

Proposing a New Model for Quality of Service Acceptance

Marwan Bsharat, Othman Ibrahim, Sawsan Bsharat

Abstract: *Quality of service (QoS) has been proofed to be a great significance effect in the utilization of cloud service in higher education institutions (HEI's), due to having many aspects determine the acceptance level of QoS while providing cloud service, QoS acceptance not given sufficient attention from HEIs and decision-makers. In this research, previous QoS studies are review in this field to identify QoS acceptance variables by review studies for the last 5 years. Thus, with the aim to discover QoS aspects this research intends to develop an integrated model to understand these variables and relationship between QoS acceptance variables, which must be efficiently studied. Hence, the integrated model between TOE (Technological, Organizational, and environmental) and HOT (Human, Organizational, and Technological) theory is presented in this research to be the core contribution. The integrated model helps HEIs to evaluate and explore QoS aspects to increase utilizing of cloud service, improving HEIs efficiency, and help decision-makers to facilitate the acceptance of QoS in HEIs.*

Keywords: Quality of Service; Acceptance; HEI; TOE framework; HOT framework; cloud service

I. INTRODUCTION

Higher Education Institutions (HEIs) are considered to be one of the primary pillars of community change as it associates among governments, industry, and colleges [1]. HEIs have advanced from the use of the traditional education process to achieve knowledge towards continuous modernization of the Information Technology (IT) infrastructure in order to improve research and learning events by using cloud services [2]; [3]; [4]. The quality and number of services are improved in new technology; therefore, there is an increase in the number of HEIs that switch from the traditional form to the online service form. [5, 6]. Cloud Service is a developing innovation. Advance in processing power, connectivity, virtualization, and storage are consolidated to make a new environment [7, 8]. The computing scene is quickly changing towards creating developing software utilized by millions to expand as a service [9]. Cloud service helps to reduce costs significantly while developing the speed of use application, computing assets get to be distinctly less expensive and effective and more pervasively accessible than any time [8, 10].

Revised Manuscript Received on July 06, 2019.

Mr. Marwan Bsharat is third year of Ph.D. in Quality of Service of cloud service in the education industry at the University Technology Malaysia.

Dr. Othman Bin Ibrahim, Associate Professor head of university Technology Malaysia career center, he received PhD in Computation 2004 from University of Manchester Institute of Science and Technology, Malaysia.

Ms. Sawsan Bsharat her education in computer science 2009, from Al-Najah National University – Palestine,

The proficiency and adequacy of Cloud Service are essential in higher education. The capacities of this innovation can be utilized to support group collaborative learning in education industry [11-13].

Cloud computing services ensure the access of a broad number of clients while it still guarantees the quality, availability, and security of its service [14]. Also, HEIs have the capacity to improve their services, and accommodate the maximum number of students and/or staff [15]. Moreover, cloud service innovation is employed as a response to a need to create a service offered by many organizations, especially HEIs, to decrease the cost of utilizing servers on the premises [3, 16].

Quality of Service (QoS) is the combination of many properties, such as availability, which is the time during which a service is at work, security properties, which incorporate the presence and types of confirmation mechanisms the services offer, and reaction time [17-20]. Moreover, QoS is an expansive term utilized to depict the general experience of clients or applications provided over a network [21]. In fact, the level of fulfillment experienced by the client (teachers or student) must be higher than that achieved by the normal service [22, 23].

II. QUALITY OF SERVICE ROLE IN CLOUD SERVICE

The degree of QoS acceptance in utilizing cloud service by HEIs can be measured by the increase of service use, which is expected to help support and improve the learning process in HEIs. In recent years, organizations, particularly HEIs, have shown the enormous migration of IT applications and services to the cloud. The main concern of decision-makers in HEIs when migrating to the cloud is the QoS aspects, whereas these aspects include for instance availability, reliability, performance [6, 20], IT infrastructure [24], cost [25], human capital [26], and service provider [11].

HEIs needs to identify QoS variables from different aspects for instance regulation, cost reduction, and trustworthy [27, 28], while another researcher has been identifying other factors such as performance and environments [29, 30], ICT infrastructure, user satisfaction, clients' needs security, and reliability [24]. Many researchers start investigate QoS in different aspects such as [31] study QoS from perspective of SLA contract management, [32] also explore QoS from allocating optimal resources, and [33] study QoS from cloud provider aspect to how can provider collaborate consistently to procure more assets in peak time to satisfy their QoS targets.

Proposing a New Model for Quality of Service Acceptance

III. JUSTIFICATION OF INTEGRATION TOE FRAMEWORK AND HOT-FIT FRAMEWORK

Tornatzky [34] present the TOE framework, which affords supportive theory to understand the QoS variables and their relations and provide robust analytical theory to contemplating organizational level acceptance in various categories of technologies [35, 36]. TOE utilize in organization level to predicts adoption and acceptance process of technology [37]. A study of the literature indicates that the TOE framework [34] provides a supportive framework for understanding QoS acceptance of cloud service utilization, As well, TOE framework, [35] trusted that the principle estimations of TOE are solid hypothetical bases and reliable exploratory support, and its Empirical discoveries from these examinations asserted that the TOE is an important framework in which to appreciate its technology acceptance [34, 38, 39]. The TOE framework includes three main factors related to an organization's context that could affect the acceptance of technological tools: (1) the technological dimension, (2) the organizational dimension, and (3) the environmental dimension. As shown in (Fig.1).

A study about IT utilizing HOT structure conducted that it builds up a superior and clarifying intra-firm development acceptance [40]. However, the clarification control for institution technology acceptance reception must become acquainted with different factors that can be considered as various layers of the case that impact the outline and the utilization of data innovation for example the individual, the assignment [41, 42], human variables [43], variables to consolidate with the environmental, technological and organizational settings.

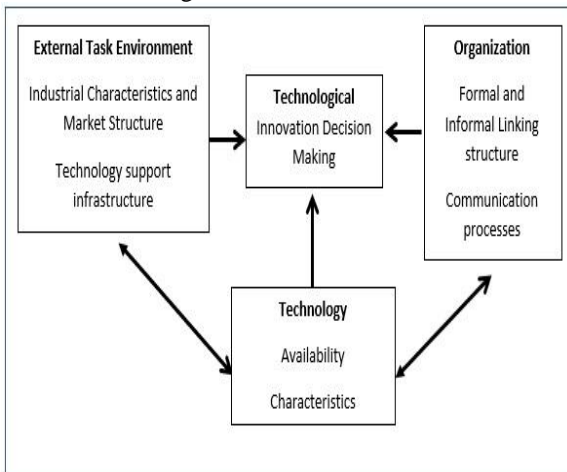


Figure 1: TOE framework [34]

The Hot-fit framework has technological and organization, this framework, unlike TOE use human factor which includes users experience and expectations which helps to identify human capital in organizations, this dimension plays a critical rule in QoS acceptance [36, 44]. Additionally, HOT-fit framework [43] highlighted extra qualities, for example, fit between technological, human and organizational parameters, human dimension helps to detect human experiences in the organization [27], and fit between technology and human aspect [43].

As shown in (Fig.2). Moreover, these extra highlights empower more understanding and a holistic approach to evaluate the assessment. In this research, the researcher

intends to use a portion of HOT-fit framework which is Human context to find the influence of human on QoS acceptance of utilization cloud service.

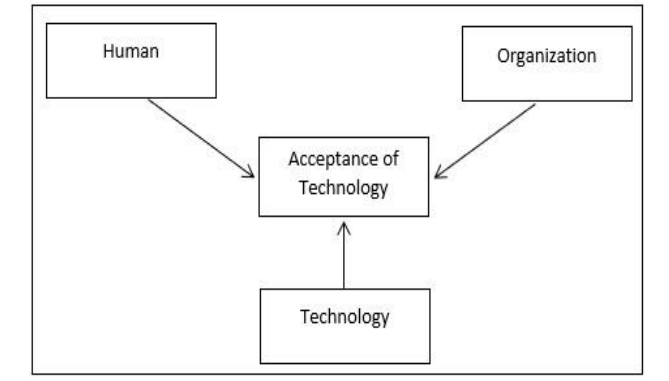


Figure 2: HOT-fit framework [43]

IV. RESEARCH METHODOLOGY

The methodology used to achieve this research by exploring the most significant factors influencing QoS acceptance. The research achieves this objective by review prior factors which are conducted by many studies, and research material has been studied to conduct the factors influencing QoS acceptance. The primary studies include more than 20 papers in the conferences and journals from 2013 to 2018. 14 factors which came from reviewed studies were perceived as the most significant factors in the previous investigations. At that point, QoS acceptance factors which were recognized were build up in the research model.

V. CONCEPTUAL RESEARCH MODEL

The conceptual model presented in this research gotten from integrated TOE (Fig.1) and HOT framework. The main aim of the conceptual model to understand, evaluate QoS acceptance variables in the education context. Moreover, provides details behind the integrating process of two theories (TOE and HOT). QoS acceptance of cloud service utilization uses TOE as the main framework, and at the same time, the HOT framework is used to include the human dimension. In QoS acceptance of cloud service utilization in HEIs, the decision-maker needs to consider four factors or dimensions (technological, organizational, environmental, and human) to support the decisions regarding QoS acceptance of cloud services; therefore, to help support decision-makers in HEIs, the researchers have built a theoretical model called TOEH to help determine the factors with the most influence on QoS acceptance. The researcher intends to utilize TOE to exploring QoS variables from different aspects, moreover, recognize different core QoS variables in cloud service and the relationship between core variables and other variables for instance abilities, inspirations. Therefore, TOE provides an appropriate analytic instrument of organizational acceptance of such technology for different aspects. A study of the literature recommends that technology, organization, and environment (TOE) framework by [34] may give a supportive beginning stage to



considering acceptance of technology [38, 39, 45].

The TOE framework perceives three highlights of an organizational context that could affect acceptance of technological tools: (1) the technological context depicts the present technology being accepted and utilized to the organization [34, 38]; (2) the Organizational context suggests characteristics of the organization [36], for instance, IS/IT Knowledge, and size [46]; (3) the Environmental context is the field in which an organization coordinates its business, insinuating its industry, competitors, and dealings with the business[28], [17]. The TOE framework clears up acceptance of the technology.

From related works of previous studies done in the field of QoS and utilization of cloud service in different industries, it found that human dimension plays a significant aspect of accepting and improving QoS. Szewczk and Snodgrass [47] stressed the critical and crucial role of the human during the process of QoS acceptance of innovation. the absence of a human in QoS acceptance has been a deterrent to the achievement of QoS acceptance.

Subsequently, human comprehension has been an essential item of top management and staff information about QoS. The institutions and human measurements are considered as critical issues in the execution and development of QoS acceptance. In research, led by Mayer & Mayer [48], founded major boundaries of QoS acceptance of innovation is the absence of human expertise and ability prerequisites in the developing process of accepting new technology.

Meanwhile research model includes the human factor in accepting QoS since this aspect involves decision-making by top management of HEI's which consider a noticeable and indispensable factor in accepting QoS of technologies [36, 44]. Whereas TOE theory excludes the human factor but the HOT used to include it to evaluate the fit between human factor and other factors such as technology with QoS acceptance [43]. Moreover, the integration process will help the researcher to understand QoS acceptance variables of utilizing cloud service in HEIs, and study critical aspects affecting QoS acceptance process and help decision-makers to utilize cloud service in HEI's.

The decision-maker need to consider four factors or dimensions (technological, organizational, environmental, and human) to support the decisions regarding QoS acceptance of cloud services; therefore, to help support decision-makers in HEIs, the researchers have built a theoretical model called TOEH (Human-Technology-Organization-Environment) to help determine the factors with the most influence QoS acceptance.

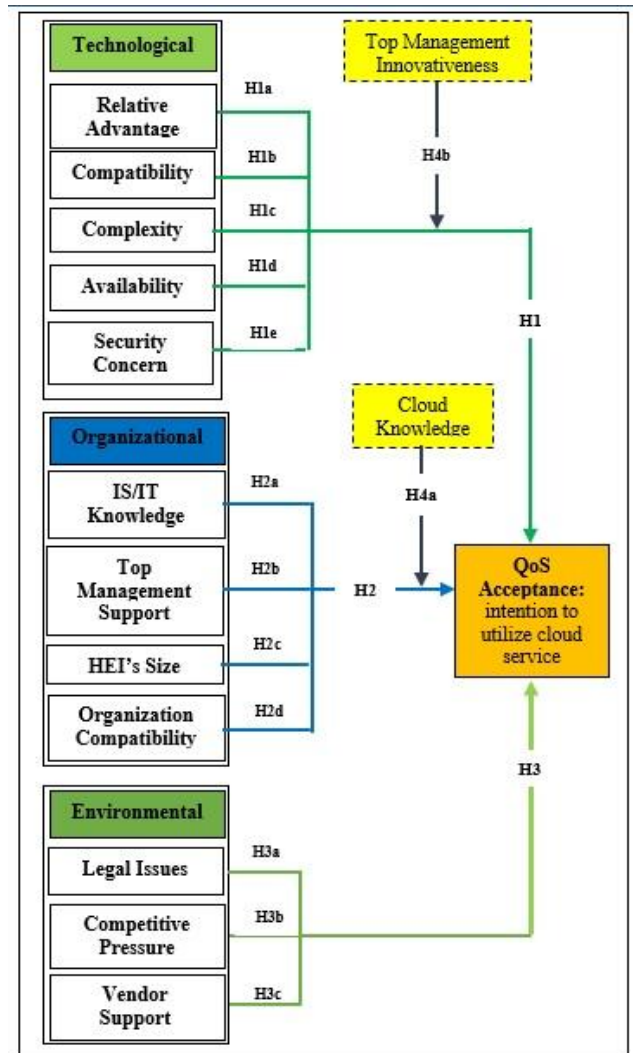


Fig. 3. Initial Integrated Model

VI. CONCLUSION

Exploring QoS variables play an important role in confirming acceptance of QoS is maintained and confirmed proposed model to support QoS acceptance by evaluating aspects of QoS to increase the level of cloud service utilization. Moreover, from studies review in QoS found human aspect is significant impact to ensure QoS acceptance, whereas human factor include decision making, top management innovativeness related to QoS acceptance, and additional significant factors (technology, organization, and external factors (environment)) factors, each of aspects has own influence level in acceptance of QoS which need to determine and categorize based on prior studies that have been reviewed.

The developed model provides a clear picture for decision makers in HEI's on the important factors affect QoS and understand by exploring and evaluation, and build HEI's strategies plans regarding utilization cloud service.

REFERENCES

1. Drăgan, M., D. Ivana, and R. Arba, *Business process modeling in higher education institutions. Developing a framework for total quality management at institutional level*. Procedia Economics and Finance, 2014. **16**: p. 95-103.
2. Misut, M. and M. Pokorny, *Does ICT Improve the Efficiency of Learning?* Procedia-Social and Behavioral Sciences, 2015. **177**: p. 306-311.
3. Shakeabubakor, A.A., E. Sundararajan, and A.R. Hamdan, *Cloud Computing Services and Applications to Improve Productivity of University Researchers*. International Journal of Information and Electronics Engineering, 2015. **5**(2): p. 153.
4. Albion, P.R., et al., *Teachers' professional development for ICT integration: Towards a reciprocal relationship between research and practice*. Education and Information Technologies, 2015. **20**(4): p. 655-673.
5. Duță, N. and O. Martínez-Rivera, *Between theory and practice: the importance of ICT in Higher Education as a tool for collaborative learning*. Procedia-Social and Behavioral Sciences, 2015. **180**: p. 1466-1473.
6. Persico, D., S. Manca, and F. Pozzi, *Adapting the Technology Acceptance Model to evaluate the innovative potential of e-learning systems*. Computers in Human Behavior, 2014. **30**: p. 614-622.
7. Singh, S. and I. Chana, *QRSF: QoS-aware resource scheduling framework in cloud computing*. The Journal of Supercomputing, 2015. **71**(1): p. 241-292.
8. Malathi, M. *Cloud computing concepts*. in *Electronics Computer Technology (ICECT), 2011 3rd International Conference on*. 2011. IEEE.
9. Sasikala, P., *Research challenges and potential green technological applications in cloud computing*. International Journal of Cloud Computing, 2013. **2**(1): p. 1-19.
10. Puthal, D., et al. *Cloud computing features, issues, and challenges: a big picture*. in *Computational Intelligence and Networks (CINE), 2015 International Conference on*. 2015. IEEE.
11. Alharthi, A., et al., *An overview of cloud services adoption challenges in higher education institutions*. 2015.
12. Rizzardini, R.H. and H. Amado, *Measuring emotional responses to experiences with Cloud-based learning activities*. Alexander Mikroyannidis, 2012: p. 53.
13. Rizzardini, R.H., et al., *Cloud services within a ROLE-enabled Personal Learning Environment*. 2012.
14. Ali, M., S.U. Khan, and A.V. Vasilakos, *Security in cloud computing: Opportunities and challenges*. Information Sciences, 2015. **305**: p. 357-383.
15. Alhamazani, K., et al., *An overview of the commercial cloud monitoring tools: research dimensions, design issues, and state-of-the-art*. Computing, 2015. **97**(4): p. 357-377.
16. Manvi, S.S. and G.K. Shyam, *Resource management for Infrastructure as a Service (IaaS) in cloud computing: A survey*. Journal of Network and Computer Applications, 2014. **41**: p. 424-440.
17. Akpan, H.A. and B.R. Vadhanam, *A survey on Quality of service in cloud computing*. International Journal of Computer Trends and Technology, 2015. **27**(1): p. 58-63.
18. Barham, K.A., *Computer Integration in Palestinian Secondary Schools: Theory and Practice*. 2014.
19. Chen, X., et al., *Web service recommendation via exploiting location and QoS information*. IEEE Transactions on Parallel and Distributed Systems, 2014. **25**(7): p. 1913-1924.
20. Rajput, L.S. and B.S. Deora, *DEVELOPING A CLOUD BASED E-LEARNING FRAMEWORK FOR HIGHER EDUCATION INSTITUTIONS (HEI)*. 2017.
21. Toney, M.S.B. and N. Kale, *A Literature Review on Quality of Service (QoS) Measurements of Web Services in the Cloud*. 2014.
22. Wang, S., et al., *Multi-user web service selection based on multi-QoS prediction*. Information Systems Frontiers, 2014. **16**(1): p. 143-152.
23. Ardagna, D., et al., *Quality-of-service in cloud computing: modeling techniques and their applications*. Journal of Internet Services and Applications, 2014. **5**(1): p. 11.
24. Paredes, R.K. and A.A. Hernandez, *Designing an Adaptive Bandwidth Management for Higher Education Institutions*. International Journal of Computing Sciences Research, 2018. **2**(1): p. 17-35.
25. Khan, S.R. *An empirical factors that influences the adoption and selection of internet service: An exploratory study in higher education*. in *2017 Fourth HCT Information Technology Trends (ITT)*. 2017. IEEE.
26. Sabi, H.M., et al., *Conceptualizing a model for adoption of cloud computing in education*. International Journal of Information Management, 2016. **36**(2): p. 183-191.
27. Budiman, E., et al. *QoE and QoS Evaluation for Academic Portal in Private Higher Education Institution*. in *2018 International Conference on Computer Engineering, Network and Intelligent Multimedia (CENIM)*. 2018.
28. Sultana, J., M.F.A. Mazmum, and N.J. Nipa, *Factors Affecting Cloud Computing Adoption in Higher Education in Bangladesh: A Case of University of Dhaka*. Applied and Computational Mathematics, 2017. **6**(3): p. 129-136.
29. Suradi, N.R.M., S. Kahar, and N.A.A. Jamaluddin, *Identification of Software Quality Characteristics on Academic Application In Higher Education Institution (HEI)*. Journal of Telecommunication, Electronic and Computer Engineering (JTEC), 2018. **10**(2-7): p. 133-136.
30. Budiman, E., S. Alam, and M. Akbar. *Mobile Learning: Utilization of Media to Increase Student Learning Outcomes*. in *2018 5th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*. 2018.
31. Buyya, R., S.K. Garg, and R.N. Calheiros. *SLA-oriented resource provisioning for cloud computing: Challenges, architecture, and solutions*. in *2011 International Conference on Cloud and Service Computing*. 2011.
32. Feng, G., et al., *Revenue Maximization Using Adaptive Resource Provisioning in Cloud Computing Environments*, in *Proceedings of the 2012 ACM/IEEE 13th International Conference on Grid Computing*. 2012, IEEE Computer Society. p. 192-200.
33. Salam, S., *QoS oriented inter-cloud federation framework*. IEEE Systems Journal, 2015: p. 642-643.
34. Tornatzky, L.G., M. Fleischer, and A.K. Chakrabarti, *Processes of technological innovation*. 1990: Lexington Books.
35. Oliveira, T. and M.F. Martins, *Literature review of information technology adoption models at firm level*. The Electronic Journal Information Systems Evaluation, 2011. **14**(1): p. 110-121.
36. Khan, A. and J.M. Woosley, *Comparison of contemporary technology acceptance models and evaluation of the best fit for health industry organizations*. IJCSSET, 2011. **1**(11): p. 709-17.
37. Wang, M.W., O.-K. Lee, and K.H. Lim, *Knowledge management systems diffusion in Chinese enterprises: a multi-stage approach with the technology-organization-environment framework*. PACIS 2007 Proceedings, 2007: p. 70.
38. Musawa, M.S. and E. Wahab, *The adoption of electronic data interchange (EDI) technology by Nigerian SMEs: A conceptual framework*. Journal of Business Management and Economics, 2012. **3**(2): p. 55-68.
39. Ifinedo, P., *An empirical analysis of factors influencing Internet/e-business technologies adoption by SMEs in Canada*. International Journal of Information Technology & Decision Making, 2011. **10**(04): p. 731-766.
40. Paul Jones, P.G.P., et al., *SMEs' adoption of enterprise applications: A technology-organisation-environment model*. Journal of Small Business and Enterprise Development, 2013. **20**(4): p. 735-753.
41. Premkumar, G., *A meta-analysis of research on information technology implementation in small business*. Journal of organizational computing and electronic commerce, 2003. **13**(2): p. 91-121.
42. Kwon, T.H. and R.W. Zmud. *Unifying the fragmented models of information systems implementation*. in *Critical issues in information systems research*. 1987. John Wiley & Sons, Inc.
43. Yusof, M.M., et al., *An evaluation framework for Health Information Systems: human, organization and technology-fit factors (HOT-fit)*. International journal of medical informatics, 2008. **77**(6): p. 386-398.
44. Yang, Z., et al., *Understanding SaaS adoption from the perspective of organizational users: A tripod readiness model*. Computers in Human Behavior, 2015. **45**: p. 254-264.
45. Yeboah-Boateng, E.O. and K.A. Essandoh, *Factors influencing the adoption of cloud computing by small and medium enterprises in developing economies*. International Journal of Emerging Science and Engineering, 2014. **2**(4): p. 13-20.
46. Noce, A. and C. Peters, *Barriers to electronic commerce in Canada: a size of firm and industry analysis (III-C)*. 2005: Industry Canada, Electronic Commerce Branch.



47. Szewczak, E. and C. Snodgrass, *Managing the human side of information technology: Challenges and solutions*. 2003: IGI Global.
48. Mayer, J. and J. Mayer. *Technology diffusion, human capital and economic growth in developing countries*. 2001. United Nations Conference on Trade and Development.

AUTHORS PROFILE



Mr. Marwan Bsharat is third year of Ph.D. in Quality of Service of cloud service in the education industry at the University Technology Malaysia. He received a bachelor's degree in computer master's degree in Technopreneurship at the UCSI University – Malaysia. His current field of work experience in monitoring & evaluation systems in the education industry in Palestine, and development systems that help

improve efficiency and effectiveness of learning process and use the most advanced technology in education industry especially in higher education institutions. He also works in the ministry of education by development and quality assurance of technology tools that have been utilized in districts schools, universities. His current research focuses on assessing the quality of Service (QoS) of cloud service in higher education institutions to increasingly depend on the cloud to publish classes and develop learning process mobility for students and reduce IT infrastructure in premises, also reduce learning the cost for both students and universities.



Associate Professor Dr. Othman Bin Ibrahim is head of university Technology Malaysia career center, he received PhD in Computation 2004 from University of Manchester Institute of Science and Technology, Master of Information Technology 1999 from Universiti Kebangsaan Malaysia, Bachelor of Computer Science 1997 from Universiti of Technology Malaysia, and Diploma of Computer Science 1994, from

Universiti of Technology Malaysia. He is senior lecturer from May 2007 until now, department of Information System, Faculty of Computer Science & Information System, University of Technology Malaysia. User Support Analyst, 1997 – June 1998, Telekom Publication Sdn. Bhd Kuala Lumpur Tutor, July 1998 – October 1999. His publication in the Moderating Effect of Hospital Size on Inter and Intra-organizational Factors of Hospital Information, Predicting determinants of hotel success and development using Structural Equation Modelling (SEM)-ANFIS method, Academic researchers' behavioral intention to use academic social networking sites: A case of Malaysian research universities, Cloud Computing Fitness for E-Government Implementation: Importance-Performance Analysis, Integrated Feedback Control Reporting for Improving Quality of Technical Service Reporting in IT Service Management, A knowledge-based system for breast cancer classification using fuzzy logic method, Determining the importance of hospital information system adoption factors using fuzzy analytic network process (ANP), An interpretive structural modeling of the features influencing researchers' selection of reference management software.



Ms. Sawsan Bsharat her education in computer science 2009, from Al-Najah National University – Palestine, current field of work in development, IT audit for primary education in Palestine with 5 years' experience in IT audit, quality of experience of using technology tools in ministry of education in Palestine from 2015, Experience in the development of methods of using modern technologies in basic and

secondary education by measuring the acceptability of these technologies at the level of human resources, and benefiting from the available IT infrastructure, evaluate the organization human experience of using new technology available . Now preparing a master degree in using e-learning in primary education in a developing country.