Cyber Security to Information Assurance: The Changing World of Cyber Sciences

P. K. Paul[1], P. S. Aithal[2]

[1]*Raiganj University (RGU), West Bengal, India*
[2]*Vice Chancellor, Srinivas University, Mangalore, Karnataka, India*
Corresponding Author: P.K. Paul & email: *pkpaul.infotech@gmail.com*

Abstract

Cyber is related to information technology. There are many objects/areas which are associated with cyber. Such as Cyber crime, Cybernetics, Cyber space, Cyber hygiene, Cyber warfare, Cyber organism, Cyber law, Cyber attack, Cyber culture, Cyber age, Cyber café, Cyber security, Cyber forensic. When crime involves with computer and network, it is called as cyber-crime. This kind of offence mainly undertake by an individual or group to an individual or group. Cyber-crime is mainly related with internet crime. In recent past cyber-crime is also has a different form, it is called cyber-crime. Cyber-crime may have different target tools and technologies Such as Individual computer, Group of computer, Server/s, Database, Network, Website, Intranet/ extranet system. Cybernetics is an important concept of controlling system using technology. It is very much associated with physical, biological, social systems. Cyber warfare is an important concept in cyber world. It is about the use of IT and cyber related technologies for the development of individuals or group or simply to the society. Cyber warfare is very much related with the ICT4D. Cyber culture is an important concept information/ society/ information age/ IT age/ Digital age or more clearly Digital society. The emerging concept of cyber areas lead this is as an important area of study. This paper highlighted the basic overview of different areas within 'Cyber' and also the emerging opportunities in this field as educational programs.

Keywords: *Cyber Security, Information Security, Information Assurance, ICT4D, Information Systems, Digital Forensic*

Introduction

The Cyber world is changing rapidly and the new inventions of tools and technologies lead the concepts of newer information technologies and systems. As far as digital information

system is concerned the trend is increasing day by day due to introduction of the security issue. Initially computer security was evolved but gradually other related and allied concepts have been emerged [1], [4]. The usefulness of the computer networks comes with a drawback and issue i.e. security and privacy and here the concept of network security changed the entire shift of computation and Network Informatics. The 1990s and there after the concept of web and allied services was important. The birth of various websites and similar portals comes with the concern of security and privacy.

The increasing rate of websites and web services arise the concept of web security; which initially include the planning, designing, development of the web sites. Gradually the concepts of web development and web management also play a leading role in this respect. Naturally all the data and contents within network and web lead the concept of Database Security. The emerging context of Database Security and altogether Web security, Network Security etc lead the concept of IT Security. The context is also termed as Cyber Security or Information Systems Security [2], [5].

Manual Information is important and valuable in all sorts whether it is organizational or individuals. Governments are the highest generator of information and all different types of information (including private organizations), privacy and security is must—and here the concept of Information Security (and partially Information Privacy) lands. Hence both technological and manual information leads the concepts. More importantly another concepts emerged within this security issue i.e. Information Assurance; which is talks about not only manual information security but also technological. Additionally apart from all the concern of Information Security Information Assurance is comes with the issues, guidelines and framework for the information security and privacy for the organizations and institutions.

Objective and Agenda

The present paper is conceptual and theoretical in nature and deals with different concerns and issues—

- To learn about the basics of security issues including Cryptography, Computer Security, Network Security etc.
- To know about the other advanced concepts in security and privacy viz. Information Technology Security or Cyber Security.
- To learn about the more broader concepts and feature of security space viz. Information Security or Information Assurance.
- To dig out the features and characteristics of the Information Assurance in brief manner.
- To dig out the concepts of other Cyber related areas viz. Cyber Crime, Cyber Laws etc in brief manner.

- To learn about the concepts in other security issues viz. Cloud Security, Mobile Application/ Mobile Security etc.
- To learn about the current challenges and issues of these emerging security and privacy concerns.

Cyber Science and Technology: Basics

Cyber is related to information technology and various objects are associated with cyber viz. Cyber Cafe, Cyber crime, , Cyber warfare, Cyber organism, Cyber law, Cyber attack, Cyber culture, Cyber age, Cybernetics, Cyber space, Cyber hygiene, Cyber security, Cyber forensic. Among these Cyber Sciences and Technologies few important are includes (herewith)—

Cyber café is derived from the term 'Café and the term Cafe derived from Coffee. In generally cyber café deals with the following attributes—

- To use the Internet to the licensed or registered members of the concerned cafe.
- To use for the purpose of the documentation, official purpose as well as academic purpose (including business and personal purpose).
- To provide basic training and competency in computer literacy and also other areas such as Internet Literacy, Web Literacy, Network Literacy etc [3], [4], [8].

Cybernetics is a controlling system using technology and associated with physical, biological, social systems. Cyber warfare is an important concept in cyber world. It is about the war and kind of terrorism by the cyber means and tools by a state, nation and territories to other countries. Cyber culture is lies on the concepts of information/ society/ information age/ IT age/ Digital Age/ Digital society. Here common people or individuals much associated with IT and digital tools and products viz. cyber products, tools and technologies. Cyber culture is the application of IT and Cyber Systems in cultural affairs, rituals etc.

Cyber forensic is is associated with the management science, law, medical science and naturally information technology. Cyber forensic is also a part of digital forensic science and it is required for examine the context of cyber-crime and analysing data. Cyber Law combined with information technology or IT with Legal Studies/ Law. Cyber Law is also known as IT Law or Internet Law or ICT (Information and Communication Technology) Law. Rules and regulations are the core concern of the law and thus it is specifically passed and ensured by the different entities viz. controlling body, constitution, court or similar bodies. There are many concerns related with the (directly and indirectly) IT and Laws related act viz. —

- Data Accountability & Trust Act

- Computer Fraud and Abuse Act, 1984
- Communication Act, 1996
- IT Act 2000 etc
- Electronic Commission Privacy Act, 1986
- Federal Privacy Act, 1974
- Data Security Act, 2007

Information Technology (IT) Act was passed in the year 2000 and in 2005 another important related act was passed by the parliament i.e. Right to Information (RTI) Act, 2000. IT Act was mainly undertaken due to growing number of cyber crime in India. IT Act is endorsed throughout the nation for offence and crime management. In 2008 the IT Act was revised. Most of the important portion of this act is under Section 66 of Indian IT Act, 2000.

Cyber Crime

Crime when involves with computer and network that is called cyber-crime (it is associated with the Internet Crime) and this kind of offence mainly undertaken by an individual or group to an individual or group etc. In recent past it has different kind of form and may have different targeting tools and technologies viz.

- Individual computer.
- Group of computer.
- Server/s.
- Database/s.
- Network/s.
- Website/s.
- Intranet/ extranet system etc.

Cyber Security

Cyber security is another concept related with the field and it is required for preventing pointless/ unnecessary access from third party. Cyber security is closely associated with the following areas –

- Computer Security
- IT Security.
- Information Security.

Cyber-crimeas treated as IT Act thus it is increasing day by day in different areas such as (most important components of IT)-

- Network Security
- Web Security
- Database Security

Network Security

Network security is about planning, designing, development, management and administration of secure network system. Network security is all about the following—

- Network security is about proper planning and policy formulation for network management and preventing unauthorized access.
- It's all about misuse, modification and mismanagement of network products and tools.
- Network security is for proper balancing between private network and public network.
- Network security may be for an individual and obviously for institution, organizations and companies.
- Network security is lies on computers networking devices such as routers, switch, repeater, hub etc.
- Network security may also called (Partially) internet security and web security.

Day by day the importance of network security is increasing. It is an important thread to individual to organization.

Web Security

Web security is an important part of Information assurance. More closely it is a part of security. The following diagram territory of web security.

Web security is about secure websites and web applications. Initially the concept of web security is only lies on websites only but gradually it is become a concept of web application, web services and so on. A secure vendor, URL is an important part in an early stages of web security, but gradually the concept of web 2.0changed the traditional concepts of websites. IT is now a vital issue due to liberty and accessibility from the specific websites (Such as down loading and uploading). So in a broader sense web security is about planning, designing, development and management of a website with concern of security or guideline [2], [5], [6].

Database Security

Database security is an important issue and part of Information and IT Security. Database Security is required for design, development and maintenance of database. A database normally responsible for storing different kind of contents such as text, audio, video, image and so on. Hence it Database security is also important for better data management. Server security is also an important part in database security.

Database security is involving different types of technical, administrative and physical management [4], [7].

Cloud Security

Cloud Security is an important Issue in current days due to advancement of Information technology applications, Cloud security is about managing security   and cloud and virtualization System , cloud computing is gaining its popularity different form (public cloud, private cloud , hybrid cloud) and in all cases security is an important issue . In database and data management cloud computing is gaining popularity due to the concern of cloud data security. Cloud security is gaining its role in different segment of policies, management areas and technical issue. It is an important concern for IT and Information Security. Cloud Security is about data centre security with different platforms, such as PaaS, SaaS , IaaS. In cloud computing Security is important due to Public cloud an infrastructure as services, any kind of Organization and Institution and individual security. In Government bodies and Institution cloud security is valuable for different kind of risk management. Cloud security is about controlling different parameters and all about cloud security architecture. In cloud computing security is important for Hybrid cloud is some of the cases. Cloud computing has different kind of security control viz.

- Preventive Control
- Detective control
- Corrective control
- Deterrent control

Cloud computing security is important for Identity manage, Data Security, Private Security as well [3], [6].

Mobile Security

Mobile Security is about the security concern of the Mobile Devices in current age specially the emerging electronic devices. Mobile Security is an emerging area of Mobile Computing and closely associated with the other security concerns viz. Cloud Security, IT Security, Network Security etc. The evolvement of smart phone arises the concepts of Mobile Security as well. The Electronic devices and its security lead another concepts viz. Mobile Application Security. It is broader sense protecting an electronic (mobile) devices from the un-protected means, its include malware, vulnerability etc.

Information Assurance: A Journey towards Diverse Range

Information Assurance is an important area of Information Science and Technology. Information Assurance is broader among these allied areas viz. Cryptography, Computer Security, Network Security, IT Security, Information security, Information etc. The following diagram (fig: 1) shows the smaller (similar) areas of this field –
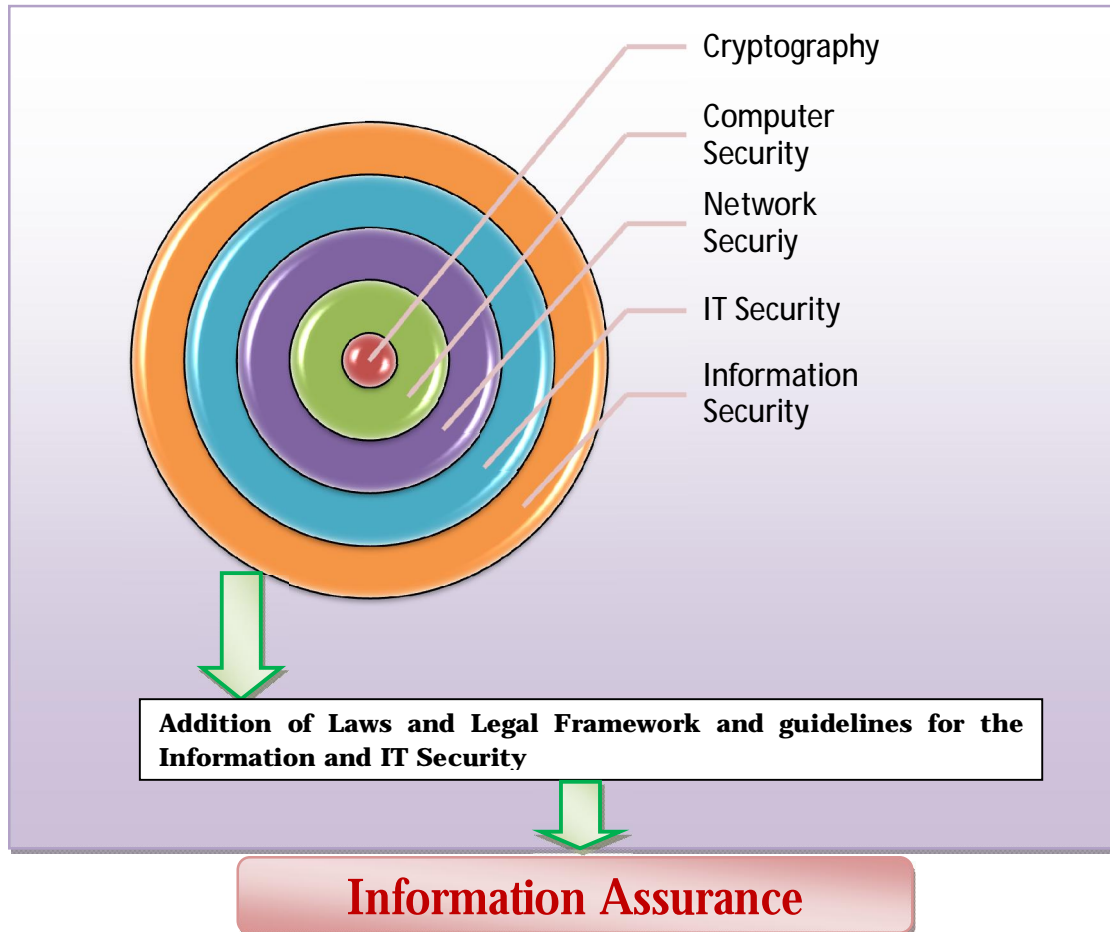
Fig: 1-The world of security regarding Information and IT

Information Assurance is deals (both theory and practice) with information including managing and assuring information etc with technological and manual solutions. It is closely related with information privacy and also extension of information security. Information Assurance is responsible for the secure information uses, processing, storage and transformation (Database Security/ Network Security/ Web Security. In western countries Information Assurance is also associated with cyber security also. Information Assurance can be done by two ways –

- **Technological Means.**
- **Traditional and Manual Means.**

Conclusion

Hence information Assurance is a broadest area and covering the areas of IT and Information Security and also other emerging areas viz. mobile security, cloud security, infrastructure management and security. The rate of Cyber Crime creates the need of Information Assurance positions in government bodies and private entitles. The countries in Asia and Africa have limited programs in this field especially in the area of IA; hence universities need to put importance in this concern to fulfil the demand of skilled and knowledgeable manpower in this field of fields.

Reference

[1] Bélanger, F., & Crossler, R. E. (2011). Privacy in the digital age: a review of information privacy research in information systems. *MIS quarterly*, *35*(4), 1017-1042.

[2] Chakraborty, R., Ramireddy, S., Raghu, T. S., & Rao, H. R. (2010). The information assurance practices of cloud computing vendors. *IT professional*, *12*(4), 29-37.

[3] McFadzean, E., Ezingeard, J. N., & Birchall, D. (2011). Information assurance and corporate strategy: a Delphi study of choices, challenges, and developments for the future. *Information Systems Management*, *28*(2), 102-129.

[4] Paul, P.K., Chatterjee, D., Bhuimali,A., Atarthy, A. (2016). Cyber Crime: An Important facet for promoting Digital Humanities—A Short Review in *Saudi Journal of Humanities and Social Science,* 1 (1), 13-16

[5] Paul, P.K. & Aithal, P. S. (2018). Cyber Crime: Challenges, Issues, Recommendation and Suggestion in Indian Context, International Journal of Advanced Trends in Engineering and Technology 3(1), 59-62

[6] Paul, P. K (2013) Cyber Crime and its Challenges with Special Reference to Solution. *International Journal System Simulation,* 7 (2), 77-82.

[7] Schafer, J., Ragsdale, D. J., Surdu, J. R., & Carver, C. A. (2001). The IWAR range: a laboratory for undergraduate information assurance education. *Journal of Computing Sciences in Colleges*, *16*(4), 223-232.

[8] Schepens, W., Ragsdale, D., Surdu, J. R., Schafer, J., & New Port, R. I. (2002). The Cyber Defense Exercise: An evaluation of the effectiveness of information assurance education. *The Journal of Information Security*, *1*(2), 1-14.