



A Systematic Review of Usability Evaluation Approaches on Mobile Tourism Applications

Azham Hussain^{*1}, Wasan Abdulwahab Mohammed^{1,2}, Manhal Isam Sabri^{1,3}, and Omar Hamid Flayyih^{1,4}

¹Human-Centered Computing Research Lab, School of Computing, Universiti Utara Malaysia, 06010, Malaysia

²Directorate of Education in Karkh 1, Ministry of Education, Iraq

³Office of Deputy of Ministry for Distributed Affairs, Ministry of Electricity, Baghdad, Iraq

⁴Directorate of Education in Salah Al-Din, Ministry of Education, Iraq

*Corresponding Author Email: azham.h@uum.edu.my

Abstract

Currently, tourism faced several transformations and challenges, particularly due to the influence and due to the expansion of Information Communication Technologies (ICTs), such as Internet and smartphones. These modern technologies have significantly changed the tourists' behavior, especially the ways of getting tourist information and travel destination. Therefore, most of the tourist enterprises adopt new competitive methods in order to improve their competitiveness and attractiveness in the tourism context. Thus, this situation opened the doors to the most recent development in the technological field, which sees mobile devices as new interesting potentials to advance the touristic sector. In fact, exploiting mobile applications in the tourist sector are useful tools, merely if well created and organized, in turn, they can damage result if they are not clearly designed. However, even though the evaluation of mobile applications is crucial and can reduce or increase of the users, little of research highlighted on the most of the approaches utilized to assess mobile tourist applications. Consequently, this paper sought to review the previous literature to explore the most methods and metrics exploited to evaluate the usability of mobile tourist applications. The findings uncovered that, out of 27 was 88% of the selected studies used whether Questionnaire or Lab experiment as a method to evaluate the usability. While, metrics were: Comprehensibility, Effectiveness, Efficiency, Learnability, Satisfaction, Simplicity of use, Usefulness and Visualization.

Keywords: Tourism Application, Mobile Devices, Usability.

1. Introduction

With the fast improvement of mobile innovations, different sorts of portable applications have turned out to be extremely popular^{1,2}. As a progressive innovation, cell phone empowers the entrance to data whenever, anyplace, even in conditions with rare physical system connections³. What's more, numerous areas have picked up advantages from the use of versatile applications, for example, coordinations, debacle, the travel industry, transportation and venture checking and the board activities^{4,5,6,7,8}.

The travel industry as a worldwide industry and as the greatest supplier of employments on earth brags a more prominent exhibit heterogeneous partners than numerous different ventures⁹. In the last decade, tourism faced new transformations and challenges, specifically due to the influence and due to the expansion of Information Communication Technologies (ICTs), such as Internet and smartphones, originating consequently the so called electronic Tourism (or eTourism)^{10,11}. Using modern technologies have significantly changed the tourists' behavior, in particular the means of getting touristic information. Moreover, these advances have permitted goals, traveler associations and undertakings to embrace new aggressive strategies so as to improve their engaging quality and their intensity in the travel industry field. Subsequently, this

circumstance opened the ways to the latest improvement in the mechanical field, which sees cell phones as new fascinating possibilities to propel the touristic area¹².

The fast growth of applications is also noticeable in the tourism field, where tourist mobile guide applications gained a growing importance¹³, since they support tourists in a given destination different from the place where they live, becoming on one hand helping interactive instruments for visitors, and on the other hand, means of promotion for the destination. Thus, mobile tourist applications are useful instruments, merely if well created and organized; in many cases in fact, they can have a damaging result if they are not clearly constructed¹⁴. Subsequently, ease of use has been progressively perceived as a critical quality measurement to decide the achievement of portable applications, for example, versatile visitor applications. In the similar context, Bahn, Lee, Jo, Suh, Song and Yun¹⁵ stated that, Ease of use has been an essential quality in the improvement of utilization and in addition item.

Evaluating the usability of application is a distinct and challenging task, as the characteristics of mobile devices are peculiar. However, little research has been published on the methods or approach used to usability evaluation for mobile tourist and what the different of the approaches utilized in the previous literature still unexplored. This agreed by Hussain, Saleh, Taher, Ahmed and Lammasha¹⁶, who said that, "Usability of mobile applications is important." with important of the evaluation usability this paper aims to review

previous literatures to identify what the approaches used to evaluate the usability of the mobile tourist applications.

2. Research method

Orderly surveys are a thorough and straightforward type of writing review¹⁷. As indicated by Hemingway and Brereton¹⁸, the methodical audits have progressively supplanted conventional surveys and master editorials as a method for condensing the examination proof. It has increased critical prevalence among programming building specialists since 2004¹⁹. In this deliberate audit, the specialists connected the techniques that proposed by Hussain, Hussein, Dahr and Neamah²⁰, Figure 1 delineated these strategies for orderly survey.

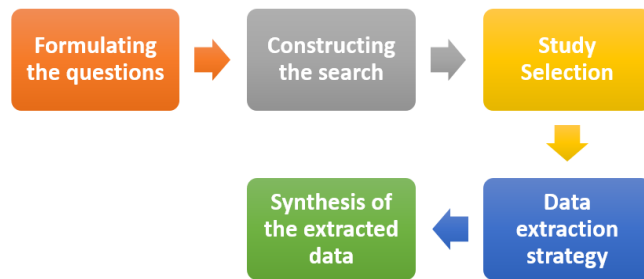


Figure 1: Procedures to conduct SLR

2.1. Formulating the questions

Figuring the exploration questions is the most essential piece of any precise review²¹. In addition, Meade and Richardson²² expressed that, the deliberate audit must start with a well-constructed inquire about inquiry and must be pertinent to the inspiration of the investigation. Consequently, the goal of the survey is to answer the accompanying exploration questions:

- What sorts of methods used to assess the likelihood of utilizing the travel industry Mobile applications?
- What the most grids utilized for assessing the ease of use of the travel industry Mobile applications?

2.2. Constructing the Search

In this stage, the analysts were structured their strategy for get-together the papers dependent on the catchphrases, date and the computerized libraries to answer the inquiries that previously mentioned past segment. Sarrami-Foroushani et al.,²³ alluded that, developing the inquiry methodology included tending to the accompanying components: choosing databases; aggregating a rundown of key pursuit terms; and setting up incorporation and rejection criteria.

Data Sources: In this section, the following electronic databases will be searched:

- ACM Digital Library (dl.acm.org)
- IEEE Xplore (ieeexplore.ieee.org)
- ScienceDirect (www.sciencedirect.com)

These digital Databases can free access to the researchers in Universiti Utara Malaysia. In addition to the previous electronic databases, this study will be utilized the most popular research engine for academic purposes known Google.scholar (<http://scholar.google.com>).

Search Terms: In order to attain the main thrust of this study, several

terms will be proposed building on the research questions. According to Rai, Sahoo and Mehruz²⁴, the search terms can be constructed by using Boolean ANDs and ORs. Therefore, this paper will be used the following search terms (keywords):

1. Mobile Tourist
2. Mobile Tourism
3. Mobile Tourist Guide Application
4. Mobile Tourism Guide Application
5. M-Tourist Application
6. M-Tourism Application

All these search terms for mobile tourist will be combined by using the Boolean “OR” operator, which entails that a paper only had to include any one of the terms to be retrieved. That is, this study will be searched:

1 OR 2 OR 3 OR 4 OR 5 OR 6

Study Selection Criteria: According to Kitchenham²⁵ study choice criteria are utilized to figure out which ponders are incorporated into, or prohibited from, a precise audit. All in all, incorporation and avoidance criteria will be founded on the exploration question. In this orderly audit, there are explicit criteria will be connected to indicate which bit of the investigation found by the pursuit term will be rejected. In the following these criteria:

- Studies that are not applicable to the exploration questions;
- Studies that are not inside the predetermined day and age;
- Studies that don't give an experimental premise to their discoveries;
- Duplicate considers in various sources; and
- Studies not written in English

In addition, this systematic review will be concentrates on the literatures that published between 2010 and 2016. According to study conducted by Hussain et al.,²⁰ the beginning of 2010 witnessed a major development in Mobile devices.

Data Extraction Strategy: According to Kitchenham²⁵ and Hussain et al.,²⁰, the objective of this step is to design data extraction forms to accurately record the information researchers obtain from the primary studies. Information extraction shapes are characterized and steered when the audit convention is characterized. This clears the peruser what information would be removed from the essential examination and furthermore it limits the shot of biasness. When all is said in done, information extraction includes drawing up a nitty gritty table depicting each investigation that is checked on in detail (few out of every odd examination that was situated in the audit, just those examinations that meet all the consideration criteria). This paper will pursue the technique that led by Salvador, Nakasone and Pow-Sang²⁷ to structure the information extraction.

Synthesis of the Extracted Data: Information blend includes grouping and abridging the aftereffects of the included essential studies²³. In this stage, extricated data about the examinations has been arranged in a way steady with the audit question. 27 out of 193 investigations met the incorporation criteria. The complete number of selected studies is shown in Table 1.

Table 1: ist of Selected Studies Based on the Certain Criteria

Study ID	Author (s)	Year
S[1]	Alshattnawi	2013
S[2]	Singh and Singh	2014
S[3]	Han, Shih, Rosson and Carroll	2014
S[4]	Jinendra, Bhagyashri, Pranav, Seema and Parag	2012
S[5]	Al-Rayes, Sevkli, Al-Moaiqel, Al-Ajlan, Al-Salem and Al-Fantoukh	2011
S[6]	Cheng, Hsiang and Wu	2010
S[7]	Gavalas and Kenteris	2012
S[8]	Kourouthanassis, Boletsis, Bardaki, and Chasanidou	2015

S[19]	Hsieh, Wu, Tsai, Shih and Li	2012
S[10]	Panahi, Woods and Thwaites	2013
S[11]	Zhao, Peng and Sun	2015
S[12]	Tobing	2015
S[13]	Smirnov, Kashevnik, Ponomarev, Shchekotov and Kulakov	2015
S[14]	Yu and Chang	2012
S[15]	Realinho, Romão, Birra and Dias	2011
S[16]	Anacleto, Figueiredo, Almeida and Novais	2014
S[17]	Anacleto, Figueiredo, Luz, Almeida and Novais	2011
S[18]	Alamäki and Dirin	2014
S[19]	Gavalas, Konstantopoulos, Mastakas and Pantziou	2014
S[20]	Gallego, Woerndl and Huccas	2013
S[21]	Halili, Aliu And Rrmoku	2014
S[22]	Lin, Kao, Lam and Tsai	2014
S[23]	Schaller	2014
S[24]	Braunhofer, Elahi, Ge, Ricci and Schievenin	2013
S[25]	Noguera, Barranco, Segura and Martínez	2012
S[26]	Smirnov, Kashevnik, Balandin and Laizane	2013
S[27]	Braunhofer, Elahi and Ricci	2014

There are several constraints make the researchers concentrates only of such number of the papers, first, now all the digital libraries can access by the researchers. The keywords for searching these particular papers. However, the selected studies were cover all the requirement or the inclusion criteria.

3. Findings and discussion

So as to examine the most working framework used to plan portable the travel industry applications, the RQ1 has been built up. In the comparative vein, the analysts needed to investigate the most mainstream Usability Evaluation Methods in Mobile Tourism Application? Consequently, a second research question was set up.

The past research questions were replied by looking at the earlier writing on versatile applications. The scope of writing on the point of versatile applications²⁶ is so expansive it was imperative to restrict the writing survey to the most important and ongoing productions and to constrain the distribution interim to papers distributed somewhere in the range of 2010 and 2016, and additionally centers particularly around the Mobile the travel industry applications²⁷.

RQ1: What sorts of procedures used to assess the likelihood of utilizing the travel industry Mobile applications?

There are numerous manners by which versatile applications²⁸ can be assessed including Questionnaire, Interview, Observations, and so on. Concerning this investigation²⁹, the outcomes featured that, the ease of use assessment strategies were used to evaluate the versatile the travel industry application as per included technique are: research center Experiment, Focus Group, Interview and Questionnaire, as showed in Figure 2 beneath³⁰.

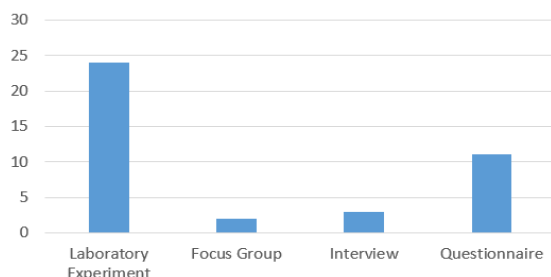


Figure 2: Usability techniques

More precisely, of 27 selected studies 60% of these study applied laboratory Experiment, and 28% of it were used Questionnaire³¹. In turn, 5% and 7% were Focus group³² and interview, respectively, more details of this percentage depicted in Figure 3.

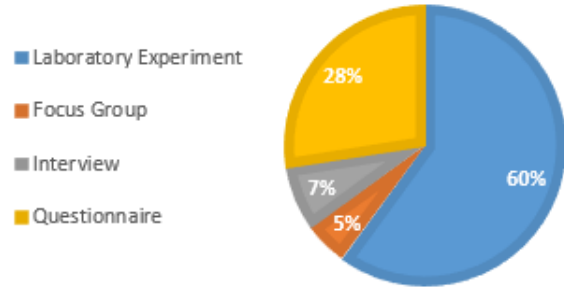


Figure 3: Usability techniques by percentage

RQ2: What the most frameworks utilized for assessing the ease of use of the travel industry Mobile applications?

The present research question was set up to find the most measurements used to assess the portable the travel industry applications. Figure 4 shows the results for this question based on metrics of evaluation.

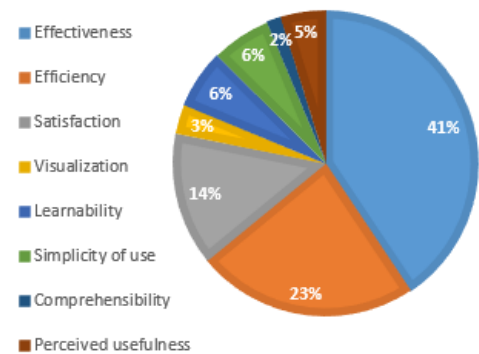


Figure 4: Metrics of evaluation

With respect to RQ2, this systematic review discovered eight metrics were used among these selected studies. Effectiveness and efficiency was mostly using. These two dimensions was frequently used for evaluation the usability of mobile applications. Based on the Figure 4 above, the effectiveness constituted 41%, while efficiency was 23 % from the selected studies. In addition, satisfaction also was constantly used, by 14 % from these studies. On the other hand, there is several metrics were less used such as learnability, simplicity of use, usefulness, visualization and comprehensibility were 6%, 6%, 5%, 3% and 2% respectively.

4. Conclusion

This systematic literature reviews according to research questions. The first research question related to the usability evaluation methods, while second research question pertaining to the metrics used by these methods.

In fact, the selected studies used variety methods to assess the usability of the mobile tourism applications. For instance, Questionnaire and Lab experiment was used continuously within the selected studies. Interview with participants and Focus group also used but less then experimental and questionnaire method.

The results from the second research question which are related to

metrics discovered that, majority of the selected studies harnessed the Satisfaction, Effectiveness and Efficiency as a metrics to evaluate the usability of the mobile application.

Indeed, exploiting mobile applications in the tourist sector are useful tools, merely if well created and organized, in turn, they can damage result if they are not clearly designed. However, even though the evaluation of mobile applications is crucial and can reduce or increase of the users, little of research highlighted on the most of the approaches and metrics utilized to assess mobile in general, and tourist applications in particular.

Appendix: selected studies

- S [1] S. Alshattawi. (2013) Building mobile tourist guide applications using different development mobile platforms.
- S [2] S. P. Singh and P. Singh. Design and implementation of a location-based multimedia mobile tourist guide system," *International Journal of Information and Communication Technology*. vol. 7 (2014) 40-51.
- S [3] K. Han, P. C. Shih, M. B. Rosson, and J. M. Carroll, "Enhancing community awareness of and participation in local heritage with a mobile application," in *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing*, (2014) 1144-1155.
- S [4] D. R. Jinendra, J. R. Bhagyashri, G. Y. Pranav, V. U. Seema, and A. N. Parag. Smart travel guides: Application for android mobile," *International Journal of Electronics, Communication and Soft Computing Science & Engineering (IJECSCE)*. vol. 2 (2012) 115.
- S [5] K. A. A. Al-Rayes, A. Z. Sevкли, H. F. Al-Moiqel, H. M. Al-Ajlan, K. Al-Salem, and N. I. Al-Fantoukh. (2011) A mobile tourist guide for trip planning. *IEEE Technology and Engineering Education (ITEE)*, vol. 6, 1-6.
- S [6] J.-S. Cheng, H.-W. Hsiang, and W.-C. Wu. The design of intelligent mobile tourism service system. in *Computer Symposium (ICS)*. 2010 International, (2010) 813-817.
- S [7] D. Gavalas and M. Kenteris. Evaluation of a web recommender system in electronic and mobile tourism. *International Journal of Web Engineering and Technology*, vol. 7 (2012) 4-21.
- S [8] P. Kourouthanassis, C. Boletsis, C. Bardaki, and D. Chasanidou. Tourists responses to mobile augmented reality travel guides: The role of emotions on adoption behavior. *Pervasive and Mobile Computing*, vol. 18 (2015) 71-87.
- S [9] M.-Y. Hsieh, T.-Y. Wu, Y.-T. Tsai, C.-H. Shih, and K.-C. Li. Interactive design using non-touch technologies for group trip. in *Intelligent Signal Processing and Communications Systems (ISPACS)*, 2012 International Symposium, (2012) 216-221.
- S [10] M. S. Panahi, P. Woods, and H. Thwaites. Designing and developing a location-based mobile tourism application by using cloud-based platform. in *Technology, Informatics, Management, Engineering, and Environment (TIME-E)*, 2013 International Conference, (2013) 151-156.
- S [11] H. Zhao, H. Peng, and C. Sun. A Mobile Service Platform for Xinjiang Tourism. in *Measuring Technology and Mechatronics Automation (ICMTMA)*, 2015 Seventh International Conference, (2015) 26-30.
- S [12] R. D. H. Tobing. Mobile tourism application for Samosir Regency on Android platform. in *Technology Management and Emerging Technologies (ISTMET)*, 2015 International Symposium, (2015) 249-253.
- S [13] A. Smirnov, A. Kashevnik, A. Ponomarev, M. Shchekotov, and K. Kulakov. Application for e-Tourism: Intelligent Mobile Tourist Guide. in *Advanced Applied Informatics (IIAI-AAI)*, 2015 IIAI 4th International Congress, (2015) 40-45.
- S [14] C.-C. Yu and H.-p. Chang. Towards context-aware recommendation for personalized mobile travel planning. in *Context-Aware Systems and Applications*, ed: Springer, (2012) 121-130.
- S [15] V. Realinho, T. Romão, F. Birra, and A. E. Dias. Building mobile context-aware applications for leisure and entertainment. in *Proceedings of the 8th International Conference on Advances in Computer Entertainment Technology*, (2011) 29.
- S [16] R. Anacleto, L. Figueiredo, A. Almeida, and P. Novais, Mobile application to provide personalized sightseeing tours. *Journal of Network and Computer Applications*, vol. 41 (2014) 56-64, 2014.
- S [17] R. Anacleto, L. Figueiredo, N. Luz, A. Almeida, and P. Novais. Recommendation and planning through mobile devices in tourism context. in *Ambient Intelligence-Software and Applications*, ed: Springer. (2011) 133-140.
- S [18] A. Alamäki and A. Dirin. Designing mobile guide service for small tourism companies using user centered design principle. in *International Conference on Computer Science, Computer Engineering, and Social Media*, Thessaloniki, (2014) 47-58; Greece.
- S [19] D. Gavalas, C. Konstantopoulos, K. Mastakas, and G. Pantziou. Mobile recommender systems in tourism. *Journal of Network and Computer Applications*. vol. 39 (2014) 319-333.
- S [20] D. Gallego, W. Woerndl, and G. Huecas. Evaluating the impact of proactivity in the user experience of a context-aware restaurant recommender for Android smartphones. *Journal of Systems Architecture*. vol. 59 (2013) 748-758.
- S [21] A. Halili, A. Aliu, and K. Rrmoku. The use of an android platform application as a way to promote attractive touristic spots in Republic of Kosovo. *ISTI*. (2014).
- S [22] P.-J. Lin, C.-C. Kao, K.-H. Lam, and I.-C. Tsai. Design and Implementation of a Tourism System Using Mobile Augmented Reality and GIS Technologies. in *Proceedings of the 2nd International Conference on Intelligent Technologies and Engineering Systems (ICITES2013)*, (2014) 1093-1099.
- S [23] R. Schaller. Mobile tourist guides: bridging the gap between automation and users retaining control of their itineraries. in *Proceedings of the 5th Information Interaction in Context Symposium*, (2014) 320-323.
- S [24] M. Braunhofer, M. Elahi, M. Ge, F. Ricci, and T. Schievenin. STS: Design of Weather-Aware Mobile Recommender Systems in Tourism. in Paper presented at the International Conference on Intelligent User Interfaces: (2013).
- S [25] J. M. Noguera, M. J. Barranco, R. J. Segura, and L. Martínez. A mobile 3D-GIS hybrid recommender system for tourism. *Information Sciences*. vol. 215 (2012) 37-52.
- S [26] A. Smirnov, A. Kashevnik, S. I. Balandin, and S. Laizane. Intelligent mobile tourist guide. in *Internet of Things, Smart Spaces, and Next Generation Networking*, ed: Springer. (2013) 94-106.
- S [27] M. Braunhofer, M. Elahi, and F. Ricci. Usability assessment of a context-aware and personality-based mobile recommender system. in *E-commerce and web technologies*, ed: Springer. (2014) 77-88.

References

- [1] D. Gavalas and D. Economou. (2011) Development platforms for mobile applications: Status and trends. *Software, IEEE*, vol. 28, pp. 77-86.
- [2] R. Baharuddin, D. Singh, and R. Razali. Usability dimensions for mobile applications—A review. *Res. J. Appl. Sci. Eng. Technol*, (2013) vol. 5, 2225-2231.
- [3] D. Gavalas, C. Konstantopoulos, K. Mastakas, and G. Pantziou, Mobile recommender systems in tourism. *Journal of Network and Computer Applications*. vol. 39 (2014) 319-333.
- [4] Sridhar KP, Baskar S, Shakeel PM, Dhulipala VS., "Developing brain abnormality recognize system using multi-objective pattern producing neural network", *Journal of Ambient Intelligence and Humanized Computing*, 2018:1-9. <https://doi.org/10.1007/s12652-018-1058-y>
- [5] J. Lee, D. L. Niko, H. Hwang, M. Park, and C. Kim. A GIS-based design for a smartphone disaster information service application. in *2011 First ACIS/JNU International Conference on Computers, Networks, Systems and Industrial Engineering (CNSI)*, (2011) 338-341.
- [6] Á. Monares, S. F. Ochoa, J. A. Pino, V. Herskovic, J. Rodriguez-Covili, and A. Neyem. Mobile computing in urban emergency situations: Improving the support to firefighters in the field. *Expert Systems with Applications*, vol. 38 (2011) 1255-1267.
- [7] Baskar, S., & Dhulipala, V. R., "Biomedical Rehabilitation: Data Error Detection and Correction Using Two Dimensional Linear Feedback Shift Register Based Cyclic Redundancy Check", *Journal of Medical Imaging and Health Informatics*, 2018, 8(4), 805-808.

- [8] S. F. Ochoa, G. Bravo, J. A. Pino, and J. Rodríguez-Covili. Coordinating loosely-coupled work in construction inspection activities. *Group Decision and Negotiation*. vol. 20 (2011) 39-56, 2011.
- [9] Shakeel PM, Baskar S, Dhulipala VS, Jaber MM., "Cloud based framework for diagnosis of diabetes mellitus using K-means clustering", *Health information science and systems*, 2018 Dec 1;6(1):16. <https://doi.org/10.1007/s13755-018-0054-0>
- [10] L. Violi. *Mobile Application Usability: The case of the tourist mobile guide iTicino*. Master Dissertation (2011).
- [11] D. Buhalis and R. Law. Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism management*, vol. 29 (2008) 609-623.
- [12] Sridhar KP, Baskar S, Shakeel PM, Dhulipala VS., "Developing brain abnormality recognize system using multi-objective pattern producing neural network", *Journal of Ambient Intelligence and Humanized Computing*, 2018:1-9. <https://doi.org/10.1007/s12652-018-1058-y>
- [13] D. Gavalas and M. Kenteris. A web-based pervasive recommendation system for mobile tourist guides. *Personal and Ubiquitous Computing*. vol. 15 (2011) 759-770.
- [14] C. Visentin, *Canton Ticino visto dagli altri: l'immagine del territorio nelle guide turistiche internazionali*: G. Casagrande, (2007).
- [15] S. Bahn, C. Lee, J. Jo, W. Suh, J. Song, and M. Yun. Incorporating user acceptance into usability evaluation scheme for the user interface of mobile services. in *2007 IEEE International Conference on Industrial Engineering and Engineering Management*, (2007) 492-496.
- [16] A. Hussain, A. Saleh, A. Taher, I. Ahmed, and M. Lammasha. Usability Evaluation Method for Mobile Learning Application Using Agile: A Systematic Review. *Jurnal Teknologi*. vol. 77 (2015).
- [17] R. Mallett, J. Hagen-Zanker, R. Slater, and M. Duvendack. The benefits and challenges of using systematic reviews in international development research. *Journal of development effectiveness*. vol. 4 (2012) 445-455.
- [18] P. Hemingway and N. Brereton. (2009) What is a systematic review.
- [19] H. Zhang and M. A. Babar. Systematic reviews in software engineering: An empirical investigation. *Information and Software Technology*. vol. 55 (2013) 1341-1354.
- [20] A. B. Hussain, R. M. Hussein, J. M. Dahr, and M. A. Neamah. Existing Trends in Usability Evaluation Method (Uem) for M-Learning Apps: A Systematic Review. *ARNP Journal of Engineering and Applied Sciences*. vol. 10 (2015).
- [21] B. Kitchenham, *Procedures for performing systematic reviews*, Keele University, Keele, UK (2004) vol. 33, pp. 1-26.
- [22] M. O. Meade and W. S. Richardson. Selecting and appraising studies for a systematic review. *Annals of internal medicine*. vol. 127 (1997) 531-537.
- [23] P. Sarrami-Foroushani, J. Travaglia, D. Debono, R. Clay-Williams, and J. Braithwaite. Scoping Meta-Review: Introducing a New Methodology. *Clinical and translational science*. vol. 8 (2015) 77-81.
- [24] R. Rai, G. Sahoo, and S. Mehruz. Exploring the factors influencing the cloud computing adoption: a systematic study on cloud migration. *SpringerPlus*. vol. 4 (2015) 197.
- [25] B. Kitchenham. Guidelines for performing systematic literature reviews in software engineering. in *Technical report*. Ver. 2.3 EBSE Technical Report. EBSE, ed, (2007).
- [26] C. Salvador, A. Nakasone, and J. A. Pow-Sang. A systematic review of usability techniques in agile methodologies. in *Proceedings of the 7th Euro American Conference on Telematics and Information Systems*, (2014) 17.
- [27] Selvakumar S, Inbarani H, Shakeel PM. A Hybrid Personalized Tag Recommendations for Social E-Learning System. *International Journal of Control Theory and Applications*. 2016;9(2):1187-99.
- [28] M. Kenteris, D. Gavalas, and A. Mpitzopoulos. (2010) A mobile tourism recommender system. in *Computers and Communications (ISCC), 2010 IEEE Symposium*, 840-845.
- [29] S.-F. Tseng and Y.-L. Won. Integrating multiple recommendation schemes for designing sales force support system: a travel agency example. *International Journal of Electronic Business*. vol. 13 (2016) 1-37.
- [30] MuhammedShafi. P, Selvakumar.S*, Mohamed Shakeel.P, "An Efficient Optimal Fuzzy C Means (OFCM) Algorithm with Particle Swarm Optimization (PSO) To Analyze and Predict Crime Data", *Journal of Advanced Research in Dynamic and Control Systems*, Issue: 06, 2018, Pages: 699-707
- [31] Z. Chen, L. Zhu, and Y. Teng, Application of GIS/GPS Technology in Mobile Logistics Public Information Platform. in *2010 International Conference on Logistics Engineering and Intelligent Transportation Systems (LEITS)*, (2010) 1-4.
- [32] M. Wang, Y. Yang, X. Song, H. Yang, and J. Wang. Mobile GIS system for pipeline inspection at CoalBed Methane field. in *19th International Conference on Geoinformatics*, (2011) 1-4.