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Cyber Security Education and Research in the Finland's Universities and Universities of Applied Sciences

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ABSTRACT

The revolution in information technology that began in the 1990s has been transforming Finland into an information society. Imaginative data processing and utilization, arising from the needs of citizens and the business community, are some of the most important elements in a thriving society. Information and know-how have become key 'commodities' in society, and they can be utilized all the more efficiently through information technology. For all nations, the information technology revolution quietly changed the way business and government operate, as well as the daily life of citizens. Our daily life, fundamental rights, social interactions and economies depend on information and communication technology working seamlessly. An open and free cyberspace has promoted political and social inclusion worldwide; it has broken down barriers between countries, communities and citizens, allowing interaction and sharing of information and ideas across the globe. Individuals, public and private organizations alike depend on the cyber world. From the citizens using social media, to banks growing their business, to law enforcement supporting national security – every sector of the society is increasingly dependent upon technology and networked systems. While the public sector, the economy and the business community as well as citizens benefit from globally networked services, the digital IT society contains inherent vulnerabilities which may generate security risks to citizens, the business community or the vital functions of society. Without sufficient awareness of the risks in cyber world, however, behavioral decisions and unseen threats can negatively impact the security of the critical infrastructure and can cause physical damage in the real world. On an individual level, what is at stake is the vulnerability of each individual user in cyber world. As the world grows more connected through cyber world, a highly skilled cyber security workforce is required to secure, protect, and defend national critical information infrastructure. Across the private and public sector organizations are looking for well-trained professionals to assess, design, develop, and implement cyber security solutions and strategies. While the demand for cyber security professionals is high, the supply is low. Meeting the growing demand for cyber security professionals begins in the education system. The most efficient custom to increase cyber security is the improvement of the know-how. The cyber security strategies and development plans require the improvement of the know-how of the citizens and actors of the economic life and public administration. Pursuant to Finland's Cyber Security Strategy (2013) "the implementation of cyber security R&D and education at different levels does not only strengthen national expertise, it also bolsters Finland as an information society." In this article are analyzed the cyber security research and education which is offered in Finland's universities and universities of applied sciences.

KEYWORDS

Cyber Competence, Cyber Education, Cyber Research, Cyber Strategy, Finland

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1. INTRODUCTION

The global cyber world connects states, businesses and citizens in an entirely new manner. The significance of time and place in communications has transformed. Although the digital information society has remarkably increased well-being, on the flip side it also contains risks of various cyber world threats. The target of an attack can be inexpensively reached from anywhere in the world, and the command servers that execute the operation can be positioned in any country, cloaking the actual perpetrator of the attack.

The asymmetrical threat posed by cyber-attacks and the inherent vulnerabilities of cyberspace constitute a serious security risk confronting all nations. In recent years, attacks against critical infrastructures, critical information infrastructures and the Internet have become ever more frequent and complex because perpetrators have become more professional.

Competence is a crucial point at issue for the information society. In addition to boosting cyber security's qualitative and quantitative competencies new methods, instruments and pedagogical skills are needed, which can both improve the quality of education and increase the appeal of ICT studies and the desire to continue with post-graduate studies. Competence includes attributes such as individuality and a sense of community which are derived from the combined effect of formal education and informal experiences.

The goal of improving cyber security competencies is to boost the skills of citizens and professionals in such a manner that by 2016 Finland will be a global forerunner in cyber threat preparedness and in managing disruptions caused by these threats. This paper analyzes the fundamentals of national cyber security research and education, defines cyber security competencies and evaluates cyber security research and education at different universities and research institutes.

2. FINNISH EDUCATION SYSTEM

The Finnish education system (Figure 1) is composed of:

- Nine-year basic education (comprehensive school) for the whole age group, preceded by one year of voluntary pre-primary education. Students usually start school at age 7
- Upper secondary education, comprising general education and vocational education and training (vocational qualifications and further and specialist qualifications)
- Higher education, provided by universities and polytechnics (universities of applied sciences)

Basic education is a free, general education. Graduating from comprehensive school does not give students an exam, but certificates eligibility for further studies. After basic education, 95.5% of school-leavers continue in additional voluntary basic education in upper secondary schools or in initial vocational education and training (VAT). General upper secondary education is a three-year voluntary education that ends in the matriculation examination. After graduation from general upper secondary education students are qualified to apply to a university or polytechnic education. (MEC 2015)

Vocational education and training is a voluntary three-year education. The vocational qualification provides extensive basic skills for different occupations in the field and more specialized skills in at least one sector. Prior studies and work experience can shorten the study time. After graduation from vocational education and training students are qualified to apply to a university or polytechnic education. (Ibid.)

The Finnish higher education system consists of two complementary sectors: polytechnics (also known as universities of applied sciences) and universities. The mission of universities is to conduct scientific research and provide undergraduate and postgraduate education based on it. Universities must promote free research and scientific and artistic education, provide higher education based on research, and educate students to serve their country and humanity. In carrying out this mission,