Effectiveness of Multimedia Technology on Student Supervision During Covid-19 Pandemics in Middle East University

Firas Tayseer Mohammad Ayasrah[1], Hanan Nassar Aljermawi[2]

Abstract

The COVID-19 pandemic problem has impacted traditional methods of education and assessment. Students often take examinations and quizzes at home, where they have ready access to a plethora of unregulated materials should monitoring be inadequate. This article gives a comprehensive overview of the resources accessible to educators for efficient monitoring of student engagement in online learning environments. The use of animation, videos, music, tests, etc. is just a few examples of the interactive learning technologies discussed in this article. To ensure fair and accurate online assessment, the paper also suggests online supervision techniques like visual tracking behaviour and eye-tracking, which provide a method for validating students' hands-on experience with lab equipment in a dedicated network laboratory using remote access.

Keywords: *Effectiveness, Multimedia Technology, Student, Supervision, Covid-19, and Middle East University*

Introduction

Wuhan, the capital of China's Hubei province, was the epicentre of the 2019 coronavirus disease (COVID-19) outbreak in December. is a contagious, recently discovered virus with far-reaching public health consequences, including significant mortality rates among at-risk populations and widespread economic and social upheaval. By the end of 2019, the COVID-19 epidemic had had a significant impact on how most students approached their coursework. National lockdowns, social isolation, and working from home are the new trends that are being closely adhered to by the vast majority of governments throughout the globe in an effort to slow the spread of the sickness and flatten the "growth curve" caused by it. All levels of schools, colleges, universities, and comparable institutions have shut down, leaving students without access to education [1-2]. One possible solution to this pandemic problem is the increasing prevalence of "online" educational resources [3]. It's true that virtual classrooms have been around for a while, but until recently they were only a supplement to more conventional forms of instruction. As a result of the epidemic, the traditional "mixed-mode" (offline and online) strategy of providing education has been replaced with an "online-only" one [4].

Multimedia is essential to online education, and the right kind of online multimedia technology proved to be a useful tool for monitoring students at Middle East University when a pandemic broke out there. Beginning in the 1990s and continuing on until the present day, advancements in hardware and software have given new meaning to the term "multimedia technology," as the

---
[1] College of Education, Humanities and Science Al Ain University Al Ain, UAE
Email: firas.ayasrah@aau.ac.ae Orcid: https://orcid.org/0000-0002-6477-000X
[2] Educational college Taibah University Saudi Arabia Email: H.jermawi@hotmail

merging of satellites, personal computers, sound, and video has created new media with enormous promise. These innovations held the potential to provide better educational facilities that catered to the unique requirements of each student [4]. Contextual factors, such as learning situations and groups, such as student-peer and instructor interactions, are given considerable attention in multimedia instruction. Cooperative learning is often regarded as an effective method for enhancing the quality of education [5]. However, multimedia-based learning does have its drawbacks, such as the availability of reliable teaching and assessment platforms, the learners' motives and activities, and the instructional contexts. The potential of multimedia instruction is maximised if these obstacles can be overcome.

When we talk about "supervision activities," we're referring to the continuing initiatives to encourage, coordinate, and guide teachers' growth at schools on an individual and collective basis to ensure that the learning process runs smoothly and effectively to meet the learning goals. This is consistent with what Mukhtar says about the role of school principals, which is to "observe, supervise, guide, and stimulate the activities carried out by others with the purpose of enhancing the learning process" [27]. Due to the online nature of the learning process during the COVID-19 epidemic, supervision was also handled digitally. Even if most of the teaching and learning in this current age has taken place through digital means, it has remained the responsibility of principals as supervisors to guarantee the highest possible standards of instruction and student achievement. In light of this pandemic's unique educational challenges, it was clear that a new kind of monitoring was required. According to Adam and Dickey [28], supervision is a service that focuses primarily on enhancing the quality of education. Everything from the instructors to the students to the course content to the instructional materials to the social and physical contexts is directly relevant to this field of study. In other words, the purpose of supervision is to assist and encourage educators in the enhancement of their professional skills, particularly in the learning process and in all facets of the educational process, including but not limited to educators, students, curricula, learning materials, and the upkeep of a good and conducive learning environment.

Multimedia education has been shown to have positive results in a number of areas, including the efficient transmission of information to students, the capturing and retention of students' interests, the enhancement of students' comprehension of course materials, and the development of teachers' own expertise. This approach has gained widespread acceptance because it produces such positive results in the classroom [6]. In the wake of the COVID-19 pandemic, when cluster infections were becoming more common, multimedia instruction has replaced traditional classroom instruction as the preferred form of instruction. However, further research is needed to prove the advantages of digital-based education in the context of COVID-19. The goal of this study was to see how well multimedia technology could be used to monitor students at Middle East University during the COV-19 outbreak.

Concept of Multimedia Technology

Text (alphabetic or numeric), symbols, graphics, photographs, music, video, and animations are all examples of material that may be used in multimedia presentations with the aim of improving comprehension or memory [7]. For enhanced communication and understanding, it complements spoken education by the use of visualisation technology in the form of static and moving visuals [8]. Multimedia technology [9] refers to the gear and software necessary to create and execute multimedia applications. Integration, variety, and interactivity are just a few

of the features of multimedia technology that allow for the dissemination of information and ideas via the combination of digital and print media. In this way, the digital and print aspects refer to any multimedia-based apps or tools that are used to share information with the goal of helping the target audience understand concepts better.

The emergence of information and communication technologies is really revolutionising many spheres of human activity. This is particularly true in the realm of education (ICT). Information and communication technologies (ICT) make use of computers and the internet to gather, process, store, display, and distribute data, much of which is digital in nature. Information and communication technology (ICT) includes multimedia technology, which focuses on the digital representation and presentation of information in many media forms, including text, audio, video, and others [7]. This method relies on combining a lot of different technologies to give data in the best structures, sizes, and containers.

However, for educational purposes, the multimedia application's design quality and complexity must be sufficient to mix the many aspects of the cognitive processes to produce the greatest possible imitation of the instructor. Today's market offers a wide variety of multimedia applications. Math, social science, science, physiology, physics, and PE courses are just some of the areas where these tools have been put to use in the classroom [10,11].

Multimedia Technology in Learning and Teaching

Multimedia or digital learning materials help students create useful mental representations via the incorporation of a variety of media components that facilitate knowledge processing. Digital learning resources convey information, which consists of content and occasionally learning activities, via the use of a mix of text, pictures, video, and audio. Research on the use of multimedia in education has shown that students do better when they integrate visuals with text than when they use text alone [12]. According to [13], many pedagogical approaches were put into practise with the use of digital tools. The authors of the study described the ways in which they used various methods to introduce themes to students, show concepts to them, excite a group, provide access to several text formats, and encourage student participation. To a large extent, the use of multimedia in the classroom may be broken down into two camps: those devoted to instruction and those more focused on student exploration and discovery. Eady and Lockyer make a list of some of the digital and multimedia learning tools that are available.

The cognitive theory of multimedia learning makes three assumptions that characterise how individuals learn from instructional multimedia resources, and a knowledge of these assumptions is necessary for creating effective learning-focused multimedia. Dual-channel, capacity constraints, and active processing are some ways to put these presumptions into practise [14]. Dual-channel instruction presumes that students have several ways of processing audio and video separately. The limited capacity presupposes that each channel can only handle a certain amount of data at once. Teachers may avoid information overload by keeping the pace of their classes manageable if they have a firm grasp on these factors. In contrast, students will be aware of their own data processing strengths and weaknesses. The theory of active processing says that people are good at managing the different kinds of information they deal with, which lets them decide which pieces of information to choose, organize, and put together.

The Importance of Multimedia in the Teaching and Learning Process

Scholars in the fields of information technology (IT) and education technology continue to investigate the potential of multimedia technologies for improving educational outcomes. Software may be employed to further education in many different areas. Giving students hands-on experience is crucial in almost every academic discipline.

In the current era of COVID-19, the usefulness of multimedia technology and apps in the classroom as a means of instruction or study cannot be overstated. Several studies looking at the effects of multimedia technology on schools have found the same thing. Multiple studies have shown that employing multimedia technologies in math classrooms may considerably enhance students' understanding of the material [15]. Multimedia has been shown to improve students' education in a number of published publications [16]. Multimedia tools facilitate the simplification of complex topics, the recognition of individual differences, and the coordination of several representations, each of which offers a unique viewpoint. With the right typefaces and layout, a computer-based method may serve as a beneficial interface between students and the material they are studying.

Although there is no doubt that multimedia technology improves classroom instruction, it is important to keep in mind that this tool is not without its share of shortcomings. Unfriendly programming or user interface, a lack of resources, a lack of expertise or competence, a lack of time, and prohibitive maintenance costs are just a few examples [18].

Techniques for Supervising Multimedia Technology

The goal of supervision is to ensure that the supervised multimedia programme serves its intended purpose and is of value to its intended audience. [19] argues that creators of multimedia technologies have preconceived notions about how such tools will be put to use, whether those notions are purely practical (centred on the interface) or pedagogically motivated (involving the learning designs, processes, and outcomes). The assessment of multimedia may be done in a variety of ways but often involves some combination of experimentation, comparison, and surveys. The main goal is to find a good balance between how accurate assessments are and how much time and work they take to complete [20].

Analyzing student access computer logs, as well as the frequency of involvement and length of engagement [21], were early efforts to analyse student behaviour when interacting with online information. The results of [22] showed that visual monitoring in the online classroom was more successful than the traditional approach of manually analysing student behaviour. Students' facial expressions were also analysed to help classify the various components of the visual tracking behaviour seen in an online classroom.

Tracking student activity is used in a number of published publications that investigate how students engage with digital devices in the classroom. For instance, [23] integrated monitoring of student behaviour into a learning management system (LMS), which revealed data on the amount of time a student spent poring over the materials online. They were able to do this by using biometric identification techniques like facial recognition and fingerprint scanning, as well as voice recognition. Despite the growing popularity of eye-tracking studies on the impact of multimedia usage on learning, a recent systematic review [24] showed that these studies were done almost exclusively on college students. Students' eye movements were shown to be associated with the selection, organisation, and integration of information delivered through

multimedia technologies; however, investigations into the relationship between eye movements and metacognition and emotions were limited. Elementary school students' engagement in multimedia was assessed by eye-tracking [25]. Many studies have only used eye-tracking data, but some have combined it with verbal data to learn more about what students were thinking and how they were looking at what they were learning [26].

Types of Multimedia Technology

Text, sound, images, animation, and moving video are all essential components of multimedia presentations.

Text

As the most well-known method of communication, text consists of a predetermined collection of words or symbols that may be communicated vocally or written down. It's used in a wide variety of multimedia programmes, and the way it can be combined with other media types to provide information and convey ideas is very remarkable and profound. Text is the backbone of word processors and remains the primary data source for many multimedia applications. Putting a book into a digital format is essential for many multimedia uses. This change allows the presenter instantaneous access to the information and the ability to provide pop-up windows defining certain phrases. The Windows Help Engine is an example of a popular programme used often by a wide range of people. The "Hypertext" is a text-based information reader that simplifies finding resources on a certain subject. PDF and Wordpad are two such examples.

Audio: Audio is the most effective method of grabbing listeners' attention, since the incorporation of sound into a media application provides consumers with information that would be inconvenient to convey in any other manner. Certain types of information simply cannot be conveyed effectively without the use of voice, music, and sound effects.The term "audio" is used to refer to the sounds being produced. Audio may also improve the user's understanding of facts presented in a different medium. Researchers in the field of learning have found that using more than one sense to present new information makes it more likely that the information will be remembered later.

Images that Never Change.

At the same time, graphics, or the digital representation of non-textual information like a sketch, chart, or image, provide a visual appeal to the multimedia application. Their use aids in the elucidation of concepts via the use of dynamic still images. When compared to a DOS-based system, this facilitates the presentation of graphic pictures. Images in the realm of static graphics may be made in a variety of forms.

Animation

To provide the impression of movement, animation uses a sequence of still images. Digital animation is widely employed in multimedia presentations. Two primary types of digital animation exist: those created in two dimensions (2D) and those created in three (3D). Simply put, 2D animation is the art of giving life to static images. These things move across the screen and are placed in a wide variety of settings and scenarios. The term "3D animation" describes the process of giving motion to digitally rendered three-dimensional objects using pictures. Some examples of animation are objects that rotate or yaw across the screen.

Video

In video, a series of static images are captured, recorded, processed, stored, transmitted, and reconstructed digitally so that they provide the impression of motion. In other words, they are photographs that, when sped up to a rate of less than a second per frame, seem to be in continuous motion. When compared to animation, videos tend to use more photorealistic visual sequences or live recordings. Multimedia components like sound, graphics, and animation are all included in the video to make your goods and services more engaging, but this comes at a price. In spite of the fact that video costs a lot of bandwidth to download, it may be useful for conveying certain kinds of information. Making use of video in e-learning aids in demonstrating equipment and processes in a realistic setting. Quick Time, Video for Windows, and MPEG are the three most widely used digital video formats.

Multimedia Technology in Student Supervision During COVID-19

Due to the global spread of the COVID-19 virus, schools and educational institutions have stated that face-to-face instruction would no longer be offered. There is a significant chasm between what educators and students are used to and what they must now contend with, presenting a number of difficulties on both sides. Therefore, there is a rising demand among educators and students for the cutting-edge tools required in today's classrooms. Multimedia, on the other hand, combines several pedagogical approaches into a single medium, expanding the range of possible curriculum presentations. Social engagement between two people with potentially different perspectives but similar goals constitutes supervision. The term "supervision" refers to a "close, one-on-one interaction between the supervisor and the pupil."

Educators were pushed to make use of technology and different facets of education, including features of supervision, during the COVID-19 pandemic, making it essential to give support and help from numerous components of education to boost academic supervisory activities. To grow into their roles as supervisors and learn how to effectively use the supervisory process in a highly digital setting [29, 30], educational supervisors must also reorganise the technology of resources and networks. Because of these factors, it was anticipated that principals' use of technology would make their roles as academic supervisors easier. In addition, traditional methods of monitoring students' progress have to be modified to suit the needs of distance education. The creation of interactive models and efficient and suitable virtual training [31] necessitated new methods of supervising, controlling, advising, and guiding the whole school community as a result of the rise of virtualized education. When direct or in-person supervision cannot be carried out, school principals may still use the IT-based academic supervision model to assist and educate teachers to develop their professional competence using online platforms and other digital means. One solution to the challenge of enforcing academic supervision is to make use of cutting-edge technologies in this area [32]. Furthermore, Guntoro stresses that web-based apps provide a means of communication and information acquisition through World Wide Web technology, with the goal of offering anytime, anywhere access to instruction, manuals, rich resources, and collaborative learning. Previous research shows that online supervision approaches may be a substitute to traditional supervision in addressing difficulties, and this is particularly true during the current COVID-19 epidemic. Due to the nature of DL, there is a lack of face-to-face connection between students and teachers, and the absence of supervisors might slow down the process of bonding between students and instructors. The risks associated with ODL include the potential for students to feel alone and discouraged, and the possibility that the COVID-19 distance between them and their supervisor may cause them

to doubt the quality of their work. Supervisors have an extra job to do when their students are working in a virtual environment. They have to make sure that their students feel comfortable asking questions and getting feedback throughout the whole research project.

Distance supervision can become passive due to a lack of face-to-face interaction, causing dissatisfaction among students, which becomes the biggest challenge for supervisors [34]. [33] stated that face-to-face interaction between student and teacher is vital for the motivation, confidence building, and knowledge enhancement of the supervisee. However, a helpful atmosphere for thesis students and their advisors may be created via the strategic use of ICT. Research by [35-39] revealed no statistically significant differences between traditional in-person tutoring and online tutoring utilising ICT. In order to provide regular feedback and strong engagement between supervisor and supervisee [40-45], ICT may be of tremendous aid. By reducing the need for supervisors to travel to meet with their mentees and allowing for more convenient meeting times, virtual meetings may boost student-teacher connections. When and how often the supervisor meets with the person he or she is in charge of is completely up to the supervisor [46-49].

Conclusion

Conclusions From employing it as a medium of education with online material, simulation, visual literacy, cost effectiveness, and mass storage, to the many other ways in which students and instructors may benefit from technology in the classroom, the list of ways in which it can be used is almost endless. Using technology in the classroom and beyond has its benefits, but it also has its drawbacks, just like everything else in life. As more and more people have access to computers and the internet, more and more educational programmes and apps have been developed to aid in teaching and learning. Everything here is designed to assist students in improving their learning and comprehension of their subject matter. Humans now need to learn how to use technology since it is so fundamental to daily life. The modern world is increasingly dependent on electronic devices such as computers, the internet, mobile phones, videos, MP3 players, portable media players, smartphones, tablets, and more. This has led to a generation of pupils who acquire knowledge at an unprecedented rate. The use of computers in the classroom has many benefits, but it still has to be monitored by both parents and educators for the sake of the students' safety. Copyright infringement, unauthorised use of data and software, invasion of privacy, and the dehumanisation of students as learners are additional pressing concerns that must be addressed. These are significant problems that have real-world consequences for students, educators, and parents, all of whom have a stake in children's success in the classroom. The author advocates setting up a system to encourage the use of technology in schools for educational purposes while also instituting a regulatory mechanism to ensure students are making ethical decisions when accessing and using content found online.

References

Abusaimeh, H. (2020). Distributed denial of service attacks in cloud computing. International Journal of Advanced Computer Science and Applications, 11(6).

Abusaimeh, H., Shkoukani, M., & Alshrouf, F. (2014). Balancing the network clusters for the lifetime enhancement in dense wireless sensor networks. Arabian Journal for Science and Engineering, 39, 3771-3779.

Abusaimeh, H., & Alshareef, Y. (2021). Detecting the phishing website with the highest accuracy. TEM Journal, 10(2), 947.

Abusaimeh, H. (2020). Virtual machine escape in cloud computing services. International Journal of Advanced Computer Science and Applications, 11(7).

Mahafzah, A. H., & Abusaimeh, H. (2018). Optimizing power-based indoor tracking system for wireless sensor networks using ZigBee. International Journal of Advanced Computer Science and Applications, 9(12).

Abusaimeh, H. (2022). Computation Offloading for Mobile Cloud Computing Frameworks and Techniques. TEM Journal, 11(3), 1042-1046.

Abusaimeh, H. (2020). Enhance the security and prevent vampire attack on wireless sensor networks using energy and broadcasts threshold values. International Journal of Advanced Computer Science and Applications, 11(3).

Abusaimeh, H., Sharabati, A., & Asha, S. (2023). Using cloud computing services to enhance competitive advantage of commercial organizations. International Journal of Data and Network Science, 7(3), 1349-1360.

ABUSAIMEH, H., & ISAID, O. (2017). HYBRID DATA DEDUPLICATION TECHNIQUE IN CLOUD COMPUTING FOR CLOUD STORAGE. Journal of Theoretical & Applied Information Technology, 95(24).

[1]. Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet. (2020) 395:931–4.

[2]. Li Q, Guan XH, Wu P, Wang XY, Zhou L, Tong YQ, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. New Engl J Med. (2020) 382:1199–207.

[3]. Daniel SJ. Education and the COVID-19 pandemic. Prospects. (2020) 49:91–6.

[4]. Fatima A. Multimedia in education and the COVID 19 era. International Journal of Operational Research in Management, Social Sciences & Education. (2021) 7:146 – 152

[5]. Funa, A.; Talaue, F. Constructivist learning amid the COVID-19 pandemic: Investigating students' perceptions of biology self-learning modules. Int. J. Learn. Teach. Educ. Res. (2021), 20, 250–264.

[6]. Jeon, S.; Park, H. Effect of preoperative education using multimedia on pain, uncertainty, anxiety and depression in hysterectomy patients. Korean J. Women Health Nurs. (2016), 22, 39–47.

[7] N. Guan, J. Song, D. Li On the advantages of computer multimedia-aided English teaching Procedia Comput. Sci., 131 (2018), pp. 727-732 2018

[8] E. Alemdag, K. Cagiltay A systematic review of eye tracking research on multimedia learning Comput. Educ., 125 (2018), pp. 413-428 2018

[9] A.Y. Kapi, N. Osman, R.Z. Ramli, J.M. Taib Multimedia education tools for effective teaching and learning J. Telecommun. Electron. Comput. Eng., 9 (2-8) (2017), pp. 143-146

[10] M.T. Al-Hariri, A.A. Al-Hattami Impact of students' use of technology on their learning achievements in physiology courses at the University of Dammam J. Taibah Univ. Med. Sci., 12 (1) (2017), pp. 82-85

[11] I. Shah, M. Khan Impact of multimedia-aided teaching on students' academic achievement and attitude at elementary level US China Educ. Rev., 5 (5) (2015), pp. 349-360

[12] H.Y. Chen, K.Y. Liu Web-based synchronized multimedia lecture system design for teaching/learning Chinese as second language Comput. Educ., 50 (3) (2008), pp. 693-702

[13] R.E. Mayer Applying the science of learning: evidence-based principles for the design of multimedia instruction Am. Psychol., 63 (8) (2008), pp. 760-769

[14] M.J. Eady, L. Lockyer "Tools for Learning: Technology and Teaching Strategies," Learning to Teach in the Primary School Queensland University of Technology, Australia (2013), p. 71

[15]   (E. Alemdag, K. Cagiltay A systematic review of eye tracking research on multimedia learning Comput. Educ., 125 (2018), pp. 413-428

[16]   M. Milovanovic, J. Obradovic, A. Milajic Application of interactive multimedia tools in teaching mathematics--examples of lessons from geometry Turk. Online J. of Educ. Technol.-TOJET, 12 (1) (2013), pp. 19-31

[17]   I. Shah, M. Khan Impact of multimedia-aided teaching on students' academic achievement and attitude at elementary level US China Educ. Rev., 5 (5) (2015), pp. 349-360

[18]   N.A.H. Al-Ajmi, Z.M. Aljazzaf Factors influencing the use of multimedia technologies in teaching English language in Kuwait Int. J. Emerg. Technol. Learn., 15 (5) (2020), pp. 212-234

[19]   G.E. Kennedy, T.S. Judd Expectations and reality: evaluating patterns of learning behaviour using audit trails Comput. Educ., 49 (3) (2007), pp. 840-855

[20]   R.E. Mayer Cognitive theory of multimedia learning Camb. handb. Multimed Learn., 41 (2005), pp. 31-48

[21]   A.I. Molina, O. Navarro, M. Ortega, M. Lacruz Evaluating multimedia learning materials in primary education using eye tracking Comput. Stand. Interfac., 59 (2018), pp. 45-60

[22]   R.E. Mayer Applying the science of learning: evidence-based principles for the design of multimedia instruction Am. Psychol., 63 (8) (2008), pp. 760-769

[23]   Nie and Zhe, 2020 Y. Nie, Y. Zhe On-line classroom visual tracking and quality evaluation by an advanced feature mining technique Signal Process. Image Commun., 84 (May) (2020), p. 115817

[24]   E.G. Agulla, E.A. Rúa, J.L.A. Castro, D.G. Jiménez, L.A. Rifón Multimodal biometrics-based student attendance measurement in learning management systems 2009 11th IEEE International Symposium on Multimedia (2009), pp. 699-704

[25]   E. Alemdag, K. Cagiltay A systematic review of eye tracking research on multimedia learning Comput. Educ., 125 (2018), pp. 413-428

[26] L. Stark, R. Brünken, B. Park Emotional text design in multimedia learning: a mixed-methods study using eye tracking Comput. Educ., 120 (2018), pp. 185-196

[27]   Mukhtar & Iskandar, Orientasi Baru Supervise Pendidikan. Jakarta: Gaung Persadapress, 2013.

[28]   Suharsaputra Uhar, Supervisi Pendelikon: Pendekatan Sistem Berbasis Kinerja. Bandung: PT Refika Aditama, 2018.

[29] S. J. Zepeda, Instructional supervision: Applying tools and concepts. Taylor & Francis. 2016.

[30]   E. Vázquez Cano and M. a L. Sevillano García, "Ict Strategies and Tools for the Improvement of Instructional Supervision. the Virtual Supervision," Turkish Online J. Educ. Technol., vol. 12, no. 1, pp. 77–87, 2013, [Online]. Available: http://ezproxy.lib.swin.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&db= ehh&AN=85319838&site=ehost-live&scope=site.

[31]   J. Larreamendy-Joerns and G. Leinhardt, "Going the Distance with Online Education," Rev. Educ. Res., vol. 76, pp. 567–605, Dec. 2006, doi: 10.3102/00346543076004567

[32]   E. W. T. Chan, S.C.H. & Ngai, "A Qualitative Study of Information Technology Adoption: How Ten Organizations Adopted Web-Based Training," J. Dep. Manag., 2007.

[33]   Butcher, J. and Sieminski, S. (2006), "The challenge of a distance learning professional doctorate in education", Open Learning: The Journal of Open, Distance and e-Learning, Vol. 21 No. 1, pp. 59-69.

[34]   MacKeogh, K. (2006), "Supervising undergraduate research using online and peer supervision", in Huba, M. (Ed.), 7th International Virtual University Conference, Bratislava 14-15 December 2006, Technical University Bratislava, Bratislava, pp. 19-24.

[35]   Iwasaki, C., Tada, Y., Furukawa, T., Sasaki, K., Yamada, Y., Nakazawa, T. and Ikezawa, T. (2019), "Design of e-learning and online tutoring as learning support for academic writing", Asian Association of Open Universities Journal, Vol. 14 No. 2, pp. 85-96, doi: 10.1108/AAOUJ-06-2019-0024.

[36]   Hansen, P. and Hansson, H. (2015), "Optimizing student and supervisor interaction during the SciPro thesis process–concepts and design", in Li, F., Klamma, R., Laanpere, M., Zhang, J., Manjón, B. and Lau, R. (Eds), International Conference on Web-Based Learning, Springer, Cham, pp. 245-250.

[37]   Karunaratne, T. (2018), "Blended supervision for thesis projects in higher education: a case study", Electronic Journal of E-Learning, Vol. 16 No. 2, pp. 79-90.

[38]   Firas Tayseer Mohammad Ayasrah, Ala Shdouh, & Khaleel Al-Said. (2023). Blockchain-based student assessment and evaluation: a secure and transparent approach in jordan's tertiary institutions. Kurdish Studies, 11(2), 2036–2049. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/762

[39]   Ayasrah, F. T. M. (2020). Challenging Factors and Opportunities of Technology in Education. International Journal of Advanced Science and Technology, 29(4s), 962 - 972. Retrieved from http://sersc.org/journals/index.php/IJAST/article/view/6557

[40]   Abdulkader, R., Ayasrah, F. T. M., Nallagattla, V. R. G., Hiran, K. K., Dadheech, P., Balasubramaniam, V., & Sengan, S. (2023). Optimizing student engagement in edge-based online learning with advanced analytics. Array, 19, 100301.

[41]   Aljermawi, H., Ayasrah, F., Al-Said, K., Abualnadi, H., & Alhosani, Y. (2024). The effect of using flipped learning on student achievement and measuring their attitudes towards learning through it during the corona pandemic period. International Journal of Data and Network Science, 8(1), 243-254.

[42]   Ayasrah, F. T. M., Abu-Alnadi, H. J. ., Al-Said, K. ., Shrivastava, G. ., Mohan, G. K. ., Muniyandy, E. ., & Chandra, U. . (2024). IoT Integration for Machine Learning System using Big Data Processing. International Journal of Intelligent Systems and Applications in Engineering, 12(14s), 591–599. Retrieved from https://ijisae.org/index.php/IJISAE/article/view/4698

[43]   Venkateswaran, P. S., Ayasrah, F. T., Nomula, V. K., Paramasivan, P., Anand, P., & Bogeshwaran, K. (2024). Applications of Artificial Intelligence Tools in Higher Education. In S. Singh, S. Rajest, S. Hadoussa, A. Obaid, & R. Regin (Eds.), Data-Driven Decision Making for Long-Term Business Success (pp. 124-136). IGI Global. https://doi.org/10.4018/979-8-3693-2193-5.ch008

[44]   Ayasrah, F. T. M., Alarabi, K., Al Mansouri, M., Fattah, H. A. A., & Al-Said, K. (2024). Enhancing secondary school students' attitudes toward physics by using computer simulations.

[45]   Ayasrah, F. T. M., Alarabi, K., & Fattah, H. A. A. (2023). A Secure Technology Environment and AI's Effect on Science Teaching: Prospective Science Teachers. Migration Letters, 20(S2), 289-302.

[46]   Younis Alhosani, Phd candidate, Rashid Al Riyami, Assistant Professor, Khaleel Alarabi, & Firas Tayseer Mohammad Ayasrah. (2023). Academic excellence: key factors and review of world-class institutions. Kurdish Studies, 11(2), 2023–2035. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/761

[47]   Habis, B., Tayseer, F., Ayasrah, M., & Balawi, M. (2023). Impact of electronic games addiction post COVID-19 on the mental health of public-school students in Jordan. International Journal of Education, 11(3), 473-485.

[48]   Taha, S., Abulibdeh, E., El-Gendi, H., Almarashdi, H. S., Alghazo, E. M., Mostafa, I. I., ... & Alkhalaileh, M. S. (2023). Exploring Media and Communication Studentsâ€™ Perception of Egyptian Universitiesâ€™ Use of Augmented Reality in Learning. Studies in Media and Communication, 11(4), 209-219.

[49]   Alhawamdeh, H., Al-Saad, S. A., Almasarweh, M. S., Al-Hamad, A. A. S., Ahmad, A. Y., & Ayasrah, F. T. M. (2023). The role of energy management practices in sustainable tourism development: a case study of Jerash, Jordan. International Journal of Energy Economics and Policy, 13(6), 321-333.

Ahmad, A. Y. B., Kumari, D. K., Shukla, A., Deepak, A., Chandnani, M., Pundir, S., & Shrivastava, A. (2024). Framework for Cloud Based Document Management System with Institutional Schema of Database. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 672-678.

Ahmad, A. Y. B., Hannoon, A., Al-Daoud, K. I., Abu-Alsondos, I. A., & Al-Qaisieh, M. S. (2023). Assessment of Cloud Based Accounting Technology Adoption and Business Performance. Kurdish Studies, 11(3).

Ahmad, A. Y. B., Kumari, D. K., Shukla, A., Deepak, A., Chandnani, M., Pundir, S., & Shrivastava, A. (2024). Framework for Cloud Based Document Management System with Institutional Schema of Database. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 672-678.

Ahmad, A. Y. B., Tiwari, A., Nayeem, M. A., Biswal, B. K., Satapathy, D. P., Kulshreshtha, K., & Bordoloi, D. (2024). Artificial Intelligence Perspective Framework of the Smart Finance and Accounting Management Model. International Journal of Intelligent Systems and Applications in Engineering, 12(4s), 586-594.

Ahmad, A., Abusaimeh, H., Rababah, A., Alqsass, M., Al-Olima, N., & Hamdan, M. (2024). Assessment of effects in advances of accounting technologies on quality financial reports in Jordanian public sector. Uncertain Supply Chain Management, 12(1), 133-142.

Ahmad, A. (2024). Ethical implications of artificial intelligence in accounting: A framework for responsible ai adoption in multinational corporations in Jordan. International Journal of Data and Network Science, 8(1), 401-414.

Ahmad Y. A. Bani Ahmad, "Firm Determinants that Influences Implementation of Accounting Technologies in Business Organizations," WSEAS Transactions on Business and Economics, vol. 21, pp. 1-11, 2024

Ahmad, A. Y. B., William, P., Uike, D., Murgai, A., Bajaj, K. K., Deepak, A., & Shrivastava, A. (2024). Framework for Sustainable Energy Management using Smart Grid Panels Integrated with Machine Learning and IOT based Approach. International Journal of Intelligent Systems and Applications in Engineering, 12(2s), 581-590.

Ahmad, A. B., Atta, A. A. B., Asma'a Al-Amarneh, M. S., & Dahbour, S. A. (2023). Fund Family Selectivity Skills and Market Timing Ability: Comparison Study

Ahmad, A. Y. Bani ahmad, (2019). Empirical Analysis on Accounting Information System Usage in Banking Sector in Jordan. Academy of Accounting and Financial Studies Journal, 23(5), 1-9.

Ahmad, A. Y. B., Gongada, T. N., Shrivastava, G., Gabbi, R. S., Islam, S., & Nagaraju, K. (2023). E-Commerce Trend Analysis and Management for Industry 5.0 using User Data Analysis. International Journal of Intelligent Systems and Applications in Engineering, 11(11s), 135-150.

Alhawamdeh, H., Al-Saad, S. A., Almasarweh, M. S., Al-Hamad, A. A.-S. A., Bani Ahmad, A. Y. A. B., & Ayasrah, F. T. M. (2023). The Role of Energy Management Practices in Sustainable Tourism Development: A Case Study of Jerash, Jordan. International Journal of Energy Economics and Policy, 13(6), 321–333. https://doi.org/10.32479/ijeep.14724

Allahham, M., & Ahmad, A. (2024). AI-induced anxiety in the assessment of factors influencing the adoption of mobile payment services in supply chain firms: A mental accounting perspective. International Journal of Data and Network Science, 8(1), 505-514.

A. Y. A. B. Ahmad, S. S. Kumari, M. S, S. K. Guha, A. Gehlot and B. Pant, "Blockchain Implementation in Financial Sector and Cyber Security System," 2023 International Conference on Artificial Intelligence and Smart Communication (AISC), Greater Noida, India, 2023, pp. 586-590, https://doi.org/10.1109/AISC56616.2023.10085045

Ahmad, A. Y. B., Atta, A. A. B., Shehadeh, M. A. H. A., Baniata, H. M. A., & Hani, L. Y. B. (2023). Fund family performance: Evidence from emerging countries. WSEAS Trans. Bus. Econ, 20, 951-964.

Bani Atta, A. A., Ali Mustafa, J., Al-Qudah, S. S., Massad, E., & Ahmad, A. B. (2023). The effect of macroprudential regulation on banks' profitability during financial crises [Specialissue]. Corporate Governance and Organizational Behavior Review, 7(2), 245-258.

Cheng, Congbin, Sayed Fayaz Ahmad, Muhammad Irshad, Ghadeer Alsanie, Yasser Khan, Ahmad Y. A. Bani Ahmad (Ayassrah), and Abdu Rahman Aleemi. 2023. "Impact of Green Process Innovation and Productivity on Sustainability: The Moderating Role of Environmental Awareness" Sustainability 15, no. 17: 12945. https://doi.org/10.3390/su151712945

Atta, A., Baniata, H., Othman, O., Ali, B., Abughaush, S., Aljundi, N., & Ahmad, A. (2024). The impact of computer assisted auditing techniques in the audit process: an assessment of performance and effort expectancy. International Journal of Data and Network Science, 8(2), 977-988.

ALLAHHAM, M., SHARABATI, A. A. A., HATAMLAH, H., AHMAD, A. Y. B., SABRA, S., & DAOUD, M. K. Big Data Analytics and AI for Green Supply Chain Integration and Sustainability in Hospitals.Magboul, I., Jebreel, M., Dweiri, M., Qabajeh, M., Al-Shorafa, A., & Ahmad, A. (2024). Antecedents and outcomes of green information technology Adoption: Insights from an oil industry. International Journal of Data and Network Science, 8(2), 921-934.

Daoud, M. K., Al-Qeed, M., Ahmad, A. Y. B., & Al-Gasawneh, J. A. (2023). Mobile Marketing: Exploring the Efficacy of User-Centric Strategies for Enhanced Consumer Engagement and Conversion Rates. International Journal of Membrane Science and Technology, 10(2), 1252-1262.

Daoud, M., Taha, S., Al-Qeed, M., Alsafadi, Y., Ahmad, A., & Allahham, M. (2024). EcoConnect: Guiding environmental awareness via digital marketing approaches. International Journal of Data and Network Science, 8(1), 235-242.

Fraihat, B. A. M., Ahmad, A. Y. B., Alaa, A. A., Alhawamdeh, A. M., Soumadi, M. M., Aln'emi, E. A. S., & Alkhawaldeh, B. Y. S. (2023). Evaluating Technology Improvement in Sustainable Development Goals by Analysing Financial Development and Energy Consumption in Jordan. International Journal of Energy Economics and Policy, 13(4), 348

Almestarihi, R., Ahmad, A., Frangieh, R., Abu-AlSondos, I., Nser, K., & Ziani, A. (2024). Measuring the ROI of paid advertising campaigns in digital marketing and its effect on business profitability. Uncertain Supply Chain Management, 12(2), 1275-1284.

Al-Dweiri, M., Ramadan, B., Rawshdeh, A., Nassoura, A., Al-Hamad, A., & Ahmad, A. (2024). The mediating role of lean operations on the relationship between supply chain integration and operational performance. Uncertain Supply Chain Management, 12(2), 1163-1174.

Lin, C., Ahmad, S. F., Ayassrah, A. Y. B. A., Irshad, M., Telba, A. A., Awwad, E. M., & Majid, M. I. (2023). Green production and green technology for sustainability: The mediating role of waste reduction and energy use. Heliyon, e22496.

M. K. Daoud, D. Alqudah, M. Al-Qeed, B. A. Al Qaied, and A. Y. A. B. Ahmad, "The Relationship Between Mobile Marketing and Customer Perceptions in Jordanian Commercial Banks: The Electronic Quality as A Mediator Variable", ijmst, vol. 10, no. 2, pp. 1360-1371, Jun. 2023

Mohammad Jebreel, Mohammad Alnaimat, Amjad Al-Shorafa, Majed Qabajeh, Mohammad Alqsass, & Ahmad Bani Ahmad. (2023). The Impact of Activity Ratios on Change in Earnings (Case Study:Based on Jordanian Food Companies). Kurdish Studies, 11(2), 4551–4560. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/1044

Mohammad Alqsass, Munir Al-Hakim, Qais Al Kilani, Lina Warrad, Majed Qabajeh, Ahmad Y. A.Bani Ahmad, & Adnan qubbaja. (2023). The Impact of Operating Cash Flow on Earnings Per Share (Case Study Based on Jordanian Banks). Kurdish Studies, 11(2), 2718–2729. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/831

Mohammad Alqsass, Munir Al-Haki, Mohammad Dweiri, Majed Qabajeh, Dmaithan almajali, Ahmad Bani Ahmad, & Adnan Qubbaja. (2023). The Impact of Current Ratio on Net Profit Margin (Case Study: Based on Jordanian Banks). Kurdish Studies, 11(2), 2894–2903. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/834

Mustafa, J. A., ATTA, A. A. B., AHMAD, A. Y. B., SHEHADEH, M., & Agustina, R. (2023). Spillover Effect in Islamic and Conventional Fund Family: Evidence from Emerging Countries. WSEAS Transactions on Business and Economics, 20, 1042-1058.

Mohsin, H. J., Hani, L. Y. B., Atta, A. A. B., Al-Alawnh, N. A. K., Ahmad, A. B., & Samara, H. H. (2023). THE IMPACT OF DIGITAL FINANCIAL TECHNOLOGIES ON THE DEVELOPMENT OF ENTREPRENEURSHIP: EVIDENCE FROM COMMERCIAL BANKS IN THE EMERGING MARKETS.

Ni, L., Ahmad, S. F., Alshammari, T. O., Liang, H., Alsanie, G., Irshad, M., ... & Ayassrah, A. Y. B. A. (2023). The role of environmental regulation and green human capital towards sustainable development: The mediating role of green innovation and industry upgradation. Journal of Cleaner Production, 138497.

Peng, Yixuan, Sayed Fayaz Ahmad, Ahmad Y. A. Bani Ahmad, Mustafa S. Al Shaikh, Mohammad Khalaf Daoud, and Fuad Mohammed Hussein Alhamdi. 2023. "Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals" Sustainability 15, no. 19: 14165. https://doi.org/10.3390/su151914165

Peiran Liang, Yulu Guo, Sohaib Tahir Chauhdary, Manoj Kumar Agrawal, Sayed Fayaz Ahmad, Ahmad Yahiya Ahmad Bani Ahmad, Ahmad A. Ifseisi, Tiancheng Ji,2024,"Sustainable development and multi-aspect analysis of a novel polygeneration system using biogas upgrading and LNG regasification processes, producing power, heating, fresh water and liquid CO2,"Process Safety and Environmental Protection

Peiran Liang, Yulu Guo, Tirumala Uday Kumar Nutakki, Manoj Kumar Agrawal, Taseer Muhammad, Sayed Fayaz Ahmad, Ahmad Yahiya Ahmad Bani Ahmad, Muxing Qin, 2024. "Comprehensive assessment and sustainability improvement of a natural gas power plant utilizing an environmentally friendly combined cooling heating and power-desalination arrangement",Journal of Cleaner Production,Volume 436,,140387

R. A. Y. A. Bani Ahmad, Y. M. A. Tarshany, F. T. M. Ayasrah, F. S. Mohamad, S. I. A. Saany and B. Pandey, "The Role of Cybersecurity in E-Commerce to Achieve the Maqasid of Money," 2023 International Conference on Computer Science and Emerging Technologies (CSET), Bangalore, India, 2023, pp. 1-8, doi: 10.1109/CSET58993.2023.10346972.

Rumman, G., Alkhazali, A., Barnat, S., Alzoubi, S., AlZagheer, H., Dalbouh, M., ... & Darawsheh, S. (2024). The contemporary management accounting practices adoption in the public industry: Evidence from Jordan. International Journal of Data and Network Science, 8(2), 1237-1246.

Singh, R., Gupta, N. R., & Ahmad, A. Y. (2024). An Empirical Study on Challenges of Working from Home During COVID-19 on Work-Life Domains in the Education Sector in Bengaluru. In S. Singh, S. Rajest, S. Hadoussa, A. Obaid, & R. Regin (Eds.), Data-Driven Intelligent Business Sustainability (pp. 111-121). IGI Global. https://doi.org/10.4018/979-8-3693-0049-7.ch008

William, P., Ahmad, A. Y. B., Deepak, A., Gupta, R., Bajaj, K. K., & Deshmukh, R. (2024). Sustainable Implementation of Artificial Intelligence Based Decision Support System for Irrigation Projects in the Development of Rural Settlements. International Journal of Intelligent Systems and Applications in Engineering, 12(3s), 48-56.

Wang, C., Ahmad, S. F., Ayassrah, A. Y. B. A., Awwad, E. M., Irshad, M., Ali, Y. A., ... & Han, H. (2023). An empirical evaluation of technology acceptance model for Artificial Intelligence in E-commerce. Heliyon, 9(8).

Yahiya Ahmad Bani Ahmad (Ayassrah), Ahmad; Ahmad Mahmoud Bani Atta, Anas; Ali Alawawdeh, Hanan; Abdallah Aljundi, Nawaf; Morshed, Amer; and Amin Dahbour, Saleh (2023) "The Effect of System Quality and User Quality of Information Technology on Internal Audit Effectiveness in Jordan, And the Moderating Effect of Management Support," Applied Mathematics & Information Sciences: Vol. 17: Iss. 5, Article 12. DOI: https://dx.doi.org/10.18576/amis/170512

Zhan, Y., Ahmad, S. F., Irshad, M., Al-Razgan, M., Awwad, E. M., Ali, Y. A., & Ayassrah, A. Y. B. A. (2024). Investigating the role of Cybersecurity's perceived threats in the adoption of health information systems. Heliyon, 10(1).

SALIH, A. A., & NASEREDDIN, A. Y. The Role of Strategic Awareness in Developing the Practice of Strategic Foresight in Business Organizations-Epistemological Perspective.

Nasereddin, A. (2023). Exploring the effect of corporate environmental management responsibility on firm performance. Uncertain Supply Chain Management, 11(2), 625-636.

Salih, A., Mousa, Z., & Nasereddin, A. (2023). The impact of career capital on sustainable competitive advantage: The mediating role of human resource management capabilities. Uncertain Supply Chain Management, 11(2), 489-502.

Raza, A., Al Nasar, M. R., Hanandeh, E. S., Zitar, R. A., Nasereddin, A. Y., & Abualigah, L. (2023). A Novel Methodology for Human Kinematics Motion Detection Based on Smartphones Sensor Data Using Artificial Intelligence. Technologies, 11(2), 55.

Nasereddin, A. Y. (2023). Impact of the Blue Ocean Strategy Dimensions in Achieving Competitive Advantage from the Perspective of Faculty Members.

Nasereddin, A. Y. (2023). A Business Analytics Approach to Strategic Management using Uncovering Corporate Challenges through Topic Modeling.

Yacoub Nasereddin, Ahmad (2023) "The Impact of Lean Thinking on Strategic Planning in Industrial Companies in Jordan from the Upper and Middle Management: A Perspective Study," Information Sciences Letters: Vol. 12: Iss. 6, PP –

Conflict of Interest

The author declares that he has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article