

Internet of Things to Improve the Quality of Islamic Education

Hana Ayu Safitri^{1*}, Muh.Nur Rochim Maksum²

¹²Universitas Muhammadiyah Surakarta

*Correspondence: Hana Ayu Safitri
Email: g000210147@student.ums.ac.id
DOI:
<https://doi.org/10.23917/iseedu.v8i1.8845>

Received: 22-03-2024
Accepted: 20-04-2024
Published: 11-05-2024



Copyright: © 2024 by the authors.
Submitted for possible open access
publication under the terms and conditions
of the Creative Commons Attribution (CC
BY) license
(<https://creativecommons.org/licenses/by/4.0/>)

Abstract:

The Internet of Things is a wireless network that connects one object to another using the internet that does not require interaction between humans. Internet of Things is one of the trends to apply it in the world of education. The purpose of the study is to analyze the use of Internet of Things technology to improve the quality of Islamic education. The method used in this study is library research by collecting literature related to the use of IoT in educational institutions. The result of this research is that sensors connected to IoT in Islamic educational institutions strive to collect data in a very fast time, automatic management of facilities so that they are more efficient.

Keywords: Internet of Things, Quality, Islamic Religious Education

Introduction

Technology in education is the application of teaching and learning process activities in a very interesting educational environment, especially learning in Islam (Terzieva, Ilchev , & Todorova, 2022). The impact given to this technological change on life especially on the education system. Educational technology discusses education such as curriculum, management, the essence of which is all summarized in one summary in educational technology. The application of educational technology should not be used carelessly in accordance with existing guidelines, the Qur'an and hadith as our guidelines in Islam in order to maintain religious beliefs and the development of the times (Sultana & Tamanna , 2022). Technology is a process of research results of scientists thFat can be used by everyone without painstakingly making it, so it can be concluded that technological developments must be used as well as possible to facilitate the educational process.

The world of education cannot be separated from the development of technology today, it is necessary to learn media in the form of the internet in conducting learning, education needs the internet as a medium, with the internet in education as a medium to make it easier to send assignments via email or others, find information about the widest possible material, and so on (Kumar & Al-Besher, 2022). Utilizing internet media is also very important in carrying out good learning. There has been a long relationship between education and technology, education is now carried out online and online, learning materials that were originally in paper form can now be used as files (PDF), to improve quality learning in terms of interactivity, interest, and learning motivation. Therefore, to increase the contribution in using learning technology, research is needed, both in terms of management of education implementation and in terms of communication. With conventional methods, the large number of students and the increasingly complex curriculum become a difficult

challenge when still using these methods. Technology has long been used in the educational process, for example the use of e-learning, using e-learning provides many advantages in learning, such as the delivery of very broad material, flexibility, and ease in storing material in learning (Baidi & Sutrisno, 2022).

Islamic Religious Education is learning with the aim of introducing religious teachings from an early age, which must be conveyed to students, Islamic religious education is an obligation to learn and educating is the responsibility of Muslims. Islamic religious education technology is that everyone can enjoy and use it. In the use of every individual has a desire, technology can bring positive things or even plunge into negative things. In realizing effective learning, broad insight into the creation of education

in the use of technology is needed. Must make the most of it in the use of Islamic religious education technology. In this era of global development in improving the quality of education, inevitably in determining the quality of education must be considered the results of empirical studies in developed countries, otherwise the world of education of our nation will suffer. Therefore, it is the responsibility to repair all existing systems. With the development of the times in the use of Islamic religious education methods must harmonize students for the optimization of the results of the development of the era in which they live. Teachers are no longer centralized in education today, but move to students. These factors are needed to take advantage of optimization so that the context of Islamic education with technology makes facilities for students.

In the rapidly growing digital era, *Internet Of Thing* (IoT) technology has been used as a major influence innovation for trajectories in the Education sector, technological advances are demands to increase the creation of optimizing learning environments such as the management of facilities and infrastructure of Islamic educational institutions (Morchid, El Alami , Raezah, & Sabbar, 2024) Internet of Things (IoT) technology is used as a support in learning needs among them, namely theoretical and practical learning that utilizes the internet. Internet Of Thing (IoT) technology can affect students in the teaching and learning process. Data obtained in IoT can be used effectively in educational environments, one of which is by using paper textbooks into electronic books, in Islamic religious education one example is, printed Quran into digital Qur'an (Aldhaheri, Alwahedi, Ferrag, & Battah , 2024).

Technology of Things (IoT) opens up new opportunities for optimizing the management of facilities and infrastructure in education, various devices and sensors that are interconnected, IoT is utilized in educational institutions to use real-time data to improve the learning environment comfortably and safely. Using IoT in a wise and efficient way, for the development and progress of Islamic education, Islamic educational institutions can make a positive contribution. IoT can improve students' experience in learning, where students in Indonesia generally have smartphones that are used as learning media. Technology Of Things is here to change learning methods (Saada, 2023).

The use of the Internet of Things has been used in several fields. The start of this application with the automation of the home object to the wearable pliers object. During the pandemic, the use of applications with the help of IoT tools can reduce the spread of the corona virus by monitoring patients, conducting primary analysis, and following protocols according to existing regulations. The use of IoT aims to change the way education works in improving the quality of students (Hanafi, Taufiq, Saefi, & Iksan, 2023).

In the Islamic education sector, to face the challenges of this increasingly complex digital era,

in addition to fighting global competition, to face the growing number of students who continue to increase in educational institutions. So the need for the right technology to improve a quality learning environment in the management of comfortable and modern facilities. By understanding the right technology, to meet the growing needs of education in the face of global competition, educational institutions must be better prepared for the challenges of it all (Insyirah, Maksum, Jinan, & Husein, 2023).

The purpose of this study is to analyze in Islamic religious education about the use of IoT to improve convenience, security, and efficiency in managing facilities. This research discusses the basics of the Internet of Things to convey an understanding of how technology to face challenges in Islamic educational institutions.

Research Method

This article uses library research methods or literature studies, an approach used to collect and analyze relevant literature related to Internet of Things Technology in Islamic education. In the library research method, the first time is to determine keywords in accordance with the theme raised, such as "Internet of things, IoT in educational institutions, and IoT implementation in Islamic educational institutions". Continue to search for literature that is a variety of trusted sources such as relevant previous research, national and international journals, books, and proceedings. Then the acquisition of data from literature is continued to identify in accordance with the topic raised.

Result and Discussion

The Internet of things (IoT) consists of a combination of the words "Internet" and "Things". The word "internet" is defined as internet protocols (TCP / IP) used in computer networks. This network is usually used to communicate and share certain information. While "Things" is a physical world consisting of objects in retrieval using sensors sent via the internet. Internet of Things (IoT) can be understood as hardware, software, and websites used to build a fabric system. Because there is a difference between the two, namely hardware and website protocols, for that an embedded system is needed in the form of a gateway using the internet or wifi to connect the differences in protocols

Internet of Things (IoT) innovations are very important in the world of education, one of which is higher education, because universities are currently one of the institutions that contribute to educational activities in Indonesia. To adapt the Internet of Things in educational institutions, it must continuously innovate, such as learning-oriented curricula such as entrepreneurship, and collaboration in addition to hard-skills. In addition, for all types of work today still related to information technology and artificial intelligence, therefore in educational institutions must introduce through the tasks given by students (Taj, Imran, Kastrati, Daudpota, & Memon, 2023)

With the development of technology today can increase access to learning, with this online platform students can access materials and assignments anywhere and anytime so that they can learn independently and the opportunity to learn outside the school environment. In addition, this technology makes it easier for teachers to use learning methods, so that teachers present their learning materials can take advantage of various other tools and applications, therefore learning can be more active, interactive and attract students' attention, for example learning that displays videos and games that can arouse their motivation

Internet of Things (IoT) as an internet network used to connect all objects that can communicate

with one another. For example, the installation of CCTV along a highway that is tens of kilometers away and the connection uses an internet connection that is united in rung control, as for smart homes whose connections also use internet connections are also run with smartphones. This IoT device consists of the use of sensors in data collection, communication media that use internet connections, and information collection using servers that have been received by sensors (Hastasari, Setiawan, & Aw, 2022)

Systems connected to IoT are interfaces for users in accessing and controlling objects in IoT. users can monitor an object, control certain functions and receive reports from IoT objects through websites or special applications. The benefits of IoT in everyday life such as homes can be equipped with sensors that monitor temperature and human presence. Using the internet can be sent to the central system regarding data through sensors. Where, the central system can take action according to what is received after analyzing the incoming data, for example if the temperature in the room is too low, then the system automatically activates the air conditioner to increase the temperature (Aldin, Ghods, Nayebipour, & Torshiz, 2024).

In the health sector, IoT can be used in monitoring patient conditions in real time. With the installation of sensors in the patient's body that record the patient's condition to send vital data such as oxygen levels, heart rate, and blood pressure to the health system that monitors to warn if experiencing an emergency. In agriculture, IoT sensors can monitor soil moisture, air quality, and water used in crop needs, so that information from these sensors can optimize crop yields. In addition, in the industrial field, IoT sensors are used to monitor the course of the production process, sensors installed on machines can notify of problems that occur. (Gunasekara, Borrero, Vasuian, & Bryceson, 2018)

While in the world of education, IoT has an influence in the world of education, which can improve the level of flexibility and effectiveness. Technology and information are developing rapidly after the application of IoT systems, in general IoT is used in the world for the following:

1. E-Learning

E-learning is an educational system where teaching and learning activities are carried out outside the classroom using telephones, as well as other communication tools that can help in the learning process. This environment is also referred to as online or virtual learning. E- learning depends on the internet, if the internet is not connected then the shopping using this e- learning system cannot run. The flexibility in the use of e-learning is that students can learn anywhere and anytime, and there are recordings of material that students may be able to repeat to learn

2. Book Borrowing

The IoT system facilitates the process of borrowing books safely, anyone who will borrow books does not have to come to school but can use a connected application in the library. and then pick up books at the school that have been ordered through the library application. Because the transaction is recorded automatically so that it can analyze what is of interest seen from the collection of books borrowed. With this it becomes very important in developing the collection of the library

3. Smart Classrooms

Intelligent classroom systems are learning environments from IoT applications, these environments where enhanced technology is complete with computers, specialized software, and audio or visual capabilities. With this system can determine about the environment that can

monitor various oxygen, temperature, noise, baud and other environmentally friendly conditions

4. Attendance Monitoring System

One application applied in the field of education is the attendance monitoring system. To monitor student attendance through this application use RFID tags. Attendance of incoming students can be recorded automatically using IoT devices as an example of ECG patterns used by smart bands using this for proof of their identity

5. Education through Gamification

It can be said to be a good learning exercise when a player can feel his learning experience while playing, because Gamification can involve users can get entertainment and increase concentration on the game. Applying these gamification techniques to the Internet of Things helps system interaction. The Internet of Things helps improve their learning by using Internet of Things methods in experimental communities (Ahaidous, Tabaa, & Hachimi, 2023).

6. Cost Efficiency

With the use of IoT in the use of dashboards that contain data about school equipment, operational costs are reduced, for example, in securing school buildings, it takes only a few officers to maintain security, with motion sensors and live motion cameras that help security officers catch suspicious objects. With a model like this it is more effective compared to keeping with a manual model.

Improving educational facilities with the use of Internet of Things applications

To use surveillance cameras can provide security and privacy in presence, find modern security alternatives, databases and security records, financial and economic development can be through transactions with financially available to talented and intelligent students to achieve additional products (service sector education, improved wifi connection, Bluetooth and WLAN) emerging intelligent generation for possibilities in facing skills in utilizing the Internet of Things, and the availability of approved medical reports and records, methods to facilitate in detecting diseases of students and allow to reduce them, in the improvement of the administration of schools using intelligent systems of programs and data analysis, in the replacement by electronic administration, ways of reducing and saving time in improving the quality of education, Teacher practices in the use of the Internet of Things in intelligent education all contribute to As a study explains the need to power smart school environments and enable widespread application of systems, the lack of electronics in gifted schools is a concern in student data privacy (Ali, Nilal, Razzaq, & Khan, 2017).

The positive impact of using IoT in Islamic education

The use of IoT in the world of education has a huge impact. First, increasing operational efficiency and reducing financing for example: the use of smart boards in interactive learning, learning using platforms in Internet of Things technology so as to reduce the cost of learning and the quality of learning is improved. Second, improving the experience in teaching and learning, for example: access to very broad material, teachers and students in learning can access resources from anywhere, making it easier in the teaching and learning process. Third, the positive impact on environmental friendliness, for example: the use of all-digital teaching materials so that learning uses IoT-based digital platforms, such as videos, ebooks, and e- learning with educational institutions using these things so that they can reduce waste production (Bhardwaj, Kaushik, Bharany, & Kim, 2023).

The Role of IoT Technology in the Management of Facilities of Islamic Educational Institutions

Internet of Things (IoT) technology is becoming a very important role in the management of Islamic educational institution facilities. With the creation of a more efficient, comfortable and modern learning environment in facility management with the use of IoT (Ali & Nihad, 2021):

1. Optimizing Facility Use with IoT

Management of educational institutions in optimizing the use of facilities more effectively using IoT technology. Sensors and connected devices in the manager can monitor classrooms, laboratories, and libraries in real-time use. To collect data helps the facility management in using it, ensuring the room in optimal use, and avoiding collisions in carrying out activities

2. Application of IoT Connected Sensors for Monitoring and Data Collection

Educational institutions are easier to monitor accurately about various humidity, air quality, temperature, and lighting in the classroom by using IoT technology through the application of sensors, so as to create comfort for residents, the process of regulating air conditions in the room which includes aspects of temperature, humidity, cleanliness, and odor. The collected data can be analyzed by identifying certain patterns, such as uncomfortable environmental conditions and rush hour hours. Therefore, it can take the right action in improving the comfort and quality of the learning environment

3. Facility Automation and Energy Efficiency with IoT Technology

Facilities in educational institutions are automated for applications using IoT, such as lighting, temperature compliance, and security systems. Student and staff attendance is automatically recorded based on the schedule in the system settings. IoT technology is also a more efficient monitor related to energy consumption and also to help save energy.

Internet Of Things Technology Challenges Islamic Educational Institutions

First, there are limited resources and nudgets, educational institutions that use Internet of Things Technology, there are challenges and obstacles that need to be overcome. One of challenges and obstacles that exists in the educational environment is limited resources and budget (Rao & Elias-Medina, 2024). The implementation of IoT in educational institutions also requires a considerable budget in infrastructure, devices and technical skills. Education institutions in the use of IoT have limited budgets so it is difficult time and costs (Shi, Haga, & Okada, 2021).

Another challenge is data security and privacy. Increased risk for cybersecurity in using IoT technology, especially the same network that connects many devices. Data hacking, illegal access to sensitive information, and attacks on campus infrastructure are all potential threats to the use of IoT (Pradhan, Peter, & Mbohwa, 2023). Not only that, IoT sensors used to collect data must be considered in privacy policies and data protection settings so as not to violate individual rights. Become a bottleneck in IoT systems between compatibility and interoperability. The application of IoT technology requires efficient integration in various devices and platforms to make it more complex. If it is not done properly, this results in difficulty in managing the system as a whole, slow in the process of adoption, and can even cause operational efficiency. In addition, other challenges include the use of cultural change and adoption. The adoption of IoT technology also requires changes in thinking patterns and old ways of working. In the use of new technologies and the benefits of technology, students and staff need to understand them (Uckelmann, 2011).

Islamic educational institutions urgently need to take a careful approach and careful planning to overcome challenges and obstacles. So what needs to be done to be successful in using IoT to

improve learning and teaching is, form a cost and benefit analysis, prioritize data security and privacy, and create a seamless connection (Gomez , Huete, Hoyos, Perez, & Grigori , 2013).

Both security and data privacy. Islamic educational institutions in using the Internet of Things (IoT) must take care seriously related to data security and privacy. The variety of connection devices and sensors can open up potential cybersecurity risks and potential data privacy breaches. Some security challenges to watch out for include:

1. Hacking Treat

IoT provides many potential entry points for hackers who undertake to access institutional networks. The security system owned by IoT is not strong, so hackers can steal data, access sensitive information, and disrupt activities on campus

2. DDoS (Distributed Denial of Service)

IoT devices are so weak about security that it's easy to launch DDoS attacks, and excessive server and network internet traffic can be the cause of instability and service unavailability.

3. Data theft

IoT sensors used in data collection must strictly protect students' personal and academic information. The cause of identity theft, fraud and even wrong use of personal information because the data is held in the wrong hand. Data leak incidents and cyber attacks have an impact on consumer confidence in data security that must be provided. Inaccurate data exits in the campus environment are caused by faulty IoT sensors or manipulation.

To overcome the above challenges, educational institutions must be more careful and plan more carefully, the steps that must be followed up are educational institutions conducting training and use to students, teachers and staff about data privacy to be safe, making regular updates in devices to overcome attacks, and installing detection systems to overcome cyber threats.

Conclusion

Internet The Internet of Things is becoming a very important part of Islamic educational institutions. By utilizing Technology of Things Islamic educational institutions can create comfortable and conducive learning, improved quality of education, and optimization of resources. The concept of IoT plays a role in connecting various physical devices to the internet. The application of technology in educational institutions can enable the exchange of data between devices. Facility management in education using IoT devices is more effective in regulating class, temperature, and energy use. Educational institutions in improving security and surveillance use Internet of Things technology such as, motion sensors, surveillance cameras, and emergency notification systems. Although the use of IoT has many benefits in educational institutions there are also challenges that must be faced such as: hacking threats, DDoS attacks, and data theft, to overcome this, it must attend training and use to students, teachers and staff about data privacy to be safe.

Reference

- Ahaidous, K., Tabaa, M., & Hachimi, H. (2023). Towards IoT-Big Data architecture for future education. *Procedia Computer Science*, 220, 348-355.
- Aldhaheri, A., Alwahedi, F., Ferrag, M., & Battah , A. (2024). Deep learning for cyber threat detection in IoT networks: A review. *internet of Things Cyber-Physical Sys*, 4, 110-128.

- Aldin, H., Ghods, M., Nayeipour, F., & Torshiz, M. (2024). A comprehensive review of energy harvesting and routing strategies for IoT sensors sustainability and communication technology. *Sensors International*, 100258.
- Ali, M., Nilal, H., Razzaq, M., & Khan, J. (2017). IoTFLiP: IoT-based flipped learning platform for medical education. *Digital Communications and networks*, 3 (3), 188-194.
- Ali, S., & Nihad, M. (2021). Internet of Things for Education Field. *Journal of physics: conference series*, 1897 (1), 012076.
- Baidi, B., & Sutrisno. (2022). Academic reform and sustainability of Islamic higher education in Indonesia. *International Journal of Educational Development*.
- Bhardwaj, Kaushik, K., Bharany, S., & Kim, S. (2023). Forensic analysis and security assessment of IoT camera firmware for smart homes. *Egyptian Informatics Journal*, (24) 4, 100409.
- Gomez , J., Huete, J., Hoyos, O., Perez, L., & Grigori , D. (2013). Interaction system based on Internet of things as support for education. *Procedia Computer Science*, 21, 132-139.
- Gunasekara, K., Borrero, A., Vasuian, F., & Bryceson, K. (2018). Experiences in building an IoT infrastructure for agriculture education. *Procedia Computer Science*, 135, 155-162.
- Hanafi, Y., Taufiq, A., Saefi, M., & Iksan, M. (2023). The new identity of Indonesian Islamic boarding schools in the “new normal”: the education leadership response to COVID-19. *Heliyon*, 7(3).
- Hastasari, C., Setiawan, B., & Aw, S. (2022). Students’ communication patterns of islamic boarding schools: the case of Students in Muallimin Muhammadiyah Yogyakarta. *Heliyon*, 8(1).
- Insyirah, Y., Maksum, M., Jinan, M., & Husein, S. (2023). The Contribution of the Digital Era in the Social Life of Adolescent Millennials with Integrity: From the Perspective of the Quran Surah Al-Mujadilah Verse 11. In *Proceedings of the International Conference on Islamic and Muhammadiyah Studies*, 773 (67).
- Kumar, K., & Al-Besher, A. (2022). IoT enabled e-learning system for higher education. *Measurement : Sensors*, 24, 100480.
- Morchid, A., El Alami , R., Raezah, A., & Sabbar, Y. (2024). Applications of internet of things (IoT) and sensors technology to increase food security and agricultural Sustainability: Benefits and challenges. *Ain Shams Engineering Journal*, 15 (3), 102509.
- Pradhan, A., Peter, o., & Mbohwa, C. (2023). Industrial internet of things (IIoT): opportunities, challenges, and requirements in manufacturing businesses in emerging economies. *Procedia Computer Science*, 217, 856-865.
- Rao, A., & Elias-Medina, A. (2024). Designing an internet of things laboratory to improve student understanding of secure IoT systems. *Internet of Things and cybe-physical Systems*, 154-166.
- Saada, N. (2023). Educating for global citizenship in religious education. *International Journal of Educational Development*, 103, 102894.
- Shi, W., Haga, A., & Okada, Y. (2021). Web-Based 3D and 360° VR Materials for IoT Security Education and Test Supporting Learning Analytics. *Internet of things*, 15, 100424.
- Sultana, M., & Tamanna , M. (2022). Evaluating the Potential and Challenges of IoT in Education and Other Sectors during the COVID-19 Pandemic: The Case of Bangladesh. *Technol Soc*.
- Taj, S., Imran, A., Kastrati, Z., Daudpota, S., & Memon, R. (2023). IoT-based supply chain management: A systematic literature review. *Internet of Things*, 24, 100982.
- Terzieva, V., Ilchev , S., & Todorova, K. (2022). The Role of Internet of Things in Smart Education. *IFAC-PapersOnLine*, 108-13.
- Uckelmann, D. (2011). *Architecting the Internet of Things*. Springer.