SiUinde – A collaborative platform to share conditions for near-the-shore activities

Carlos Serrão[1], André Coelho[2], Nelson Carvalho[3], Helder Carvalho[4]
Department of Information Science and Technology, School of Technology and Architecture
ISCTE-IUL/ADETTI-IUL
Av. das Forças Armadas, 1649-026, Lisbon, Portugal
[1]carlos.serrao@iscte.pt, [2]andre.marques.coelho, [3]hel.carvalho, [4]nelson.icebox{@gmail.com}

Abstract— **Currently, a large number of near-the-shore activities (sports and leisure) with a huge set of practitioners (growing everyday) exist. Also, the number of commercial companies, such as sport schools, that explore such type of costal activities are also on the rising. These kind of coastal activities are dependent of a set of conditions (in particular on what concerns the sun, the wind and waves) that affect directly or indirectly, the type of activity – mostly sportive – that can be practiced (surf, windsurf, paddle, kite surfing, canoeing, paragliding and others) on a given spot at a given time. This paper presents a platform, called SiUinde that was developed to allow users to collaboratively communicate reports about the coastal conditions, using several parameters, which include the wind conditions and the sea conditions, through a smartphone or tablet, permitting other users to have an in-depth and timely overview of the best places to enjoy their near-the-shore activities. This collaborative platform, takes advantage from the concept of collaborative intelligence and crowdsourcing to provide to the end-users the best possible recommendations for their preferred near-the-shore activities.**

Keywords- mobile; near-the-shore; social networks; collaborative intelligence; sea; wind; crowdsourcing; user generated content

I. INTRODUCTION

The Portuguese coast alone is quite extensive – 943Km in the continent adding to 667Km and 250Km in Azores and Madeira islands, respectively [1]. Also, other countries, such as Brazil, have more than 8000Km of coast, one of the largest in the World. And these are just two examples of the many more that can be found around the World, that share the same characteristics. Along those massive coastal lines, a buzzing community takes advantage from these resources to carry their economical, sportive and leisure activities.

There are a large number of near-the-shore activities (both in terms of sports and leisure) that engage a large set of practitioners (and the number increases on a daily basis). Indirectly, the volume of commercial companies, such as schools, bars and restaurants, that explore such type of near-the-shore activities are also on the rise. These coastal activities are dependent of a set of conditions (in particular on what concerns the sun, wind and swell) that affect directly or indirectly, the type of activity – mostly sportive – that can be carried (surf, windsurf, paddle, kite surfing, canoeing, paragliding and others) on a given location at a given time.

Considering the users that often spend a lot of time finding the right conditions to conduct their favorite near-the-shore activities (or even those users that use the coast and sea as a mean of personal sustenance), emerged the idea to create a system that allows the collaborative sharing of coastal conditions [2], composed by several parameters (mostly sun, wind and sea conditions) in a fast, simple and interactive manner. These are some of the most important parameters to consider, and current systems associated with these types of near-the-shore activities, such as sports, are somewhat limited on what concerns the sharing of information in almost real time between different users.

Most of the current existing systems are based on weather data or on video feeds streamed over the Internet, and a user cannot request or view other user's opinions in order to know the place with the best possible conditions for a near-the-shore activity at a given instant, or even, share ideas related to a favorite activity.

The opportunities offered by social networks that rely on technology as a communication and collaboration tool can be explored to extract specific knowledge and to add value for end-users. This way, information exchanged by the different users can be dynamic and timely updated. The idea is to complement the predictions made by different existing systems, because on a sufficiently enriched network, there can be constant information exchange, which means that the whole system is always updated. On the other hand, it is possible to use machine learning techniques and data analysis to make increasingly accurate system recommendations.

SiUinde (an acronym derived from the combination of "sea" and "wind" words) can be described as a platform that offers users a way to exchange information on the status conditions of the sun, sea and wind (as well as a set of other parameters along the coast). For this, the user only needs a device with Internet access to produce reports on the observed conditions at a given location in a given time. Additionally, a user wishing to find a good spot to practice his favorite near-the-shore activity, can, through SiUinde, conduct a survey and analyze reports submitted by other users (there is also the possibility of asking the local conditions for certain groups of

users, maintain the ranking of the various users, and many others).

The following section of this paper will provide an overview of the SiUinde system, its main functionalities and implementation details. Next another section will present the validation of the developed system prototype. Finally, some conclusions of this work are highlighted and also some directions for future work are presented.

II. THE SIUINDE PLATFORM

The initial and main goal of the SiUinde platform was, but not limited to, to provide the solution to some of the solicitations of the near-the-shore activity practitioners, mainly sport active users. Their main request was to have a simple way to have accurate reports about the conditions for a given coastal activity on a specific spot at a given time [3]. Also, they would like to have a platform that could allow them to get recommendations about the best places to practice their near-the-shore activities, and finally they would like the system to be extremely simple to use.

Social networks have become an essential part of everyone everyday life's [4]. It has become perfectly natural, to have access to some kind of social network, either on a computer or on a mobile device. Social networks made possible for users to promote their public profiles, articulate a list of other connected users, and share content over a boundary system. The SiUinde platform takes advantages of the social network characteristics in order to:

- Allow the condition status reports to be easily and swiftly exchanged;
- Permit a more accurate and faster information update;
- Submitted reports can be easily indexed and searched;
- It will make possible the establishment of relationships between different users and follow specific users as preferred information sources;
- Allow the possibility to find other users with similar interests - possibly users that develop the same activities in the same region;
- Facilitate the information exchange between users that share the same interests about a particular activity (for instance, for surf, users can exchange information about materials they use).

Therefore, this platform takes full advantage of these social networks as a mean to leverage its usefulness and relevance for end-users.

A. Similar systems and platforms

During the SiUinde platform development, it was necessary to survey and compare some of the existing systems and platforms that shared some similarities. This comparison was broken in three different groups: web-based, native mobile and hybrid mobile applications. All the analyzed mobile systems allowed the access to several coastal condition parameters or other relevant information. In the web-based category, Meteopraias (http://www.meteopraias.com/), SurfTotal (http://www.surftotal.com/), BodyBoardTotal, PraiaSAPO (http://praias.sapo.pt/) and BeachCam (http://beachcam.sapo.pt/) were considered. In the native mobile applications segment, Weddar (http://www.weddar.com/), MSW Surf Forecast (http://magicseaweed.com/) and Glassy Pro Time To Surf (https://glassy.pro/) among the many existing applications, were selected for analysis. Finally in the hybrid category, Windguru (http://www.windguru.cz/int/), BeachCam, Surf Report (http://www.surfreport.pt/), Vodafone Praia Direto (http://praiaemdirecto.com/), WindFinder (http://www.windfinder.com/) and Surfline (http://www.surfline.com/) were considered for analysis. The next figure (Figure 1) provides an overview of the comparison of the identified systems.

		Surfline	WindFinder	Vodafone Praia Direto	SurfReport	BeachCam	Windguru	Glassy Pro TimeToSurf	MSW Surf Forecast	Weddar	BeachCam	PraiaSAPO	BodyboardTotal	SurfTotal	MeteoPraias
	Type	H	H	H	H	H	H	M	M	M	W	W	W	W	W
Wind information	Wind speed	3	3	3	3	3	3	3	3	2	3	2	3	3	2
	Wind direction	3	3	3	3	3	3	3	3	2	3	2	3	3	2
Sea Information	Wave size	3	3	N	3	3	3	3	N	N	3	2	3	3	2
	Swell direction	3	3	N	3	3	3	3	3	N	3	2	3	3	2
	Wave periodicity	3	3	N	3	3	3	3	1	N	3	N	3	3	N
	Tide prediction	3	3	N	2	3	N	3	1	N	3	3	N	N	N
Beach infor.	# persons on watter	N	N	N	N	N	N	N	N	N	N	2	2	2	2
Livecam feed information	Wave direction	2	N	N	2	2	N	N	N	N	2	2	1	1	N
	Unavailable period	2	N	N	1	3	N	N	N	N	3	3	1	1	N
	# of spots covered	3	N	N	2	2	N	N	N	N	2	2	2	2	N
Infor. Update	Frequemcy	2	2	3	2	2	2	2	2	3	2	1	2	2	1
Social integration and	Interaction with other users	1	1	N	1	1	1	2	N	2	1	2	1	1	N
	User network creation	N	N	N	N	N	N	2	N	3	N	N	N	N	N

Figure 1. Comparison between the different systems (W – Web-based; M – Native mobile; H - Hybrid) according to a set of features (1 - Weak support; 2 – Medium support; 3 – Strong support; N – Not available)

From this analysis it was possible to conclude that most of the existing tools/systems are extremely vertical – most of them offer support for just a type of activity while some give more importance to some specific characteristics over others. It is also possible to conclude that most tools put a major emphasis on the sea and wind conditions (in a static fashion),

disregarding other aspects like beach information, livecam feed information and social integration and interaction.

B. SiUinde characteristics and requirements

After the conducted analysis it was possible to identify similar systems. A set of key-characteristics was identified and a comparison was made between the different tools according to those characteristics, in terms of advantages and disadvantages (Figure 1). The list of requirements that the SiUinde would have to support, included simple and easy to use reporting mechanisms, social networks integration and exploitation, personalized recommendations and learning capabilities.

From the list of the SiUinde requirements it is possible to highlight the more relevant ones:

- The system would have to give the user access and creation of reports about the conditions of a specific near-the-shore geo-referenced spot (containing a set of parameters - sun, wind, wave, affluence, and other conditions;
- The possibility to write and receive comments on reports, and to add complementary information to such reports (such as pictures and short videos);
- The elaboration of a simple, intuitive and easy to use reporting scale, to report conditions on particular coastal location (auto-determined by the user location), and provide advices on the type of activities that might be more advisable to carry on such location;
- Allow the users to ask for specific geographical location conditions, by sending a request to specific users or to the "network";
- Create some "gamification" functionalities on the system [5][6][7] that would allow the establishment of a ranking that awards the best reports and recommendations submitted by users and, the creation of virtual geocaching [8] functionalities that would reward users with points for being at a specific location;
- The application would have to be multiplatform, offering support for both iOS and Android (two of the most common mobile platforms);
- The design of a mechanism that through the crossing of a set of different sources of information (using some existing publicly available API) is capable of producing reliable recommendations for the user on what concerns the optimal conditions to endure its favorite near-the-shore activities, in a specific geographic range;
- Through the analysis of the system information find relations between the data that allow the prediction of ideal conditions for a given type of activity in a given place;
- Develop a way so that the system could learn from the user system usage (types of activities, activity on the system, interaction with other users, other) and user preferences [9] to automatically create personalized near-the-shore routes that are in line with the user requirements [10]. For instance, it will be possible for the system to create a specific route for surf spots, in a specific region, that are adequate for a specific user skill-level.

A prototype of the SiUinde platform system was developed having into consideration not only the requirements that were enlisted but also some of the characteristics of the tools that were previously identified and presented (Figure 2).

C. SiUinde mobile application

The SiUinde platform is composed by two major components that allow the implementation of the enlisted requirements: a mobile frontend and a server-side backend (following a similar paradigm to what is the current state of the art in terms of mobile development).

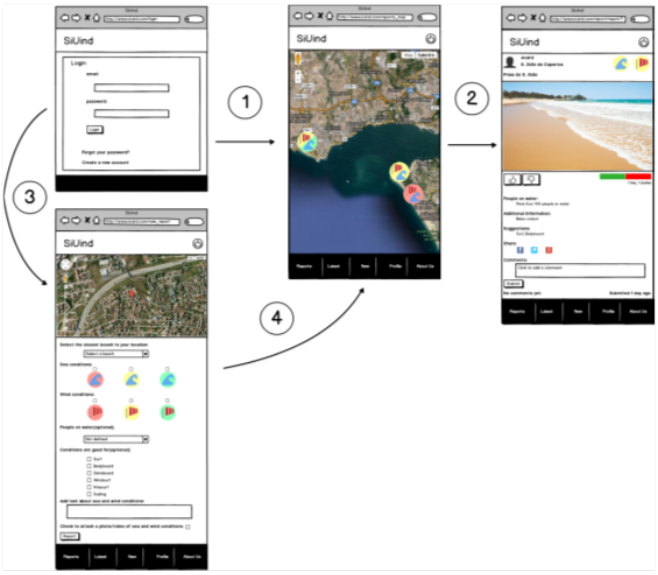

Figure 2. Mockups and storyboards of the SiUinde mobile application

During the different iterations of the development of the SiUinde mobile solution, it was possible to conceptualize the final results through the conceptions of several screen mockups and storyboards that allowed the realization of how the final system would look like and the different interactions between the multiples screens (Figure 2). The development of the mobile application also placed an important emphasis on the UI/UX [16] aspects – the objective was to build an interesting user experience for the end user that was extremely easy to use in order to facilitate both the reporting and the visualization of geo-referenced reports (Figure 3). In order to facilitate this mobile application, a simplistic graphical iconic scale was created to represent most of the reporting parameters that SiUinde would have to handle (sun, wind, wave, others). The application detects the user location when producing a report, and the user with some simple touches on the screen can create a simplistic report.

One of the concerns for the design of the mobile frontend was to ensure that the mobile application was as much as possible platform independent (Figure 2). On a first stage, the

first prototype was developed using Web-based technology (HTML5, CSS e Javascript) [11] which allowed the application to run inside any mobile web browser. After this first prototype some other options were considered – using Phonegap [12] or natively write the mobile application on iOS (using ObjectiveC) [13] and Android (using Java) [14]. Finally, a third option was considered, allowing SiUinde to obtain mobile platform independence, while producing native applications for both iOS and Android. For the development of the mobile frontend, it was selected a hybrid mobile development approach that was Appcelerator Titanium [15]. Appcelerator Titanium follows an MVC development approach, where the controllers and models are developed using Javascript, while the views are easily created with XML and TSS (quite similar to what CSS is to HTML). Titanium takes the source-code and then generates native applications for different mobile platforms (in this case, iOS and Android).

Figure 3. SiUinde mobile application screenshots running on iOS (it is possible to visualize the iconic scale on the reports and on the map)

In the mobile application it will be possible to add some extra information to the report, such as free description text, comments, pictures or even short videos. The same iconic scale is used to place icons over the map, representing the different conditions experienced at different locations.

D. SiUinde backend

An important part of most mobile-based application resides on a server-side backend. The SiUinde system is no exception. The SiUinde backend platform is responsible for the implementation of many of the tasks that the mobile application will have to make available for the end-user.

The SiUinde mobile application frontend that was presented in the previous sections, interacts with the backend through a well-defined REST API. This API provides the only secure and authenticated communication channel between the mobile application and the backend. The API offers access to a different set of functionalities that cover the report collection and generation, social network report sharing and commenting, user registration and authentication (broker to social networks), recommendations, access to complementary information and reports classification and feedback.

The following image (Figure 4) provides an overview of the backend architecture, initially developed in PHP and later ported to Node.js, due to scalability and future development purposes. When compared to PHP, Node.js is clearly gaining momentum. Node.js is based on JavaScript, providing an improved, functional and non-blocking I/O mechanism that allows better performance.

At the top of the SiUinde backend architecture lies a **REST API** that implements a secure and authenticated channel between the mobile application and the backend. The REST API implements the functions that invoke functionalities on the backend to deploy specific functionalities on the SiUinde mobile application.

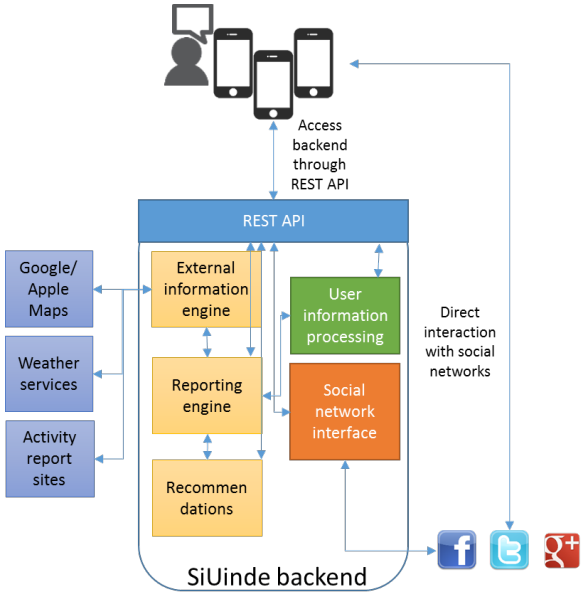

Figure 4. General overview of the SiUinde backend architecture and associated services

The user information engine is responsible for handling the registration of users on the system (with the possibility of the association of the user social network account), handle the authentication requests from the mobile application, store and retrieve information about the user and their relations. In resume, this is a module that handles all the user-related information and user interaction on the system. It is also deeply integrated with the reporting engine, in order to follow the user-generated reports, their feedback and to establish the user ranking based on their peer-recognition on the system.

The role of the social network interface is to ensure that the social network liaison mechanisms are in place in order to retrieve information of the social networks on behalf of a given user and also to ensure that it is possible to publish information

about reports and associated content on a set of user pre-selected platforms.

Acquisition of different data from external information sources is the responsibility of the external information engine module. This module, establishes the connection with SiUinde's external sources of data, such as Google and Apple maps (it depends on the mobile platform), open weather services (we are currently using OpenWeatherMaps, however other weather services can be integrated) and other near-the-shore activity sites (which provide open access to data and open APIs) to feed activity specific information into the SiUinde system.

The reporting engine module aggregates the reporting information collected from the users, combines the different reports and the user's feedback, and presents the different reports on the maps. The reporting engine also combines the reports with external information sources, with information from the users and from the recommendations engine.

Finally, the recommendations engine module gathers all the information on the system for a given user, analyzing its preferences and activity (and friend's activity), their reports, comments and feedback to produce specialized recommendations for the user.

As it was previously mentioned, the system's backend is of extreme importance for the SiUinde mobile application. A significant part of functionalities that are present at the mobile frontend are the result of the work being processed by this backend.

In the following section, some testing and validation results of the system are presented, which constitute an important source of feedback to document if the SiUinde requirements match the users expectations and also to identify opportunities for improvement and future work.

III. SiUinde system testing and validation

After the SiUinde prototype has been developed and some internal tests conducted, a group of users were selected in order to conduct real-world tests with it (the survey was conducted in Portugal). Due to the characteristics of the developed system, two different groups were selected: a first group, composed by users that were our major target (users that carry some type of near-the-shore activities) and a second group that containing a non-specialized type of users.

The objective of this testing phase was to validate if the developed prototype was indeed addressing the requirements that were identified as major concerns of these types of users and how they evaluated the tool in general. The users were given the opportunity to freely test the SiUinde mobile application and at the end they were invited to fill a small survey about their experience.

The survey that was conducted for validation of the SiUinde system, targeted a group of users that focused primarily in one of the most important features of the system: the reporting mechanisms. That survey was composed by five groups of questions: the sample description, the type of near-the-shore activities and existing applications, the reports communication, the reports visualization and a general evaluation of the system.

A. *Sample description*

Within a total of 250 participants, 75% were male and 25% female, around 80% of the respondents had between 21 and 40 years old and 65% of them carried some type of near-the-shore sports activity (Figure 5). From that sample it is also important to conclude that most of the persons were focused on surf and bodyboard activities.

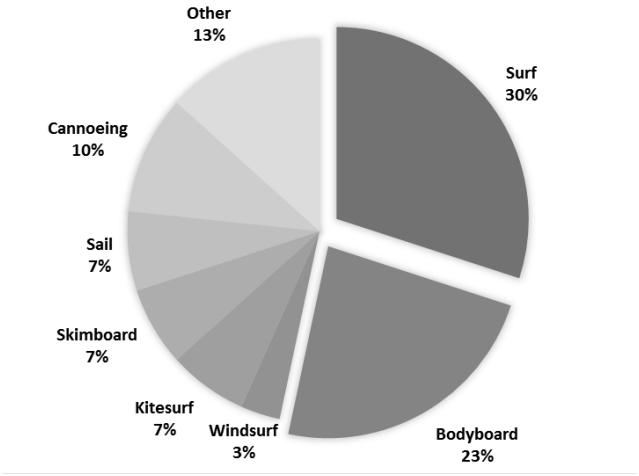

Figure 5. Number of practitioners by type of sports

B. *Type of near-the-shore activities and existing applications*

Around 61% of the surveyed users used some kind of application to find information about the near-the-shore conditions and Windguru is selected as their main application of choice in 46% of the cases. The user satisfaction level with the type and quality of the existing applications is high (83% of the users were quite satisfied), however none of the user gave top scores to the existing applications, referring the need for improvement. Also, on what concerns the information update on the applications, around 40% of the users rated this aspect with a medium grade (3, on a scale from 1 to 5).

C. *Reports communication and visualization*

The results presented here are specific to the SiUinde application usage by the surveyed users. While testing the application, users attested the following:

- A large majority of users (86%) find easily their position on the map;
- 77% of the users attested that the geolocation on the application was accurate and precise;
- The selection of the nearest beach was extremely useful and intuitive (75% of the respondents);
- 81% of the users considered that the amount of beaches presented on the map is sufficient;
- 72% of the respondents considered that the icons and the scale selected to produce and visualize the reports (in terms of sun, sea and wind conditions) were adequate;

- On what concerns the reporting on the number of persons on the water, 61% considers the functionality useful and intuitive;
- Regarding the selection of activities according to the conditions of the location, 79% of the users considered this functionality useful and intuitive;
- The functionality to add free text, photos and video to the report, has been well accepted by end-users and 96% of the users highly valuated this option;
- The easiness about report submitting and visualization of reporting information on the maps has also received good feedback -98% of the users were satisfied with these functionalities.

D. General evaluation of SiUinde

On what concerns the general usage of the SiUinde application by end-users, 76% considered that the application was extremely easy to use. Also, 76% of the users considered that SiUinde introduces something new when compared with the similar applications that they already use.

Another important aspect from this part of the survey is the fact that 85% of the users consider using SiUinde in the near future, replacing their current applications of choice.

As a general conclusion from this validation, it was possible to conclude that users find the application useful to support their near-the-shore activities, easy to use and attractive, capable of providing intuitive reporting and visualization functionalities, and would consider using it in the future.

IV. CONCLUSIONS

This article presented a system that was developed to allow the users to collaborate in the sharing of information about a group of parameters that were important for a set of near-the-coast activities. SiUinde represents an end-to-end solution, supported on a mobile smartphone/tablet application and a backend system, which collects reports from individual users and from other external services, and allows users, according to their specific preferences and activities, to be informed about the near-the-shore conditions in a given place and at a given time.

Additionally, the article reported on the work that was performed to validate SiUinde with end-users. For this, it was conducted a survey with a group of potentially interested users. Due to the nature of the work and its characteristics only Portuguese test-users were considered. From the survey, and subsequent analysis, it was possible to conclude that users are satisfied with the functionalities present on the application and are willing to use the application in the future.

Although promising, there is still a larger validation that needs to be conducted after the public release of the system. Moreover, some functionalities, like the recommendation still need to be improved to meet the user demand.

REFERENCES

[1] S. P. Srivastava, H. Schouten, W. R. Roest, K. D. Klitgord, L. C. Kovacs, J. Verhoef, and R. Macnab, “Iberian plate kinematics: a jumping plate boundary between Eurasia and Africa,” *Nature*, vol. 344, no. 6268, pp. 756–759, Apr. 1990.

[2] B. Libert and J. Spector, *We Are Smarter Than Me: How to Unleash the Power of Crowds in Your Business*. Wharton School Publishing, 2007, p. 176.

[3] *Network Strategies in Europe: Developing the Future for Transport and ICT*. Ashgate Publishing, Ltd., 2008, p. 303.

[4] danah m. boyd and N. B. Ellison, “Social Network Sites: Definition, History, and Scholarship,” *J. Comput. Commun.*, vol. 13, no. 1, pp. 210–230, Oct. 2007.

[5] G. Zichermann and C. Cunningham, *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. “O’Reilly Media, Inc.,” 2011, p. 208.

[6] K. Huotari and J. Hamari, “Defining gamification,” in *Proceeding of the 16th International Academic MindTrek Conference on - MindTrek ’12*, 2012, p. 17.

[7] S. Deterding, D. Dixon, R. Khaled, and L. Nacke, “From game design elements to gamefulness,” in *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments - MindTrek ’11*, 2011, p. 9.

[8] C. J. Hooper and J. W. Rettberg, “Experiences with Geographical Collaborative Systems: Playfulness in Geosocial Networks and Geocaching.” 01-Aug-2011.

[9] T. Segaran, *Programming Collective Intelligence: Building Smart Web 2.0 Applications*. “O’Reilly Media, Inc.,” 2007, p. 360.

[10] *Information Visualization in Data Mining and Knowledge Discovery*. Morgan Kaufmann, 2002, p. 407.

[11] R. F. Grove, *Web-Based Application Development*. Jones & Bartlett Publishers, 2009.

[12] J. M. Wargo, *PhoneGap Essentials: Building Cross-Platform Mobile Apps*. Addison-Wesley, 2012, p. 384.

[13] S. G. Kochan, *Programming in Objective-C: Updated for iOS 5 and Automatic Reference Counting (ARC) (Developer’s Library)*. Addison Wesley, 2011, p. 560.

[14] J. Steele and N. To, *The Android Developer’s Cookbook: Building Applications with the Android SDK (Developer's Library)*. Addison Wesley, 2010, p. 400.

[15] C. Brousseau, *Creating Mobile Apps with Appcelerator Titanium [Paperback]*. Packt Publishing, 2013, p. 318.

[16] M. David and C. Murman, *Designing Apps for Success: Developing Consistent App Design Practices*. CRC Press, 2014, p. 280.