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THE CURRENT STATE OF INFORMATION COMMUNICATION TECHNOLOGY IN CRITICAL INFRASTRUCTURE: THE CASE OF VIETNAM

AZ INFORMÁCIÓ KOMMUNIKÁCIÓS TECHNOLÓGIA JELENLEGI HELYZETE A VIETNÁMI KRITIKUS INFRASTRUKTÚRÁBAN

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Abstract

Critical infrastructure (CI) is the most important key component of a national security and economic development. It involves some sectors like energy; finance; transportation; oil; gas and water distribution; health; government and emergency services. These critical infrastructures are becoming increasingly interconnected by the Information communication technology (ICT). This paper reports on the current state of ICT in the critical infrastructure of Vietnam. Moreover, the authors expressed that how the ICT influenced on CI development of Vietnam.

Keywords: *critical infrastructure, critical, infrastructure, ICT, Vietnam*

Absztrakt

A Kritikus Infrastruktúra a legfontosabb összetevője a nemzetbiztonsági és közgazdasági fejlesztésnek. Magában foglalja például az energiai, pénzügyi, közlekedési, olaj-, gáz-, és vízhálózati; egészségügyi; kormányzati és vészhelyzeti szektorokat. Ezek a kritikus infrastruktúrák egyre jobban összekötődnek az Információ kommunikációs technológiák (Information Communication Technology - ICT) által. Ez a cikk az ICT jelenlegi helyzetéről szól - a vietnámi kritikus infrastruktúrában. Kifejtjük, hogyan hatott az ICT a Kritikus Infrastruktúra fejlesztésére Vietnámban.

Kulcsszavak: *kritikus infrastruktúra, kritikus, infrastruktúra, ICT, Vietnám.*

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INTRODUCTION

Internet of Things (IoT) and ICT play an important role in many aspects of our lives. With the boosting of ICT in the world, the Vietnamese government has seen the pressing the inclusion of the telecommunication services and Internet services. In particularly, ICT can offer several services or resources such as reduced operating cost; diminished paper process and improved effectiveness; and efficiency of governmental activities. However, Vietnam is a developing country and among the poorest countries in the world, as a result, Vietnam ICT industry has been recently developed. Additionally, little research has been conducted into the interconnectedness between internet services and critical infrastructure. This paper; therefore, focuses on the operationalization of current state of ICT in Vietnam critical infrastructure as well as the influence of ICT in Vietnam critical infrastructure system.

BACKGROUND

Critical infrastructure

Critical infrastructure is a combination of two words: "critical" and "infrastructure". The term "critical" involves the infrastructure that offers support for economic, public health, social well-being, and for the functioning of key government responsibilities (e.g. C. Alcaraz and S. Zeadally, 2015). The word "infrastructure" refers to physical infrastructure like transport, services, technology, communication, network, assets and so on [2]. In another hand, critical infrastructure is known as "a wide array of public facilities and equipment required to provide social services and support private sector economic activity" [3]. It includes electrical power systems; gas and oil storage and transportation; banking and finance; transportation; healthcare; information and communications; water supply system [4]; emergency services (medicine, fire and law enforcement); law enforcement and internal security; foreign affairs; government; national defense and intelligence [5]. Although critical infrastructure has many aspects, an essential thing is that internet communication technology (ICT). As a result of ICT, it can connect to all other aspects of the national critical infrastructure system. Specifically, Though ICT and IoT have positive impacts on many aspects of our modern lives, they may generate potential vulnerability as a honey pot for attackers to exploit. Thus, critical infrastructure is very important for the national security because once this operating system is damaged or disrupted, it will seriously influence not only citizens but also threaten other essential national services including the government.

Types of critical infrastructure

According to the research of (S. M. Rinaldi, 2004 and G. Giannopoulos et al, 2012), there are four types of interdependencies of critical infrastructure in Europe:

Physical: the state of one infrastructure is dependent on the output of the other. In another way, a commodity of one infrastructure (an output) was made from another infrastructure (an input). For example, water and hydro electricity generation plant are interdependent. Water provides the power to make the rotation of turbine in order to produce electricity. If the drought happens and leads to not enough water, it will directly influence hydro electricity generation plant.

Cyber: the state of each infrastructure depends on information transmitted through the information infrastructure. For instance, air transportation control system relies on the computerized control system and it needs information transmitting by the information infrastructure.

Geographic: the dependency on local geography influences that affect simultaneously several infrastructures. The fiber optic communication cables, electricity lines, and telephone lines are hung on the lamp-posts. The flow of electricity, the information transmitting on telephone lines do not influence to the fiber optic cables; however, physical damage to lamp-posts, it can be the corruption for electric power and communications.

Logical: the entire of dependency types are not a physical, cyber or geographic connection. When the price of gasoline goes down in summer holidays, travelers may flock the high ways and it can cause the traffic congestion. Therefore, logical interdependency between gasoline and transportation is not a physical process but it is due to a human decision and their actions.

ICT STATE IN VIETNAM

In VietNam, there are some ICT projects which were applying in many aspects such as:

E-government

In 2010, this year was a peak point in the development of e-government in Vietnam. Regarding the implementation of Decision 43/2008/GD-TTG and 48/2009/QD-TTG of ICT application in state agencies period 2011-2015 with a total investment of 1700 billion Viet currency[8]. Vietnamese e-government mainly focusses on four main target clients such as individuals, enterprises, governmental officials and governmental agencies. It can help Vietnamese officials to diminish time and expense; reduce stagnation, bureaucracy, and extortion; operate 24/7; satisfy the demand of social needs; increase transparency and decrease paper and so on [9]. During last 26 years, there were 5 big projects implemented, two of them was supported by French government (in 1991-1993 and 1994-1996); one was provided by State budget (1996-1998), another one was under the Prime Minister's Decision in 1997 and the last one was considered as the milestone for e-government in Viet Nam from 2001 to 2007. Although all achievements were not as expected [8], Vietnam's position rank has increased every year regarding the global rank of e-government readiness [10].

E-commerce

Vietnam has built some typical systems such as Vietnam cyber mall, real estate exchange, e-business, blue sky, book store, electronics and mechanical appliances supermarket and so on. Vietnam's IT industry is quite young and the lack of E-commerce law is one of the barriers for foreign enterprises in trading with Vietnamese firms. Therefore, during the 4th ASEAN summit in Singapore (Nov 22nd to 25th, 2000), Vietnam signed the e-ASEAN framework agreement to facilitate e-commerce in ASEAN [11]. Moreover, Vietnamese Political Bureau promulgated a Politburo's Directive No.CT58BCT on Oct 17th, 2000, followed by the government's decision No 81/2001/QDTTG to develop information technologies in the cause of industrialization and modernization [11]. With the objectives toward the year of 2020, the ICT of Vietnam will reach the advanced level in the region to make economic branch increase at the high growth rate in order to contribute to the GDP growth.

Challenges

Although Vietnam ICT human resources are rich, their IT professional skill is not enough to well compete with the other countries in the same region and in the world [12]. Moreover, the online legislative framework; for examples, legal laws or regulations for e-business, e-government, e-marketing and the like didn't get completely [11]. In addition, the current internet service providers (ISPs) also skip the security standards of their networks; hence, the computer security and information assurance issues are a major challenge for Vietnam ICT development not only for officials and providers but also for users [13]. In another way, ICT training projects for staffs, workers, and citizens are not paid attention, as a result, the qualification and capacities of IT staffs are at a low level [14]. In briefly, Vietnamese government needs to invest more budgets in some IT training projects not only for organizations but also for individuals in order to upgrade IT skill levels.

Threats / Security Concerns

According to A. Ahmad and M. A. Elhossiny,2012) and (M. U. Bokhari, et al,.), there are a lot of potential threats or security issues deal with ICT systems such as malicious attacks and hackers. Firstly, malicious attacks are related to the small program or some codes that can monitor all your online activities and capture all personal information like spywares, Trojans, adware, and so on. Moreover, they can change and damage your laptop seriously without the user's permission as virus threats. Secondly, hackers who can attack the other people via the Internet by using some malicious codes to steal, change or destroy the victim's data. Attackers can put the hidden codes inside the advertisements, photos and send them to the online social network (Facebook, Twitter …etc.). In addition, the security problems for the ICT system can be defined in different ways as authentication, available, integrity and confidentiality [16], [17].

- Integrity: unauthorized users alter or modify the content of the information by executing malicious codes.
- Authentication: the attackers steal the user's authentication or the information are eavesdropped in the insecure communication.
- Availability: the intruders use DoS or DDoS technology to attack the victims.
- Confidentiality: insecure storage, information leakage.

In fact, in November 2002, during a Hacking workshop, Vietnamese hackers showed the their penetration evidence into some important systems for example the billing system of Hanoi telecom company (the largest local provider of telephone lines), VDC (national Internet Service Provider company) and more than 80 percent of domestic company website [13]. Hence, Vietnamese government began to take the security vulnerabilities into consideration of Vietnam's Internet infrastructure.

THE INFLUENCES OF ICT ON CRITICAL INFRASTRUCTURE

Internet users

In 2000, there were only 200,000 people over approximately 79 million people - likely 0.3% citizens of Vietnamese population use the Internet as a tool to serve their lives. After 5 years later, it dramatically increased from 0.3 % to 12.7 %. Moreover, in 2010, this rate peaked up nearly 2.4 times from 12.7% to 30.7%. Consequently, Viet Nam recognized that the Internet is a

useful tool in many aspects to boost the country's development; for example, Viet Nam government invested one billion and 15 million USD for information technology in 2006. Furthermore, in 2016, there were a huge number of Vietnamese people penetrated to the Internet as 52 %. In summary, Viet Nam is a country which has approximately 95 million in the population [18]; however, the speed of approaching new technology, especially Internet is extremely fast (figure 1).

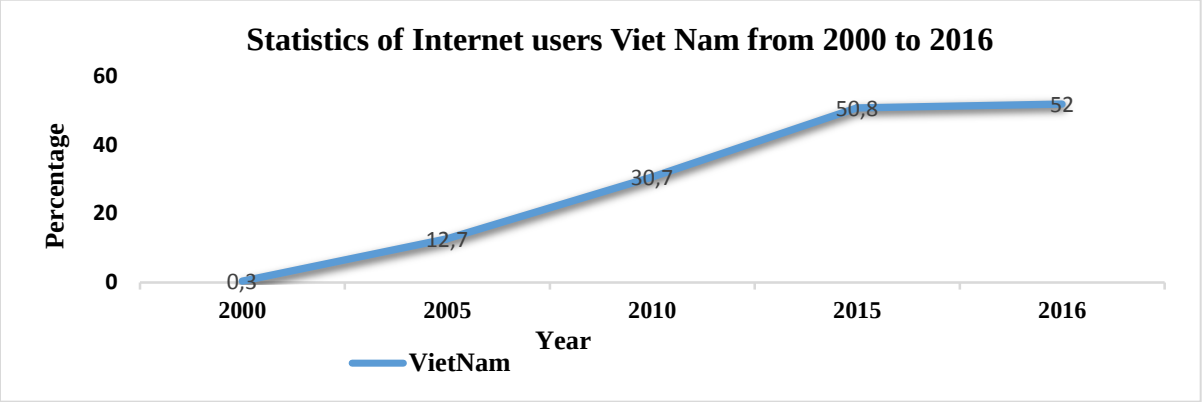

Fig.1 Viet Nam and Hungary Internet users statistics [19]; [20]

Cyber-attacks from ICT to critical infrastructure

ICT is expanding with the incredible speed in Viet Nam, especially Internet users; however, the threat of cyber-attacks in critical infrastructure also increases quickly. It threatens to not only national critical infrastructure but also national security and citizen's life. The attackers mainly use Internet as a powerful environment to hijack some parts of critical infrastructure as the government agencies, industry, and transportation. For example, in 2014, there was a report from BKAV (a famous IT and network security company in Viet Nam) said that there were more than 200 websites were attacked by Chinese hackers including six government agencies websites which have "gov.vn" domain [21]. Moreover, according to Kaspersky Lab noted that the percentage of industrial computers was attacked from 17% in July 2016 to more than 24% in December 2016. Viet Nam is the top of three targeted-attack countries with more than 66%, Algeria (over 65%) and Morocco (60%) [22]. Furthermore, the recent dangerous attack occurred on 29th, July 2016, the official website of Viet Nam Airlines was hijacked by a Trojan named (Troijan.Win32. Dropper.Encrypt.K.) and the users were redirected to another website which contained false information. It led to 400,000 Golden Lotus member's data were published on the website such as name, birthday, workplace, address, nationality, telephone number, password and so on [23]. Then, the perpetrator was identified by Chinese hacker group named 1937CN – the strongest hacker group in China. Furthermore, this group also attacked around 1000 Vietnamese websites among 15 government websites with the domain (gov.vn), 50 education websites (edu.vn) and around 200 websites of Philippines on the last two days of May in 2015 [24]. Therefore, if Vietnamese critical infrastructure is threatened or damaged, it will lead to the unimaginable effects not only for the government but also for Vietnamese citizens. These damage influenced on Vietnamese critical infrastructure, especially in air transportation.

CONCLUSION

This paper has provided an overview of how ICT is vital for the economic development and national security in Vietnam, particularly in critical infrastructure. It is hoped that ICT can help Vietnam reach the percentage of Internet users at world's average level and gain Vietnam information technologies at the advanced level in the Asian communities in 2020. Although ICT offers many chances for Vietnam to develop in the long run, it still has some security concerns. It is therefore necessary for doing further research into the security of ICT which government and individuals can rely on.

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