The Analysis of the Concepts of Informatics, Cyber Crimes and Computer Forensics

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Abstract—Informatics is a discipline that involves the whole process of storing, processing, rearranging, copying and transferring all types of data obtained from the processing of information numerically and electronically. The various devices that perform these processes are called the information system. Cybercrime is a top definition that includes the concepts of “digital crime”, “electronic crime”, “cybercrime”, “internet crime”, “hi tech crime”, “computer crime” etc. Every illegal and unauthorized behavior showed by people while they are using the information systems is considered as cybercrime.

Computer forensics is the whole of evidence investigation process that applies scientific technical procedures on a classical crime or a cybercrime. The possible electronic evidences are obtained on the media and then these evidences are transformed to legal electronic evidences by applying computer forensics methods. Finally, they are submitted to the judicial authorities in an understandable manner.

Index Terms — Informatics, information systems, cybercrimes, computer forensics

I. INTRODUCTION

A. Information Society

Considering human history, it is seen that there are three important and fundamental changes [1]. These are respectively; the agrarian revolution, the industrial revolution and the information revolution [1]. Human communities engaged in hunting and gathering live as nomads, living with the agrarian revolution once they start farming. [2]. The period up to the 1600s was agricultural society [3]. In Europe, the production of goods and services began with the contribution of the new inventions. The industrial revolution began in 18th and 19th centuries [4]. The period between the 1600s and the early 1900s was the industrial society period [3].

Information society has formed with information revolution. The information society use information technologies in every part of life and have easy access to information [5]. The concept of the information comes from the Latin root of “informato” and it is used to mean “formation”, “formalization” and “communication” [6].

In the information societies, information is a major factor of competition and the societies that aim to become information society place greater importance on science and technology in order to maintain their stability. Transformation to information society; Not only in one department, but also in all social and institutional areas in every part of the society.

B. The Concept of Informatics and Information Systems

The word “Informatics” [7], is an academic and professional discipline that involves the whole process of storing, automatically processing, rearranging, copying and transferring all types of data that is obtained from the processing of information numerically and electronically [8, 9].

In the last century, the concept of informatics is used to mean storing, processing, organizing, assessing and transferring data that people have in many fields like technical, economic, social, cultural, legal or social life [10].

C. Computer

The definition of the computer becomes important due to the increase in cybercrimes [1]. According to a definition, the computer is an electromagnetic, optical and mechanical device that stores and processes data obtained via electromagnetic optical methods, mathematical principles and programs [11].

The computer can also be called "computer [12]", "electronic brain", "automatically processing system" [13], "regulator", "electronic machine" [10]. The common name is "systems that automatically process data in the framework of programs prepared with mathematical and logical action sequences" [14].

D. Information System

The term "system" should be understood not only in the computer but also in the various devices that enable the storage, processing, use and transmission of shelves and data [12, 15].

Although informatics and computer are sometimes used with the same meaning in teaching and practice, they do not have the same meaning. Informatics is more extensive and includes computer [12]. Information systems involve all technologies including communications and computers that are used to collect, process, store, transmit information from one place to another via networks [16].

In the Turkish Criminal Code numbered 5237, “The information system referred, is the magnetic systems which enable the automatic process after collecting and placing data”
The characteristics of information systems can be expressed as follows [16]: It is formed by the combination of many structures. One of these structures is the computer.

- Informatics has an interdisciplinary structure. It contains multiple sciences such as Mathematics, Statistics, Computer-based systems, Electronics.
- Information systems focus on solving problems. They ensure the development of practical thinking and quick decision-making.
- It prioritizes not only the improvement of a program but also its design and it forms the system.
- It is not just application-based, but it contains theory and it also allows them to be carried out in harmony.

Information systems are considered as three classes [18]. These are as below:

The first of these is open computer systems and they are desktop, portable computers and small servers used in everyday life.

The second group of information systems are communication systems. Communication systems provide more and more data transfer, while they store huge amount of data regarding the communication that can be an electronic evidence source.

Embedded information systems are the integrated systems that are formed by electronic hardware and software. The biggest difference of these systems is to perform a single task and indirectly interact with the user. Personal computers, printers, scanners, calculators, mobile phones, televisions, cameras, dishwashers, washing machines and electronic toys have these systems [19].

E. Information Technologies

Information technology is a concept used for all information services that can be connected with communication and computer systems [19]. Therefore, this concept should not be limited to only computer hardware and software. Within the context of information technology, four main categories such as software, services, hardware and equipment can be mentioned [19].

We can classify the history of information technologies in four main periods [3, 20]. These are:

- Pre-Mechanical Age (3000 B.C. - 1450 A.D.),
- Mechanical Age (1450-1840),
- Electro Mechanical Age (1840-1940),
- Electronic Age (1940 – ….).

In the first age, human beings found the writing and created alphabets, realized new counting systems and ensured the collection of information with the books they wrote and the libraries they created [3, 20].

The Mechanical Age developed through the activation of positive sciences starting with the Renaissance period on the world stage. The distribution of information increased with the invention of the printing press. Tools that were invented by especially Blaise Pascal (1623-1662) and Gottfried Wilhelm von Leibniz (1646-1716) and then mathematical calculations were developed [20].

In the Electromechanical Age, the discovery of electricity, the Volt's battery and telegraph are major developments. Telegraph can be regarded as the historical milestone of telecommunication in today's sense. The balance between electronics and mechanics in inventions began to shift gradually towards electronics with Graham Bell’s phone. Sending the sound away in 1876 with the phone followed, spreading electronic waves away with Marconi’s radio invention in 1894 [20].

The period from the beginning of the 1940s up to today is the Electronic Period. The discovery of vacuum tubes and the invention of the first computer ENIAC (Electronic Numeral Integrator and Computer) in 1946, became a sign of removing from mechanics. “The computer composes the core of the modern information technology” [20].

F. Cyber Space

The cyber that is the basic word of the information age. It is the abbreviated form of the cybernetic word. The cyberspace word is derived from the word kubernetes in Greek, which means “pilot who manages the ship” or “helmsman” [21]. Cyber space covers all mechanisms within information and communication systems [3].

Cyberspace is a “globally interconnected, computer-aided, computer-accessible or computer-based, diverse, artificial or “virtual” reality [22]. The physical components of cyber space are; computers, electronic devices and the tools that provide access to the Internet. The virtual environments of cyber space are computer networks, network systems and the Internet [23].

II. THE SEPARATION OF CYBER CRIMES AND COMPUTER FORENSICS

A.. Cyber Crimes and Information Law

The word “crime” means “the unlawful act that is defined by the state in laws” [24]. Within the legal system, crimes are divided into two as crimes with legal sanctions and offences with administrative sanctions [3]. Since cybercrimes are a special type of crime separated from classical crimes in many ways, A new discipline, “information law” has emerged. This discipline will meet the new requirements.

Although cybercrime is referred to as "digital crime", "electronic crime", "cybercrime", "internet crime", "high technology crimes", "computer crime", the concept of cybercrime is a top definition covering all. Although there is not a common definition of cybercrime, the most widely accepted definition in the international arena is the definition made by The Commission of European Economic Community (EEC) at Paris meeting in May 1983.

According to this definition, cybercrimes are illegal, unethical or an unauthorized actions in a system that processes information automatically or provides data transfer [3, 25]”.

A large part of crimes in our national legal system was regulated in the Turkish Criminal Code numbered 5237 [26]. Cybercrimes were regulated in according to international law.
in Articles 243, 244, 245 and 246 of the Turkish Criminal Code [27, 28]. Cybercrimes are divided into two parts. One of them is “true cybercrimes” and other one is “crimes committed through information” [26].

If the information technologies are the aim of the crime, it is “cybercrimes”. If Information technology is a tool in classical crimes, it is the “the crimes committed through information” [26].

B. The Separation of Cybercrimes and Computer Forensics

Computer forensic is the resolution method of cybercrimes and it is a process that should definitely be applied in these criminal crimes [26].

Computer forensics is the whole of evidence investigation process that applies scientific technical procedures. The electronic evidences related to the crime on the media are submitted to the judicial authorities without destroying, damaging and in an understandable manner by using scientific and technology-assisted methods [26, 29]. At the end of the investigation of information devices, the identification of whether the suspect is guilty is called computer forensics [30].

With the use of information technologies in the world of crime, “information-related crimes” have emerged [31]. Figure 1 shows the separation of information-related crimes and computer forensics. Figure 2 shows the information-related crimes and legal regulation of computer forensics process. The computer forensics process was regulated under the heading “search, copy and seizure of computers, computer programs and records in Article 134 of the Code of Criminal Procedure numbered 5237 [26].

In the international area, the most comprehensive regulation on cybercrimes is the “European Cybercrime Convention” [1]. This Convention was adopted by the Committee of Ministers of the European Council on 8 November 2001 and was presented for signature at the International Conference on Cybercrimes held in Budapest on 23 November 2001 [32]. The Crime Convention that consists of four parts and forty-eight articles was signed by the European Council that has 26 member States, the United States, Japan, Canada and South Africa [32]. The Convention signed by Turkey in Strasbourg on 10 November 2010 started to be implemented, after Law No. 6533 (on the Approval of the Turkish Grand National Assembly for the Convention on Crimes committed in the Virtual Environment) was published in the 2014 official newspaper [1].

![Diagram](image-url)

**Figure 1.** The separation of Information-Related Crimes and Computer Forensics [26].
III. COMPUTER FORENSICS SCIENCE

A. The Formation of Computer Forensics Discipline

Finding true evidences in the right ways, analyzing, reviewing and submitting them to the judicial authorities in criminal cases led to the creation various sub-sciences in the main heading of the criminal procedure law. Disciplines such as computer forensics, forensic medicine and forensic psychology can be shown as example of these sciences [33].

The original name is “Computer Forensics”. This concept consists of the words “computer” and “forensics” it can be called “computer criminalistics” or “computer forensics science” [1]; but in the doctrine, the term “Computer Forensics” is predominantly preferred [30]. Therefore, computer forensics was emerged as one of the most common methods of finding evidence on computers and other electronic devices [33].

B. Computer Forensics and Information Security

Computer forensics is also considered as a subdiscipline of law and computer security under the main heading of “Information Security”. This discipline can also be regarded as an approach involving forensic analysis and studies against cybercrimes, information security vulnerabilities, national security measures and computer abuses [34].

The items of information security are “privacy”, “integrity”, “accessibility” and “recoverability”. The integrity of the information is that the information is not damaged. Accessibility is the ability to access information when requested. Recoverability is to take precautions to replicate information when it is lost [26, 35].

The reflection of information security in the world is “information security”. Information security is based on security, privacy, reliability and availability. Safety and usability are inversely proportional [36].

C. Purpose of Computer Forensics

The main purpose of computer forensics is collection, analysis and submission of legal electronic evidences [34, 37]. The purpose of computer forensics is not to show any person guilty or innocent, but to submit numerical evidences in full and impartial manner to forensic units. From this point of view, computer forensics is a completely technical review method, although it does not involve a commentary activity [34]. The interpretation of the evidences and the determination of whether a person is guilty or not is obtained after computer forensics processes [33].
D. Computer Forensics Process

The processes that should be followed, finding electronic evidence in order to obtain a legal evidence in computer forensics is called “the phases of computer forensics”. Without following these phases, electronic evidence is not used to solve the concrete case and to clarify the material facts before the judicial authorities [1].

The phases of computer forensics shown in Figure 3 are as follows [30, 33]. It starts with Identification of the evidence in the crime scene investigation,

- Collection of evidence
- Protection of evidence
- Analysis of evidence
- Reporting and submission of the evidences.

![Computer forensics loop model](image)

Figure. 3. Computer forensics loop model [1].

IV. CONCLUSION

The computer, information, cybercrime and computer forensics have different contents. The rapid development of information systems, including computers, revealed the concepts of cybercrime and information law. These terms are new. Their content is constantly changing and improving. This study can be helpful for researchers that work in fields like information law, law enforcement agencies, computer forensics and academy.

This paper will be useful to reveal the separation of these concepts, scientifically and can increase the speed of scientific studies and give ideas who will work in these fields.

A statistical research can be done to detect how many people know the differences of informatics, cybercrime and computer forensics terms.

REFERENCES


