Internet of Things for Smart City. A Case Study: SMEs Project in Sleman Regency

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Abstract

IoT improves the proficiency, precision, and viability in activities and the board of such development ecosystem targeting and ensuring a high caliber of life and animating advancement procedure of organizations. A smart city has been created by setting up cutting edge business-drove development in joint with government and companies to give a solid start business condition, sensible charges, and minimal effort to live and to work together. This paper summarizes the role of IoTs for Small Medium Enterprises in Sleman Regency, divided into 2 categories: development and marketing. This particular study contributes to the strategy of IoTs development for Small Medium Enterprises’ project.

1. Introduction

Internet of Things (IoT) is one of the pillars of technology in Industry 4.0. The concept of IoT impacts the way we live and how we work. The simple definition of IoT is connecting any device with the internet (and/or each other) [1]. This includes everything from smartphones, coffee makers, headphones, wearables, and everything else you can think of [2]. In this intricate situation, the use of the IoT paradigm in an urban setting is exceptionally compelling [3], as it reacts to the strong push of numerous public governments to embrace ICT solutions in the administration of open issues, hence acknowledging these called Smart City idea [4]. Given issues experienced by business visionaries and in SMEs, the quickening advanced change places IT experts before two testing circumstances concerning social associations among one another and with different entertainers [5], SMEs are the main sector of the Indonesian economy. The existence of SMEs is so strong because they are spread throughout the country and control 99 percent of business activities in Indonesia, with more than 98 percent of them having the status of micro-enterprises [6]. According to the Chairman of the Association of Indigenous Indonesian Entrepreneurs (HIPPI), the productive sector of SMEs can employ more than 107.6 million Indonesians and contribute 60.6 percent of Indonesia's GDP [6].

SMEs can be more developed if they can apply IoT in their business. Under the vision of the regent of Sleman, Drs. H. Sri Purnomo, M.SI, which is the realization of a more prosperous, independent, cultured Sleman society and the integration of the e-government system towards smart regency in 2021 [7]. The application of smart city in Sleman Regency with the name smart regency is an endpoint in turning Sleman Regency into a smart regency in 2021, with the mission of implementing the solution principle of the smart city model, such as improving good governance through improving the quality of the bureaucracy that is responsive to services to the community (sensing), increasing the strengthening of the people's economic system, accessibility, and economic capacity people and poverty reduction (understanding), increasing the application and integration of the e-government system through sustainable stages (acting) [8]. In 2020, Sleman Regency has 48,681 SMEs consisting of 47,611 micro-enterprises, 1,026 small businesses, and 44 medium enterprises [9]. Building a smart city means integrating information and communication technology in everyday city governance. The integration of technology in city governance is carried out through the Internet of Things (IoT) [10], which is a network of electronic devices that are connected to each other by minimizing human intervention. The efforts
made by the Sleman government to develop SMEs are by optimizing the use of information technology, one of which is the development of IoTs for SMEs in Sleman. This paper analyzes and summarizes the extent of implementation of IoTs to SMEs that help accelerate the smart regency in Sleman in 2021 that used the qualitative method through in-depth interviews and observation with several SME’s in Sleman Regency.

The objective of this paper is to discuss an IoT that is used by SMEs in the Sleman Regency that supports the implementation of Smart Regency 2021. We describe the specific importance of IoTs for SMEs in Sleman Regency, the obstacles for SME owners in Sleman Regency with IoT-based digital applications, and strategies to improve the quality of human resources and SME products through IoT-based digital applications in Sleman Regency. We overview the interviews and observation approach for the utilization of IoT services, and the related protocols and technologies, discussing their sustainability for the Smart Regency environment. Finally, we substantiate the discussion by reporting our interviews and observations in the Sleman Smart Regency project, which is a proof-of-concept deployment of an IoT for SMEs. Finally, section V provides the conclusion and recommendation for a better IoT implementation for SMEs in Sleman Regency, Indonesia.

2. Literature Review and Related Studies

Since AI, as buzzy as the term is as of now, generally, it functions as a significant part of an item. Artificial intelligence is just one stage, it does not include gathering data or doing anything significant with it [11]. Artificial intelligence (AI) holds the likelihood to gigantically improve government tasks and help address the issues of residents in new habits, stretching out from traffic the executives to medical services conveyance to handling tax documents [12]. While public part specialists are continuously mindful of the groundbreaking impact of data and AI-powered arrangements, the information required for AI answers to be made and sent is normally neither accessible nor discoverable [13].

Public sector specialists may similarly not have the suitable information and ability to make key purchasing decisions for AI-powered apparatuses [13]. The weakness of good examinations incorporates further layers of unpredictability [8]. Therefore, specialists will, by and large, delay purchasing decisions or diminish apparent danger by zeroing in their purchasing on a few known suppliers [14]. The vulnerability of moral contemplations that AI can handle different difficulties that the public area faces today. The public area has different areas that could benefit from AI. There are different resident confronting jobs, similar to wellbeing and social administrations, equity and policing, outskirt administrations, income, organization and benefits, and government-managed retirement, where AI can uphold the public division [15]. For example, a portion of the key advancements that the US Government is considering are measure mechanization, AI, Internet of Things, personality investigation, biometrics, and so on [8].

One of the key reasons that AI has not been so notable in the public area is the fear of losing positions. It will help people with discarding unremarkable and tedious assignments. The spotlight can be more on more-basic and choice-arranged undertakings. One early territory of government application is in client care chatbots [7]. As state and neighborhood governments started putting information on destinations in ongoing decades, they found that they could use those entries as methods for addressing addresses that constituents used to need to call an office to ask about. Ideally that outcomes in repetitive tasks [16]. Government working environments did not have a similar number of calls to answer, so they could give extra time and advantages for various limits. Moreover, when somebody is brought in, their call might be tended to quicker.

Nowadays, the activity of the Government Digital Service (GDS) as a significant part of the Cabinet Office concerns the computerized change of government [7]. They are a point of convergence of greatness in computerized, innovation and information, teaming up with offices to help them with their change [17]. They work with them to manufacture stages, principles, and advanced administrations. Artificial Intelligence reasoning assumes a developing function in IoT applications and organizations.
The two speculations and acquisitions in new businesses that merge AI and IoT have move in the course of recent years [18].

3. Research Method
The method used is the qualitative method through in-depth interviews and observation with several SMEs in Sleman Regency. The in-depth interview was done in this research because it is deemed helpful when there is a need for definite data about an individual's considerations [19] and practices or need to investigate new issues top to bottom [20]. Meetings are regularly used to give setting to other information about IoTs that are used by owners of SMEs in Sleman Regency, additionally, the fundamental preferred of observation is its explicitness. We can gather information at the time they happen. The spectator does not need to ask people about their behavior and reports from others [21]. The person can just look as people act and talk about the IoTs usage by the owners of SMEs in Sleman Regency.

4. Findings and Discussion
1) For what reason is Artificial Intelligence Vital for SMEs?
   The fundamental extent of AI is to increase a serious advantage inside internet business, fabricating, HR, bookkeeping, client relations, advertising, and so on [21]. The cycles of AI will, in general, improve undertaking execution, raise deals, lower costs, computerize client executives, spare time, limit imperfections, and advance information assortment and handling [2]. Different man-made consciousness methods can be utilized in big business execution like fluffy rationale, counterfeit neural organizations, master frameworks, hereditary calculations, AI strategies, swarm knowledge-based calculations, profound learning, and so on. Regardless of different methods, the center point of AI administration stays direct and give more adaptable, versatile, and intelligent arrangements according to the clients' advantages and prerequisites [22].

The Importance of AI in term of Internet of Things for SMEs in Sleman Regency
The term Internet of Things (IoT) infers to mind the stereotypical image of a working woman who triggers the cooker at home as she leaves the office to drive back home, or a cooler which sends a recharging note to a merchant when it detects a portion of the oftentimes required things, for example, when milk or margarine are needed [21]. Given the various prospects in which IoT can be used, numerous huge item organizations have just set out on projects to incorporate IoT similarity with their current or new items. Below are the several things about IoT that help SMEs in Sleman, Yogyakarta, Indonesia based on several interviews and observation:
1. IoT makes the owner omnipresent
   In Sleman Regency, there are 48 thousand types of SMEs, which consist of the trade and services sector. This number continues to increase from year to year [4]. As stated in research by Narwane et al., instances of things go from shopper arranged gadgets, for example, wearables and smart home arrangements (consumer IoT) to associated hardware in the endeavor (Enterprise IoT) [23] and modern resources, for example, machines, robots, or even laborers in keen manufacturing plants and mechanical offices (Industrial IoT, the basic part of Industry 4.0) [24].
2. IoT helps in Remote Monitoring/Control
   The SMEs owners in Sleman Regency, with a little group of support staff, need to oversee most if not all of the capacities, such as the finance, marketing, operations, and human resources. IoT does not just give methods for controlling machines and cycles on the shop-floor but also permits the machine to interface straightforwardly over the web. This relates with research by Del et al., that IoT sensors are fit for the social occasion more nitty-gritty information than manual checking techniques [25]. Instead of simply perusing a meter intermittently, people can connect sensors to singular bits of gear for vital observing or a huge number of individual resources for IoT resource following [26]. Having an inside and
out comprehension of how the office works is the initial move toward rolling out significant improvements.

3. Post-sales services

With restricted labor available, the SME needs to guarantee that it can give great uptime ensures just as great reaction and goal times. SMEs which either fabricate/gracefully or simply administration items, for example, water channels, espresso apportioning machines, printers, or even lifts think that it hard to screen the momentum state of the item in administration at the customer's end - and subsequently need to rely upon the customer to advise them regarding the disappointment in this manner influencing uptime and administration levels. As stated by Perera et al., IoT frameworks present organizations with a wide scope of chances to improve, or even reexamine [27], the post-deal understanding for themselves and their clients from expanding consumer loyalty to diminishing expenses to shortening reaction times [28].

4. IoT and independent frameworks

The machines learn with each exchange, creation, or administration experience. This implies the epitomized business rules in Sleman Regency in the regulator joined to the machine can be changed dependent on new encounters. The correspondence between the machine, sensors, business rules motors, and the AI calculations on a focal worker all connect because of IoT. IoT framework has four essential plan objectives: [1] decrease advancement time and offer IoT answers for sale to the public sooner; (2) lessen clear multifaceted nature of sending and working an IoT arrange; (3) improve application portability and interoperability; and (4) improve functionality, dependability, and viability [40]. Given the immense scope of existing and developing correspondence innovation decisions, it is illogical for applications to deal with the mix of potential approaches to an interface. Systems shroud availability intricacy underneath a more elevated level message passing deliberation like REST and distribute buy-in [29].

IoT-based online applications used by Sleman SMEs varies, such as Shopee and Tokopedia. In addition, the government itself has an application called E-SME that can be used by SME owners. E-SME is a concept about the product marketing system of Indonesian SME products in penetrating the free market based on smartphone applications. Due to the existing conditions in the community, the SME producers still experience problems in the marketing process. So that with the E-SME concept, it is hoped that it can help SME producers in marketing their products. However, the owners of SMEs do not maximize the use of E-SME because there are many obstacles compared to using applications such as Shopee or Tokopedia, such as these applications only found in the Android application, the E-SME application is not as complete as Shopee and Tokopedia so it is not effective enough.

The IoT application that can also greatly support the development of SMEs is social media. Social media has the potential to help SMEs in marketing their products [30]. These applications intend to initiate and circulate online information about the user's experience in consuming a product or brand, with the main goal of engaging society [31].

2) The obstacles experienced by SMEs owner in Sleman Regency with IoT-based digital applications

The limited condition of Indonesian SMEs entering the digital market is also strengthened by a study [32] which states that the characteristics of SMEs in Sleman Regency are still very few in developing digital marketing that is networked and uses sophisticated technology. This can be seen from SMEs that still use static sites by 32.5%, interactive sites by 25%, and have not been digitally involved with a percentage of 7.2% for SMEs [4]. Another problem faced by SMEs in Sleman Regency in facing digital marketing is the lack of quality of human resources both in government and SMEs owners, the competitive atmosphere of competitors who are still unable
to encourage readiness to use information technology for SMEs [33]. Moreover, the problems faced by SMEs towards the digital market from the achievements seen in the implementation of the E-SME program launched by the Ministry of Industry. Until mid-2019, the total turnover of SMEs through the E-SME program was only IDR 600 million.

The biggest obstacle faced by SMEs is the lack of quality of the products being marketed so that they do not sell well [34]. This is also in line with previous research that one of the factors that became an obstacle was the uneven distribution of information, especially in developing countries, which caused the emergence of this technology-stuttering virus [35]. Also, the generation gap between SME actors represented by generation X and millennial generation SME actors creates a distance about this SMEs problem [36].

3) Strategies to Improve the Quality of Human Resources and SMEs Product Through Artificial Intelligence of IoT-Based Digital Applications in Sleman Regency

By paying attention to the challenges and goals of developing SMEs in Sleman Regency in the future and referring to the direction of national policy and in the field of SMEs in 2020, the policies implemented are aimed at increasing the productivity, feasibility, and added value of SMEs so that they can grow to a larger and more empowered scale, competitiveness using IoT-based digital applications. The policy direction for improving the quality of human resources is carried out through several strategic steps to increase the competitiveness of SMEs as follows:

a. Increasing the capacity of SME human resources in the regions through training and mentoring that involves stakeholders, such as the local government, entrepreneurs, and academics to increase the competitiveness of SMEs.

b. Increasing the spirit of entrepreneurship with profitable and sustainable businesses. Strengthening SMEs is focused on improving the performance and competitiveness of SMEs as the achievement of performance targets through programs, activities and outputs must be implemented through integration and cooperation in the planning, implementation, data, and information processes.

c. Program implementation must be inclusive, paying attention to equal access and opportunities between SMEs. The implementation of programs and activities is supported by partnerships and strategic cooperation with bilateral and multilateral cooperation based on the principle of symbiotic mutualism.

The government through the Sleman creative house organizes various training and mentoring classes to help business actors set business strategies and improve the quality of business management in all aspects. Including human resource management, production systems, marketing, etc. To be in addition to quality, the products also need to appear modern. The packaging is very important today to strengthen product brands that are always up to date and present. Go digital encourages SMEs to maximize the development of the digital world. Digital product promotion has become a necessity. Digital financial transactions have also become commonplace. RKS provides design and photography services for SMEs to have attractive online promotional materials. Meanwhile, Go Online is to encourage SMEs to take advantage of social media and market places for product marketing.

5. Conclusion

The term Internet of Things (IoT) infers to mind the stereotypical image of a working woman who triggers the cooker at home as she leaves the office to drive back home, or a cooler which sends a recharging note to a merchant when it detects a portion of the oftentimes required things, for example, when milk or margarine are needed. The strategies did by the government in Sleman Regency are to increase the capacity of SME human resources in the regions through training and mentoring, increase the spirit of entrepreneurship with profitable and sustainable businesses, and paying attention to equal access and opportunities between SMEs in Sleman Regency. By the implementation of Internet of Things in the Sleman Regency for SMEs is supports the Sleman smart regency 2021 vision.
The most significant limitation of this study is the limited SMEs in the Sleman Regency and in terms of IoTs. Besides, internet surveys have not been included much in the study. In future studies, therefore, different findings could be obtained by comparing the findings of studies in different publications. Considering the rapid development of technology, it is estimated that studies of IoT for SMEs to support smart city may give different results in different places and at different times. For this reason, it is necessary to continually revisit and update the relevant studies.

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