The New Conceptual Cloud Computing Modelling for Improving Healthcare Management in Health Organizations

Article *in* Science and Technology of Advanced Materials · January 2019

CITATIONS
2

READS
8

7 authors, including:

Mohamed Doheir
Technical University of Malaysia Malacca
23 PUBLICATIONS **79** CITATIONS
SEE PROFILE

Abdelrafe Elzamly
Al-Aqsa University
34 PUBLICATIONS **248** CITATIONS
SEE PROFILE

Burairah Hussin
Univesiti Teknikal Malaysia, Melaka
112 PUBLICATIONS **551** CITATIONS
SEE PROFILE

International Journal of Advanced Science and Technology
Vol. 28, No. 1, (2019), pp. 351-362

The New Conceptual Cloud Computing Modelling for Improving Healthcare Management in Health Organizations

Mohamed Doheir[1], AbdSamad Hasan Basari[2], Abdelrafe Elzamly[3], Burairah Hussin[4], NoorayisahbeMohd Yaacob[5], Sayed Samer Ali Al-Shami[6]
[1,2,4,5]*Information & Communication Technology, UniversitiTeknikal Malaysia Melaka (UTeM)*
[3]*Faculty of computer and information technology, Al-Aqsa University, Gaza, Palestine*
[6]*Institute of Technology Management and Technopreneurship, UniversitiTeknikal Malaysia Melaka*

Abstract

The aim of this paper is to propose the new conceptual cloud computing modelling for improving healthcare management in health organizations. The new conceptual cloud computing modelling modelling for improving healthcare management includes cloud computing service structures as cloud communications as a service, software as a service, platform as a service, and infrastructure as a service; and deployment models include public cloud, private cloud, hybrid cloud;and resources management in cloud computing like cloud mobility and API management, cloud organization process management, knowledge Administration of cloud systems, and cloud operation and environment management. However, we will determine the critical issues for cloud healthcare management in all components of cloud computing system. After then we will determine cloud solutions and controls to reduce critical issues in healthcare management. All critical issues in cloud computing will classify based on cloud computing management modeling system.Cloud computing environment should integrate among these components for improving cloud healthcare systems in health organization.
Keywords*: cloud computing, computing service structures, deployment models, resources management system*

1 Introduction

They proposed a framework to address these security issues at the authentication and storage level in cloud computing. While addressing the security issues the first and the foremost thing is to classify what data needs security and what data needn't bother with security and hence data gets classified into two classes sensitive and non-sensitive (Kaur & Zandu 2016). Additionally, the paper developed a quantitative risk model suitable for a dynamic mobile cloud environment. Also they used the model to analyze a mobile cloud based health application and report our findings, which have implications for cloud computing as a whole (Samad et al. 2013). All of these factors are motivating healthcare providers to consider cloud computing as a solution to help them swiftly integrate with other practices, cut costs, maintain quality, meet regulations, safeguard patient information, and increase productivity.Although there are many methods in software risk management, software development projects have a high rate of risk failure. Much of the failure could be avoided by managers pro-actively maintenance and dealing with risk factors rather than waiting for problems to occur and then trying to react

ISSN: 2005-4238 IJAST

(Elzamly & Hussin 2016). Healthcare has many unique requirements when it comes to technology, which is why adopting purpose-built, cloud-based solutions is becoming an ever-more attractive alternative to support a diversified infrastructure, access resources on- demand, speed provisioning, and ensure in-house data security (ClearDATA 2014). Several serious issues concerning security, data protection and ownership, quality of services, and mobility need to be resolved before cloud computing can be widely adopted(Hoang & Chen 2010). Although much research and progress in the area of cloud computing project, many today cloud computing projects have a very high failure rate especially when it comes to the banking area(Elzamly, Hussin & ASH 2016; Elzamly et al. 2017). This paper proposes Mobile Cloud for Assistive Healthcare (MoCAsH) as an infrastructure for assistive healthcare. Besides inheriting the advantages of Cloud computing, MoCAsH embraces important concepts of mobile sensing, active sensor records, and collaborative planning by deploying intelligent mobile agents, context-aware middleware, and collaborative protocol for efficient resource sharing and planning(Hoang & Chen 2010). This cloud maturity scape is for healthcare organizations that are interested in understanding how they can take the necessary actions to move forward successfully with cloud computing or to improve the results from existing cloud projects. The model has the following functions (Hanover 2014). Despite much research and progress in the area of software project management, software de- velopment projects still fail to deliver accept- able systems on time and within budget (Elzamly & Hussin 2015).

However, they introduced the concepts of PHM and discuss the opportunities provided by the IoT. Developments are illustrated with examples of innovations from manufacturing, consumer products, and infrastructure. From this review, a number of challenges that result from the rapid adoption of IoT-based PHM are identified. These include appropriate analytics, security, IoT platforms, sensor energy harvesting, IoT business models, and licensing approaches (Kwon et al. 2016). Therefore, the main aim of this paper is to propose a new framework to secure cloud computing, prevent security risks and improves the performance and the time of data processing .This framework combines between various powerful security techniques such secret sharing schema, Fully Homomorphic Encryption (FHE), multi cloud approach and the implementation of a processing dispatcher which distributes a set of operations on FHE encrypted data between a number of processing engines (Zibouh et al. 2016). The proposal is presented as an access control model based on an extension of the XACML standard with three new components: the Risk Engine, the Risk Quantification Web Services and the Risk Policies (Ricardo et al. 2014). Additionally, they proposed a new conceptual framework for cloud computing risk management in banking organizations (Elzamly, Hussin, Naser, et al. 2016). However, we will explain the new model for cloud computing healthcare management in Figure 1.

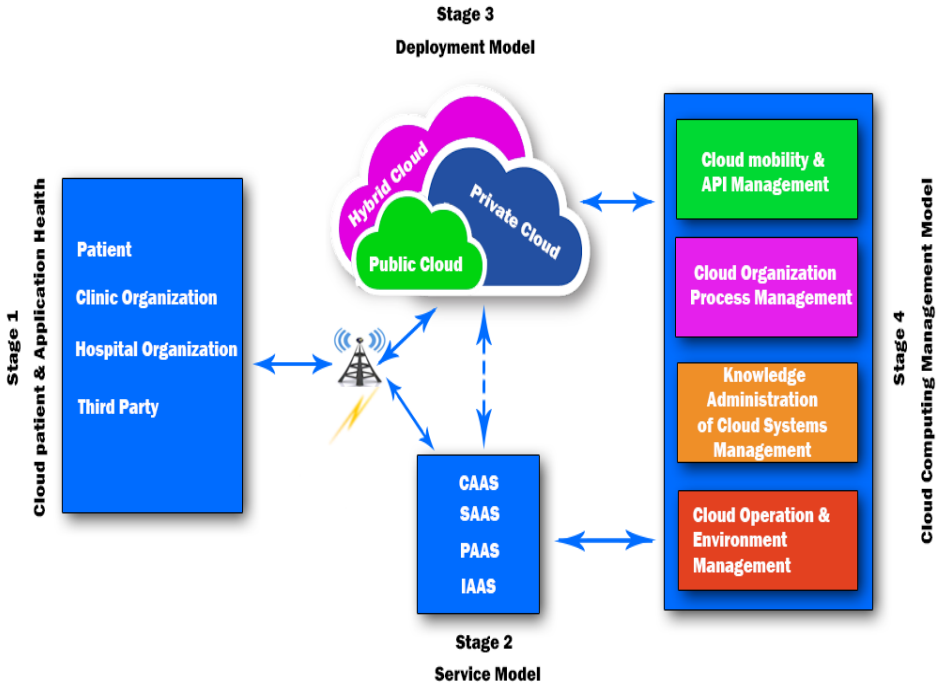

Figure 1 Design the new conceptual cloud computing model for Improving Healthcare Management

In this model, we will determine the critical issues for cloud healthcare management in all components of cloud computing system. After then we will determine cloud solutions and controls to reduce critical issues in healthcare management. All critical issues in cloud computing will classify based on cloud computing management model that includes cloud mobility and API management, cloud organization process management, cloud knowledge management, cloud operation and environment management. However, we need to select the techniques and methods to control the issues by using support vector Regression (SVR), other regression analysis techniques. Then a model, which has integral components of a cloud healthcare management system for improving, follows the next steps:

Step1: Initialization of the model reviews the critical issues for cloud healthcare management in all components of cloud computing system (stage1, stage2, stage3).

Step2: Identifying and classifying the critical issues for cloud health care management based on cloud computing management model (cloud mobility and API management, cloud organization process management, cloud knowledge management, cloud operation and environment management).

Step3: Determining the solutions and control factors that help the developers and cloud managers to reduce it.

Step 4: Using the techniques and methods for mitigating the critical issues in cloud healthcare management by SVR,and otherregression techniques

Step 5: finally create new models formanaging cloud issues in healthcare organization.

2 Cloud Computing Service Structures

The service structures make up the particularity of this new system of communication and information distribution and sharing on the Internet. This system greatest feature is on the system service structures (i.e. Hardware, software and

operational infrastructures distribution on completely separated locations, but all acting/operating as a single housed blocks system like the model. There are four basic cloud deployment models based on the National Institute for Standards and Technology (NIST). This new internet computing services are typically characterized by the following computing systems set into three layers. These are: a Computing unit, system's storage unit, then an inter-systems information exchange unit, which are all commonly labelled in literature as shown in Figure 2.

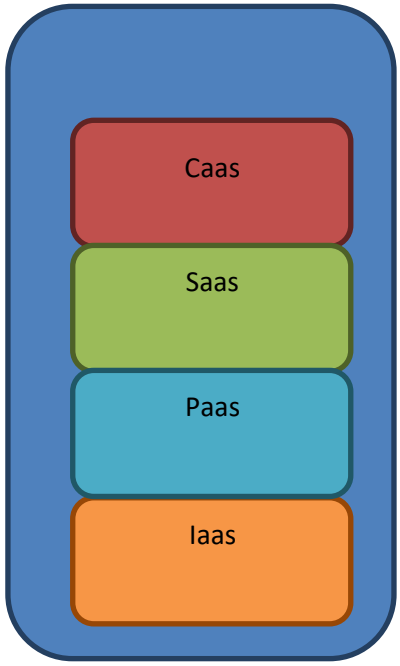

Figure 2Service structures Architecture

Legend: The entities /units/blocs into above Figure 2 are commonly defined in literature as:

- CaaS: Communication as a Service
- SaaS,: Software as a Service
- PaaS: Platform as a Service
- IaaS: Infrastructure as a Service

2.1 Communications as a Service

The cloud system communications are made possible through CaaS (See Figure 2) as the communications mechanisms between the cloud service providers. Furthermore, they also ensure applications and/or data migration between different clouds to enable inter-clouds to communicate and achieve scalability as well as data integrity. The concept is referred as Intercloud, which enables the various cloud vendors to exchange information on behalf of their clients as well as the vendors (Rajaei & Wappelhorst 2011). The services provisioning mechanism represented by "CaaS" refers to different possible individual group specialized and acting promptly to satisfy the demanded service that can be any of IT/ICT application service (e.g. HTTP, VoIP applications). It is used for authentication and authorization of servers and data so that security can be maintained. These services are developed through web applications and database servers.

The architecture of mobile cloud computing is highly specialized where a large number of resource are pooled together for delivering quality services to end users. The ability to access large amount of data and processing data through clouds can only be achieved when strong and power server and resources are employed (Dinh et al. 2013; Jansen & Grance 2011a).

2.2 Software as a Service (SaaS)

SaaS is aimportant cloud application which provides direct connections link into controlled and managed servicesonline (Dinh et al. 2013). Itsmain function has to do with providing a platform where the applications live into third party database and their delivery through global networks, Cloud's customers using this delivery service of cloud computing to deploy the cloud's installations; then use the application on fix (PC) or mobile computers. However, another virtual system labeled SaaS is a mechanism creating the interactions to various open application services (e.g. Amazon. Google map) on the Internet (Khan et al. 2016); and it allows users to get all they need as applications software ready for use on any of their computer without any pre-installation but just by clicking the link (Huth & Cebula, 2011) ;and therefore that service is mainly for ensuring the availability of the different systems for use to every subscriber (Strowd & Lewis, 2010). In general, services application based cloud computing is just a ready to use free from any deployment or maintenance tasks social media-networks service applications apply. Therefore, it is the providers enabled link to their service application online that is offered for access to users (Gavrilov & Trajkovik, 2012).

2.3 Platform as a Service (PaaS)

Furthermore, they indicated that platform as a service consists of e-health environment where cloud applications are deployed with minimum costs of purchasing the hardware or software (Dinh et al. 2013). In most cases, some applications and support of cloud computing are provided from within its other systems developers. For instance, an android is the case with the developers and providers of android operating system and applications and services used through the clouds. This enables extensive data processing on the clouds and services are accessed by users at any place and at any time (Gellman 2009). With PaaS, application programming interfaces (APIs) are provided for direct use on the cloud. This cloud's tool or system is generally its own laboratory for its developer's members ; and it even allows other task or skill specialists (e.g. vendors) to be hired and then to use it for outsourced application job (Shared Assessments, 2010); and this status has offered special advantages and new business opportunities in applications development to advance skilled developer.

2.4 Infrastructure as a Service (IaaS)

Based on (Dinh et al. 2013), the infrastructure as mobile computing service consists of the hardware services which are needed to store cloud applications as well as real software system to support their operation. They represent all to include from the server to the networking physical infrastructures and along with all the intelligence that are used to create the systems as viewed online. In fact, such applications are supplied by cloud specialist developers such as Amazon (Cisco 2012). Furthermore, the infrastructure for cloud computing is mainly of two types where virtualization and para-virtualization

are used. Virtualization and para-virtualization have relevance for cloud computing because it is the most appropriate method to access services in the cloud. Full virtualization requires specific hardware combinations to make highly effective and efficient. It has been successful due to sharing of computer system among several users. Multiple users can share and make use of computer systems through cloud computing.

However, IaaS can be said the cloud supplier for its virtual facilities in term of computing units, networking systems and datahouse(Khan et al. 2016). However, an IaaS agreement, as the name states, deals primarily with computational infrastructure. It is another clouds subscription's condition that IaaS layer contents will be supplied to user by clouds management (Huth & Cebula, 2011). However, subsvribers are given some bonuses in using IaaS for personal application developments, including some configuration limits. These resources typically provide a variety of interfaces to facilitate interaction, and there are usually additional services provided, such as query services for storage resources (Strowd & Lewis 2010). IaaS can be seen virtual platform offered to all users to carry out their multipurposes tasks, subject to available required facilities; but the data security matter remains the subcriber's responsibility, mainly for healthcare systems (Gavrilov & Trajkovik, 2012).

3 Deployment models

The models choice is subbect to subscriber interests and how much he/she can afford financially; many enterprises prefer public model (Khan et al. 2016). Those choosing private model possess all necessary application and request only for being hosted(Khan et al. 2016). Further, cloud computing is a model for on demand network access to a shared pool of resources such as servers, storage, applications and related services(Taneja & Tyagi 2017). These are: public cloud, private cloud, and hybrid cloud, which are all commonly named in literature as shown in Figure 2.5.

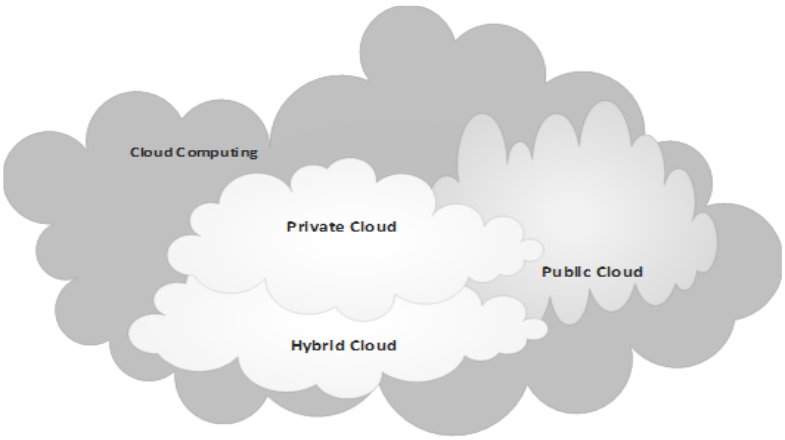

Figure 3The diagram for Cloud Computing Deployment Models

3.1 Public Cloud

Public clouds are the most common computing resources which provided offsite and over the internet through an external company such as Amazon. Public clouds have gained immense significance due to the easy access to information and applications; it provides to many internet's user its systems for sharing common infrastructure and this has led towards increased demand for cloud computing.

3.2 Private Cloud

Therefore, the importance of private clouds emerged from having secured data. However, the costs of maintaining private cloud are high which needs to be reduced in future. Both the public and private clouds play an essential part in managing computer resources and IT networks (Gaffo & Barros 2012; Jansen & Grance 2011a). Private - the accessibility and availability of the patient condition information, analysis, and prescription to medical professional only. To a confined use within an enterprise whether by few individual or the entire community, private cloud applies(Huth & Cebula 2011; Jansen & Grance 2011b); but, this restriction does not reduce anything from management to the infrastructures support as compared to other deployment model features (Jansen & Grance 2011a); similarly, the attributes (e.g. public or external,, private or internal) often used in naming a model are simply a matter of language synonyms (Reyana & Amutha, 2016).

3.3 Hybrid Cloud

It refers to a combination of the two models of cloud computing viewed under one ownership. A typical example is about an internal cloud based service owner who is sharing another business with an external one owner. Therefore, whenever any of the two partners presents that business, the platform of presentation is considered a hybrid cloud (Goyal, 2014). Furthermore, hybrid cloud which can expose some information to the Internet happens between the public cloud and private cloud. It is mainly used in private companies (Phumcharoen 2017).However, hybrid cloud are still getting sufficient support regarding their operation requirements between end-users and servers at cloud side (Khan et al. 2016).

4 Types of Resources Management in Cloud Computing

Among others options, resources pool centralized management is known as the main feature in clouds system services operation. This method through the virtual storage technology anddistributed deployment of cloud services allows to provide users with a huge service's centers to facilitate the user's centralized storage, online office, shared resources and other applications(Lu 2016). And with the help of network communication equipment, the user can according to the business needs of the selective service, and according to the use of the amount of pay, in order to save investment costs while enjoying high performance cloud services(Lu 2016). Most of/ cloud service's providers deploy more efforts only in ensuring the systems with computing resources availability;they generally neglect forecasting about the required category and amount and thus getting ready with before their subscriber's demands.In fact, not every cloud services' consumers are aware of these details and their implication on the system she/he is using. This situation's drawback is the misuse of cloud computing time for such

requests that are often untimely and of little importance (Xu & Li 2016). The current thesis study intends to suggest an enhanced version of exiting SVM to address the issue of credit analysis. The model combines random subspace strategy and boosting strategy, which encourages diversity. SVM is considered as a state-of-art model to solve classification problem(Yao & Lian 2016).Some key advantages of acquiring this most beneficial technology are pay-as- per-use, high fault tolerant, high scalability, improved performance, better and quicker infrastructure setup, least or no infrastructure / platform maintenance (Ahamed & Iyengar 2016). Furthermore, Cloud computing have certain characteristics like Agility, Elasticity, multitenancy, location independency, on-demand service, resource pooling (Ahamed & Iyengar 2016). Among difficult operational issues of healthcare operators, are the instability and growing number of customers who can be reached only through cloud, and thus increasing the initial information exchange safety problems (CA Technologies, 2014). The huge economical and industrial advantages deploying cloud services are threatened by either of the following various problems (Gordon, 2010).The Cloud computing management model can be divided into cloud mobility and API management, cloud organization process management, knowledge administration of cloud systems, and cloud operation and environment management as follow in Figure 2.6:

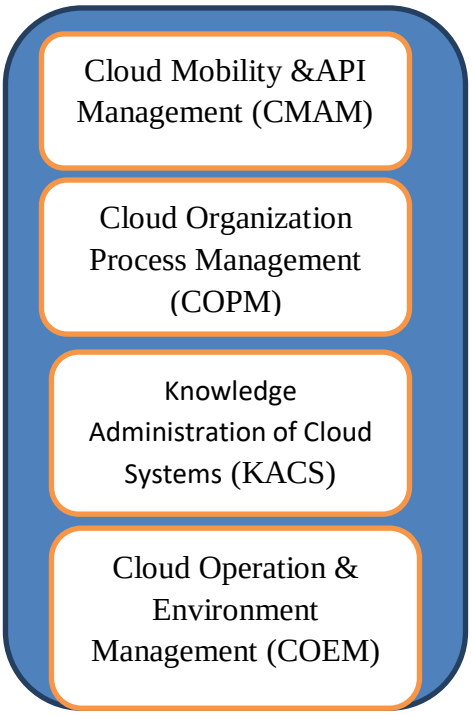

Figure 4The diagram for Cloud Computing Management Models

4.1 Cloud Mobility and API Management

API platforms play a critical role in powering an organization's mobile and social media strategy. They also enable organizations to embrace a world of smart devices and sensors, popularly known as the 'Internet of Things' (IoT) (Naidu & Vasantharaj 2015). There are many components for API Management such as API Gateway, API Developer Portal, Enterprise Service Manager (ESM)(Development, staging, life-cycle management of up to production operation, Analysis of data, performance monitoring). Safety in Cloud

Mobility and API Management create a centralized security control with a single security control base using the cloud blocs/units interconnection architecture in matter of services and user's authentication check, including other related tasks (Lele & Lihua 2016).

4.2 Cloud Organization Process Management

This is all about how to handle and support for instance a cloud based enterprise services and enable/design a coordination of access levels' into its software base (Emam 2005). The enterprise subscribing such a service must comply with the cloud services provider's guideline such as the type of improvements offered and conditions(Emam 2005).In such a contract, the "process focus" refers to the organization's computed set of services, whose tasks effective execution must undertake by the cloud provider's managementwith warranty for improving the contemporary process situation (Naik & Priyadarshi Tripathy 2008).However, the operation of the organization's current process status and expectation and subscribing to cloud management support must be documented at contracting time (Naik & Priyadarshi Tripathy 2008).

4.3 Knowledge Administration of Cloud Systems

This is a multiple disciplinary approach to achieving organizational objectives by making the best use of knowledge (Abdulrahman et al. 2015). It can be seen also as knowledge administration or management in an organization perspective for being about how to well-utilize the knowledge base in its overall information system (i.e. data and information, and their utilization tools), (Wolf 2001).However, cloud knowledge administration expects to improve cloud performance and mainly enable minimizing some risks involved regardless of prediction (Cooper 2003); this latter being the main challenging task fading cloud and users together. In expectation of enabling better use of an organization's resources to achieve its goals, knowledge management achievement success is subject to human skills support (Wolf, 2001). Probably with cloud technology growing improvement, eHealth services model is expanding around the world; and their particular issues are the information and exchange standards (Gavrilov & Trajkovik, 2012) .

4.4 Cloud Operation and Environment Management

Clouds perform on the basis support of its general infrastructures and associated management and control systems, along with applications service systems , acting all together to ensure permanent services delivery to all subscribers (Lele & Lihua 2016). Databases or data house/warehouse (i.e. datacenters) are the basis components of cloud environment (Xu et al. 2016). Cloud computing environment, the construction of digital libraries include computing resources, digital information resources, storage space, user interface and application information systems, according to the characteristics of cloud computing technology at present, application status and associated data technology to build digital library actual demand conditions. Application platform the entire digital library in services platform, and core part of the library of cloud services platform, which includes software layer and the platform layer. Among them, the software layer integrates a variety of library applications, business management systems, and a variety of Web (Li & Cui 2016). Good resource management architecture can highly improve the cloud computing system in the availability, robustness, etc. System architecture is a key issue to be considered in the establishment of cloud computing environment (Li 2016). Lastly,

the issues related clouds operation are some technical aspects must be viewed and reconsidered in design time, Some examples include computing offload modeling and the relevant pros and cons when or not implemented; how network end nodes shift or change of location can influence the behavior of systems through some networking protocol (Fernando et al. 2013).

5 Conclusions

The aim of this paper is to propose the new conceptual cloud computing modelling for improving healthcare management in health organizations. The new conceptual cloud computing modelling modelling for improving healthcare management includes cloud computing service structures as cloud communications as a service, software as a service, platform as a service, and infrastructure as a service; and deployment models include public cloud, private cloud, hybrid cloud;and resources management in cloud computing like cloud mobility and API management, cloud organization process management, knowledge Administration of cloud systems, and cloud operation and environment management. However, we will determine the critical issues for cloud healthcare management in all components of cloud computing system. After then we will determine cloud solutions and controls to reduce critical issues in healthcare management. All critical issues in cloud computing will classify based on cloud computing management modeling system. Cloud computing environment should integrate among these components for improving cloud healthcare systems in health organization.

6 References:

[1] Abdulrahman, H., Poh, N. & Burnett, J., 2015. Privacy preservation, sharing and collection of patient records using cryptographic techniques for cross-clinical secondary analytics. In *IEEE SSCI 2014 - 2014 IEEE Symposium Series on Computational Intelligence - CICARE 2014: 2014 IEEE Symposium on Computational Intelligence in Healthcare and e-Health, Proceedings*. pp. 148–153.

[2] Ahamed, J. & Iyengar, N., 2016. A Review on Distributed Denial of Service (DDoS) Mitigation Techniques in Cloud Computing Environment. *International Journal of Security and Its Applications*, 10(8), pp.277–294.

[3] CA Technologies, 2014. *Healthcare Security Solutions: Protecting your Organization, Patients, and Information*, Available at: ca.com.

[4] Cisco, 2012. *Cisco Systems*, Available at: http://www.cisco.com/assets/cdc_content_elements/docs/annualreports/ar2012.pdf.

[5] ClearDATA, 2014. *Best Practices in Cloud Computing for the Healthcare Industry*, Available at: http://www.gartner.com/newsroom/.

[6] Cooper, L., 2003. A research agenda to reduce risk in new product development through knowledge management: a practitioner perspective. *Journal of Engineering and Technology Management*, 20(1–2), pp.117–140. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0923474803000079 [Accessed October 31, 2010].

[7] Dinh, H.T. et al., 2013. A Survey of Mobile Cloud Computing : Architecture , Applications , and Approaches. *Wireless Communications and Mobile Computing* -, (Cc), pp.1–38.

[8] Elzamly, A., Hussin, B., Naser, S.A., et al., 2016. A New Conceptual Framework Modelling for Cloud Computing Risk Management in Banking Organizations. *International Journal of Grid and Distributed Computing*, 9(9), pp.137–154.

[9] Elzamly, A. et al., 2017. Predicting Critical Cloud Computing Security Issues using Artificial Neural Network (ANNs) Algorithms in Banking Organizations. *International Journal of Information Technology and Electrical Engineering*, 6(2), pp.40–45.

[10] Elzamly, A. & Hussin, B., 2015. Modelling and Evaluating Software Project Risks with Quantitative Analysis Techniques in Planning Software Development. *Journal of Computing and*

Information Technology, 23(2), pp.113–120.

[11] Elzamly, A. & Hussin, B., 2016. Quantitative and Intelligent Risk Models in Risk Management for Constructing Software Development Projects: A Review. *International Journal of Software Engineering and Its Applications*, 10(2), pp.9–20.

[12] Elzamly, A., Hussin, B. & ASH, B., 2016. Classification of Critical Cloud Computing Security Issues for Banking Organizations: A Cloud Delphi Study. *International Journal of Grid and Distributed Computing*, 9(8), pp.137–158.

[13] Emam, K., 2005. *The ROI from software quality*, Auerbach Publications.

[14] Fernando, N., Loke, S.W. & Rahayu, W., 2013. Mobile cloud computing: A survey. *Future Generation Computer Systems*, 29(1), pp.84–106. Available at: http://dx.doi.org/10.1016/j.future.2012.05.023.

[15] Gaffo, F.H. & Barros, R.M. De, 2012. GAIA Risks - A Service-based Framework to Manage Project Risks.

[16] Gavrilov, G. & Trajkovik, V., 2012. Security and Privacy Issues and Requirements for Healthcare Cloud Computing. *ICT Innovations 2012 Web Proceedings*, pp.143–152.

[17] Gellman, R., 2009. *Privacy in the clouds: risks to privacy and confidentiality from cloud computing*, Available at: http://www.worldprivacyforum.org/pdf/WPF_Cloud_Privacy_Report.pdf%5Cnhttp://www.citeulike.org/group/17033/article/11066827.

[18] Gordon, J., 2010. *Exploring the Future of Cloud Computing : Technology-Driven Transformation*, Available at: http://www3.weforum.org/docs/WEF_ITTC_FutureCloudComputing_Report_2010.pdf.

[19] Goyal, S., 2014. Public vs Private vs Hybrid vs Community-Cloud Computing: A Critical Review. *International Journal of Computer Network and Information Security*, 6(3), pp.20–29. Available at: http://www.mecs-press.org/ijcnis/ijcnis-v6-n3/v6n3-3.html.

[20] Hanover, J., 2014. *Business Strategy: IDC MaturityScape — Cloud in Healthcare Provider*,

[21] Hoang, D. & Chen, L., 2010. Mobile Cloud for Assistive Healthcare (MoCAsH). In *2010 IEEE Asia-Pacific Services Computing Conference Mobile*. pp. 325–332.

[22] Huth, A. & Cebula, J., 2011. *The basics of cloud computing*,

[23] Jansen, W. & Grance, T., 2011a. *Guidelines on Security and Privacy in Public Cloud Computing*, Available at: http://csrc.nist.gov/publications/nistpubs/800-144/SP800-144.pdf.

[24] Jansen, W. & Grance, T., 2011b. *Guidelines on Security and Privacy in Public Cloud Computing*, Available at: http://csrc.nist.gov/publications/nistpubs/800-144/SP800-144.pdf.

[25] Kaur, K. & Zandu, V., 2016. Secure Data Classification Model in Cloud Computing Using Machine Learning Approach. *International Journal of Grid and Distributed Computing*, 9(8), pp.13–22.

[26] Khan, A. et al., 2016. Critical Analysis of Cloud Computing Software Development Process Models. *International Journal of Software Engineering and Its Applications*, 10(11), pp.451–466. Available at: http://dx.doi.org/10.14257/ijseia.2016.10.11.36.

[27] Kwon, D. et al., 2016. IoT-Based Prognostics and Systems Health Management for Industrial Applications. In *SPECIAL SECTION ON TRENDS AND ADVANCES FOR AMBIENT INTELLIGENCE WITH INTERNET OF THINGS (IoT) SYSTEMS*. pp. 3659–3670.

[28] Lele, Q. & Lihua, K., 2016. Technical Framework Design of Safety Production Information Management Platform for Chemical Industrial Parks Based on Cloud Computing and the Internet of Things. *International Journal of Grid and Distributed Computing*, 9(6), pp.299–314.

[29] Li, J. & Cui, C., 2016. Mobile Cloud-based Big Data Library Management System. *International Journal of Grid and Distributed Computing*, 9(8), pp.335–344.

[30] Li, Z., 2016. Design of Cloud Computing Platform for Education Laboratory. *International Journal of Grid and Distributed Computing*, 9(5), pp.217–228.

[31] Lu, K., 2016. Study on Data Privacy Monitoring of Cloud Computing and Access Control Strategy. *International Journal of Grid and Distributed Computing*, 9(7), pp.237–242.

[32] Naidu, N. & Vasantharaj, V., 2015. *API Management Platforms - Digital Glue in the API economy*,

[33] Naik, K. & Priyadarshi Tripathy, 2008. *Software Testing and Quality Assurance: Theory and Practice*, Wiley-Spektrum.

[34] Phumcharoen, J., 2017. Cloud Computing : The challenges of software business. *International Journal of Applied Computer Technology and Information Systems*, 6(2), pp.6–10.

[35] Rajaei, H. & Wappelhorst, J., 2011. Clouds & Grids: A Network and Simulation Perspective. In

Conference: 2011 Spring Simulation Multi-conference, SpringSim '11, Boston, MA, USA. pp. 143–150.

[36] Reyana, A. & Amutha, M., 2016. Security Enhancement Using P-Encryption Approach for Safer Clouds. *IJSRSET* |, 2(5), pp.445–448.

[37] Ricardo, D., Westphall, C. & Westphall, C., 2014. A Dynamic Risk-based Access Control Architecture for Cloud Computing. In *2014 IEEE Network Operations and Management Symposium (NOMS)*. p. 9.

[38] Samad, J., Loke, S. & Reed, K., 2013. Quantitative risk analysis for mobile cloud computing: A preliminary approach and a health application case study. In *12th IEEE International Conference on Trust, Security and Privacy in Computing and Communications Quantitative*. pp. 1378–1385. Available at: http://www.scopus.com/inward/record.url?eid=2-s2.0-84893476701&partnerID=40&md5=696bfd6c4da0e34b13d06c20c312b289.

[39] Shared Assessments, 2010. *Evaluating Cloud Risk for the Enterprise : A Shared Assessments Guide*,

[40] Strowd, H.D. & Lewis, G.A., 2010. *T-Check in system-of-systems technologies: Cloud computing*, Available at: http://repository.cmu.edu/sei/43/%0Ahttp://www.sei.cmu.edu/reports/10tn009.pdf.

[41] Taneja, D. & Tyagi, S., 2017. Information Security in Cloud Computing : A systematic Literature Review and Analysis. *International Journal of Scientific Engineering and Technology*, 6(1), pp.50–55.

[42] Wolf, B., 2001. 1 Introduction to Knowledge Management. In pp. 1–30.

[43] Xu, L. & Li, J., 2016. Building Efficient Resource Management Systems in the Cloud : Opportunities and Challenges. *International Journal of Grid and Distributed Computing*, 9(3), pp.157–172.

[44] Xu, L., Wang, W. & Zhang, X., 2016. Oriented-SLA and Energy-Efficient Virtual Machine Management Strategy of Cloud Data Centers. *International Journal of Grid and Distributed Computing*, 9(1), pp.237–248.

[45] Yao, J. & Lian, C., 2016. A New Ensemble Model based Support Vector Machine for Credit Assessing. *International Journal of Grid and Distributed Computing*, 9(6), pp.159–168.

[46] Zibouh, O., Dalli, A. & Drissi, H., 2016. Cloud Computing Security Through Parallelizing Fully Homomorphic Encryption Applied to Multi-Cloud Approach. , 87(2), pp.300–307.