

# City and Communication Technology Advancements in Industrial Revolution

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## ABSTRACT

The journey of the industrial revolution has reached its fourth stage, as long as industrial civilization takes place, people who inhabit urban areas are familiar with the term globalization, a concept of community trends integrated into global communities in various fields, one of which is technology. In the application of industrial revolution 3.0, the application of industrial revolution technology in urban areas is not a taboo thing to be applied in various sectors of the field, starting from individual, education, organization, government, and communication technology industry. The emergence of the term Information and Communication Technology (ICT) in the industrial revolution 3.0, which includes the trend of using technology based on cloud computing, mobile devices, social networking, and big data illustrates the increasingly rapid progress for a region that has a plurality of people in it. The tendency of urban people to choose to interact through specialized communication networks and rely on information sources using ICT systems in various sectors will focus on the research discussion. Globalization as a form of future civilization created when the public can access information and become the primary commodity of the socio-political economy and culture. The interaction between people based on information technology and communication becomes an essential role in the progress of civilization. This study will further discuss urban society in the application and use of ICT, using qualitative research with desk research and using literature to illustrate urban communities can side by ICT as a form of globalization from the application of the industrial revolution.

**Keywords:** Industrial Revolution, ICT, Globalization, City, Urban Communities.

## 1. INTRODUCTION

Entering a condition where technology penetration and rapid development are becoming a technological disruption, the connection of basic human needs to each network and all automation illustrates the ease and change in behaviour patterns of life experiences before the technology is advancing rapidly. In urban areas, the tendency towards the practice of integrated technology in various need of aspects likes to choose to interact through specialized communication networks and to depend on sources of information is the main of social commodity, political, economy and culture as well as interactions between people who are already based on information and communication technology to be an essential role for the advancement of civilization. Moreover, from this, city residents' needs for information and fulfilment of fast-paced living standards without convoluted make many elements such as the communications technology industry and government improve in order to change to follow the flow of technological developments.

With so many changes and technological advances, changing societies in the urban sphere are experiencing high standards of using technology to enjoy the role of technology in helping get easy access from various aspects of life both individually and communally. Digital and technology, as it now makes the city have very dominant access and become a role player in other developing regions to transform using technology. The development of transmission technology, including computer networks, has also triggered internet and digital broadcasting users. The development of mobile phones, which proliferated into social penetration, played a significant role in the digital revolution by providing ubiquitous entertainment, communication, and online connectivity [1].

Utilization of technology in government work as a fulfilment of services to the city community, which is now the focus of most cities future strategies, is now being a development motivation for industrial revolution usage in the communications technology industry for municipal governments through Information and Communication Technology (ICT). Cities with a diverse base provide their citizens with easy access to services in every aspect, from

the economy, education to government bureaucracy. The characteristic of the industrial revolution 3.0 was marked by changes in the industrial order in each country, changing the entire production system, management, and government.

City residents who in their daily lives are fast-paced and have little time to take care of many things outside of daily activities are very dependent on the ease of integrated technology. This newest technology could encourage the concept of a smart city that integrates public services, information disclosure, and aspects relating to economic improvement and public welfare to accelerate regional development by developing types of government services, so that city residents get bureaucratic convenience.

This paper will focus on how cities use communication technology in each sector as part of the disruption of the industrial revolution 3.0 in city developments and going forward to industrial revolution 4.0. The aim is to describe the existence of cities as insemination of globalization and an industrial revolution that triggers cultural and economic shifts through complex industrial systems, ranging from involving machines, the growth of sustainability technology, new energy sources, and the development of transportation. It causes a shift or transition of rural people's lives to urban life and the transition from human power to mechanical power, geospatial, Artificial Intelligence (AI), and robotics technology.

## 2. LITERATURE REVIEW

### 2.1 Urban Community and Technology

Urban community is an element of urban life, is heterogeneous in its social position, the occurrence of social change is very visible in terms of economic development, and social development affects the emergence of urbanization. Economic development will be followed by an overhaul in the mode of economic activity, the more advanced an economy, the more important the role of industrial and commercial activities and influencing changes in the way of life of urban society in the areas of settlement, law, politics, security and social aspects. The process of moving people from rural villages to the city will be followed by the physical development of the city including changes in the existing functions in cities, in addition to this there will be a wider division of labor, increased specialization of work systems, the easier use of non-human labor, the faster changes in the use of technology, the reduced distance, time and space as well as enlarging the population that receives public services [2]. Technological advances in urban areas cause industrial sector activities to grow and develop in terms of type and quality; they will impact city conditions that will change or grow quickly and strategically.

Referring to the emergence of global transformation that currently exists will tend to change the face of the city and its environment. The amount of city space that is filled

by industrial technology infrastructure and communication technology makes it easy for every individual community to connect to the network. Industrial revolution 4.0, which now dominates the city, provides a shift in digital technology. Urban communities are still enjoying the industrial revolution 3.0 with more inclination towards electronics than analog mechanical systems; the change to digital technology is enough to disrupt industries, especially global communication and energy. On the electronics and information technology side began to automate production and take over the global supply chain [3]. The fourth industrial revolution or the digital revolution refers to technological advancements from electronic devices and where the internet began to develop and have surprising speed, and anyone can access it. Many industries rely on cloud storage, big data, and cognitive computing. Progress during the industrial revolution 4.0 included personal computers, the internet, and Information and Communication Technology (ICT).

### 2.2 Smart City

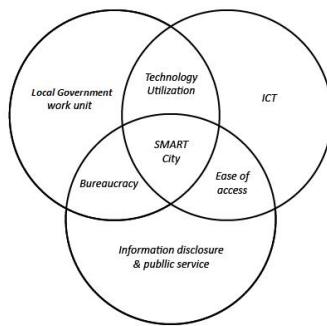
Cities and urban areas became centres of innovation from the Industrial Revolution to the present era of the digital revolution. Many cities adopt the concept of a smart city that combines modern technology, information, and communication infrastructure intending to increase economic growth and high quality of life for urban communities. The concept of a smart city is a vision of a city where life is more accessible, better, cheaper, and more enjoyable. A smart city is a combination of traditional infrastructure by combining modern technological infrastructure to facilitate sustainable development [4], [5]. There are many diverse in defining smart city. Smart city is not only focused on technology but also the organization and its use. The explanation of the most uniform smart city is a city that performs well with a way of looking forward in the fields of economy, society, government, mobility, environment and decent life that built on an intelligent combination of support and activities of urban citizens who be aware of progress and be independent. Smart city is a new concept for managing city functions and city life, changing manufacturing patterns from competitive to collaborative which has the potential to make city devices more efficient, better understand technology, better connected with cables and with all that, is expected to improve the quality of life of city residents [6], [7].

The design implementation of smart city adopted from the IBM concept has a patent from 'smarter cities' to claim the development of smart concepts from various aspects such as the spread of information and communication technology to a high level of education. IBM provides three Is which are fundamental to the smart city: Instrumented, Interconnected, Intelligent [8].

- Instrumented refers to the ability to directly capture and integrate real-world data through the use of sensors, meters, equipment, personal devices, and other similar sensors;

- Interconnected refers to integrating data into a computing platform that enables the communication of information among various city services;
- Intelligent refers to the inclusion of sophisticated analytics, modelling, optimization, visualization services, and artificial intelligence to make better operational decisions.

Underlying the practice of a smart city is the demand of city residents who own liveable cities. This concept is not just a utopia but has realized by combining new dimensions in using information and communication technology to build and integrate essential infrastructure and services in cities. The initiative to build smart cities is to reduce and improve visible urban problems and make the city a better place. Because of this, some people view smart cities as liveable city icons [9]. A smart city has many dimensions of development, divides into six dimensions [10]: smart economy (economic innovation, entrepreneurship, productivity), smart mobility (accessibility, integrated transportation systems), smart environment (waste control, pollution, source management sustainable power), smart people (level of qualification, creativity, flexibility), smart living (quality of life, welfare) and smart governance (public service, information disclosure, and governance). In the field of urban planning, intelligence in growth requires strategic direction.



**Figure 1:** Integration of Smart City

Governments and public institutions can implement smart ideas for policies, strategies, and other new programs to target sustainable development, healthy economic growth, and better quality of life for citizens. As a part of a smart city, an organization is inseparable from technology, including the meaning of achieving something from a goal that usually conceptualized through products or services. From a technology point of view, a smart city can be seen in terms of its production using technology tools and equipment, activities or processes of its production methods, and knowledge that can develop application concepts with additional features. Viewed from outside the organization, technology is a product or service provider that meets the needs and wants. In terms of profit, an organization in government can implement technology according to the community's demands and needs.

### 2.3 Communication Technology Industry

The industry behind the city's progress is communication technology, the presence of communication technology as part of the use of technology in the government section is a stage of developing the use of smart technology. It gets significant attention, and technology has entered into commercial applications that support smart cities, such as intelligent services, artificial intelligence, and machine thinking. Intelligence in the context of technology implies the principle of all-round automatic computing [11] where intelligence functions as a benchmark for the adaptability of specific technological contexts. Intelligent systems intended to use data-based analysis, network communication, and algorithmic decisions to respond in real-time to complex and dynamic situations [12]. In the development of urban technology infrastructure, supporting technologies incorporated into it are mobile, wireless infrastructure, data, content, network distribution, and artificial intelligence. The pace of technological discovery, lifestyle changes, and the development of society towards increasingly open technology has made the communication technology industry enter the growing economic sector non-stop.

Having a sophisticated network infrastructure is very important to develop information and communication technology ecosystems, smart cities that use many technologies in it refer to connected communities that combine broadband communication infrastructure, flexible computing infrastructure, service-oriented based on open industry standards and, innovative services to meet the needs of governments and institutions of government workers, city residents, and related businesses [13]. In social factors, future network technology must facilitate community and inclusive environmental growth by supporting public and private environmentally friendly applications such as education, transportation, health, and energy awareness, among individual members of the community and making roadmaps to imagine and provide all aspects of operations and management.

The communications technology industry also leads to the realm of public relations; the presence of smart cities in the use of new technology has grown dramatically over the past few years. New features that appear on the website, mobile devices with smarter and more reliable systems, and restructuring of news services can change the path of public relations to become more familiar with the technology. Public relations in the technological era are now needed to be a skilled strategist and innovator in technology. Communication professionals have seen the emergence of a variety of social media and new technologies [14]. Mastering new technology must make government public relations more relevant, including the analogy of technology use, trend exploration, scanning, cross-impact analysis, scenario making, mapping, simulation, and modelling of communication messages desired by city residents.

## 2.4 Technology Infrastructure

Infrastructure plays an essential part in the development of a country even to the regions, and infrastructure depends on physical networks [15]. This type of infrastructure can be understood as representative of public facilities, the use of telecommunications as part of the information is interrelated. On this basis, infrastructure is built by the state also region to facilitate the public to access and communicate efficiently. The term information infrastructure has increasingly used to refer to integrated solutions based on the combination of information and communication technology currently underway [16] which is useful for the utilization of service space between the government and the city community and in realizing cities that integrated with the latest technology infrastructure for investment and business development. In the development of technology and information, the internet is also one part of it integrated with information and communication technology (ICT) that leads to technological convergence. ICT convergence has opened up much use of new technology, information infrastructure can see as a step in the development of information technology and a step in infrastructure development and technology. The information infrastructure shares several aspects with other types of information technology to have several unique aspects that make it different.

The term technology infrastructure is used in connection to information technology to indicate basic support systems such as operating systems, file servers, protocols, and others. Realizing that related to city development accompanied by various technological infrastructures, currently, cities that focus on smart cities implement infrastructure policies to make cities more effective and efficient in services by having sophisticated network infrastructure, which is very important to develop information and communication technology ecosystems [17].

As well as the infrastructure of the wireless network, it is inseparable from the internet. Many internet users currently relate to broadband; many people roam with connected network devices as a device that offers unlimited integration of digital technology, content, and services for any purpose. Significant investment is needed to change or improve existing wireless communication network technology. By considering new priorities from old implemented technologies to the new era, some network demands can be realized by new network technologies that continue to improve in parallel with user trends and technological developments. It also anticipated that such new architecture could be the foundation of future networks in making city implement the fast paced industrial revolution in whole sectors.

## 3. METHODS

The research method used in this paper was qualitative desk research with a constructivist interpretive point of view that places observations and objectivity in finding a

reality [18]. Use a literature review study, this paper will elaborate in order to find out how the role of the communication technology industry in urban development to shape urban society can side by side using ICT as an appropriate form of the industrial revolution.

## 4. RESULTS AND DISCUSSIONS

### 4.1 In Term of Infrastructure

The development and structuring of urban areas massively following advances in industrial technology and communication technology is a real challenge for city governments to make collaboration between the role of industry, communication, government, and society an inseparable part of the industrial revolution. The development of the industrial revolution, which currently implemented in various fields, including smart cities, has made infrastructure an essential part of urban development. Internet technology and renewable energy have begun to join forces to create new infrastructure in the 3.0 industrial revolution that will change the way power distribution is in the 21st century [3]. Periodically, a city moves from traditionalism to the transformation in harmony with information and communication technology. The absorption and use of various technological tools, both individually and organization, could become a new habit to develop. The utilization of technology by the government could cut bureaucracy for public services.

Infrastructure built to support a smart city can be in the form of telecommunications networks that help communication access in real-time. In terms of service and information needs, infrastructure connected in real-time will facilitate the flow of data information exchange. Technology is one of the core concepts of developing a smart city, in the seventh edition of the IESE Cities in Motion Index (CIMI) in 2020. Technology holds aspects to improve the quality of life that is potential and superior in the field of work, security and productivity. The infrastructure used in the development of cities in the context of the industrial revolution is the use of wired and wireless telecommunications connection technology in households to business needs. The scope of high innovation in the development of cities into the realm of technological infrastructure is cellular data network services, internet, telephone, Wi-Fi, computer usage to broadband subscription services.

Communications industry has seen significant changes in customer growth, infrastructure deployments, and especially cellular broadband growth. The increasing use of smartphones and the steady growth of cellular broadband have led to significant changes in the way users communicate and live their daily lives. Telecommunications allow orders to be exchanged in real-time and become a product of the communications technology industry that can increase individuals, organizations, and businesses and reduce high conventional costs. Information and telecommunications

are very closely related. All of these will not happen if there is no cable connecting in the information infrastructure. In recent years, optical fibres has widely used in the communications industry that enables long-distance transmission and higher bandwidth (data rates) than other forms of communication [19]. In infrastructure, fibres optic cables form "trunk lines" that extend from the location of the provider to the residential environment or residential area. Cable distribution is not only by land but also through an underwater cable network. There is now a joint project called the Integrated Underwater Fibres Optic System, where many aspects utilize the underwater network for optical fibres to increase bandwidth and handling coverage areas. In this system, the communication system uses copper-based power cables available for signal transmission [20].

Along with the increasing population in urban areas related to the development of various sectors, it led to an increase in market demand related to internet service providers. In this regard, governments and service providers face challenges in building networks that can even be distributed throughout the area and provide significantly better quality connections and create more business opportunities, especially in markets full of ICT. Besides increasing attention to the cellular market, broadband networks are still the necessary infrastructure needed to ensure connections everywhere. Delayed substitution to a faster and more reliable network can mean loss of competitiveness in the broadband market. In particular, the replacement of old technology to a new fibres platform (optical fibres cable) is crucial for future internet services such as very high-quality content, video streaming services, and the internet [21].

#### 4.1.1 Over the Top Services

Referring to the use of technology infrastructure available in cities, it will lead to Over the Top (OTT) services for the public. It specified for urban residents who use smartphones to access various services and features on-demand. Smart cities are not only limited to infrastructure but also through integrated services such as population administration services and public services by relying on websites and special applications integrated with OTT services. The number of smartphone users resulting in the number of downloads of communication applications so that entertainment applications are the most popular. Some aspects or goals of the application reflect a socially constructed reality in which society based on the ability of people to communicate with each other. From this, what can be highlighted is data, content, distribution, and networking, concepts based on information systems technology. Existing data in an application in addition to data derived from manufacturer information and internet information, there is also data in the form of application users who download and provide personal information for the first registration using the application.

The purpose of data is to enable communication between

users and communication between advertisers, also manufacturers and users. Communicating in the communication industry today depends on the network. Accessibility of OTT services depends on the internet accessibility. OTT services are practically more convenient to use when mobile broadband connectivity is available. The penetration of smartphones that support mobile broadband and the ability to download new applications has increased significantly; also, it has led to higher internet data consumption [22].

#### 4.2 Smart City and Network Security

When cities develop into cities that are all technology, the strength of government organizations is an element that cannot be separated from the presence of smart cities. In government organizations as the main actor in the formation of a smart city, start from the point of view at various aspects of the needs of the organizational environment such as the social, cultural, legal, political, economic, technological and physical sectors[23] which will influence the concepts and needs that will carry out in developing smart city application. Various sectors in the provision of smart city services for city communities can be seen from the government's activities and the city community that can integrate into an integrated service. Social sector will refer to lifestyle, religious practice, trade, and profession. Cultural sector looks at the historical potential, traditions, behaviour, and values of social groups. The legal sector focuses on the constitution and law enforcement.

The political sector emphasizes the political system that exists in an organizational environment. The technology sector is a knowledge base for information technology and communication, as well as scientific developments that can be used or produce innovative products or services. The physical sector includes natural resources, transportation accessibility, and the environment. As part of a smart city, an organization is inseparable from technology, which includes the meaning of achieving something from a goal that usually conceptualized through a product or service. From a technological point of view, a smart city can be seen in terms of its production using technological equipment and equipment, activities, or processes on its production methods and knowledge that can develop application concepts with additional features. When viewed from outside the organization, technology is a product or service provider that meets needs and wants. From the profit side, an organization in government can apply technology according to society's demands and needs. This application is used as a part of the function of all work units of government organizations. The government faces many challenges to develop smart cities to exceed the capacities of the classical government processes.

Therefore, it requires a new and innovative form of government[24]. The smart city was associated with the

first combined footprint of the third and fourth industrial revolution by adopting various smart and automated socio-technical systems. This pattern is a new social phenomenon that emerges from new forms of socio-technical improvement and mediation across the realms of media, manufacturing and mobility, and production and consumption, which become reification for city residents [25]. The role of government work units in running and managing smart cities is more to the use of every city institution to collaborate to improve the urban economy, the quality of life of city residents, and various problems using information and communication technology[26].

Things that must be considered in developing a technology-based smart city are network service security, in the context of the unlimited use of Over the Top (OTT) services for urban communities, when cities develop into cities that are all technology, the strength of government organizations is an element that cannot be separated from the presence of smart cities. Data sharing is another key feature of the social networking service where users can share interests, videos, photos, activities, and many things that could spread some pieces of information. The large amount of personal data that users share makes it a desirable target for hackers. Hackers will attack sensitive personal content, only by using social network service data, the attacker can carry out various types of attacks, such as spam, malware, social bots, and identity theft. Besides, hackers can find other vital data, such as bank account information, by analysing users' data and can commit internet crimes, such as bank fraud. Attacks within social networking services can range from account hijacking, fraud, and impersonation attacks to malware distribution. Sophisticated attacks like this can also harm corporate networks. There are several categories of security problems in social networking services, namely (1) privacy concerns, (2) viral marketing, (3) network structure based attacks, (4) malware attacks [27]. Social networking services have become the most promising target of hackers for identity theft. In this type of attack, hackers exploit a user's confidential data, such as social security numbers, full names, telephone numbers, and addresses, without his permission to commit cybercrimes, such as theft or fraud. Because of this, the hacker can only access data about the user's friends and then pretend to be trusted friends.

Besides, hackers can persuade users to request additional commercial and sensitive information. In this attack, the hacker tries to obtain the user's financial information using the personal data shared on the user's social media. Hackers can also log into the social media accounts of 'well-known celebrities' and then use these accounts to interact with their followers. For example, in smartphone user data or social media, many applications offer registration at first, sometimes these applications require the user's credit card details; personal information, such as telephone numbers; and email ID to complete the registration process. Users who provide their telephone numbers and credit card details can increase the risk of identity theft. It can lead to reputational defamation. Reputation is a type of collective judgment by a

community of individuals, associations, or groups of people. Reputation plays an essential role in many fields, such as organizations, companies, social statuses, groups, and even government. This high utilization of OTT services can affect the status and credibility of users in real life. In its application, various kinds of social media can also damage large businesses and organizations, where if one significant data leaks and something unwanted happens, then it is certain that the reputation and security of the service are weak and can be hacked easily.

One of the advantages of today's digital era is that it captures a substantial volume of information about people, objects, and relationships, which can be called big data [28]. Data range from social media applications, such as Twitter, Facebook, and YouTube, for business activities to sensory data collected from satellites, traffic cameras, and even video games and household appliances. As big data's emergence speaks for a broader phenomenon than ubiquitous computing, big data is one element of increasing technological and social hybridization. If in the application of smart cities, safeguarding personal data for government organizations that have public services is something that must be done, public data security is a state secret that can only be accessed by state institutions related to administration and civil records.

### **4.3 In Term of Economy**

With the development of cities and the communication technology industry's presence, the economic side has greatly influenced the business sector and regional income. Starting with the use of cellular services creates new business opportunities in the cellular market and broadband networks. Then the easier access to information, the news can spread quickly and widely. The advantages of social media calculated by increasing reputation and awareness of information related to the various potentials offered by a city. Indirectly, the role of social media, word of mouth, and news spread all over is of interest in easily and precisely advertising the potential of the city. Advertising is the most important tool in running a business. In order to persuade and influence, advertising is related to consumerization patterns, and the amount of media space currently makes companies that have products and services to drive promotions to increase sales and get the attention of the public as brand awareness. Ease of bureaucracy is also one of the critical things in developing investment in cities; through technology and applications, managing business processes can be more efficient in terms of time and financial aspects.

The arrival of internet and website has become an advertising business field in a new way, namely pop-up advertising and advertising banners on the website, the industrial revolution is now playing again in the internet and digital world, this is a big shock to the advertising world which continues to penetrate applying new concepts

and keeping up with developments trend-following consumer patterns [29]. The crowdsourcing method or seeking funding online is also hidden advertising, based on the real experiences of a person or group that is spread through social media networks and can inspire the public to participate in producing new content that is one-sided or funding on a large scale. As a government or business organization that focuses on customer satisfaction, this crowdsourcing phenomenon can involve users or consumers as stakeholders to collaborate in creating superior products and services [3], [30].

#### 4.4 City Development from Internet of Things (IoT)

The 3.0 industrial revolution, which is currently ongoing, is also merging into the 4.0 industrial revolution as part of urban planning. The industrial revolution 4.0 now has a role in technology-based urban development. Utilization of Internet of Things technology in the simplest terms, namely the application of technology in a society, is where all members have access to a full internet environment inhabited by self-configuration, self-management, and smart technology anytime, anywhere related to the city. Artificial Intelligence (AI), connectivity and sensor is a part of Internet of Things. Wireless infrastructure can shape the concept of a digital city. It offers a combination of grassroots and civic networks, city information and communication networks, city-oriented commercial websites, virtual communities, and ICT experiments in the neighbourhood[31]. The broadband infrastructure with wireless networks interacting with the digital city has moved beyond individual homes to community spaces and other locations, indoors or outdoors, wherever network access is available. Unwanted access can change the way citizens engage with the digital city environment, enabling interaction from places and times convenient for city dwellers. This hope moves beyond a digital city vision as a specific government-led project to a digital city vision as a place that offers seamless integration of digital technology, content, and services for any purpose. Cities are becoming digital spaces, where connectivity supports citizen interaction not only with local governments and residents but with content, applications, services, and people located everywhere. The Internet of Things is increasingly hosting adaptive use resources that can identify each user and generate tailor-made user interfaces based on past searches.

#### 5. CONCLUSION

The tremendous advances in network technology in recent years have brought about a new information revolution alongside the industrial revolution. Today, networks are an integral part of social infrastructure in the commercial

world and everyday life. In social factors and the continued development of city governments, future network technologies should facilitate the inclusive growth of society and the environment by supporting public and private social environmentally friendly applications such as education, transportation, health, and energy awareness, among individual members of society and creating a road map to envision and provide all aspects of operations and management. From operations and management perspective, future network technology must solve the complexities of operation and management by supporting network self-stabilization and self-management functions with effective utilization of ICT resources and enabling smooth migration between various network services with customized services. Some technologies are developed with the assumption that each user has only one identity, while in fact, people take on different roles during each day. It is a significant complication for those who construct artificial agents to monitor and predict human needs and actions.

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