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RESEARCH ARTICLE

The Impact of Information System (Internet of Things) on Management and Globalization

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ABSTRACT

Information system with the advent of new technologies like the Internet of things (IoT) is a technology that has the ability to revolutionize our world the way most technologies that came before it did. In this paper, the impact of Information System (IoT) on management and globalization from multiply frames perspective is described. The evolution of the web and IoT impacts decision-making, communication, economics, social/cultural behavior, science, military, and politics. IoT spurs in sectors ranging from transportation to health care, entertainment to finance, and education. The breaches of security and attack vector in the computing space are on the rise worldwide, these are imminent with the introduction of AI-based systems and the IoT. An embedded holistic framework is hereby necessary to combat and mitigate the negative impact of this new technology in our society.

Key words: Internet of things, security, privacy, trust, cyber-attack, intruders

INTRODUCTION

Although Internet of Things (IoT) notion is not new, it was first mentioned by Ashton,[1] who is the founder of the MIT autoidentification center. Businesses, schools, governments, corporate, military, finance, and nonprofit sector have to invest in the improvement of their security and network infrastructure to guard their data and information against unauthorized access. Recognizing the national and economic security of the United States depends on the reliable function of critical infrastructure, the President issued an Executive Order (EO) 13636, improving critical infrastructure cyber security, in February 2013. The order directed the National Institute of Standards and Technology (NIST) to work with stakeholders to develop a voluntary framework based on existing standards, guidelines, and practices that reduce cyber risks to critical infrastructure. This global crisis calls for strong cyber resilience, cyber security, and cyber combat measures by security analysts. IoT has recently experienced speedy growth, coupled with its ability to proffer different types of services, made it one of the fastest-growing technology, with a huge impact on social/cultural behavior, decision-making, communication, economics, science, military politics, and business environments. The growing demand for billions of connected devices and services all over the world has created a huge demand for cyber/internet security. The day-to-day rise of threats and attacks has been on the upsurge in number and complexity. The number of potential attackers increases as the size of networks grows. The tools available to potential attackers are also becoming more sophisticated and effective. For IoT to attain optimal capability, it needs protection against threats and vulnerabilities.[2]

Security, in information technology (IT), is the defense of digital information and IT assets against internal and external, malicious, and accidental threats.[3,4] This defense includes detection, prevention, and response to threats through the use of security policies, software tools, and IT services. An entity is secure if the process can maintain its maximum essential value under different conditions. Security requirements in the IoT environment are not different from any other ICT systems. Consequently, ensuring IoT security requires maintaining the highest

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intrinsic value of both touchable items in device form and non-touchable ones in the form of services, information, and data. A serious concern for government and private sector business strategies for IoT connected products, platforms, and services is the adequacy of cyber security to mitigate cyber risk and attacks that accompany IoT deployments. The solution to this concern must be addressed by economic analysis, such as cost and frequency analysis of cyber-attacks. Such an investigation would help in building frameworks and methodologies for mitigating the economic and social impact of cyber risk of the deployments of IoT-connected products and services.

RELATED WORK

Since the advent of computers, computer accessories, and devices, data storage capacity has always been of great concern. The awareness and usage of computers and devices did increase over the years, necessitating the advancement in computer technology. As computers got more advanced, the size of data also increased astronomically, in consequence, creating an endless data storage capacity demand. Data storage media and medium have evolved significantly from their physical large sizes with a storage capacity of a few kilobytes of data, to small size microchips with the capacity to store gigabytes of data. Claims of paradigm shifts and revolutions are made frequently in computer technology. The effect of a technological paradigm shift as described by Kuhn[5] in the evolution of storage devices (i.e., media and medium, hard disks, and flash storage devices) from what they were before to what they are at present, and what necessitated technological paradigm shifts, the role the shifts has played in the enhancement of productivity in the computer industry and reframing organizations are briefly discussed in this section.

Kuhn[5] describes a paradigm shift as a fundamental change in the basic concepts and experimental practices of a scientific discipline. Kuhn,[5] in his work, compared paradigm shifts, which portrays a scientific revolution, to the activity of normal science, which he describes as “scientific work done within a prevailing framework or paradigm.” Paradigm is defined by dictionary dot com as an overall concept accepted by most people in an intellectual community, as those in one of the natural sciences, due to its effectiveness in explaining a complex process, idea, or set of data. Paradigm shifts become inevitable when the foremost paradigm under which normal science operates become obsolete and not compatible with societal demands and new trends, necessitating embracing a new theory or paradigm.

Kuhn[5] explains stages that lead to the shift in a cycle starting from pre-science, where all new fields start, identifying, and focusing on the problem but not having a solution to the problem yet. Then, Normal Science, where efforts to solving the problem identified, becomes fruitful. The model drift module identifies weakness and anomalies in the previous technology, thereby concretizing a decision for change. It follows if an anomaly is to evoke a crisis, it must usually be more than just an anomaly. There are always difficulties somewhere in the paradigm-nature fit; most of them are set right sooner or later, often by processes that could not have been foreseen.[5] A good example of model drift and crisis led to the advent of solid-state drives (SSDs) which moved fast into the computer industry recently. It has a very impressive technology with high-speed capabilities, low-latency, quick access to critical data, and general better overall performance in compare to Hard Disk Drive (HDD) technology that preceded it. Technology enables us as individuals and organizations to do what has to be done to meet the demands of daily living. Data have been linked to what we do, whether pursuing a subject in school, figuring out what is best to do after graduation, going on a date, buying and driving a car, getting involved in a sport or a band, etc.[6]. The paradigm shift is justified by the advent of a high speed, low-latency solid-state drives due to the amount of data computer process in recent times.

Commensurability in science refers to the comparability of theories.[7] The model revolution step is the last in the cycle before a new step start. The new model is a new paradigm. There is a resistance because the old and new paradigm becomes incommensurate. “When a paradigm shift occurs, scientists’ training and even experience changes, which makes paradigms incomparable.”[8] Kuhn’s cycle begins again when a new paradigm is settled on or supported by a group of people and that is the origin of research because there will always be problems to solve. There is always a large and difficult gap. The new paradigm, in any case, has not been able to provide a new model that can solve the sustainability problem. More is involved, however, than the incommensurability of standards. Since new paradigms are born from old ones, they ordinarily incorporate much of the vocabulary and apparatus, both conceptual and manipulative, that the traditional paradigm has previously employed.[5]

Computer Storage Device Paradigm

Figure 1 captures the evolution of computer storage device technology in chronological order. The first disk introduced by IBM was IBM 350; it was very big in size but could not contain much data. It could store approximately 3.75 MB data; it was also very expensive and available for $3,200/month.

In 1962, IBM came out with IBM 1311 which was smaller in size and could accommodate less physical space. It also had double the storage capacity of the earlier one. That revolutionary trend kept moving because the need to store more data on storage devices kept increasing at a rate faster than what storage device manufacturers could meet up with. In the millennium year, the advent of a new technology storage device called the flash drive emerged, it was fast and small in size and could contain 4 times a floppy disk that could contain. Cloud storage technology recently emerged with all data store able in the cloud and can be accessed from anywhere all over the world as long as there is internet service. This cloud storage technology peradventure opens the doors to the security challenges being experience in

Year(A.D)		storage device	description	Size
1700s		Punch card	piece of stiff paper that can be used to contain digital data represented by the presence or absence of holes in predefined positions	80 character
1928		Magnetic tape	System for storing digital information on magnetic tape using digital recording	Depends on length of tape
1932		Magnetic drum		10 kB
1940s	1946	Williams tube	First random access computer memory. Used a series of electrostatic cathode-ray tubes for digital storage	1024 bit
	1948	Selectron tube	Uses Williams principle	256-4096 bit
1950s		Magnetic core	Uses small magnetic rings made of ceramic to store information from the polarity to the magnetic field it contains	Depends on size
	1956	Hard disk	Implements rotating platters, which stores and retrieves bits of digital information from flat magnetic surface	Initial size 5MB
1960s	1963	Music tape	First audio cassette	56 KB
	1966	DRAM	DRAM cells store bits of information an electrical charge in a circuit	4KB
1970s		Bubble memory	A thin magnetic film used to store one bit of data in small magnetized areas that look like bubbles	1 Mbit
	1971	Floppy	Magnetic storage medium for computer systems, composed of a thin, flexible magnetic disk sealed in a square plastic carrier.	79.7KB
1980s		CD	a digital optical disc data storage format ,	650 MB
2000s		SD card	a non-volatile memory card format for use in portable devices.	2 MB
2003		Blu-ray	a digital optical disc data storage format, capable of storing several hours of video in high-definition (HDTV 720p and 1080p) and ultra high-definition resolution (2160p).	25 GB per layer
2013		Cloud storage	a model of computer data storage in which the digital data is stored in logical pools	Depends on host(can be scaled up)
Ongoing		DNA storage		Exabyte

Figure 1: Storage device technology in chronological order[9]

information technology industries with so many implications for globalization and IoT.

MATERIALS AND METHODS

The methodology employed in this paper is, for the most part, not independent on the auxiliary sources in the type of different published research papers in journals and conference proceedings. The description of the impact of Information System (IoT) on management and globalization from multiply frames is therefore based on this auxiliary information.

FINDINGS AND DISCUSSION

The implications of globalization and IoT are presented and discussed in this section.

Socio-Cultural Frame

The socio-cultural implications of globalization and IoT in our society could be reasoned from diverse theoretical perspectives.[10] Such perspectives come from the diverse positions taken by different schools of thought who have argued differently on the potential influence of globalization and IoT on culture and communication. Some of these theoretical models comprise cultural imperialism theory, intercultural communication theory, international flow of information theory, and knowledge gap hypothesis. Nevertheless, individual differences and technological determinism theories define a stance on emerging issues. Technological determinism was defined as the nature of media technology prevailing in a society at a particular point in time, greatly influencing how the members of that society think, act, and behave.[11]

McLuhan,[12] books, and other print media have been known to promote critical thinking in societies where the print is dominant. McLuhan,[12] in this theory, believes that all cultural, economic, social, and political changes are inherently grounded on the growth and diffusion of technology. This reasoning draws the attention of media audience on the impact and influence of communications technologies. This theory, in essence, regards our present cultural challenges as a direct result of the information explosion, globalization, and IoT. Some of the most persuasive arguments against the idea of the emergence of a global culture arising from the speedy growth of IoT come from Geertz.[13] Geertz[13] says that the world is growing more global and more divided, more thoroughly interconnected and more intricately partitioned at the same time. All these vast connections and intricate interdependence are sometimes referred to, after cultural studies sloganeers, as the "global village," or, after World Bank ones, as "borderless capitalism." However, as it has neither solidarity nor tradition, neither edge nor focus, and lacks all wholeness, it is a poor sort of village.[13]

Decision-making Frame

Debons[6] formulated a model called EATPUT due to the six fundamental components: Event, Acquisition, Transmission, Processing, Utilization, and Transfer (EATPUT) which taken together to form the acronym EATPUT. The basic system component of the EATPUT model is that it centralizes the activity of all other system components, defining the objective of the system, and prepares the stage for analysis and design of the system. The next component of the EATPUT model consists of sensors to acquire and capture the energy from events. This energy is given representation through symbols and codes. The codes represent the datum (data). The datum (data) is captured by the sensors which can be both human and technological and then reaches the next two components of the EATPUT model when it is transmitted to a data processing component that provides the individual or organization with a state of awareness regarding the many-dimensional properties of the event.

Analyzing the components of the EATPUT model, information systems prepare individuals to utilize awareness for the purpose of general development and specifically for the problem solving and decision-making processes. Debons[6] considers the computer and the evolution of IOT as the obvious choice in decision making and problem-solving. If one was to ask what tool can be considered to be more important in helping us solve problems and make decisions, we most certainly would consider the computer as the obvious choice. However, the computer is not the only choice. If we take into account the data, information, and knowledge systems, we would include IoTs and all available technologies, most importantly, such technologies as sensors, eyeglasses, binoculars, camera, radar, telephones, satellites, and so on. There are other areas such as Artificial Intelligence and experts systems that information scientist includes.[6]

Political Frame

Political frames of information use are about authority and responsibility for information flows and information behavior. Being in possession of information creates power. It is understood by the political leader in governance and control and can be dealt with. Power is the heart of Bolman and Deal's political frame perception.[14] This entails power, as gained by skill sets, personal reputation, and personality traits such as coercion.[14] Power and control over information allow a manager to deal with ambiguous situations by handling tasks and personnel through access to information. Strategic information use is about strategies of power. The politics of information is about the control and management of information resources which are aimed at getting and keeping power. Information governance is the politics of information. Control and management of information are important for an organization.[15] How information is controlled and managed impacts security breaches in the computing, information science, and IoT ecosystem.

Communication Frame

This Framing Theory is an adaptation of the Agenda Setting Theory, they both analyze about how media diverts the attention of their target audience from the main idea and importance of an issue to what they want to project. It sets a point of view by having a field of meaning. Goffman,[16] in his book, Frame Analysis, argues that people locate, perceive, identify, and label events and occurrences. People are known to have their own framework which is used to look at information system, cyber threats, and IoTs and interpret information perceived and available to them as a primary framework. There are natural and social frameworks, these frameworks help interpretation and communication of data in information science and IoT devices with how data are processed.

CONCLUSION

This paper has described how different frames impact information science using IoT as a case study. Frame and shifts in frame influence decision-making, communication, politics, and social/cultural behaviors in organizations and our society at large. The high prevalence of Internet-connected devices and dependence on Information and Communication Technology (ICT) in our day-to-day lives makes the need for an embedded holistic framework. The crisis of control theory by Greiner applies to information science describing the phases that organizations go through as they grow. Each growth phase is made up of a period of steady growth, followed by a "crisis" when major organizational change is needed if the company is to carry on growing. This means that an evidence-based framing system is crucial to the growth of information science as it relates to IoT.

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