original STOF model. Nevertheless, the analysis showed that there are components that are prioritized by the experts and considered especially important for LBS due to the special characteristics of the service. In addition, value-creating elements and application areas should be added to the Service Domain for LBS. By providing a proposition for an additional LBS classification framework, the findings of this research

have not only supported existing theoretical frameworks, but have also extended them. The implications of these findings will be discussed in the next section.

6. Conclusion

In this study LBS were investigated from a business model perspective. Thereby, components and characteristics of viable LBS business models were identified by interviewing experts from the mobile service field about LBS and aspects of their business models. The interviews led to 17 core components of LBS: *proposed values, value-creating characteristics, target groups and application areas in the service context; data, functionality, hardware and software components in the technology domain; actors, relations, activities, resources and strategies concerning the organization context; and costs, financing, pricing and revenue sources derived in the financial domain*.

Hereby, the findings support existing literature about mobile business models (see section 2) and expand it to the LBS market. The STOF model provided a useful framework for organizing the components. Nevertheless, the analysis showed that there are components that are prioritized by the experts and considered especially important for LBS due to the special characteristics of the service. Moreover, value-creating elements and application areas should be added to Service Domain for LBS.

6.1 Limitations of the study

Firstly, the scope of the research is limited since the study is focused on identifying components of viable LBS business models in Germany. Interviewing German practitioners narrowed the focus down to the German perspective.

Likewise, the used definition of business models from Bouwman et al [3], on which the guideline for the interviews was based, can be ambiguously interpreted. Deriving questions from the definitions certainly influenced the LBS business model in a specific direction. Even though all questions were asked in an open manner, the theoretical character might have prevented the identification of other components which are not included in the STOF model. Nevertheless, this study made it possible to identify the particularities, characteristics and priorities of LBS business models within this limitation.

Methodological limitations arise from the narrow scope of the data sources. Qualitative research is not meant to be generally applicable or universally valid. Moreover, expert interviews are always based on the experts' perceptions and depend on their expertise [12]. As mentioned above, all coding was done in German. The final core-categories and the subsequent subordinate codes were therefore translated and cross-checked to reduce potential biases resulting from linguistic differences.

6.2 Further research

Having provided initial insights into components and characteristics, an empirical study could further condense the findings and continue to develop a substantive theoretical framework for LBS business models.

While this research focused on a holistic understanding of the overall LBS business model, future research could be restricted to one single domain or component, which could be explored in more detail. Since there are already numerous studies that concentrate on consumers, technological infrastructure or application areas of LBS [9], [18], [19] and [20], attempts to gain further insight into the organizational or financial array might be fruitful. Since the experts frequently addressed the multiple opportunities for collaboration and cooperation between the business actors and key players in the LBS market, this aspect might constitute a comprehensive field of research.

Finally, longitudinal studies were not only able to confirm or correct the results of this study, but also to provide the possibility of keeping track of such a volatile phenomenon as LBS, which is undergoing constant change due to advances in technology.

To conclude, LBS are far from being exhaustively researched and there are many areas where further clarification is needed. As the market continues to grow, it will be interesting to follow the development of LBS further.

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