

# Mobile Information Systems for Construction Project: Literature Review

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**Abstract:** Mobile information systems are important in many aspects, one of the most important of these aspects is the construction sector. This research provides an explanation of the theoretical aspects of mobile information systems and the nature of their relationship to construction projects. Since there are many applications and developed systems that specialize in certain aspects that were presented during the research, but at the same time this aspect needs to be further developed. It was also found that certain and multiple aspects of project management would be very feasible to develop mobile information systems for them, including cost and time management, for example.

**Keywords:** Construction, Information, Mobile, project, System.

## 1. Introduction

Mobile Information Systems can be defined as the systems through which various services and information sources are accessed by the user, where they are easily transferred and operate in various locations by wireless connection (Jacobs, 2006). Users of systems share data and can perform collaborative work synchronously and asynchronously for mobile systems with a difference in information, services, and user interfaces according to the context for which the system is used (Jacobs, 2006). Fig. 1. shows the mobile information system (multichannel). One of the most widely used mobile communication technologies is the mobile information system. It's a system built on mobile information technology that can be incorporated into all aspects of life, including finance, IT, sports, medicine, and other industries, and allows information acquisition faster and work from anywhere (Rimal et al., 2017).

## 2. Cloud Computing

The European Network and Information Security Agency (ENISA) defines cloud computing as a service model for offering IT on-demand, always based on distributed computing and virtualization technologies (Catteddu, 2009). Cloud computing is not considered as a new emerging technology, but rather it is a type of computing model that provides resources as a source of services and gives members the ability to choose from among the range of services available through cloud computing such as data,

storage, servers, and finally high-performance computing.

(Shriwas et al., 2012). The following sections explain important aspects related to cloud computing.

### 2.1. Characteristics of Cloud Computing

Cloud computing has distinctive characteristics that make it distinct from the systems that may seem related to it Fig. 2. shows the characteristics of cloud computing.

### 2.2. Services of Cloud Computing

Cloud computing services can be classified into three main models according to the type of services they provide. Layers of cloud services are depicted in Fig. 3. According to (Chandrasekaran, 2014), the three types are explained below:

1. Infrastructure as a service (IaaS): Various services are provided to the customer through this layer, which is the basis for the other two types of layers. These services include processing, storage, virtual machines, networks, and other basic services that enable the user to run the software as well as deploy them.
2. Platform as a service (PaaS): It represents the middle layer, which provides an environment that the user can use to create software and also publish them on the cloud by using programming languages, tools, libraries, and services supported by the cloud.
3. Software as a service (SaaS): The applications that run on the cloud are provided to the consumer through this layer, where the applications can be accessed by the web browser or by the software screen, and the user does not have any control over the basic services referred to in the first layer through this layer.

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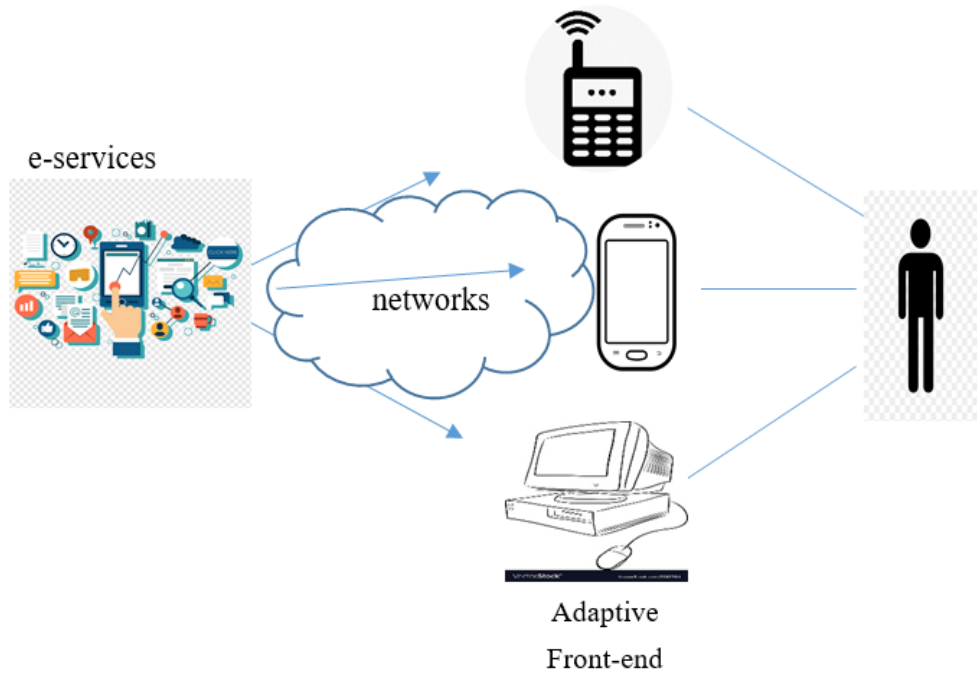


Fig. 1. The Multichannel Mobile Information System (Jacobs, 2006)

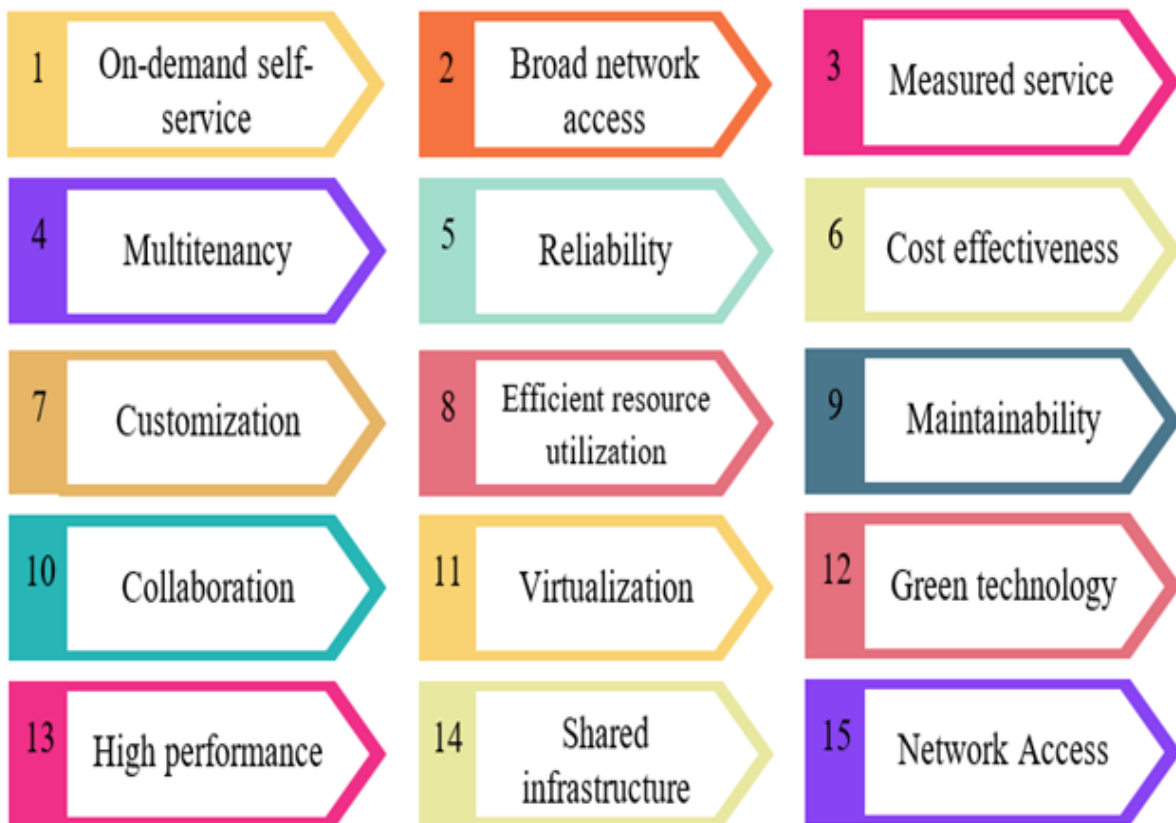
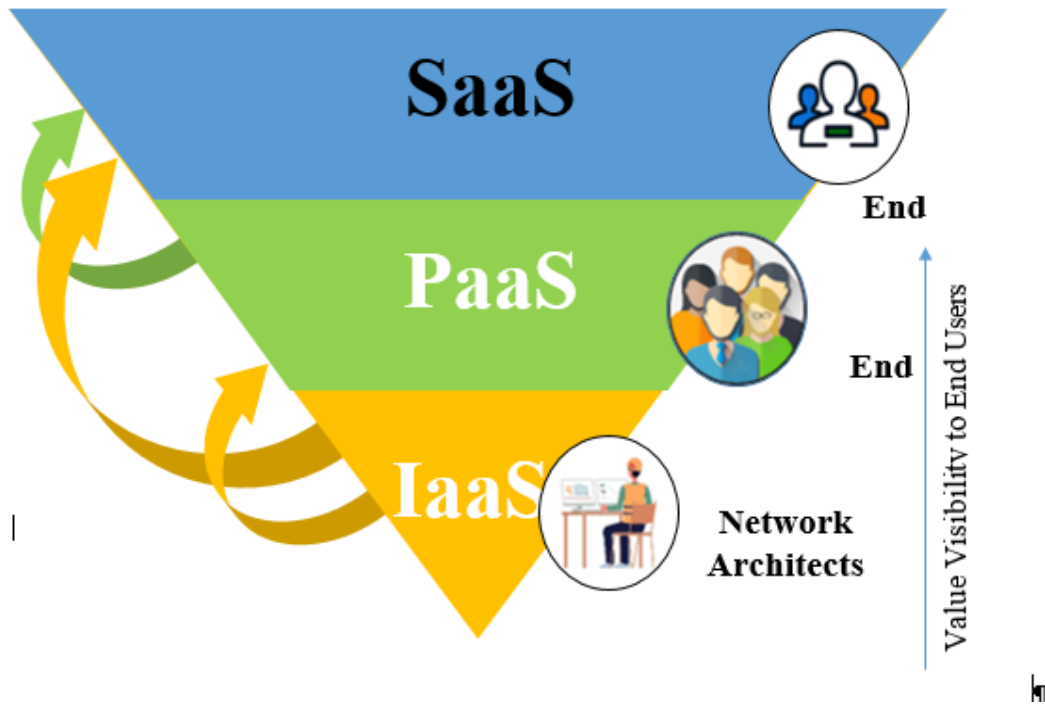


Fig. 2. The Characteristics of Cloud Computing (Researcher Depend on (Hiran et al., 2019)



**Fig. 3.** Layers of Cloud Services (Delgado Garcia, 2011)

### 2.1. Computing Deployment Model of Cloud Computing

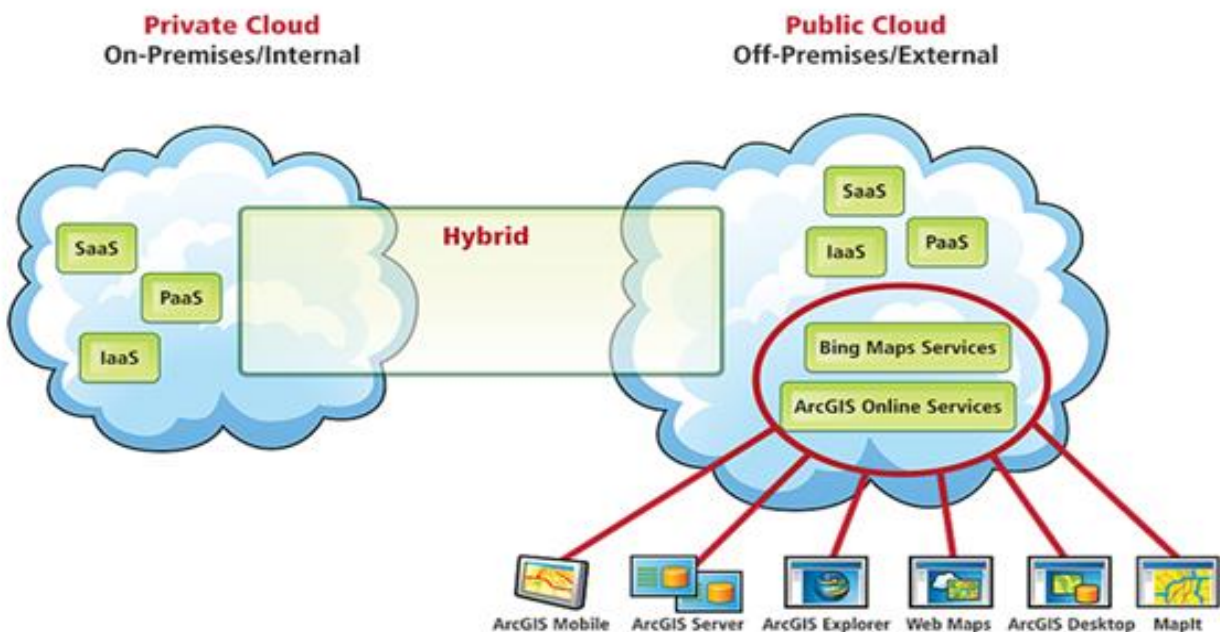
There are three different deployment strategies for cloud computing and this difference depends on the way you provide services to customers. According to (Hurwitz et al., 2012), the types of deployment strategies can be explained below:

1. Public Cloud: Through this model, anyone can access infrastructure and cloud resources as well as specify the level of security they desire.
2. Private Cloud: This model is preferred by organizations that do

not share their resources with outside parties.

3. Hybrid Cloud: This model combines the two previous models, where any organization can use this type of model, where part of the resources is placed in general and available to everyone, and another part is specific to the organization and is not available to the general public.

**Fig. 4** shows the overall structure of the deployment model.



**Fig. 4.** The Overall Structure for The Deployment Model (Prasad et al., 2012)

### 3. Mobile Application

The rapid advancement of mobile phone technology has been noticeable in recent years. Furthermore, because of the distinct and useful services provided by mobile application features, the high prevalence of mobile phone handsets in all circles of society led to an increase in demand for mobile applications in all fields. A mobile application is a package of code written in a programming language that is meant to execute on a mobile device and fulfill a certain function (Salz and Moranz, 2013).

The expansion of mobile devices and platforms presents a set of issues in terms of how to design and implement applications. The developer must decide which development plan is optimal for the application in its current condition. Essentially, the developer has three options when it comes to mobile application development (Whitmore et al., 2013).

1. Native Application: A native application is designed specifically for a specific operating system or device. A native application is downloaded and installed on the device via an internet store. Objective C, JAVA, and other programming languages are used to create native applications.
2. Web Application: A web application designed for smartphones and tablets that can be accessed via the mobile device's web browser. The three fundamental technologies (HTML, CSS, and JavaScript) are used to create the mobile web application.
3. Hyper Application: It is comprehensive of both types when hybrid application wraps around most or all of the user interface that appears in the mobile browser window, providing access to devise functions that are not available through the mobile browser.

### 4. Cloud Computing of Mobile

It represents a combination of cloud computing and mobile

computing to bring rich computational resources to mobile users as well as network operators, and finally cloud computing providers (Othman et al., 2013). The widespread adoption of cloud computing coincided with the significant adoption of mobile devices. Mobile devices can connect to cloud computing resources over a wireless network, such as 3G or GPRS (Shravanthi and Guruprasad, 2014). The impact of mobile devices on cloud computing is comparable to that of personal computers, given the widespread use of mobile devices and a large number of mobile applications released regularly. This resulted in the extension of mobile application resources via cloud computing platform resources, resulting in a new paradigm for mobile applications and improved user experience (Marinelli, 2009).

Mobile cloud computing architecture is made up of four main components: mobile, network operator, internet service provider, and cloud computing. Base stations (e.g. satellite, access point, or base transceiver station (BTS)) connect mobile devices to mobile networks by establishing and controlling connections (air links) and functional displays between mobile devices and network operators. The requests and information (location and ID) of mobile users are sent to central processors, which are connected to servers that provide mobile network services. The requests of the subscribers are then delivered to a cloud over the Internet. Cloud controllers execute requests to offer mobile users the appropriate cloud services. Utility computing, virtualization, and service-oriented architecture (web, application, and database servers) are used to create these services (Dinh et al., 2013). The Architecture of Mobile Cloud Computing can be shown in Fig. 5.

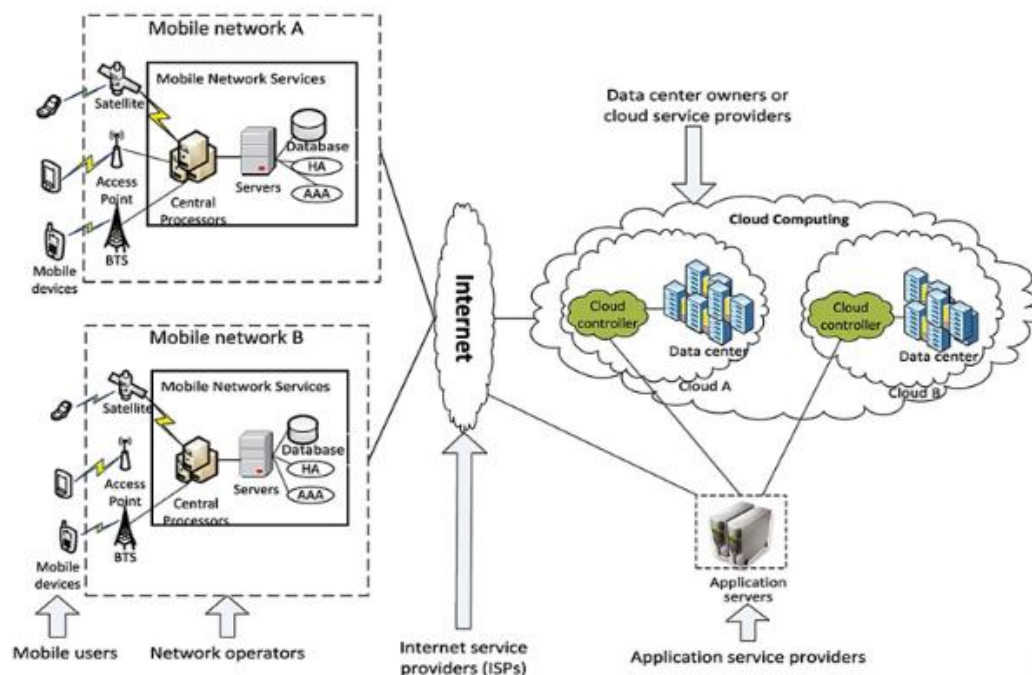


Fig. 5. Architecture of Mobile Cloud Computing (Kotwal and Singh, 2012)

## 5. Mobile Systems in Construction

Mobile applications have recently gained more popularity in the construction sector, and their adoption is vital, provided they are used appropriately and correctly. According to (Lu et al., 2015), the adoption of mobile applications is controlled by five different elements: the user, the technology, the organization, the project, and the environment. About the user, the application of new technologies requires training and knowledge. In terms of technology, it must be sufficiently easy, reliable, and provide security for the organization's information. When choosing and implementing technologies, project type, duration, cost, location, and specifications must all be taken into account. The environment also directly affects the choice of mobile applications, as there are various factors such as government regulations, market demand, competition factors, and other

factors that control the organizational behavior in the selection of mobile applications (Lu et al., 2015).

Smartphones give the possibility of continuous and daily feeding of information, so using them is a decision that most contractors think about. The benefit that can be obtained from using mobile applications on the construction site exceeds the cost of the application, training, and all costs related to their use (Barbarosoglu and Arditi, 2016). Real-time site data, as well as visual attachments, can even help a contractor gain the owner's trust. Contracting companies and professionals working in the construction industry can choose suitable and commercially available mobile applications to increase the efficiency of their work (Johnson and Wannemacher, 2011). **Table 1.** lists the most popular construction-related mobile applications available for purchase on Google Play and the Apple App Store.

**Table 1.** Summary of mobile applications related to the construction industry (Barbarosoglu and Arditi, 2016)

Specific Use	Application Name	Platform	Cost
<b>Bid Management</b>	SmartBidNet	iOS	Subscription Required
<b>BIM</b>	Autodesk BIM360 FieldBIMx	iOS iOS/Android	Subscription RequiredFree
<b>CAD, Design &amp; Drawings</b>	CAD Touch	iOS	Free
	Finger CAD	iOS	\$5.99
	REVITKeys	iOS	\$0.99
	iRhino 3D	iOS	\$3.99
	AutoCAD 360	iOS/Android	Free
	DAKO PRO Civil Eng.	Android	\$9.99
	Rilievo	Android	\$4.08
	AndCAD	Android	\$34.99
<b>Calculator</b>	Construction Master Pro	iOS/Android	\$24.99
<b>Contract Management</b>	Contract Maker Pro	iOS	\$4.99
	Contract Maker Elite	iOS	\$19.99
<b>Document Viewing</b>	Drawvis	iOS	Free
	iBlueprint	iOS	\$0.99
<b>Estimating</b>	Quick Service Estimates	iOS	Free
	Contractors Estimating	iOS	Free
	Construction Cost Estimator	iOS	\$19.99
	Ultimate Estimator	Android	\$4.99
	A Estimate All Pro	Android	\$3.99
<b>LEED</b>	Leed BDC Flashcards	iOS	\$19.99
<b>Project Management</b>	Procore	iOS	Subscription Required
	OnSite Punchlist	iOS	Free
	Construction Manager	iOS	Free
	ArchiReport	iOS	Free
	Safety	iOS	Free
	Safety Meeting	iOS/Android	Free
	Wrike	Android	Free
<b>Scheduling</b>	Project Plan 365	Android	Free
	Project Planning Pro	iOS/Android	Free

## 6. Conclusion

The construction industry is one of the most important basic industries in the economy of countries, and according to the complex nature of this industry and the different types of problems facing construction projects, there is an urgent need to develop the types of technologies and systems that must be integrated into projects to improve performance. The research showed the most important theoretical aspects of mobile information systems and aspects of their application in projects. It should be noted that it is important to develop more systems of this type and are determined by a certain aspect of project management

## 7. References

- [1] BARBAROSOGLU, B. V. & ARDITI, D. MOBILE APPLICATIONS FOR THE CONSTRUCTION INDUSTRY. 2016. ISEC.
- [2] CATTEDDU, D. Cloud Computing: benefits, risks and recommendations for information security. Iberic Web Application Security Conference, 2009. Springer, 17-17.
- [3] CHANDRASEKARAN, K. 2014. Essentials of Cloud Computing, Taylor & Francis.
- [4] DELGADO GARCIA, V. 2011. Exploring the limits of cloud computing.
- [5] DINH, H. T., LEE, C., NIYATO, D. & WANG, P. 2013. A survey of mobile cloud computing: architecture, applications, and approaches. *Wireless communications and mobile computing*, 13, 1587-1611.
- [6] Chaudhary, D. S. . (2022). Analysis of Concept of Big Data Process, Strategies, Adoption and Implementation. *International Journal on Future Revolution in Computer Science & Communication Engineering*, 8(1), 05-08. <https://doi.org/10.17762/ijfrcsce.v8i1.2065>
- [7] Boyapati, B. ., and J. . Kumar. "Parasitic Element Based Frequency Reconfigurable Antenna With Dual Wideband Characteristics for Wireless Applications". *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. 10, no. 6, June 2022, pp. 10-23, doi:10.17762/ijritcc.v10i6.5619.
- [8] HIRAN, K. K., DOSHI, R., FAGBOLA, T. & MAHRISHI, M. 2019. Cloud Computing: Master the Concepts, Architecture and Applications with Real-world examples and Case studies, BPB Publications.
- [9] JACOBS, D. 2006. Mobile Information Systems: Infrastructure and Design for Adaptivity and Flexibility. *Journal of Digital Information Management*, 4, 203-204.
- [10] JOHNSON, C. & WANNEMACHER, P. 2011. Mobile channel strategy: An overview. Forrester Research.
- [11] KOTWAL, P. A. & SINGH, A. R. Evolution and effects of mobile cloud computing, middleware services on cloud, future prospects: A peek into the mobile cloud operating systems. 2012 IEEE International Conference on Computational Intelligence and Computing Research, 2012. IEEE, 1-5.
- [12] LU, Y., LI, Y., SKIBNIEWSKI, M., WU, Z., WANG, R. & LE, Y. 2015. Information and communication technology applications in architecture, engineering, and construction organizations: A 15-year review. *Journal of Management in Engineering*, 31, A4014010.
- [13] Hermina, J. ., Karpagam, N. S. ., Deepika, P. ., Jeslet, D. S. ., & Komarasamy, D. (2022). A Novel Approach to Detect Social Distancing Among People in College Campus. *International Journal of Intelligent Systems and Applications in Engineering*, 10(2), 153-158. Retrieved from <https://ijisae.org/index.php/IJISAE/article/view/1823>
- [14] MARINELLI, E. 2009. Cloud Computing on Mobile Devices using MapReduce. Master Thesis Draft, Computer Science Dept., Carnegie Mellon University (CMU).
- [15] OTHMAN, M., MADANI, S. A. & KHAN, S. U. 2013. A survey of mobile cloud computing application models. *IEEE communications surveys & tutorials*, 16, 393-413.
- [16] PRASAD, M. R., GYANI, J. & MURTI, P. 2012. Mobile cloud computing: Implications and challenges. *Journal of Information Engineering and Applications*, 2, 7-15.
- [17] RIMAL, B. P., VAN, D. P. & MAIER, M. 2017. Mobile edge computing empowered fiber-wireless access networks in the 5G era. *IEEE Communications Magazine*, 55, 192-200.
- [18] SALZ, P. A. & MORANZ, J. 2013. The everything guide to mobile apps: A practical guide to affordable mobile app development for your business, Simon and Schuster.
- [19] SHRAVANTHI, C. & GURUPRASAD, H. 2014. Mobile Cloud Computing as future for mobile applications. *International journal of Research in Engineering and Technology*, 3, 2319-2322.
- [20] SHRIWAS, M. S., GUPTA, N. & SINHAL, A. 2012. Comparative Study of Cloud Computing and Mobile Cloud Computing. MEDHA-2012 Proceedings published by International Journal of Computer Applications (IJCA.).
- [21] WHITMORE, R., JEW, P., MUNN, K., EGAN, W., MARATHE, H., GORDON, R., HALL, C., WHITTAKER, M. & TAN, P. L. 2013. Oracle Fusion Middleware Developing Web User Interfaces with Oracle ADF Faces 12c (12.1. 2) E23447-01.