

The Role of Information and Communication Technology (ICT) in E-Government: A Literature Review of Sustainable Development Aspects

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Abstract

The development of Information and Communication Technology (ICT) makes the world more borderless and communication in various sectors easier. ICT has penetrated individual, organizational, and social barriers. The impact of ICT does not only occur in private companies or organizations but also public organizations. The application of E-Government is a form of ICT application in the public sector. E-Government is a process of using ICT as a new instrument in providing public services more effectively and efficiently. This study aims to provide an overview of the role of ICT in E-Government, which supports aspects of sustainable development in the economic, social, and environmental fields. The method used to collect research data is a literature review and data analysis techniques through a qualitative approach. The results of the study show that E-Government is able to support sustainable development from both economic, social, and environmental aspects. This research recommends that government agencies must continue to innovate, especially by involving ICT and e-government in their public services. It is important because the use of this technology can support sustainability issues in various fields. Then, various studies across sectors are also needed so that comparisons can be developed regarding the challenges that need to be faced in establishing cooperation.

Keywords: Information and Communication Technology (ICT), Electronic Government (E-Government), Sustainable Development, Communication, Environmental-Social-Economy Aspect

Abstrak

Perkembangan Teknologi Informasi dan Komunikasi (TIK) membuat dunia semakin tanpa batas (*borderless*) dan komunikasi di berbagai sektor semakin mudah. TIK telah menembus hambatan individu, organisasi, dan sosial. Dampak ICT tidak hanya terjadi pada perusahaan atau organisasi swasta namun juga organisasi publik. Penerapan E-Government merupakan salah satu bentuk penerapan ICT pada sektor publik. E-Government merupakan suatu proses pemanfaatan ICT sebagai instrumen baru dalam memberikan pelayanan publik secara lebih efektif dan efisien. Penelitian ini bertujuan untuk memberikan gambaran mengenai peran ICT dalam E-Government yang mendukung aspek pembangunan berkelanjutan di bidang ekonomi, sosial, dan lingkungan. Metode yang digunakan untuk mengumpulkan data penelitian adalah tinjauan pustaka dan teknik analisis data melalui pendekatan kualitatif. Hasil penelitian menunjukkan bahwa E-Government mampu mendukung pembangunan berkelanjutan baik dari aspek ekonomi, sosial, dan lingkungan hidup. Penelitian ini merekomendasikan agar instansi pemerintah harus terus berinovasi terutama dengan melibatkan ICT dan e-Government dalam pelayanan publiknya. Hal ini penting karena pemanfaatan teknologi ini dapat mendukung isu keberlanjutan di berbagai bidang. Kemudian, berbagai kajian lintas sektor juga diperlukan agar dapat dikembangkan perbandingan mengenai tantangan yang perlu dihadapi dalam menjalin kerja sama.

Kata Kunci: Teknologi Informasi dan Komunikasi (ICT), Electronic Government (E-Government), Pembangunan Berkelanjutan, Komunikasi, Aspek Lingkungan-Sosial-Ekonomi

CoverAge

Journal of Strategic
Communication

Vol. 14, No. 2, Hal. 91-101
Maret 2024.

Fakultas Ilmu Komunikasi,
Universitas Pancasila

Accepted February 22, 2024

Revised February 16, 2024

Approved March 14, 2024

INTRODUCTION

There is no doubt that Information and Communication Technology (ICT) is very influential in various aspects of life today. Information has become the most influential resource in social, economic, political and cultural life. There is no part of today's life, both as personal and institutional, which is not touched by information activities: accessing information, producing information, processing information, or distributing information.

The presence of ICT makes the world smaller and communication in various sectors easier. Human communication activities in various parts of the world can be carried out at any time without being limited by time and place. With ICT, the world no longer has primordial boundaries such as geography, ideology or country. ICT has penetrated individual, organizational, social, and space and time barriers. Optimizing the potential of information and communication technology (ICT) will make conveying communication to consumer audiences easier (Utami & Yuliana, 2017).

Types of organizations are basically divided into two, namely public and private organizations. Public organizations have social responsibility as their main function. While private organizations with the main principles of profit-making and carrying out social responsibility (Sharma, 2009). ICT applications in the business and public sectors are becoming a global trend. With universities implementing E-Learning, the private sector with E-Commerce, and E-Business, the government is also entering a new era with E-Government (Zouridis, 2003). The main reason for implementing E-Government is that electronic channels have been widely used in the private sector, so E-Government is used for public sector reform.

ICT development has affected an organization's work system, one of which is a government agency. This technology provides the potential to speed up policymaking because it can collect and analyze data more quickly and

easily (Tönurist, 2015).

Gupta (2008), in his study, said that the use of ICT in government agencies can improve the quality of work between organizations and their employees. In addition, this technology can reduce bureaucratic processes, raising effectiveness and efficiency, organizational structure, and management (Turnip et al., 2018).

The implementation of the use of ICT has also been widely used by various countries in the world. For example, Japan, implements My Post, where citizens can get public service bills via e-mail, pay bills electronically, and archive transaction data in an E-Po Box application (Asato, 2016). On the other hand, the Philippines has also developed The National Portal as a platform aimed at the public at large to obtain information regarding documents, decisions, and notifications from the government in one door (Magno, 2018). In Indonesia, the DKI Jakarta and Surabaya Provincial Governments have applied E-Government in its various derivatives. The Surabaya City Government, for example, has implemented E-Government in urban planning, such as e-budgeting and e-projects, as well as in staffing, such as performance measurement and promotion (Suhendra, 2017).

Several studies have provided examples of implementing technology in E-Government (Adadi et al., 2019), suggesting that the application of a semantic web-based on Artificial Intelligence (AI) can be effectively used to deliver services electronically. Al-Mushayt (2019) proposes a framework in which AI can implement E-Government that is automated and personal so that a machine is able to customize services according to individual needs.

Information and communication technology development is the key to creating sustainable collaboration between stakeholders. According to Rupo et al. (2018), collaboration is an aspect that plays a role in building innovation and sustainability of a product or service. Meanwhile, the personalization of information and communication technology is a form of sustainability

(Lorenzo-Romero et al., 2020).

The concept of sustainable development refers to development that meets the needs of the present generation without compromising the ability of future generations to meet their needs (Taherdangkoo et al., 2018). Sustainability is an intersection of three performances carried out by an organization, namely: environmental, social, and economic performance (Carter & Rogers, 2008). As for the context of an organization or company, sustainability refers to an organization's efforts to run a business in a way that is socially and environmentally responsible in the long term (Tascioglu, 2015).

Based on the elaboration above, the use of ICT in E-Government is considered to support aspects of sustainable development. This study will examine conceptually the relevance of using ICT in E-Government, which can create aspects of sustainability in society. The research question to be answered is "What is the role of using ICT in E-Government in creating economic, social, and environmental sustainability?"

LITERATURE REVIEW

Conceptualization of ICT and E-Government

ICT, as part of science and technology in general, is all technology related to the collection, processing, storage, dissemination, and presentation of information. Information technology is also a technology that is used to process data, including processing, obtaining, compiling, storing, and manipulating data in various ways to produce quality information, namely information that is relevant, accurate, and timely, which is used for personal, business, and government. In addition, it is also strategic information for decision-making (State Ministry of Research and Technology, 2006).

Meanwhile, in terminology, the World Bank defines E-Government as a government that refers to the use of information technology (such as Wide Area Networks, the Internet, and cellular computing) that has the ability to change relationships with citizens, businesses, and other

government agencies. Meanwhile, the United Nations Development Program (UNDP) defines E-Government as information and communication technology (ICT) applications run by government agencies (Indrajit, 2002). E-Government allows the community to be able to interact and receive services from local, regional, and central government 24 hours a day, seven days a week (Palvia & Sharma, 2007).

Benefits of E-Government

According to The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2005), the main benefits of E-Government supported by the use of ICT include: improving and developing government service capabilities, empowering citizens through greater access to government information and ability to interact and participate, increase government transparency and accountability, increase internal efficiency and sustainable benefits for government, improve relations between government and citizens (UNESCO New Delhi and NIC India, 2005).

E-Government also provides benefits to democracy. The implementation of E-Government will improve the quality of democracy so that it is better and more effective. The goals of democracy related to E-Government include trust and accountability, legitimacy and understanding, service and citizen satisfaction, achievement and balance of services, decision-making and effective representation, participation through input and consultation, and involvement and deliberation (Clift, 2004).

Benefits of Using ICT in E-Government

The benefits of using ICT in E-Government by the government provide several advantages: 1) increasing efficiency, the use of ICT can increase efficiency in sharing data or information within and between governments; 2) Improving services, the use of ICT can improve services to the community; 3) Help achieve a certain policy, the use of ICT can help socialize government policies to the public so that related parties can

share ideas and information related to a particular policy; 4) Help contribute to economic policy, the use of ICT in E-Government can reduce corruption and increase openness; 5) Increasing the contribution to reform, the use of ICT has changed or reformed various fields, such as: improving transparency and facilitating information sharing; 6) Increasing trust between the government and its people, the use of ICT can improve good governance through increasing transparency, reducing corruption so that it can increase public trust in government administrators (Praditya, 2014).

BENEFIT	DESCRIPTION
Increase Efficiency	The use of ICT in E-Government can increase efficiency in sharing data or information within and between governments.
Improve Service	The use of ICT in E-Government can improve services to the community.
Assisting Government Policy	The use of ICT in E-Government can help socialize government policies to the public so that related parties can share ideas and information related to a particular policy.
Increase Transparency	The use of ICT in E-Government can reduce corruption and increase openness.
Increasing Contribution to Reform	The use of ICT in E-Government can change or reform various fields.
Increasing Trust Between Government and Society	The use of ICT in E-Government can improve good governance and increase public trust in government administrators.

Table 1. Benefits of Using ICT in E-Government

Source: Processed by Author (2023)

Stages of Solutions from ICT-supported E-Government

Based on the formula put forward by Backus (2001), there are three stages of E-Government solutions supported by ICT, namely the information stage, the interaction stage, and the transformation stage. In the information stage, E-Government provides information to related parties, namely, in this case, the government to stakeholders (community, business world, government). For example, local/national information (vision, mission and organizational structure, addresses, telephone numbers, laws, rules, regulations, government news, and so on), while for business information such as business information, addresses, telephone numbers, working hours, laws, regulations (regulations

related to the business world). The interaction stage allows stakeholders to interact with the government through available communication channels. The government provides interactive channels involving stakeholders, such as downloading forms from websites, filling out online forms, e-mails, discussion groups (forums), polls, questionnaires, etc. The third stage, or the transformation stage, allows all government services supported by integrated ICT to be used by every citizen with a personal account (Palvia & Sharma, 2007).

OVERVIEW E-GOVERNANCE SOLUTIONS			
	External: G2C	External: G2B	Internal : G2G
Phase: Information	Local/Departmental/ National Information (mission statements and organizational structure Addresses, opening hours, employees, telephone numbers Laws, rules and regulations Petitions Government glossary News)	Business information opening hours, employees, telephone numbers Laws, rules and regulations	Knowledge base (static intranet) Knowledge management (LAN)
Phase: Interaction	Downloading forms on websites Submitting forms, Online help with filling in forms (permits, birth/death certificates) Intake processes for permits etc. E-mail, Newsletters, Discussing groups (e-democracy), Polls and questionnaires Personalised web pages Notification	Downloading forms on websites Submitting forms Online help with filling in forms (permits) Intake processes for permits etc. E-mail Notification	E-mail Interactive knowledge databases Complaint handling tools
Phase: Transformation	Personalised website with integrated personal account for all services	Personalised website with integrated business account for all services	Database integration

Table 2. Overview of E-Government Solutions

Source: Backus,2001

The relationships that can be built in E-Government (Backus, 2001), namely:

1. Government to Citizen (G2C)

This type is the most common E-Government application, where the government builds and implements various information technologies to improve interaction relations with the people. In other words, the main goal of developing a G-to-C type E-Government application is to bring the government closer to its people through various access channels so that people can easily reach their government to fulfill various daily service needs. The use of ICT can also be carried out by government public relations. Usually, activities are carried out by public relations for certain purposes through the delivery of communications and interactions occurring within them (Putri& Kadewardana).

2. Government to Business (G2B)

The E-Government model describes the relationship between the government and the business world. One of the main tasks of a government is to form a conducive business environment so that the wheels of a country's economy can run as it should. In carrying out their daily activities, private companies need a lot of data and information owned by the government.

3. Government to Government (G2G)

The E-Government model describes the relationship between the government and other governments or countries. In this era of globalization, it is clear that countries need to communicate with each other more intensely from day to day. The need for daily interaction between one government and the government does not only revolve around matters of state or diplomacy alone. However, it goes further to facilitate cooperation between countries and cooperation between state entities (society, industry, companies, etc.).

METHOD

This study uses a literature research model where the purpose of the research is theoretical development. The technique used to collect

research data is a literature review. The main idea of this methodology is to review available scientific articles and re-elaborate them through the narrative form to describe the topic being researched (Bryman, 2012). This research is looking for scientific articles related to the use of ICT in E-Government so that various aspects of sustainability can be analyzed. The database used to search for the literature is Google Scholar totaling 10 articles.

Various findings from these scientific articles will be compiled narratively to gain an understanding of the role of E-Government in supporting sustainable development. The method used for data analysis is the descriptive qualitative method. The method consists of the reduction, presentation, and conclusion of research data (Miles & Huberman, 1994). The reduction stage focuses on simplifying and making abstractions from the raw data that has been obtained from the data collection process. The data presentation stage is a process for unifying and organizing data that has previously been reduced so that it is easier to understand. At the data inference stage, the researcher concludes a phenomenon from the validated data.

RESULTS AND DISCUSSION

ICT and E-Governance in Sustainable Development in Economic Sector

Regarding economic sustainability, Grigonyte (2016) describes it as a process that allocates and maintains resources efficiently and responsibly so that it can carry out positive social and environmental impacts in the long term. Every decision in development must consider human activities, which is seen as the cause of environmental change. Sustainable development aims to increase the availability and adequacy of economic needs. In the process, asset preservation is carried out in the form of resource development with environmentally friendly management in an efficient manner. Sustainable development still takes into account justice for

society in the present and the future (Hasan & Azis, 2018). For profit-focused organizations, economic sustainability refers to the ability of an organization or company to build cash flow and profits above the average continuously (Moiescu, 2018). Meanwhile, public sector organizations have a role in maintaining economic sustainability by presenting an efficient system (Jaya, 2004). Based on this, economic sustainability in public organizations refers to how these organizations are able to use resources efficiently and effectively to achieve their goals optimally through public services.

Utilization of ICT in E-Government can provide effectiveness and efficiency for government agencies. In government institutions, of course, it is different from the context of profit organizations. The output of government institutions, in general, is the provision of excellent public services. In this case, government agencies must be able to create effectiveness and efficiency in each of their work programs so that each planned budget can produce the appropriate output, even more than expected, even with minimum effort.

In ICT, robots are one of the technologies used to help solve problems. Golubchikov and Thornbush (2020), their study, stated that one of the uses of robots in government aspects is to supervise and repair infrastructure, which in this case, is difficult for humans to access. Through a combination of AI and robotics, a city can carry out automatic surveillance in various sectors, such as energy, water availability, and weather. The city of Moscow, Russia, is preparing the robotic city concept to be implemented in 2030 (Golubchikov & Thornbush, 2020). In this case, of course, technology does not work alone. It also involves humans as actors who make decisions, where in the end, humans and technology will live together to solve every problem.

In another study, Alexopoulos et al. (2019) presented various examples of using Machine Learning/ML to streamline government budget planning. For example, in New Zealand's Ministry for Primary Industry, ML has been used to

predict disease risks in livestock so that more precise estimates can be obtained regarding the policies and budget planning needed to deal with these risks. The use of ML is also able to predict patterns of geographical spread of disease so that planning becomes more complex. Alexopoulos et al. (2019) also stated that government agencies in the tourism sector could use ML to provide forecasts regarding the number of tourist visits so that it becomes a reference for setting budgets.

In other matters, such as blockchain technology, it can support data security from government agencies (Khayyat et al., 2020). Government institutions, in this case, can be said to be a repository of people's personal data. This condition is, of course, a separate target and opportunity for actors who can carry out cyber attacks. In the future, it is estimated that blockchain will become a major part of data communication between government agencies so that citizen data can be safely integrated from one institution to another. The benefit of implementing this technology is the creation of efficiency and effectiveness of the public service process where people's personal data can be safely integrated with various services.

ICT and E-Governance in Sustainable Development in Social Sector

The aspect of social sustainability emphasizes that through the use of ICT and E-Government, it can provide inclusivity or equal access for all people. Sustainable development aims to empower society as a social organization. Humans are seen as the key to the success of development through the development of empowering social organizations. In addition, sustainable development also aims to increase respect for the institutional forms and social organizations of the community. Sustainable development is a control system for the development process, developing traditional community values based on local wisdom and increasing the independence and capabilities of the community by organizing (Hasan & Azis, 2018).

Another goal of social sustainability is to increase citizen participation to encourage empowerment in the political process through channels of social interaction. Mishaal (2015) and Sartori (2014) stated that social sustainability refers to social homogeneity and equality in income, needs, services, and jobs. In this definition, social sustainability emphasizes equality in living conditions for both the poor and the rich to have equal access to public services.

For example, using blockchain technology in E-Government can open access for all people to obtain information about government institutions and support security and transparency in every transaction (Khayyat et al., 2020). Through this technology, it is hoped that every interested actor has equality in accessing and obtaining information about government services and getting a role in overseeing information together. This joint supervision ultimately provides benefits in reducing acts of corruption in government institutions. In addition, the use of ICT can also build trust between the government and the public because of the high level of security for sensitive data (Khayyat et al., 2020).

ICT and E-Governance in Sustainable Development in Environmental Sector

The goal of sustainable development in the environmental sector is to preserve the environment. Sustainable environmental conditions can support the success and sustainability of economic and social development. In a society that has uncertain social and economic conditions, development will be difficult to implement. In addition, natural degradation will occur in economic development that does not limit the use of natural resources fairly (Hasan & Azis, 2018).

In sustainability development in the environmental sector, an organization must set a strategy so that all processes and work results can run while still utilizing natural resources efficiently. Morelli and Morelli (2011) explained that environmental sustainability relates to the balance between fulfilling human needs and the

capacity to support ecosystems. It is done in order to continue to regenerate services for current and future generations. In an organizational context, sustainability (Pogutz et al., 2011).

In the implementation of ICT, environmental awareness is the capacity of an organization to regulate and control the harm caused by processes, products, and business models to the environment, only used for the benefit of organizational efficiency and effectiveness but also able to make a positive contribution to the environment. Various studies have stated that with this technology, government agencies can maintain environmental sustainability.

Papadopoulou (2019) illustrates that the scenario of using the Internet of Things (IoT) in E-Government for environmental monitoring has a positive impact. By involving IoT devices, E-Government services are able to monitor waste and pollution management that comes from industrial and residential activities. By utilizing IoT, governments can make long-term policies to prevent environmental pollution. In this case, IoT devices are used to collect various historical data so that the government is able to estimate future pollution trends.

In addition to helping reduce environmental pollution, Papadopoulou (2019) created a scenario that IoT will be able to become an early detection tool for forest fires. In this case, the sensor will be an IoT device for detecting forest fires. Through these sensors, relevant stakeholders will be able to locate fires accurately, even at points that are difficult to reach. Through the use of this technology, government agencies are able to provide services according to their needs. Even in the context of forest fires, the water used to extinguish the fire is calculated according to the area of the fire to support environmental and economic sustainability aspects.

One of the important issues of using ICT is digital transformation (Al-Sai & Abualigah, 2017). This transformation is the key to how E-Government can be run by all stakeholders. In

other words, government agencies will become more paperless, or paper documents will begin to decrease. This issue is becoming increasingly important because the paper production process itself has been an environmental problem for a long time. Beckline et al. (2016) stated that the excessive use of paper has had various negative impacts on the environment, such as deforestation and chemical waste resulting from manufacturing paper production.

Conceptual Framework

From the analysis results regarding the role of ICT in E-Government, a conceptual framework can be formulated to abstract the research findings (see Figure 1). Based on the results of the analysis, the use of this technology does not only have a positive impact on organizational performance but on all elements, both socially, economically, and environmentally.

The creation of sustainable development is the goal of using ICT in E-Government. Using ICT by some government agencies has supported sustainable development in the economic, social, and environmental fields. From the economic aspect, it can provide government work efficiency and effectiveness. On the social aspect, public services are inclusive, where every community will get equal rights in terms of access. Then on the environmental aspect, the use of technology is considered capable of supporting environmental preservation programs and suppressing the consumption of resources that have a negative impact on the environment.

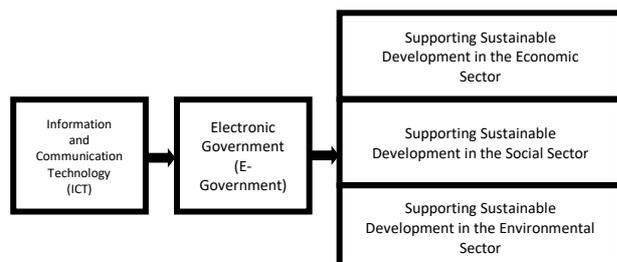


Figure 1. Conceptual Framework for the Role of ICT in E-Government that supports Sustainable Development

Source: Processed by Author (2023)

CONCLUSION

Currently, the development of ICT is growing rapidly and has a significant impact, both in the business and public sectors. With universities implementing E-Learning, the private sector with E-Commerce, and E-Business, the government is also entering a new era with E-Government. Through the use of ICT, E-Government can provide equal access to services for the community and environmental preservation. In E-Government, it is not only the automation of public services but also more than that, extraordinary efficiency and productivity increases, as well as an increase in the image of the government in front of the people it serves. E-Government encourages paradigm transformations in public services, such as accountability, transparency, accuracy, and productivity.

In addition, through the use of ICT in E-Government, public services are considered capable of continuing to innovate because the policies made will continue to adapt to the needs of the community. E-Government development is an important factor in accelerating the country's development and having an impact on sustainable development through the economic, social, and environmental sectors.

The recommendation put forward in this study is that government agencies must continue to innovate, especially by involving ICT and E-Government in their public services. This is important because the use of this technology can support sustainability issues in various fields. Then, various studies across sectors and ministries/agencies are also needed so that comparisons can be developed again regarding the challenges that need to be faced in establishing collaboration.

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