A Location-Based Service to Support Collaboration and Strategic Control in a Real Estate Broker

Christian A. Cancino(✉) and Gustavo N. Zurita

Department of Management Control and Information Systems,
Faculty of Economics and Business, University of Chile,
8330015 Santiago, Chile
{cancino,gzurita}@fen.uchile.cl

Abstract. Increasingly more companies support their strategies and value propositions offering their clients some services that require physical mobility and teamwork by their staff. This article proposes a type of Location-based Services system called Geomanagement, which supports the fulfilment of business strategy for a real estate broker agency, based on mobility and collaborative work of their employees. Geomanagement application acts as a valuable support to explore real estate and potential client information in each showing appointment, to share information among realtors and to help new and old realtors in developing teamwork skills while they are in movement. Clients also value the great contribution of Geomanagement regarding the collaboration between realtors. This study demonstrates the effectiveness of Geomanagement by generating value in, an uncommon scenario, as is a real state broker agency. We show that the implementation of Geomanagement increases both collaboration among realtors, and strategic control of managers and heads. Strengthening the link between collaboration and management control systems supported by Geomanagement, turned out to be crucial in business strategy follow-up and monitoring.

Keywords: Location-based systems · Collaboration · Management control systems

1 Introduction

Increasingly more companies sustain their added value offered to their clients, based on: (a) the execution of processes that require mobility by their staff [1]; (b) physical location information management [2]; (c) the transfer of information in real time [3]; and (d) collaborative processes and tasks support from their staff [4].

In general, Location-based Services (LBS) purposes are broadly defined as applications that provide an information service related to and dependent on the location of the mobile user [1]. According to [2], the potential for LBS is evident from powerful and ubiquitous mobile and wireless devices, which are growing in popularity. The most common LBS usage scenarios found in the literature are: emergency caller location identification [3]; vehicle fleet management [4, 5]; mobile yellow pages [6, 7]; route

S.F. Ochoa et al. (Eds.): UCAmI 2017, LNCS 10586, pp. 181–193, 2017.
DOI: 10.1007/978-3-319-67585-5_19

finding [8, 9]; roadside assistance [10]; search and rescue missions [11]; marketing promotions and client notification [12, 13]; and identification in the neighborhood store [2, 14]. Research around LBS can be viewed from different perspectives, although less frequent from a business or strategic viewpoint [14], as we can see in this study.

This article proposes a type of LBS system, which supports the fulfilment of business strategy, and collaborative work, to a real estate broker. The aim of this article is to explore the influence and benefits that a LBS has on the business strategy of a business, with the goal to specifically generate added value for its clients and manage the performance of its employees. Specifically, the LBS system-type proposed, named here on Geomanagement, aims to give collaborative support to real estate agency staff, dedicated to selling and leasing property, whose entrepreneurial business strategy sets a value proposition to its clients based on: (a) "*personalized service*", and (b) "*quality information*". This implies that resources should be allocated so that all the information on the status information with respect to the lease or sale of a property be managed in real time among the different actors of the organization – realtors, heads of departments and the general manager – improving company response times, not only to respond to its clients, but also to increase the rotation of property sales and leasing. In this usage scenario, physical location management of the properties for sale or lease, transfer and exchange of information in real time, and support for collaborative work among staff, are crucial.

Our research hypothesis is that using Geomanagement at a small real estate broker agency, generates positive effects on the fulfillment of the "personalized service" and "quality information" value proposition offered to clients, where collaboration, location information, and mobility management are part of the business model on which its performance depends.

Therefore, Geomanagement was designed, implemented, and launched, as a type of LBS application that supports the activities and tasks of the personnel of the company indicated; and whose utility was assessed based on questionnaires and in depth interviews applied to its staff and clients, in terms of how much Geomanagement supports the value proposition offered to clients.

The results found suggest that Geomanagement can doubly support a business strategy. On the one hand, it supports compliance and monitoring of the business strategy of the business through geolocation information management, which benefits heads of division and managers by reducing the asymmetry of information regarding the real activities of field staff. On the other hand, Geomanagement also supports the exchange and transfer of information, supporting collaborative activities that field staff require, with the aim of delivering quality and real-time client information.

2 Related Work

The term LBS appeared at the end of the 1990s, and is used for applications that leverage the user's physical location to provide an enhanced service or experience [16]. Since then, different definitions and usage scenarios have emerged that are important to highlight.

There are several definitions of LBS [3]: (a) LBS are applications that depend on the location of the user's device [15, 17]; (b) LBS pertain to any service that considers the geographic location of an entity [18]; and (c) LBS is a service for mobile users, where the awareness of current, past or future location forms an integral part of the service [19]. According to [2], LBS can be defined as services that depend on and are enhanced by positional information from mobile devices; and also extend spatial and temporal information processing capability to end users via Internet and wireless communication [20–23].

Table 1. Types of LBS, their usage environments and main features.

Types of LBS	Scenario of use	Main purposes and characteristics
Information and directory services	Dynamic yellow pages	Provide a wide range of localized information: landmarks, restaurants, petrol stations, ATM locations
	Personalized recommender for places in location-based online Social Network services	Users can check their nearby location information depending on where they are
Tracking and navigation services	Tracking of children, older adult or lost pets	Helps to avoid elders, children, or pets from getting lost, LBS provides a tracking assistance to users
	Tracking stolen vehicles or assets tracking	Helps to track loved things, users can also track their property, goods, or cars at any time and place
	Voice-enabled route description.	Route guidance based on map services that help users know where they are located
Emergency services	Roadside assistance	Time of roadside assistance may be reduced greatly by a tracking service
	Search and rescue missions	Guide rescuers in locating a destination efficiently and accurately; especially in the case of emergency alert services
	Police and fire response; E911; Emergency medical ambulance	LBS can guide policemen and firefighters to identify location in the case of emergency calls
Location-based advertising	Wireless coupon presentation; Client notification and identification in neighborhood store	Potential clients can receive coupons, sales information or advertisements from nearby stores
	Marketing promotions and alerts, targeted & customized ads	Promote products or services, because of the participative, interactive, open and transparent nature of social media

Source: Based on the typology of [2]

Table 1 shows a taxonomy defined by four types of services in which it is possible to group LBS: information or directory services; tracking and navigation services; emergency services; and location-based advertising.

In the first group of applications, *Information and directory services*, a study shows that, by using the location data based on GPS and users' comments at various locations, it is possible to discover interesting locations and possible activities that can be performed there for recommendations [6]. Some systems, based on an individual user's current location, retrieve important surrounding locations and their contexts for recommendations [24].

In the second group of applications, *tracking and navigation services*, studies reveal that a people location system involving a people locator with GPS capabilities in communication with a wireless network so a user interface accessible on a common computer network or by telephone is provided. These location systems include access to the user interface via a computer on the common computer network or via a telecommunications network [25–27].

In the third group of applications, *emergency services*, the literature shows mobile alerts, notifications and location-based emergency warning systems evolving from traditional short message service (SMS) notifications and cell broadcasting to more advanced location-based services. Current research explores the major issues faced by governments, businesses and society at large, toward the realization of a fully fledged system for personal mobile devices [11, 28].

Finally, with *location based advertising aplications* group, businesses can quickly contact potential clients. Augmented reality coupled with LBS has immense potential for mobile marketing in social networking scenarios [2]. According to [29], personal profiling has been regarded as a way to enrich and enhance LBS and supply people with the information that they are likely to need.

Regarding the taxonomy exposed in [2], it is important to highlight that it is difficult to find companies using LBS to support the monitoring and control of their business strategies in the series of studies analysed. It is also difficult to identify cases which explain collaboration among individuals who work in the same company, but not together, either by not sharing the same geographical location or by doing so asynchronously. In this context we believe that it is possible to extend the classification of applications shown in Table 1, which is the objective of our work.

New LBS applications can be developed to support collaboration between personnel inside organizations, and also to increase strategic control of managers and heads of areas regarding their personnel. This would support the value proposition compliance for clients, with the fulfilment of a company's strategic objectives and its long-term growth.

Can LBS support the fulfilment of the business value proposition and thus improve strategic control in an organization?

To answer this question, in this research we will develop a LBS application to support the monitoring and control of a company's strategy that provides real estate services. In this context, it is necessary to rely on the cooperation of workers engaged in mobile environments, to be able to meet a clearly defined value proposition. Questionnaires and in-depth interviews with workers, the company executive team and its clients, are applied to identify the results of its implementation.

3 The Real Estate Broker Agency and Its Value Proposition

As previously mentioned, the usage scenario corresponds to a small company, founded in 2008, which is involved in the real estate business of selling and leasing properties in Chile. It currently operates with two branches located in Santiago, and in its organizational structure, its operation with little personnel is noticeable, which in turn demands great collaboration among them and technological support to maintain its operations. The company personnel consist of eight realtors who permanently work in movement and in the field, plus the head of the sales team who remains at the branch performing the monitoring processes dealing with property sales or leasing, including business deals (Front office). A Chief Operating Officer, whose function is to control documentation and client service when property sales or leasing is defined, is also involved (Back office). Both the head of the commercial team and the chief operating officer report to the General Manager of the company (its owner), who in turn is also in charge of the guidelines and strategy of the company.

In order to explain its business strategy and to monitor the fulfilment of its objectives, the company uses the Balanced Scorecard (BSC) as a strategic control tool, which allows assessing the compliance of its monthly goals. In Fig. 1, the strategy map of the company is observed, which was developed in the year 2012 and is currently valid. In this *strategy map*, the *financial perspective* shows that the company expected to maximize an ultimate goal, expressed as the monthly income of the company. To do this, it generates a series of measurements at the system level, resources prospects, processes and clients, with which it hopes to induce positive results at the global level. From the *client perspective*, it can be observed that the value proposition seeks to provide services with "personalized service" and "quality information". Thus, it is based on property sales and lease management, a process that depends directly on resources: personnel, information systems, and properties.

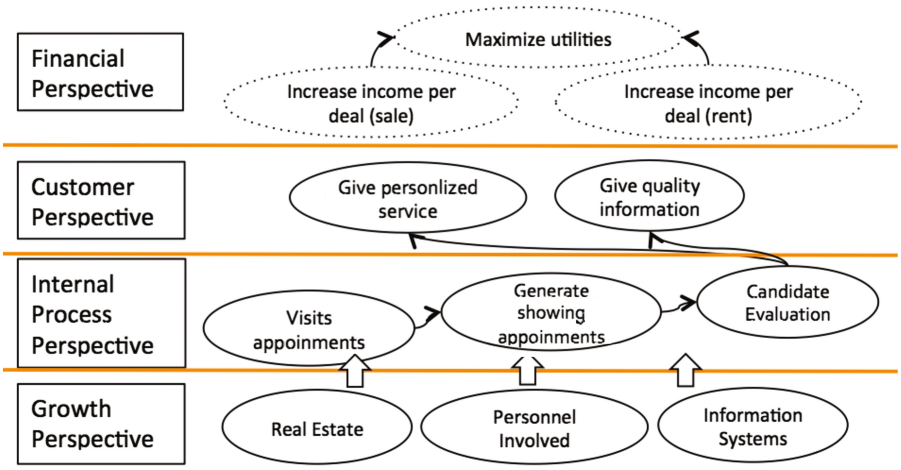

Fig. 1. Real estate agency Strategy Map

As in every BSC, four prospects presented in the *Strategy Map* are measurable through a series of performance indicators associated with the objectives pursued by the company. In Table 2, it is possible to see the BSC of the company. To understand Table 2, we will analyse a couple of objectives and their relevant indicators. One of the objectives of the relevant level of processes is to generate showing appointments, either for lease or sale of properties, the company set a goal of five *effective visits* per day to show properties. Table 2 shows that in the case of effective visits for properties for sale the goal of five visits, is being fulfilled. Therefore, BSC is associated with a positive sign of goal achievement. Regarding a second important objective, *effective visits* of leasing do not meet the daily goal.

In order to comply with the indicators in Table 2 in this usage scenario, in general it is required that the Geomanagement application is able to support: (a) the mobility of its realtors to present properties on-site to clients that are for sale or lease – complying with the added value of *personalized information* for our clients; (b) managing the information required by their clients in places where the properties are shown, or generating and/or requesting the information identified as relevant by realtors as a result of these visits, and transferring it in a collaborative way and in real time to the rest of the staff (realtors, business team leader, and Chief Operating Officer) thus complying with the added value of *quality information* for our clients.

Table 2. Balanced Scorecard of the real estate agency

	Strategy objetives	**Management indicators**	**Goal**	**current**		**assessment**	**Responsable**
Financial Perspective	Maximize utilities	EBITDA	2.5MM	1.5MM	☹	monthly	General manger
	Increase income per deal	Commision for sold properties	100%	70%	☹	monthly	Business team leader
		Commision for rental properties	100%	95%	☺	monthly	Business team leader
Clients Perspective	Give personlized service	Client satisfaction level	100%	60%	☹	monthly	Business executive
	Give quality information	Clients who recieve administration report /Total clients	100%	70%	☹	weelky	Business executive
Processes Perspective	Candidate Evaluation	Nº of offers per day for the purchase of properties available	5	1	☹	weelky	Business team leader
		Nº of offers per day for the rental of properties available	8	4	☹	weelky	Business team leader
	Generate showing appoinments	Nº of effective visits per day for properties for sale/rental	12	11	☺	weelky	Business executive
	Visits appoinments	Nº of visits agreements per day for sales/rental properties	2	2	☺	daily	Business executive
Resources Perspective	Real estate	Nº of available propeties for sale or leasing	20	15	☹	monthly	Chief Operating Officer
	Personnel involved	Nº of 'weekly talks'	2	2	☺	monthly	Chief Operating Officer
	Information system	Availibility of real estate administration system	100%	100%	☺	monthly	Chief Operating Officer

3.1 Design and Description of Geomanagement Requirements

Specifically, Geomanagement (see main interface in Fig. 2) supports the objectives of the processes described in Table 2: scheduled visits per property sale and lease i.e., those processes for which indicators must operate with a daily monitoring frequency. Geomanagement works on any browser with Internet access and can therefore operate on desktop computers or mobile devices. In a series of meetings with the company Manager, business team leader, Chief of operations and 8 realtors; five relevant Geomanagement requirements were identified and defined; expecting that it can support the monitoring and control of the company's strategy, which are described below.

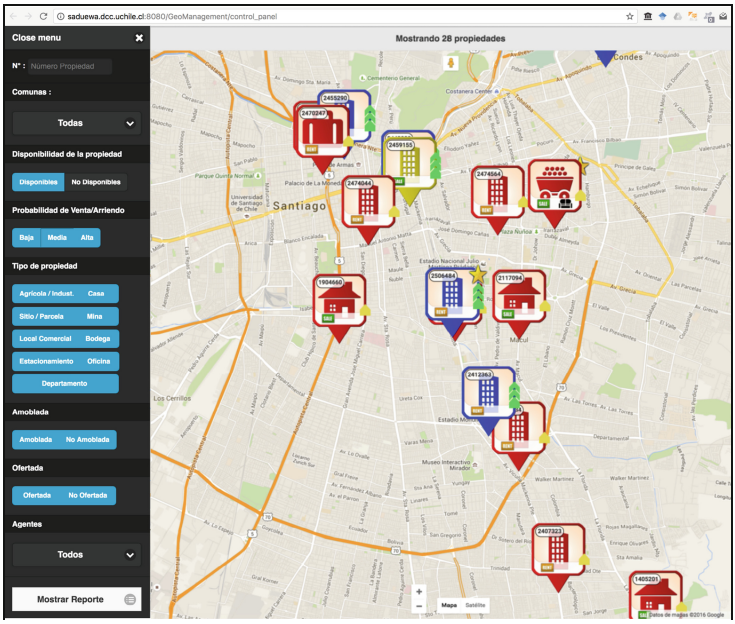

Fig. 2. Main interface of Geomagement in view of all the properties that are available to schedule visits. Icons indicate the type of property, its value, if it is for sale or lease, and the level of interest generated by the property. Left side: the filter properties options are type, probability of sale, etc.

R1. Reducing the asymmetry of information of the departments. Considering weakness problems in controlling the genuine efforts of sales executives [30], with respect to what was observed by head of sales and operations, it is necessary to control the attendance of realtors at each visit for a potential lease or sale of a property. In many situations bosses have doubts regarding staff punctuality; which is solved by validating the attendance of a realtor, by tracking mobile devices that realtors use via GPS and which is shown in Geomanagement. Knowing where the company staff is located, allows improving its control capacity.

R2. Responding in real time to client inquiries. According to the value proposition of the company to deliver a *personalized service* with *quality information*, the system manages registration, follow up and answers to all the questions and concerns that a client may have about a property for lease or sale. In order to do so, the system is required to save records of all consultations, regardless of the number of visits to a property by a client, coordinating the efforts of the various realtors involved. Through Geomanagement, realtors can jointly collaborate, because for each visit they can record the perceptions that they have of those interested in properties, and hence maximize the personalized service of future visits by clients by maintaining a single record which is accessible in real time, even if another realtor is assisting the client.

R3. Timely reporting to accelerate business deals. Through the system, commercial and operations managers should know the location of each property in terms of the probability of success of closing a business deal after each client visit. Geomanagement records this information and is accessible for any commercial realtor who resumes business with a client. Thus, the expectation or likelihood of success that an realtor perceives from a client during the visit, the number of visits from the same client, and all comments showing interest which realtors can generate regarding the expectations of their clients. Considering this information, department heads could directly contact potential clients, in order to reduce the duration of business deals.

R4. Generating periodic reports to assess business management. Through Geomanagement, business and operations managers can generate periodic reports that evaluate inter alia: number of properties for sale and lease, number of successful operations, number of business deals by agent, by 'comuna', by type of property, by number of operations, etc. In addition, it is important that all of the above indicators can be recovered for a particular date or date range. Geomanagement, by managing and retrieving the previously indicated information, provides better strategic control of the business, and assigns properties to different commercial realtors according to the performances developed by the company staff.

R5. Locating real estate location and characteristics on a map. n Geomanagement, commercial realtors can observe all the information enabling them to know the location of the properties to be able to show them on a map, their main characteristics, history of inquiries performed by different clients about a specific property, as well as the history of questions and answers given to a client by different commercial realtors, if available. The application must allow finding the location of a property on a map, with immediate feedback if it is a house or apartment, if it is furnished or unfurnished, the number of other interested clients, i.e. information that allows hastening the process of doing business, and that meets the information requirements of the clients, see Fig. 2.

4 Evaluation Methodology of Requirements Compliance

In this section we describe the measurement of Geomanagement performance as a management and strategic control mechanism, and also in helping to facilitate the supply of reliable and timely information to the different actors in the company.

4.1 Geomanagement Testing and Use

Geomanagement testing encompassed a 6-month period, from January to June of 2016, in which there were eighty visits concentrated in fourteen of the available properties. The process began with an explanation and demonstration to realtors and heads of departments of the company regarding the main aspects of the system, its operation and the information that could be obtained from its use. Subsequently, user profiles were created for every manager and realtor, who were supplied with a manual, and oriented to the Scorecard use. Afterwards we entered the property data; owner identification, realtor responsible, type of property, sale/lease, square meters, value, detail and address. This last element is considered indispensable for geolocation. Every Monday, the realtors scheduled showing appointments for the rest of the week. After data submissions were registered in the system, managers could see properties in the Scorecard which had been visited and client interest. Additionally, they could see the details of each visit, which showed date and time of the start and end of the visit, responsible realtor, client, if he appeared or not, client doubts and the answers that the realtor gave him.

Finally, the Manager has the possibility of generating a report according to different filters. For example, by property number, 'comuna' (neighborhood), property availability, probability of sale or lease, type of property, if it is furnished, if it is on offer, and by realtor. The generated report showed the data of all the properties that met the characteristics that the Manager selected, among which was the number of visits that the property had had and the perception of sale or lease.

5 Survey Results of the Geo-Management Evaluation

Using structured surveys applied to the system users (business realtors or field staff) and department heads (managers, Business team leader and Chief Operating Officer), we will analyse whether the Geomanagement application provides better support for the visiting activities regarding real estate sale and lease. In the case of the two surveys developed (for field staff and managers) a Likert scale was used (see Tables 3 and 4), with values between 1 and 5, to define a valuation of the answers to the following questions:

The company managers indicated that there are almost always problems identifying the most attractive properties for clients. However, Geomanagement allowed respondents to appreciate obtaining information in real time about potential clients and providing them with "personalized service". 100% of respondents completely agreed that

Table 3. Questionnaire about Geomanagement System to business leaders*

(a) How do you value using the Geomanagement system supporting the attributes of "personalized service and quality information" in the company?	A1	A2	A3	A4	A5	Score
(a1) How do you think clients rated their team's work on the new Geomanagement?	4	5	4	4	5	4,4
(a2) How much did your sales force collaborate with the new Geomanagement?	4	4	4	3	4	3,8
(a3) How did operational processes improve with the new Geomanagement?	4	5	4	3	4	4,0
(a4) How much do you value the LBS for strategic control?	4	5	4	3	5	4,2

*The answers to the questions to business leaders are the average data of the answer given by five senior executives of the company that manage the organization under a strategic view.

Table 4. Questionnaire about Geomanagement system to business realtors*

(b) How do you value using the Geomanagement system supporting your business activities of sales or rental in the company?	A1	A2	A3	A4	A5	A6	A7	A8	Score
(b1) How does LBS improve the relationship with clients?	4	5	4	5	5	5	4	5	4,6
(b2) How does LBS use improve collaboration with other realtors?	5	5	5	5	5	5	5	5	5,0
(b3) How does LBS improve quality information for clients?	4	5	5	5	5	4	5	5	4,8
(b4) How does the LBS improve the personalized service for clients?	4	5	4	5	3	4	4	4	4,1

*The answers to the questions to business realtors are the average data of the answered by eight sales realtors that develop their activity directly assisting the customers.

the system would help new managers who were not able to manage the characteristics of real estate. Moreover, all the managers acknowledged agreeing that the information provided by Geomanagement would be useful to keep track of their realtors and provide better information to interest groups, complying with the "quality information" value proposition (Table 5).

Table 5. Balanced Scorecard of the real estate agency after the LBS

	Strategy objetives	Management indicators	Goal	current		assessment	Responsable
Financial Perspective	Maximize utilities	EBITDA	2.5MM	2.6MM	☺	monthly	General manger
	Increase income per deal	Commision for sold properties	100%	95%	☺	monthly	Business team leader
		Commision for rental properties	100%	95%	☺	monthly	Business team leader
Clients Perspective	Give personlized service	Client satisfaction level	100%	60%	☺	monthly	Business executive
	Give quality information	Clients who recieve administration report /Total clients	100%	96%	☺	weelky	Business executive
Processes Perspective	Candidate Evaluation	Nº of offers per day for the purchase of properties available	4	3	☺	weelky	Business team leader
		Nº of offers per day for the rental of properties available	8	7	☺	weelky	Business team leader
	Generate showing appoinments	Nº of effective visits per day for properties for sale/rental	12	11	☺	weelky	Business executive
	Visits appoinments	Nº of visits agreements per day for sales/rental properties	2	2	☺	daily	Business executive
Resources Perspective	Real estate	Nº of available propeties for sale or leasing	20	15	☹	monthly	Chief Operating Officer
	Personnel involved	Nº of 'weekly talks'	2	2	☺	monthly	Chief Operating Officer
	Information system	Availibility of real estate administration system	100%	100%	☺	monthly	Chief Operating Officer

6 LBS Performance Management

In general, after the use of Geomanagement, it was possible to observe an improvement in the fulfillment of the goals and objectives proposed in the control panel of the company. The proposed Geomanagement complies with being a tool that not only supports the operational management of the business, but also strategic control, supporting the fulfilment of its value proposition.

7 Conclusions

Specifically, the results of this study show that Geomanagement such as the one applied in this study can be a useful tool for monitoring strategy and enhancing collaboration among peers. The implemented Geomanagement acts as a valuable resource to view property and potential client data in each showing appointment, to transfer information between realtors and to help new and old realtors in developing their work. The same users value the great contribution of Geomanagement to enhance collaboration between colleagues. In our understanding a contribution of this study is showing the use of LBS-systems support in contexts other than the traditionally studied (vehicle fleet management, mobile yellow pages, route finding, roadside assistance, search and rescue missions, among others) such as supporting business strategy follow-up, and

certainly, supporting collaboration among colleagues that together fulfill a business's value proposition.

The limitations of this study are related with expanding the use of Geomanagement implemented in larger organizations, to see if all the expected benefits of the system are achieved. In addition, another limitation is a longer-term assessment, in order to consider potential improvements to the system that may arise from the permanent use of Geomanagement by different users.

References

1. Petrova, K., Wang, B.: Location-based services deployment and demand: a roadmap model. Electron. Commer. Res. **11**(1), 5–29 (2011)
2. Dhar, S., Varshney, U.: Challenges and business models for mobile location-based services and advertising. Commun. ACM **54**(5), 121–128 (2011)
3. Chen, P.-T., Lin, Y.-S.: Mobile location-based services: an empirical study of user preferences. Int. J. Inf. Educ. Technol. **1**(5), 416 (2011)
4. Maurya, K., Singh, M., Jain, N.: Real time vehicle tracking system using GSM and GPS technology: an anti-theft tracking system. Int. J. Electron. Comput. Sci. Eng. IJECSE **1**(03), 1103–1107 (2012). ISSN: 2277-1956
5. Almomani, I.M., et al.: Ubiquitous GPS vehicle tracking and management system. In: 2011 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT). IEEE (2011)
6. Zheng, V.W., et al.: Collaborative location and activity recommendations with gps history data. In: Proceedings of the 19th International Conference on World Wide Web. ACM (2010)
7. Chow, C.-Y., Mokbel, M.F., Liu, X.: Spatial cloaking for anonymous location-based services in mobile peer-to-peer environments. GeoInformatica **15**(2), 351–380 (2011)
8. Rehrl, K., Häusler, E., Leitinger, S.: Comparing the effectiveness of gps-enhanced voice guidance for pedestrians with metric- and landmark-based instruction sets. In: Fabrikant, S. I., Reichenbacher, T., van Kreveld, M., Schlieder, C. (eds.) GIScience 2010. LNCS, vol. 6292, pp. 189–203. Springer, Heidelberg (2010). doi:10.1007/978-3-642-15300-6_14
9. Sarjakoski, L.T., et al.: Analysis of verbal route descriptions and landmarks for hiking. Pers. Ubiquit. Comput. **16**(8), 1001–1011 (2012)
10. Yang, B., Fang, L.: Automated extraction of 3-D railway tracks from mobile laser scanning point clouds. IEEE J. Sel. Top. Appl. Earth Observ. Remote Sens. **7**(12), 4750–4761 (2014)
11. Rahdar, R., Stracener, J.T., Olinick, E.V.: A systems engineering approach to improving the accuracy of mobile station location estimation. IEEE Syst. J. **8**(1), 14–22 (2014)
12. Chen, S.Z.: Social media: an unmissable opportunity for Chinese enterprises. Mod. Econ. Inf. **6**, 2 (2012)
13. Zhou, L., Wang, T.: Social media: a new vehicle for city marketing in China. Cities **37**, 27–32 (2014)
14. Wilson, M.W.: Location-based services, conspicuous mobility, and the location-aware future. Geoforum **43**(6), 1266–1275 (2012)
15. Liang, T.-P., et al.: Adoption of mobile technology in business: a fit-viability model. Ind. Manag. Data Syst. **107**(8), 1154–1169 (2007)
16. Kosta, E., et al.: Legal considerations on privacy-enhancing location based services using PRIME technology. Comput. Law Secur. Rev. **24**(2), 139–146 (2008)

17. Liang, C.W., et al.: Open location-based services: LBS toolbar as example. ICL Tech. J. **123**, 35–41 (2008)
18. Junglas, I.A., Watson, R.T.: Location-based services. Commun. ACM **51**(3), 65–69 (2008)
19. Kühn, P.J.: Location-based services in mobile communication infrastructures. AEU-Int. J. Electron. Commun. **58**(3), 159–164 (2004)
20. Giaglis, G., Kourouthanassis, P., Tsamakos, A.: Towards a classification framework for mobile location services. In: Mobile Commerce: Technology, Theory and Application, pp. 67–85 (2003)
21. Zeimpekis, V., Giaglis, G.M., Lekakos, G.: A taxonomy of indoor and outdoor positioning techniques for mobile location services. ACM SIGecom Exch. **3**(4), 19–27 (2002)
22. Heinonen, K., Pura, M.: Classifying mobile services (2006)
23. Schumann, M., Narzt, W.: Business model development for a mobile context-aware service. In: Bled eConference (2013)
24. Chow, C.-Y., Mokbel, M.F., He, T.: A privacy-preserving location monitoring system for wireless sensor networks. IEEE Trans. Mob. Comput. **10**(1), 94–107 (2011)
25. Soper, D.: Is human mobility tracking a good idea? Commun. ACM **55**(4), 35–37 (2012)
26. Zickuhr, K., Madden, M.: Older Adults and Internet Use. Pew Internet & American Life Project, Washington, DC (2012)
27. Thomas, L., et al.: Location tracking: views from the older adult population. Age Ageing **42** (6), 758–763 (2013)
28. Aloudat, A., Michael, K.: The socio-ethical considerations surrounding government mandated location-based services during emergencies: an Australian case study. In: Quigley, M. (ed.) ICT Ethics and Security in the 21st Century: New Developments and Applications. ISI Global, Hershey (2010)
29. Shiode, N., et al.: The impact and penetration of location-based services (2002)
30. Anthony, R., Govindarajan, V.: Management Control Systems. McGraw-Hill, North Tazewell (2008)