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Influence of Information, Communication, and Technology (ICT) to Sustainable Development

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Abstract

Sustainable development has become an important issue since 1980, especially in mainstream of international environment. Its implementation can be then influenced by information, communication, and technology (ICT) either in positive ways or negative ways. ICT influence to it in positive sites can be seen in activities of selling and buying (trade and business), applying a job, getting some information, and other activities. When it is used in an appropriate ways, it will support the human beings life that has influence to sustainable development. In negative dimension otherwise, ICT focuses on applying technology especially using internet as a basis. It brings some disadvantages as a consequence of the development of it. The growing danger from crimes committed against computer or against information an computers is an example internet misuse. Lack of protection to businesses and governments activities are also a current fact that it is facing. Deny access or destroy valuable information is always a real threat to the businessman and the government. In fact, it can be said that the misuse of the internet is threatening the sustainable development in broad sense.

Keywords: ICT; Sustainable development.

1. Introduction

Sustainable development has become an important issue since 1980, especially in mainstream of international environment [1].

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Discussing and debating related to it are almost talked in some international conference and forum in order to spread the idea of understanding relationship between human beings and nature [2]. It is also associated with several dimensions such as environment, trade, economic, and social [3,4].

Sustainable development is deemed as one of issues that everybody really wants to support; even in somehow nobody knows what it means [5]. An indication of it can be seen through some dimension of it. If people know sustainable development prior merely related to environmental issue, it has been developed to reach other dimensions as if economic, trade, and technology. Bearing amongst them therefore show that sustainable development has been influenced by those dimensions. In other words, it can be said, to get sustainable development in real situation is not easy-task because it is complicated.

One of sustainable development's concerns is technology. Technology covers information, communication, and technology itself (ICT). In recent years, one of ICT's aspects is internet. The use of the internet has grown at an explosive rate, but there is not currently single entity to control the enormous amount of information that transmitted through it [6].

The use of the internet is creating to help human beings activities. The human beings activities nowadays depend on it. What they want to do always based on the internet, such as selling and buying something, applying a job, getting some information, and other activities. Those of advantages of the internet actually have connection to the idea of sustainable development. When it is used in an appropriate ways, it will support the human beings life that has influence to sustainable development.

However, the internet itself brings some disadvantages as a consequence of the development of it. The growing danger from crimes committed against computer or against information an computers is an example internet misuse. Lack of protection to businesses and governments activities are also a current fact that it is facing [7,8]. Deny access or destroy valuable information is always a real threat to the businessman and the government. In fact, it can be said that the misuse of the internet is threatening the sustainable development in broad sense.

This paper will discuss deeply influence ICT to sustainable development in broad sense. Indeed, before doing it, it is very important to make clear definition of sustainable development as scholars and expertise's debate in order to see and explore how ICT is able to influence sustainable development either in positive ways or negative ways.

2. Meaning of Sustainable Development

Concept of sustainable development in some scholars' point of view is various. They tend to relate it to justice, inter-generational and intra-generational equity, a trade-off between anthropocentricism and eco-centricism [9]. Diverse concept of the scholars' shows people understands to develop sustainable in all dimensions of life.

Related to definition of sustainable development, the Bruntland Commission states definition of sustainable development that:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within two key concepts. *First*, the concept of "needs" in particular the essential needs of the world's poor, to which overriding priority should be given; and *secondly*, the idea of limitation imposed by the state of technology and social organization on the environment's ability to meet present and future needs"[10].

World Commission on Environment and Development (WCED's) definition is the most commonly cited definition and it is still the best and the most widely accepted definition. It is because the definition emphasizes environmental and social concern that implies broad-ranging and fundamentally challenging responsibilities for both government and business [11]. A social concern can be seen in words …*the essential needs of the world's poor*… that issue a degree of equity in distribution of resources within societies [12]. An environmental concern is stipulated in …*the environment's ability to meet present and future needs*… given by the state of technology and society [13]. It is similar to WCED, the Organization for Economic Cooperation and Development (OECD) states that, "the sustainable development concept constitutes a further elaboration of the close links between economic activity and the conservation of environmental resources. It implies a partnership between the environment and the economy"[14].

Both environmental and social concern as mentioned in the Bruntland definition integrates an economic approach to assess social insurance and environmental program. In terms of it, balance is the key for the government to achieve sustainability either in social and environmental program[15]. At the same time of bringing positive impact of both environmental and social dimension, they also create an economic dimension of their arisen problems. According to Jeremy Eppel, open access of many environmental resources means economic actors should pay attention to full cost of environmental degradation that they may be caused[16]. Ideally, they have to mix environmental amenities and production of good they have in order to achieve market mechanism. When they can fulfill this objective, they will create human welfare with economic, social, and environmental base for future generations.

The pattern of environmental and social dimension – and economic dimension as mentioned above then is explained in different point of view by Turner. He stipulates two poles of sustainability as very strong and very weak sustainability. Very strong sustainability emphasizes to not use all natural resources for economic activities. It puts social and economic activities totally constrained by the environment. It is commonly called as "eco-centric". Whereas very weak sustainability means a techno-centric worldview of almost infinite substitutability of resources where amongst environmental, economic, and social interest compete one to another. In terms of it, it focuses on maintaining economy[17]. Daly and Cobb furthermore indicates that weak sustainability sees natural and manufactured capital as interchangeable with technology able to fill human produced gaps in the natural world such as a lack of resources or damage to the environment[18].

Turner's scheme is elaborated in the same sense by Colby. Colby [19] describes five views of "environmental management in development". They are frontier economics; environmental protection; resource management; eco-development; and deep ecology. Those views will create a pattern to connect one to another such as relationship between human and nature, dominant threat of nature, technologies and strategies [20].

Both Turner and Colby views basically wants to deliver a message that amongst environmental, economic and social can work together in same the line and time in order to drive sustainability of worldwide life. In terms of it, sustainability development has to be incorporated for two main ideas. First, the needs of present generation and the protection of the resource base for future generations; secondly, the integration of social, economic, and environmental aspects in developmental process [21,22]. It draws that resources depletion and environmental degradation can influence economic aspect or otherwise. Therefore, it is interesting to see Kuznets curve that predicts as societies become richer, the pollution per unit of production will decrease, and possibility of sustained growth [23,24].

In terms of international law perspectives, key components of sustainable development have been further developed through a number of techniques and processes, including treaty-making, case law, doctrine and instruments adopted by relevant Non-governmental Organizations, such as the World Conservation Union (IUCN) and the International Law Association (ILA). For instance, at a conference in New Delhi in 2002, the latter adopted a Declaration of Principles of Inter-national Law Relating to Sustainable Development. That Declaration purports to capture its key contents in the following seven principles:

1. The duty of States to ensure sustainable use of natural resources;

2. The principle of equity and the eradication of poverty;

3. The principle of common but differentiated responsibilities;

4. The principle of the precautionary approach to human health, natural resources and ecosystems;

5. The principle of public participation and access to information and justice;

6. The principle of good governance;

7. The principle of integration and interrelationship, in particular in relation to human rights and social, economic and environmental objectives [25].

Finally, it can be said from such discussion as conducted above that various meaning of sustainability development emphasize for what people do nowadays will bring positive impact today and for future. Future generation must get and see like what people get in present. The 1992 Rio Declaration on Environment and Development guarantees this intention and purposes in Principles 3 and 4 Declaration Rio; Principle 3 states that “the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations”; and, Principle 4 states that in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

Based on the Declaration Rio, there are basically moral values and principles that people today have to take responsible for what they do, including the government policy [26]. This care also that for the future implies,

among others, a wise use of natural resources and other aspects regarding the environmental footprint [27].

However, pursuant to author that various definition of sustainable development as discussed do not explore and elaborate more its influence in perspective of information, communication and technologies (ICT). Those point of views scholars tend to see merely in environmental, economic and social dimensions. However, ICT has been dramatically developed to reach all people activities today. Indeed, it will influence environmental, economic and social dimension in specific area and sustainable development in global terms. Without supporting of ICT, sustainable development will face lots of problems to be applied present and for future. However, it is realized that ICT has a risk for the goal sustainable development [28].

2.1 Influence ICT to Sustainable Development

A growth of information, communication and technology (ICT) comprises the most vibrant, competitive, and rapidly growing economic sector, around the world [29]. It tends to be rampant but it has not reached its peak [30]. In one side, it creates a lot of advantage but in other side it has also disadvantages. The development of ICT has created environmental biases including people. Mochtar Kusumaatmadja [31] states that a change of order and regularity are the twin goals of changing society (building). Therefore, if the change is going to be done orderly and regularly, the law as a tool cannot be ignored.

A change in the social and cultural character of the community as a result of the development of ICT is certainly a fact that cannot be avoided. Changes in the character of the community led to a pattern of "denial of humanitarian human nature' as a rational creature of God". The impact can be predicted that the community had become uncontrolled to reach the criminalization point that they obtain from the development of ICT.

2.1.1 Influence of ICT to Sustainable Development in Positive Ways

ICT has been spread worldwide. It has been accelerating economic and social changes across all areas of human activities in past decades [32]. Computer, internet, mobile-phone, etc are innovative technologies that have been reached either in developing countries or least developing countries. Consequences of spread out of those innovative technologies bring high expectation for improving outcomes of the society. Pursuant to Joachim, the outcome is accelerated to economic growth, getting more jobs, decreased migration pressure from rural to urban areas, increased agricultural and industrial productivity, increased services and access to them, easier diffusion of innovations, and increased public administration efficiency [33].

Similar to Joachim, Mirghani Mohamed emphasizes that ICT plays an important role in context of global socio-technological realm. The important role of it is embedded through "knowledge mobilization, network externalities, alliances and ''coopetitive'' relationships. The convergences of Knowledge Management processes, ICTs infrastructure and architecture have been augmented by the recent advancements in technology ubiquity, semantics and knowledge representation" .

Indeed, both points of views as mentioned are still confusing and a little bit difficult to be understood. EITO reports that "the validation of the deployment of ICT tools to benefit the society and economics is still at its

early stages and it's even harder to forecast the exact effects on sustainability. ICTs put forward radically new technologies that could change the current dimensions of relationship between the environment, society, and economy" [34,35]. However, the report also recognizes that ICT has influence to economic growth and sustainable development.

Wolters and Boer furthermore stipulate their research that shows connection between ICT and sustainable development. Their report indicates that ''the growth in the economy is subjected to its readiness for international competitiveness, which in turn, is a matter of embracing the knowledge-based economy. Therefore, if the economic growth is to be sustainable, then the increasing adoption of ICTs has to be conducive to sustainability" [36].

Some scholars and experts then agree that both ICT and sustainable development have connection to show their relationship one to another. However in the same time, they realize some difficulties to draw the connection. Erdmann [37,38] then states that the influence of ICT to sustainable development can be seen in some levels: First level is environmental effect because of the physical existence of ICT that causes increased consumption of energy, increased emission of greenhouse gas and increased non-recycled solid waste; Second level concerns to environmental effects because of the use and application of ICT. On this level effects are generated by virtual goods, virtual stores, tele-working, tele-meetings, tele-collaboration, etc; and finally, it is level of consideration are the systemic effects of the use of ICT. These effects include impacts on facilities managed, on supply chains, on total freight transport and on total passenger transport.

Edrmann's indicators based on ICT influence to sustainable development are still debatable. Those indicators is too complex to be understood as simply as experts or scholars think. For example can been seen such as:

1. Telematic applications and e-business/e-commerce are applied for purposes of both freight and passenger transport intensity;
2. Tele-work and tele-cooperation that can be reduced passenger travel; and
3. ICT based optimization of products and processes as well as e-business have a potential for the reduction of energy intensity of the industry as well as greenhouse gas emissions from energy industries. ICT appliances in the domestic and the tertiary sector consume energy on the other hand offices, buildings and other facilities can be run more efficiently [39].

In simple way to draw ICT's influence to sustainable development is eradication gap between poor (countries) and rich (countries). If the government and other stakeholders design and implement ICT strategies effectively, the ICT must help to reduce the gap for some disadvantaged or marginalized people [40]. When ICT strategies and policies are conducted properly, it can have an enduring, catalytic effect on developments concerns including poverty, gender inequalities, and the environment. In the context of it, ICT can facilitate access to environmental, trade, economic, and social information local, regional, and national.

Simple example of reducing gap between rich and poor countries can be seen in Bangladesh and Peru. Both countries are developing countries that attempt to measure the welfare effect of telephone use compared with

alternatives such as visiting in person, sending a messenger, and sending letters [41]. There is a gap can be between prices alternatives and local telephone use.

In terms of access to markets, services and networks, ICT enables to access them. In markets for examples can be found "1700 internet kiosks and 45 warehouses have been set up in Madhya Pradesh, India since 2000 to provide whole price information. These kiosks have offered 1-5 percent higher wholesale prices to farmers; or Ethiopia Commodity Exchange was set up in 2008 with the help of the International Food Policy Research Institute. The institution offers new ICT enabled market information and trading systems for connecting buyers and sellers; or cell phone services phased in Niger, between 2001 and 2006, provided alternative cheaper search technology to grain traders and other market actors, thereby reducing grain price dispersion by a minimum of 6.4 percent; and cell phone adoption by fishermen in Kerala, India has provided access to different market prices and opportunities to complete market transactions without being physically present. As a result, fishermen's profits have increased by 8 percent".

Services in addition provide transferring money using a mobile-phone and using of credit cards for business transaction. An example of it can be seen in developing countries like Africa, and Latin America. In terms of networking moreover, ICT has contributed to distance learning program. An example of it can be seen in Africa and India.

Internet is also one of positive influence of ICT to sustainable development. Internet has been developed to assist people in developing and the least developing countries. One of internet tools is broadband. It enables solution to help service providers in high-growth economies transform services, network and business. It is used to help people to access what they want to get from and guide them to be a part of worldwide society. Of course, it is not easy-task to spread broadband particular for rural communities. However, through broadband used, the people of rural area will get benefits from ICT applications such as e-government, e-business, and e-education [42].

Intellectual Property Rights (IPRs) also contributes positive way to sustainable development. In terms of it, it has to be protected, especially the balance interest of the disclosure and dissemination of ideas with the exclusive rights of the owners of the property to control and profit from invention and authorship [47]. As we know, ICT's innovation has been developed rapidly and in the same time, the law governing IPRs is changing very quickly. IPRs basically have measured it particular in social and economic circumstances [43].

2.1.2 Influence of ICT to Sustainable Development in Negative Ways

Various aspects of influence ICT to sustainable development in positive ways has been discussed as mentioned above. It is realized that ICT has technology basis in general. What it has been explained in positive way actually is potential to create negative way in the angle of ICT. As it is recognized then, people needs knowledge-based development to be survived and brings hope to next generation.

The rapid innovation and development today is a great potential to be misused. No matters whether it will bring damage for next generation. The perpetrator think ICT is a new "paddy field" for getting money. So it is very

important to take control of misuse of ICT in order to avoid damage for next generation.

As we know, misuse of ICT has now become a business which exceeds a trillion dollars a year. The business crime takes place in almost area of human activities such as online fraud [44, 45, 46, 47], identity theft, and lost intellectual property [48]. It is because it refers to some information that has been processed and transmitted through a computer or an internet. An example of it can be seen to some transaction that people do where their personal identity code has been used for many different transactions[49, 50].

Some transactions of people do when they access markets, services and networks open a chance for perpetrator to misuse it. It is mostly that access markets, services and networks apply information to be delivered to the providers. It means that it has opportunity for hacker not only to take information personally and give disadvantages for the people but also it can be formed in terms of stealing of money (credit cards). The condition of course creates negative effect in economic site.

In social dimension furthermore people including in rural area have access to use mobile phone. In one site as mentioned before, it gives a chance for people to get benefits. However, the negative site is waiting to take its opportunity. People will get information easily, particular in negative corners such as photography, gambling, and etc. People in this dimension will act individually rather than to get involved in his/her communities.

In the sample of environment point of views, technology contributes to produce electronic rubbish. ICT also can create wrong or false information of protection of environment. Sustainable development concept can be blurred based on the perpetrator interests to bring damage to environment.

Those examples of abuse of ICT to sustainable development give opportunity for the victims to sue the perpetrator for their conduct. According to a 2011 Norton study, threats to cyberspace have increased dramatically in the past year afflicting 431 million adult victims globally – or 14 adults' victims every second, one million cybercrime victims every day [51,52].

Some of types of crime related to misuse of ICT to sustainable development such as:

1. Unauthorized access to computer systems and service;

Crime is committed to a system of computer networks illegally, without permission, or without the knowledge of the owner of the computer network system. Hackers usually intent to sabotage or theft of important and confidential information, but there is also a reason that the hackers conduct unauthorized access just to try their skills to penetrate a system that has a high degree of protection.

2. Illegal contents;

Crime is committed by entering data or information into the internet about something that is not true, unethical and a breach of law or public order. For example of it as if loading a hoax or libel that would destroy the dignity or self-esteem of others; loading matters related to pornography; loading information is a state secret, agitation,

and propaganda against the legitimate government, and so on.

3. Data Forgery;

Crime is committed by falsifying data on important documents stored as scriptless document via internet. These crimes are usually directed to e-commerce documents by making as if going the "wrong type" that will ultimately bring benefit to an offender.

3. Conclusion

It can be concluded that ICT has influence to sustainable development both positive and negative sites. Positive site of the influence can be seen in access markets, services, networks, internet, and protection to IPRs. Negative sites otherwise, it is resulted from other site of positive ways of ICT influence to sustainable development. For example, abuse of personal data to wrong purposes especially in using transaction (business and trade) and networks. Those of misuse of ICT influence can be categorized as crime and the perpetrator can be sued for his/her conduct.

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