



International Journal of Applied Technology & Leadership
ISSN 2720-5215
Volume 2, Issue 1, January 2023
ijatl@org

Cybersecurity: Revealing the legalized profession

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Abstract

The cybersecurity profession is composed of recognized occupations accepted both nationally and internationally. Little effort has taken place to formally define the cybersecurity profession, although significant work focuses on cybersecurity task identification. Formal recognition of several professions, including cybersecurity, occurs through ISO and ANSI treaty, a treaty derived from US Legislative authority granted by the US Constitution. Analysis of current treaties and constitutional authority provides a basis for understanding, recognizing, and legalizing existing professions. This study focuses on identifying underlying contributions which provide a solid legal foundation for recognition of the multiple professions including cybersecurity in the US, without identifying individual skill sets belonging to the major technology branches of the governing technology associations.

Index Terms: US constitutional powers, defining the cybersecurity profession, legalizing professions

1. Introduction

Work specialization in the United States continues to expand based on an ever-growing desire for goods and services. This specialization is a direct driver for professions as few persons can stay up with the knowledge required to stay up with our changing world [5][2][8][9][14]. Several categories of professions came into existence through local, state, federal, or international means but are limited to the need of society and governance, this includes the cybersecurity profession [5][3]. In the United States a unique perspective on treaties provides a pathway for professional recognition through legislative power, which was driven by the 2nd iteration of the US Constitution [3][10][11][13]. This driving constitutional

power is the supremacy clause, article 6, which when combined with legislative powers granted under article 1 of the current US Constitution provides a basis for the federal recognition of approved professions [3][10][11][13].

2. Methodology

This paper addresses work classification as it becomes a profession. Society dictates the need for professions formally, informally, or through legal statute [2][8][14]. Legal drive local, state, or federal statutes in the United States [3]. Federally, the US Constitution dictates the process; however, state and local laws are dictated by each state if not covered by federal statutes [3].

The United States recognizes a holistic approach to treaties and laws through the Supremacy Clause, so it was one of the main differences between the original US Constitution, known as the Articles of Confederation, and the existing US Constitution [13][3]. The Supremacy Clause establishes federal treaty as the supreme law-making process of the land [13][3]. Congress creates federal laws through two distinct channels, a formal proposal process which is then signed into law by the executive branch or formally accepting a treaty after the executive branch had previously signed the treaty [3].

The United States belongs to many international organizations through treaty, the most inclusive agreement on metrology or the study of measurements and metrics [16]. The US Constitution lists establishing the standards of weights and measures as one of the powers of Congress [3]. Congress establishes treaties with foreign governments and, through this process, establishes the supreme law of the land [3]. Requirements for fixing weights and standards play a direct role in the most significant of all legislative responsibilities governing interstate trade [3].

The final portion of this paper covers the International Standards Organization or *ISO*, the international body for the establishment of measures and standards, and how the ISO affects US law and professional recognition [16][3]. This final discussion discloses and focuses on several occupations which should be viewed as professions but, for whatever reason, are not [1]. This includes but is not limited to technical component level security organizations, several medical fields of study, and primarily focused construction trades [1]. This may be a result of a short existence, a lack of recognition by other organizations, or confusion within the workforce.

3. Work Classification

Work classification exists for various reasons, classification exists to distinguish skilled or unskilled labor, skill types, skill levels, or even professional groups; some professions may not be recognized by all populations despite having all of the requirements to be a legally recognized profession or a necessity for society [15][2]. Sociologists view professions from social interactions perspectives, business managers and trainers view professions from business needs or skills hybridization perspective, and legislative entities view professions based upon legal interconnections with adjoining fields of study, revenue capability, and public protection [15][2]. There are many definitions of a profession; some definitions are theoretical, other definitions come from industry, yet others come with no basis at all other than someone proclaiming it is a profession [15][2]. More recently Patnayakuni and Patnayakuni aligned

cybersecurity practitioners-based initiatives with the cybersecurity professions listed in the US based National Initiative for Cybersecurity Education or *NICE* this begins to align with specific knowledge units for each given field of cybersecurity study [25]. The NICE initiative centers on content identification and knowledge units required for specific technician component level security roles across the spectrum of cybersecurity [25].

Cybersecurity has different categories of work, each specific to a particular specialization but further categorical breakdown of this is outside of the scope of this document [20][21][22][23]. Systematic investigation into the various cybersecurity technical fields revealed commonly identified many cybersecurity studies are simply specified technical component securities, in fact these components are only small portions of the cybersecurity puzzle identified as cybersecurity [1][7][19][20][21][22][23]. Each group of practitioners assumes their version of technical component security is cybersecurity, while internationally the standards indicate that all technical component security is a portion of cybersecurity [19][20][21][22][23].

The International Standards Organization and the American National Standards Institute provide standardized testing and certification according to international agreements while various technology vendors create content to a specific field of technology security [1][7][12][15]. For the purpose of this document certified individual technology component security will be treated as a recognized professional certification, provided the certification carries ISO/ANSI accreditation under ISO/ANSI 17024 accreditation. Technology component security and cybersecurity practitioners share common understandings of security, each however approaching the security problem from a particular aspect [1][7][19][20][21][22][23].

4. Defined professionalism

Defining a profession is much like defining a trade, a craft, or other working groups. Depending upon the work and the observer, the work will be part of a trade, a craft, a profession, or another designation [2]. A review of Abbot and Freidson revealed a sociologist-based case for the establishment of professions [2][5]. This reading primarily focuses on the Harvard Business Review methodology as posited by Khurana and Nohria in 2008, the existing discussion created by their assertion, and the ISO 17024:2012 requirement [8][9][2][14][6][17][7].

In the 2010 July and August edition of Harvard Business Review, Richard Barker wrote *The Big Idea: No, Management is not a profession* [2]. Barker responded directly to a 2009 Harvard Business Review article by Podolny, *the buck stops and starts at business school* [2][14]. Podolny argued for a management profession dependent upon certification and specific boundaries for the field for competence [2][14]. Clear boundaries allow organizations to identify inclusive content between limits, this content is knowledge specific and continues to evolve as society and technological advances continue to evolve [5][2].

Freidson provided a historical basis for professions and then grew ideas that further contributed to societal demand [5]. Freidson expanded upon jurisdiction and societal need for professions, including formation, hybridization, and knowledge expertise ([5]). This topic continues to be addressed by many sociologists studying societal development as work specialization continues to hybridize [5][14][2][8][9]. Hybridization is the process by which a

given craft, trade, or profession identifies what is within its purpose and what is not, during this process tasks not associated with a given hybrid job falls away and tasks that align with the job role are accepted as a part of the profession [24].

Podolny argued occupations earn professional status when they include ideals [14]. Podolny further argued a single school could not act in isolation to make the change, just as a single isolated Cybersecurity professional cannot produce profound systemic change without support from leadership and technology professionals within the business, cybersecurity professionals cannot exist in isolation [14]. Interwoven concepts such as the interconnectivity of people, processes, and technology are critical to an organization's cybersecurity efforts [12].

Barker and Podolny exchanged statements based on the conceptual work of two Harvard authors, Khurana and Nohria [14][2][8]. Khurana and Nohria argued for the application of a code of ethics for management, standardization of a body of knowledge consistent with the defined field of study limits, member certification, a member-driven board of review, and an ethics committee capable of imposing sanctions on community members as appropriate, and a governing body [8][5]. The ethics idea had previously been championed by Freidson [5]. The International Standards Organization codified several requirements mirroring the recommendations of Khurana and Nohria, including the criteria for member certification, continuing education standards, establishing standards for certifying the certification body, and the ability to censor members [8][9][7].

Certification/Certify is tested/evaluated in a static environment and verified to work in that environment only.	Formal Social Contract with Consumers									
	Defined as "highly skilled" - demanding of knowledge - professionals have high skill level versus clients who lack knowledge	Reasonable consensus within field for body of knowledge (jurisdictional)	Training or knowledge requirement based on field of knowledge	Training cannot be reliant upon Authorizing Agency	Application for Certification	Certification Exam	Review Process	Certification of Individual	Duty/Code of Ethics (if applicable)	Review Board
Freidson, 2001	X	X	X	X					X	
Khurana & Nohria, 2008	X	X	X	X	X					
Barker, 2006	X	X	X	X						X
Podolny, 2009	X	X	X	X	X					
Wall, 2006	X	X	X	X					X	
OSI, 2010	X		X	X	X	X		X		X
Khurana & Nohria, 2009	X	X	X	X	X	X		X	X	
ISO 17024, 2012	X	X	X	X	X	X	X	X	X	X

Fig. 1. Professionalism comparisons as viewed by various authors throughout recent adaptations.

5. A legal, national, and international basis

Article VI, Clause 2 of The United States Constitution states

This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, **shall be the supreme Law of the Land**; and the Judges in every state shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.

This clause is known as the Supremacy Clause and makes a validated treaty the supreme law of the land as if it had been approved legislature [10]. In 1829, Chief Justice Marshall wrote [10]:

A treaty is, in its nature, a contract between two nations, not a legislative act. It does not generally effect, of itself, the object to be accomplished; especially, so far as its operation is infra-territorial; but is carried into execution by the sovereign power of the respective parties to the instrument. In the United States, a different principle is

established. Our constitution declares a treaty to be the law of the land. It is, consequently, to be regarded in courts of justice as equivalent to an act of the legislature, whenever it operates of itself, without the aid of any legislative provision. But when the terms of the stipulation import a contract—when either of the parties engages to perform a particular act, the treaty addresses itself to the political, not the judicial department; and the legislature must execute the contract before it can become a rule for the court.

More specifically, Article VI, Clause 1 established a line of continuity from the pre-existing Articles of Confederacy to the current government through “All Debts contracted and Engagements entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.” into the current government [3]. This legitimacy extends from the Articles of Confederacy, the original US Constitution, through the modern age and our modern treaties [3]. More specifically, Article VI of the Constitution provides a path for international agreements such as the International Standards Organization 17024 or the *Conformity assessment: General requirements for bodies operating certification of persons* [7]. 17024 falls within the ISO 17000 Conformity Assessment grouping, under the International Standards Organization formally known as the *Convention concerning the creation of an international office of weights and measures, regulations, and transient provisions* and referred to as the metrology treaty [7][16].

The metrology treaty ties accreditation bodies to legal status by employing the Supremacy Clause of the United States Constitution, thus establishing a clear bi-directional link between the two [3][11][7]. Through the Supremacy Clause, the United States adopted the International Standards Organization requirements for recognition of accrediting bodies [10][7][16]. ISO 17011:2017 specifically addresses accreditation bodies by stating the “authority of an accreditation is generally derived from government” [18].

Local and state standards are each established by governing agencies. Local US municipalities typically establish requirements for local services to the general public, such as food and personal services. State entities establish standards for activities that are limited to the boundaries of each state and, per the US Constitution, expressly not given to the federal government [3]. National standards are one of Congress's responsibilities [3].

Congress fulfilled one of its primary responsibilities by approving the original *Convention concerning the creation of an international office of weights and measures, regulations, and transient provisions* in 1878; this treaty eventually became known as the International Standards Organization or ISO [3][1][7][16]. The American branch of the ISO is the American National Standards Institute or ANSI, which proudly displays those organizations having achieved national accreditation on the ANSI National Accreditation Board [1]. This treaty relationship reinforces some recognized professions while revealing modern technology-related fields that might otherwise have fallen by the wayside [1].

6. Revealing the hidden professions

Currently, the ANSI National Accreditation Board or ANAB recognizes 80 organizations certified by ISO 17024:2012 [1][7]. The current listing shows that 56 of the 80 entities fall into three major categories; a. construction and related building industries, b. technology, cybersecurity, and risk-related, and c. medical subsets [1][7]. More than a dozen information technology, cybersecurity, and risk management organizations list among its

member organizations; ASIS International, Audiovisual and Integrated Experience Association or AVIXA, CertNexus, Cisco Systems, CompTIA Certifications LLC, Federal IT Security Institute, Global Information Assurance Certification or GIAC, Information Systems Audit and Control Association or ISACA, International Association of Privacy Professionals or IAPP, International Council of E-Commerce Consultants or EC Council, International Information System Security Certification Consortium Inc or ISC2, and Society of Industrial Security Professionals adding over 70 certifications covered under the ANSI or ISO 17024 certifications [1][7].

7. Conclusion

Professions come into existence to answer many different needs and through many different pathways. Some professions are newly evolved or still developing and identified by public demand by actions taken by the organizations wishing to produce professionals themselves. Although in the United States, professions may also become recognized through outside means, such as other nations or agreements. The United States recognizes treaties as the supreme law of the land. Congress is explicitly charged through the US Constitution to write laws, establish standards, oversee interstate commerce, and create treaties. Congress used these powers to legitimize and standardize professional requirements through an international treaty which is used to identify trustworthy organizations and provides the assurance necessary to the public. The International Standards Organization, the modern descendent of the original organizational treaty, maintains higher standards than developed by sociologists or leading business school leaders. ANSI, the American branch of the ISO treaty organization provides a basis for jurisdiction to these professions, which then applies professional status to cybersecurity and several professions which society holds as critical to our overall social wellbeing.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Ervin H. Frenzel conducted research and wrote the paper. Ian McAndrews mentored Ervin H. Frenzel and analyzed content. All authors have approved the final version.

Acknowledgment

The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments. Avoid expressions such as “One of us (S.B.A.) would like to thank” Instead, write “F. A. Author thanks”

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