Developing IT Service Management in Higher Education Institutions: A Case Study of ITIL Implementation in Universities in the Kurdistan Region of Iraq

Haneen Khalid Ibrahim[1] **Ibrahim Ismael Hamarash**[2]

[1] Department of CS & IT, College of Computer Science and Information Technology, Catholic University in Erbil, Erbil, KR, Iraq

[2] Department of Electrical Engineering, College of Engineering, Salahaddin University-Erbil

https://doi.org/10.31972/iceti2024.008

Abstract

IT Service Management (ITSM) is defined as a collection of processes, documentation, and practices required to manage Information Technology (IT) services effectively. Different frameworks based on industry best practices are available in the literature for designing and building an ITSM system, with the Information Technology Infrastructure Library (ITIL) being the most popular and widely accepted as the de facto standard. ITIL offers a systematic collection of best practices, but it does not provide a specific procedure for implementing an ITSM framework in enterprises and organizations.

The core element of ITIL is the process (or practice in ITIL V4), and ITIL V4 includes 34 practices. Effective implementation of ITIL in an organization does not require the use of all these processes; the nature of the organization dictates the selection of necessary processes. However, official ITIL documents do not provide criteria for selecting the appropriate processes.

In this study, a procedure focused on process selection and adaptation for managing ITSM using the ITIL framework in universities has been proposed. This method addresses Critical Success Factors (CSFs) to determine the most suitable ITIL processes for various business functions. Data was collected from university stakeholders, including academic leaders and students, through questionnaires. The proposed framework was applied in a case study involving five private universities in the Kurdistan Region of Iraq. Ultimately, a complete lifecycle for the implementation of the selected processes was designed.

Keywords: ITSM, ITIL, IT Service Process, Frameworks,

1. Introduction

Universities are among the largest, most complex, and multifaceted organizations that heavily rely on Information Technology (IT) for their operation and development. They view IT as a fundamental asset for their success (

The integration of IT and its sub-field Artificial Intelligence (AI) in teaching and educational sectors is crucial for enhancing learning quality. To achive this, universities need to deploy technology applications across all departments to deliver optimal services to both internal and external customers (Khan, 2012). Services provided by universities—such as online and recorded lectures, assignments, lecture schedules, student and faculty recruitment, infrastructure documentation, management and administration, stakeholder communication, and initiative management—are all managed through information systems (Palilingan and Batmetan, 2018). These services must be accurate, fast, and of high quality to meet customer satisfaction.

Information Technology Service Management (ITSM) is a collection of processes, documentation, and practices essential for managing IT services. It is crucial for designing and delivering services to end users. Reviewing the best practices of ITSM has led to the development of various frameworks such as ITIL, DevOps, COBIT, Six Sigma, and others (Hertvik, 2017). Each ITSM framework has its own structure, lifecycle, processes, and modules, and many are supported by international bodies and recognized certifications. Implementing a complete framework like ITIL or COBIT in a large organization such as a university can be challenging, especially where the level of adoption is low or limited (Bianchi and Sousa, 2015).

ITIL is applicable to organizations of all sizes, particularly large ones like universities and higher education institutions. It is the most popular IT Service Management (ITSM) framework in the IT industry and is considered a de facto standard. However, while ITIL provides a systematic description of best practices, it does not offer a specific procedure for implementing an ITSM framework in enterprises.

This study investigates whether universities in the Kurdistan Region of Iraq need a standard ITSM framework and identifies the necessary processes for successfully implementing the ITIL framework on their campuses. This involves reviewing and evaluating the pros and cons of

assessing the current status of ITSM at selected universities in the Kurdistan Region, and designing an institutionalized ITSM framework based on ITIL process management for these institutions.

2. Related Works

Since its inception in the 1980s, ITIL has proven to be a crucial framework for IT service management, with its latest version, ITIL 4, released in 2019. It has been effectively implemented in small, medium, and large enterprises worldwide, establishing efficient ITSM practices. The importance of ITIL lies in its ability to cater to the unique infrastructure and requirements of each enterprise, addressing both business needs and stakeholder satisfaction. Researchers have recognized its significance and have worked to adapt ITIL's best practices to various organizations, including higher education institutions, demonstrating its versatility and impact.

An early study by Grewal (2006) highlighted the issues in ITSM, ITIL, and IT governance at seven Australian universities. This research emphasized the factors contributing to the increased implementation of ITIL in Australian universities and presented a comprehensive literature review that served as the foundation for the study. Grewal found that the most notable factors for ITIL adoption were organizational, particularly the adoption of various processes. The most commonly adopted processes were problem management and incident management. Some universities initially adopted certain processes and managed to implement more as they matured.

An approach to demonstrate how ITIL can add value to enterprises highlights five key pillars: customer care, service lifecycle, process concept, quality of service, and communication. Each pillar is described in detail, emphasizing how their development can contribute to adding value for customers and gaining a competitive advantage for companies. Although this research does not focus on higher education, it provides numerous insights into applying ITIL within organizations like universities (Himi, Bahsani, & Semma, 2011). A case study explored the implications of ITIL for the higher education sector, indicating that the domain has advanced and matured sufficiently for its application. The study suggested that higher education institutions need to conduct further research and make necessary adjustments to facilitate the adoption of core ITSM and IT Governance principles (Knahl,2013). An article published in January 2012 in

Malaysia examined the progress of ITIL implementation and its relationship with firm size using a questionnaire survey method among 84 Multimedia Super Corridor companies. The authors explored firm size from three perspectives: annual turnover, total number of employees, and total number of IT staff. They noted that effective IT Service Management (ITSM) is crucial for gaining competitive advantages in a global economy with high levels of IT investment. Depending on the organizational context, ITIL guidelines need to be adapted. The findings indicated a weak positive relationship between annual turnover and ITIL implementation progress, while there was a strong positive relationship in terms of the total number of employees and IT staff (Kanapathy and Khan, 2012).

A systematic literature review on the adoption of ITSM practices and processes by organizations between January 2010 and March 2018 was conducted by Jain, et.al.(2018). This study aimed to present adoption solutions and methods for measuring ITSM models, serving as a valuable resource for anyone interested in ITSM research during this period. The study found that the adoption of ITSM is not uniform, with some processes being adopted more frequently than others.

Another research proposed process-based and simulation methods for ITIL implementation in organizations to support business and customer needs through IT. This research was applied in a Spanish enterprise, implementing the incident management process, reviewed by ITIL experts, and assessed from the stakeholders' perspective through questionnaires. The responses highlighted the method's importance and interest, helping to identify critical success factors (Orta and Ruiz, 2019).

A study extensively highlighted the use of the Configuration Management Database (CMDB) process, a fundamental practice in ITIL 4, within academia. It examined the critical role of CMDB in driving digital transformation initiatives. The study revealed that enterprises leverage the CMDB to gain comprehensive visibility into their IT infrastructure, enabling more effective change management, minimizing downtime, and optimizing resource allocation. Additionally, the findings underscored the significant benefits of adopting CMDB practices in both academia and various industries. By ensuring that IT environments remain agile, resilient, and capable of supporting innovative digital initiatives, these practices have been shown to substantially improve the return on investment (ROI) from digital transformation efforts (Fredrick, 2024).

In a 2024 study, Chahid and colleagues examined the impact of Information Technology Governance (ITG) in the dynamic landscape of university settings. The study investigated various contingency factors influencing the effectiveness of ITG frameworks in academic environments. The researchers conducted a systematic review of 72 scholarly articles sourced from online databases, analyzing the global application of ITG in universities using both qualitative and quantitative methods. The proposed model underscores the necessity for higher education institutions to adopt flexible and tailored ITG strategies to meet their specific needs and circumstances (Chahid, 2024).

The literature survey shows that universities around the world are undertaking strategic projects to adapt ITIL to their governance structures. The main reason is to use their internal and external human resources, IT infrastructure, and spaces effectively. In the Kurdistan region, there are no known cases of public or private universities using or adapting ITIL. This study aimed to evaluate the existing infrastructure and demand for IT-focused services from the viewpoints of management, staff, and students. Based on this analysis, a framework has been designed for the efficient implementation of ITIL in private universities.

3. Methodology

The research was designed as a mixed-method study, incorporating both quantitative and qualitative approaches. Data were collected through an online survey using SurveyMonkey (SurveyMonkey, n.d.) to assess the current state of IT adaptation, usage, and digital transformation in four private universities and one independent public university in Erbil, the capital of the Kurdistan Region of Iraq. The universities involved were Tishk University, Bayan University, Knowledge University, University of Kurdistan-Erbil, and the Catholic University of Erbil. The study aimed to identify factors influencing IT stakeholders—students, academic staff, and managerial staff—in the adoption of four ITIL processes: Incident Management, Problem Management, Release Management, and Change Management during their IT Service Management (ITSM) implementations.

We selected students, academic staff, and managerial staff to participate in the survey because they are the primary stakeholders of academic institutions. In a university context, students are stakeholders as they are the primary recipients of the educational services. Academic staff are stakeholders because they provide education and conduct research, while managerial staff are

stakeholders due to their roles in overseeing and managing the university's operations. Each of these groups has interest in the quality, efficiency, and effectiveness of the university's services and performance.

Additionally, we selected the processes: Incident Management, Problem Management, Release Management, and Change Management among the 34 ITIL-4 practices because these processes are critical for ensuring efficient IT Service Management (ITSM) in academic institutions. Incident Management addresses the resolution of unplanned interruptions to IT services, ensuring minimal disruption. Problem Management focuses on identifying and resolving the root causes of recurring incidents, enhancing long-term IT stability. Release Management oversees the planning, testing, and deployment of new or updated services, ensuring they are seamlessly integrated into the existing IT environment. Change Management handles the addition, deletion, modification, or upgrade of IT services, ensuring that all changes are systematically reviewed and approved to maintain service quality and minimize risk.

The foundation of this paper is built upon ten research questions, all centered around determining the extent to which survey participants believe that adopting the four processes is an efficient and cost-effective solution within the ITSM infrastructure. Currently, stakeholders experience challenges related to these processes in their campuses. The methodology procedure phases are illustrated in Figure 1.

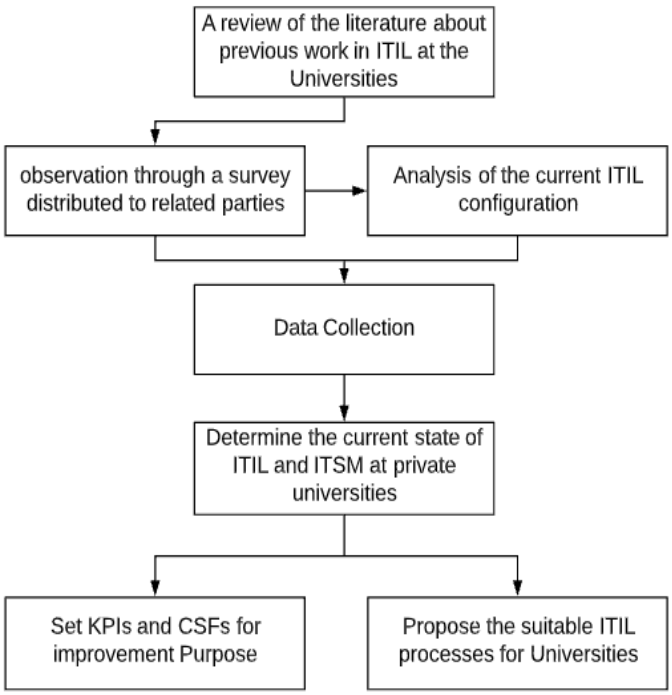

Fig.1 The methodology procedure phases

4. Results and Analysis

The questionnaire was distributed to 360 stakeholders, including 290 students, 50 academic staff, and 20 managers and decision-makers across the five universities.

Service Level Management (SLA) refers to the agreement between IT service providers and their users regarding the capacity, quality, and other regulations of the services provided. SLAs are important as they inform all parties about how to access IT services and set clear expectations for those services. In academic communities and campuses, institutions are responsible for informing stakeholders about service capacities, limitations, and communication channels. However, in all the universities involved in this study, there is no SLA in place during the initial access to IT services.

From the results, 90% of the managers confirmed the existence of integrated IT departments at their universities, and they all agreed that IT department is the main office that connect all the university departments. IT unit is responsible to deliver IT services, support internal and external users and work as an infrastructure asset. A summation of 65% of students were satisfied about the services provided by IT units at their universities. At the same time, it is still a large proportion of student which is 35% are dissatisfied with provided services. Also, three quarters of end users got support from IT department when they need it, but they have to visit the IT office physically.

The incident management process addresses and resolves all unplanned interruptions to IT services. While 90% of managers agreed that their universities employed professional IT teams, only 33% reported submitting a ticket when incidents occurred. Implementing a system for submitting online tickets is crucial for large organizations like universities, as it streamlines and automates processes. From the students' perspective, many were either unaware of this feature or it was not available at their universities. Three-quarters of the students acknowledged that universities employed professional IT teams, and more than half approached them directly.

However, the issue lies with the communication channels and the methods used to handle incidents.

The Problem Management process is the method organizations use to address recurring incidents, with the most crucial aspect being the documentation of problem details. Proper documentation enables faster, more professional, and cost-effective resolution of recurring issues. However, nearly one-third of managers reported that their universities do not document problems. This lack of documentation results in organizations facing recurring issues without a systematic approach to resolving them. Consequently, resolution times are prolonged, similar issues are handled inconsistently, and troubleshooting efforts become more costly and less professional. Furthermore, the absence of documentation prevents the accumulation of valuable knowledge, which could facilitate quicker and more effective problem resolution in the future. Ultimately, this impacts the overall efficiency and reliability of IT services

Release and Deployment Management process involves planning, testing, and announcing new services. All managers confirmed that new services are tested before being presented to end-users. Managers reported that 24% of announcements for new services are made via posters and the universities' official websites, followed by 19% through workshops held to introduce students to the new services. Students' responses were like those of the managers, with more than one-third indicating that their universities announce new services through their websites and 29% through social media apps.

Change Management involves additions, deletions, modifications, or upgrades to a service. When asked about the number of people required to approve any change, only 37% of the universities indicated that more than three individuals are involved in the approval process. The change process typically requires multiple approval levels, with each level focusing on a specific aspect of the change. For example, the college acceptance and university admission process, which changes annually, requires such a multi-level approval. In contrast, for individual change requests, such as students requesting an email change, the students must officially submit a request. However, the concern is that they must physically visit the IT department to do so.

The results analysis reveals evidence that the absence of Incident Management (67%), Change Management (63%), Release Management (75%), and Problem Management (33%) processes leads to 70% dissatisfaction among the main stakeholders in universities in the Kurdistan Region

of Iraq. Among the five universities involved in the study, only the University of Kurdistan-Hewler provides internet access to its students via the university hub. However, 100 students access the internet through personal subscriptions to commercial providers outside the university. This means that the survey participants based their opinions on full internet access both inside and outside the campus.

Implementing the four selected ITIL processes—Incident Management, Change Management, Release Management, and Problem Management—could increase satisfaction with IT services by 30%. These processes are well-documented within the ITIL 4 framework, with detailed Critical Success Factors (CSFs) and Key Performance Indicators (KPIs) available for universities to measure their implementation success. Each process comprises activities, tasks, triggering signals, and input and output resources, which need to be adapted to the specific needs of each university.

5. Conclusions

This study highlights the role of ITIL processes—Incident Management, Problem Management, Release Management, and Change Management—in enhancing IT Service Management (ITSM) within academic institutions in the Kurdistan Region of Iraq. The findings reveal significant gaps in the implementation of these processes, leading to a large amount of dissatisfaction among students, academic staff and managerial staffs. The absence of systematic Incident, Problem, Release, and Change Management processes has resulted in inefficient IT services, prolonged resolution times, and low service quality. However, implementing these ITIL processes can significantly improve stakeholder satisfaction by ensuring systematic problem resolution, and enhancing overall service availability and reliability. The study underscores the necessity for universities to adopt these four ITIL practices and customize them to their specific contexts to achieve the best ITSM performance. By doing so, institutions can improve their IT infrastructure and support their broader educational objectives, ultimately leading to a more efficient and effective academic environment. The four proposed processes are well documented in the ITIL 4 framework, and ITIL Foundation provides straightforward guidelines for their implementation.

Ethical Statement

This research was conducted in accordance with international ethical standards. All participants provided informed consent, and their anonymity and confidentiality were strictly maintained.

Acknowledgment

I would like to express my gratitude for the assistance provided by ChatGPT-4 in the proofreading of this paper.

References

Alvarez, J., 2017. 7 Benefits Of ITIL Service Management Implementation. [online] Auxis.com. Available at: https://www.auxis.com/blog/benefits-of-itil-service-management [Accessed 13 February 2020].

AXELOS, 2019. ITIL Foundation. 4th ed. London, United Kingdom: TSO (The Stationery Office), pp.13-16.

AXELOS, 2020. ITIL 4 Managing Professional Package. TSO (The Stationery Office).

Bianchi, I. and Sousa, R., 2015. IT governance for public universities: Developing a model. In: 26th IBIMA Conference on Innovation Management and Sustainable Economic Competitive Advantage: From Regional Development to Global Growth. International Business Information Management Association (IBIMA).

Bleiklie, I. and Kogan, M., 2007. Organization and Governance of Universities. Higher Education Policy, 20, pp.477–493.

Bon, J., Jong, A., Kolthof, A., Pieper, M., Tjassing, R., Veen, A. and Verheijen, T., 2007. Foundation of IT Service Management Based on ITIL V3. 3rd ed. Zaltbommel, Netherlands: Van Haren Publishing.

Chahid Abdelilah, Souad Ahriz, Kamal El Guemmat and Khalifa Mansouri, 2024. Building a Specialized IT Governance Strategy for Higher Education: A Strategic Model, Journal of Computer Science, 20(7), pp.768-782. DOI: 10.3844/jcssp.2024.768.782

Continual service improvement, 2011. Norwich: TSO, The Stationery Office, p.3.

Cortés-Sánchez, J., 2017. Mission and Vision Statements of Universities Worldwide: A Content Analysis. Documentos De Investigación, Facultad de Administración, No. 152.

Erl, T., Khattak, W. and Buhler, P., 2016. Big Data Fundamentals: Concepts, Drivers & Techniques. 1st ed. United States: Prentice Hall Press, pp.55-69.

Fernández, A. and Llorens, F., 2009. An IT Governance Framework for Universities in Spain. European University Information Systems Organization (EUNIS), Santiago de Compostela, June 23rd-26th.

Forbes Insights, 2017. Delivering Value to Today's Digital Enterprise. [online] Washington, USA: BMC, p.16. Available at: https://www.bmc.com [Accessed 4 March 2020].

Fredrick DANDE, Xiaolong Li, Musibau A. Shofoluwe and Alister McLeod, 2024. ITIL Service Configuration Management as a Driver of Enterprise Digital Transformation: A Quantitative

Research Study. Communications of the IBIMA, Vol. 2024 (2024), Article ID 917754. Available at: https://doi.org/10.5171/2024.917754.

Fry, M., 2010. ITIL Lite: A Road Map to Full or Partial ITIL Implementation. London, UK: The Stationery Office, pp.6-7.

Galup, S., Dattero, R., Quan, J. and Conger, S., 2007. Information Technology Service Management: An Emerging Area for Academic Research and Pedagogical Development. SIGMIS CPR '07: Proceedings of the 2007 ACM SIGMIS CPR Conference on Computer Personnel Research: The Global Information Technology Workforce, April 2007, pp.46–52.

Galup, S., Dattero, R., Quan, J. and Conger, S., 2009. An Overview of IT Service Management. Communications of the ACM, 52(5), pp.124-127.

Greener, S., 2008. Business Research Methods. 1st ed. BookBoon, pp.47-72.

Grewal, S., 2006. Issues in IT Governance & IT Service Management - A Study of Their Adoption in Australian Universities. Master level. University of Canberra-ACT.

Hermanto, A. and Kusnanto, G., 2017. Evaluation of the Information Technology System Services for Medium Higher Education Based on ITIL (A Case Study of Polytechnic XYZ). In: 2017 4th International Conference on Computer Applications and Information Processing Technology (CAIPT). IEEE.

Hertvik, J., 2017. ITSM Frameworks: Which Are Most Popular?. [online] BMC Blogs. Available at: https://www.bmc.com [Accessed 1 February 2020].

Himi, A., Bahsani, S. and Semma, A., 2011. The IT Service Management According to the ITIL Framework Applied to the Enterprise Value Chain. IJCSI International Journal of Computer Science Issues, 8(3), pp.515-522.

Hochstein, A., Zarnekow, R. and Brenner, W., 2005. Evaluation of Service-Oriented IT Management in Practice. Proceedings of International Conference on Services Systems and Services Management, Vol.1, pp.80-84.

Iden, J. and Eikebrokk, T., 2013. Implementing IT Service Management: A Systematic Literature Review. International Journal of Information Management, 33(3), pp.512-523.

Jain, V., Wali, O. and Saradhi, V., 2018. Information Technology Service Management [ITSM] Research: A Literature Review of Practices, Solutions and Measurement. Asian Journal of Computer Science and Technology, 7(1), pp.79-86.

Kanapathy, K. and Khan, K., 2012. Assessing the Relationship between ITIL Implementation Progress and Firm Size: Evidence from Malaysia. International Journal of Business and Management, 7(2), pp.194-199.

Kempter, A., 2019. ITIL for Small and Medium-Sized Businesses | IT Process Wiki. [online] Wiki.en.it-processmaps.com. Available at: https://wiki.en.it-processmaps.com [Accessed 3 February 2020].

Khan, Z., 2012. Technology Use Takes a Boost among University Students. Computer Technology and Application, 3(4), pp.347-354.

Kießling, M., Marrone, M. and Kolbe, L., 2010. Influence of IT Service Management on Innovation Management: First Insights from Exploratory Studies. Management of the Interconnected World, pp.129-136.

Klassen, M., 2019. ITIL vs DevOPS: Clarifying the Differences as It Relates to IT Service. [online] Cherwell Software. Available at: https://www.cherwell.com [Accessed 11 August 2019].

Knahl, M.H., 2013. Application of IT Management Frameworks in Higher Education Institutions. In: Franch, X., Soffer, P. (eds) Advanced Information Systems Engineering Workshops. CAiSE 2013. Lecture Notes in Business Information Processing, Vol. 148. Springer, Berlin, Heidelberg. Available at: https://doi.org/10.1007/978-3-642-38490-5_10.

Langebek, J., n.d. Effective Implementation of Information Technology Infrastructure Library (ITIL) at University of Copenhagen. [online] Implement Consulting Group. Available at: https://implementconsultinggroup.com/university-of-copenhagen/ [Accessed 5 January 2020].

Marrone, M. and Kolbe, L., 2010. ITIL and the Creation of Benefits: An Empirical Study on Benefits, Challenges and Processes. In: 18th European Conference on Information Systems. Association for Information Systems AIS Electronic Library (AISeL).

Marrone, M. and Kolbe, L., 2011. Impact of IT Service Management Frameworks on the IT Organization. Business & Information Systems Engineering, 3(1), pp.5-18. Available at: https://link.springer.com [Accessed 8 December 2019].

Mohideen, Z., Kaur, K., Muhamad, U., Jan, N. and Ahamadhu, A., 2017. ITIL: Implementation and Service Management Best Practices in Malaysian Academic Libraries. International Journal of Technology and Engineering Studies, 3(2), pp.65-73.

Muramalla, V. and Alqahtani, H., 2019. Quality of Services and the Impact on Students' Satisfaction in Universities. International Journal of Innovation, Creativity and Change, 7(7), pp.335-350.

Office of Government Commerce OGC, 2005. Introduction to ITIL. Netherlands: TSO (The Stationery Office), pp.21-24.

Orta, E. and Ruiz, M., 2019. Met4ITIL: A Process Management and Simulation-Based Method for Implementing ITIL. Computer Standards & Interfaces, 61, pp.1-19.

Palilingan, V. and Batmetan, J., 2018. Incident Management in Academic Information System Using ITIL Framework. IOP Conference Series: Materials Science and Engineering, 306, p.012110.

Persse, J., 2012. The ITIL Process Manual. 1st ed. Zaltbommel, Netherlands: Van Haren Publishing, p.9

Pew Research Center Methods, (n.d.). Questionnaire design - Pew Research Center Methods. [online] Available at: https://www.pewresearch.org/methods/u-s-survey-research/questionnaire-design/ [Accessed 21 January 2020].

Pink Elephant, 2008. The Benefits of ITIL®. United Kingdom: Pink Elephant.

Pink Elephant, 2014. Measuring ITSM: Are Your Processes Making The Grade? Ontario, Canada: Pink Elephant.

Pollard, C. and Cater-Steel, A., 2009. Justifications, Strategies, and Critical Success Factors in Successful ITIL Implementations in U.S. and Australian Companies: An Exploratory Study. Information Systems Management, 26(2), pp.164-175.

Prasanth, A., 2012. Cloud Computing Services: A Survey. International Journal of Computer Applications, 46(3), pp.25-29.

Rourke, F. and Brooks, G., 1967. Computers and University Administration. Administrative Science Quarterly, 11(4), pp.575-600.

Siwicki, B., 2019. How Medical University of South Carolina Used ITIL for a Telehealth Service Management Framework. [online] Healthcare IT News. Available at: https://www.healthcareitnews.com/ [Accessed 17 March 2020].

Sreejesh, S., Anusree, M. and Mohapatra, S., 2014. Business Research Methods. 1st ed. Cham, Switzerland: Springer International Publishing AG, pp.143-159.

Steffen, L., Mendonça, J. and Almeida, V., 2019. IT Service Management: Analysis and Proposition of the ITIL Model in a Brazilian Federal University. International Journal of Advanced Engineering Research and Science, 6(4), pp.163-177.

SurveyMonkey, (n.d.). SurveyMonkey. Available at: https://www.surveymonkey.com [Accessed 10 April 2023].

Swapnil, 2018. Lists 26 ITIL Processes & 4 ITIL Functions – ITIL Docs. [online] Itil-docs.com. Available at: http://www.itildocs.com/ [Accessed 15 August 2019].

Tatnall, A. and Davey, B., 2014. History of the Use of Computers and Information Technology in Education in Universities and Schools in Victoria. In: IFIP International Conference on Human Choice and Computers. pp.214-225.

Watts, S., 2017. ITIL V2 Vs ITIL V3: What's the Difference?. [online] BMC Blogs. Available at: https://www.bmc.com [Accessed 22 March 2020].

Watts, S. and Raza, M., 2019. SaaS vs PaaS vs IaaS: What's the Difference and How to Choose. [online] BMC Blogs. Available at: https://www.bmc.com/ [Accessed 4 March 2020].

Yazici, A., Mishra, A. and Kontogiorgis, P., 2015. IT Service Management (ITSM) Education and Research: Global View. International Journal of Engineering Education, 3(4), pp.1071–1080.

Yeary, J., 2019. The Evolution of ITIL: ITIL History & Beginnings. Available at: https://orangematter.solarwinds.com/ [Accessed 6 March 2020].

Zhen, W. and Xin-yu, Z., 2007. An ITIL-based IT Service Management Model for Chinese Universities. In: 5th ACIS International Conference on Software Engineering Research, Management & Applications (SERA 2007). [online] Busan, South Korea: IEEE, pp.493-497. Available at: https://ieeexplore.ieee.org/ [Accessed 6 January 2020].