Strengthening Intelligence Education with Information-Processing and Knowledge-Organization Competencies

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Abstract

This paper studies the weaknesses of intelligence-education curriculum in the United States from a Library and Information Science perspective. Intelligence information processing is a separate step in the traditional intelligence cycle; however, information-processing competencies are often included in the intelligence collection and analysis competencies in the Intelligence Community. A study of the websites of the intelligence-education programs in the major 27 intelligence-education institutions in the United States reveals that information processing is often implicitly included in an intelligence analysis or collection course; and only three universities offer such courses that include information-processing components. Only one university has been found to offer courses that implicitly include components of the knowledge-organization competency. This paper recommends strengthening intelligence-education curriculum with information-processing and knowledge-organization competencies.

Introduction

As a direct response to the September 11, 2001 tragedy, we have seen the rapid increase of intelligence studies education programs across the United States.[1] Though many of these programs are not accredited by any organization, the International Association for Intelligence Education (IAFIE) has been discussing and formulating standards for intelligence education. IAFIE was founded in 2004 with the mission of advancing research, knowledge and professional development in intelligence education.[2] Most IAFIE members are intelligence studies trainers and educators. Other members are open source information analysts, and educators who have an interest in intelligence education. For instance, the author of this paper was a science and technology policy analyst, with a duty similar to that of the Library of Congress Congressional Research Service,[3] and is now a library and information science (LIS) educator.

Batty (2005) illustrated the interconnection of intelligence work and information science, and the close relationship between intelligence work and the information professions.[4] Intelligence work follows a cyclical process involving the identification of a customer's requirements/needs, planning/direction, collection, processing, analysis, production, and dissemination.[5] In contrast, LIS work follows an information-transfer cycle involving the creation, acquisition (based on user's requirements/needs), organization/processing, distribution, preservation, access and use of information.[6] Naturally, intelligence work and intelligence education tend to put a great deal of emphasis on intelligence analysis. In contrast, LIS work and education pay much more attention to information processing and knowledge organization. Therefore, it is natural to question the role of information processing and knowledge organization in intelligence work and education.

An intelligence analysis job announcement recently caught my attention since the position had two categories of duties: (1) information collection, cataloging and storage, (2) information analysis for decision-making or recommendation (see Appendix A for the gist of the job announcement). The requirement of information-organization competency made this job advertisement atypical. This discrepancy motivated me to do a preliminary study on the role of information processing and knowledge organization in intelligence work and intelligence education.

The major research questions of this paper are: (1) Is information processing an important part of intelligence work? (2) Are information-processing and knowledge-organization competencies a part of the intelligence education? The first question can be answered by conducting a brief

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[1] Spracher, William C*., National Security Intelligence Professional Education: A Map of U.S. Civilian University Programs and Competencies* (Doctoral dissertation at the George Washington University, 2009).

[2] International Association for Intelligence Education, "About Us," April 14, 2013, available at: *http://www.iafie.org/?page=About_Us.*

[3] Library of Congress Congressional Research Service, "Areas of Research," April 14, 2013, *available at: http://www.loc.gov/crsinfo/research/.*

[4] David Batty, "Intelligence Work and Information Science: Two Men in a Boat," in Robert V. Williams and Ben-Ami Lipetz (eds.), *Covert and Overt: Recollecting and Connecting Intelligence Service and Information Science* (Medford, NJ: Information Today, 2005), 25-32.

[5] Clark, Robert M., Intelligence Analysis: A Target-Centric Approach, Third edition (Washington D.C.: CQ Press, 2010), 10.

[6] Leigh S. Estabrook, "Library and Information Science," in *Encyclopedia of Library and Information Sciences, Third Edition* (New York: Taylor and Francis, 2009), 3287-3292.

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literature review on the nature of intelligence work and the required competencies for intelligence work. The second question can be answered by examining the curriculum and courses of the major intelligence-education programs in the United States.

This study finds that intelligence information processing is a separate step in the traditional intelligence cycle model, but is not a separate course in the studied intelligence education programs in the United States. Knowledge organization is an important part of intelligence analysis, but is not explicitly addressed in any intelligence analysis course description. This study recommends strengthening information-processing and knowledge-organization competencies in the intelligence-education programs in the United States.

In the next section, this paper conducts a brief literature review on the nature of intelligence work and required competencies. In the third section, it introduces the definitions of information processing and knowledge organization for this study, and their roles in intelligence work. In the fourth section, it introduces the methodology of the study, followed by data analysis and findings. Then it discusses benefits and possible challenges of strengthening information-processing and knowledge-organization competencies in the intelligence-education programs. Finally, this paper provides the conclusion and limitations of the study.

A Brief Literature Review on the Nature of Intelligence Work and Required Competencies

Strickland (2005)[7] and Clark (2010)[8] introduce the traditional intelligence cycle model, which defines intelligence work as a six-step or five-step process of developing raw information into intelligence product:

- "First, requirements or needs – specification of the intelligence problem, which is provided by an intelligence customer.

- Second, planning and direction – assigning collectors to gather missing bits of information; assigning analysts to do research and write a report on the intelligence problem.

- Third, collection, or gathering of information.

- Fourth, processing – converting raw data into information in a form usable by analysts through methods such as decryption of encrypted signals; translation of foreign language material; validation of responses from HUMINT (note: human intelligence) sources; and various forms of data representation.

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[7] Lee S. Strickland, "Knowledge Transfer: Information Science Shapes Intelligence in the Cold War Era," in Robert V. Williams and Ben-Ami Lipetz (eds.), *Covert and Overt: Recollecting and Connecting Intelligence Service and Information Science* (Medford, NJ: Information Today, 2005), 147-166.
[8] Clark, *Intelligence Analysis: A Target Centric Approach*, 10-11.

- Fifth, analysis – converting the collected and processed information into intelligence or knowledge through "a process of integrating, evaluating, and ascertaining the contextual meaning of the totality of available information."

- Sixth, dissemination – distributing the finished intelligence to the customer in a written report or a briefing."[9]

The first step is in Clark's (2010) intelligence cycle model, but not in Strickland's (2005) model, therefore there are two versions of the model. The Central Intelligence Agency (CIA) follows the five-step model, and interprets information processing as a variety of tasks from translating a document to describing a satellite photo.[10] Describing a photo would be considered an information organization task in library and information science.

The Office of the Director of National Intelligence (ODNI) specifies the following technical expertise competencies for intelligence analysis and production:

- "Processing and exploitation capabilities: Demonstrates knowledge of how relevant INTs (note: intelligences) are processed from collection to dissemination and demonstrates knowledge of INT report formats and terminology. Understands capabilities and limitations of information processing and exploitation techniques associated with each INT.

- "Researching: Identifies a need for and knows where or how to gather information. Obtains, evaluates, organizes, and maintains information." [11]

In the traditional intelligence cycle model, information processing and exploitation is an individual step, separate from analysis; whereas ODNI specifies both information processing and exploitation, and information organization and maintenance as analysis competencies. Similarly, Johnston (2003)[12] developed a taxonomy of intelligence analysis variables. The systematic variables (see Table 1) include information archive (in the second column) and information processing (in the third column). Information processing is also classified as an analytical methodology.

Table 1. Systematic Variables of Intelligence Analysis[13]

User Requirements Operations	Information Archive Storage	Analytical Methodology Approach	Reporting Methods

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[9] Ibid.; Strickland, "Knowledge Transfer: Information Science Shapes Intelligence in the Cold War Era."
[10] The Central Intelligence Agency, "The Intelligence Cycle," March 23, 2013, available at: *https://www.cia.gov/kids-page/6-12th-grade/who-we-are-what-we-do/the-intelligence-cycle.html.*
[11] Office of the Director of National Intelligence, Intelligence Community Directive Number 610: Competency Directories for the Intelligence Community Workforce (2008), G-1, G-2, available at: *https://e-commerce.sscno.nmci.navy.mil/command/02/acq/navbusopor.nsf/0. /455EA52F9285BD878625772F00527457/$FILE/ICD_610.pdf.*
[12] Rob Johnston, "Developing a Taxonomy of Intelligence Analysis Variables: Foundations for Meta-analysis," *Studies in Intelligence* 47:3 (2003), available at: *https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/csi-studies/studies/vol47no3/article05.html.*
[13] Ibid.

Information Acquisition	Access	Intuitive	Verbal
Collection methods	Correlation	Structured	Written
Overt	Retrieval	Semi-structured	
Covert		Information Processing	
Information Reliability		Historical information	
Reproducible		Current information	
Consistent		Decision Strategies	
Information Validity		Estimative	
Historical		Predictive	
Single Source			
Dual Source			
Triangulation			

The IAFIE Standards for Intelligence Education Undergraduate and Graduate Programs define the undergraduate degree Core Area (CA) outcomes. The core area for intelligence collection is defined as "the process of collecting, processing and exploiting information used in intelligence products," and requires the following outcomes:

> "Explain the organization, capabilities, limitations, exploitation and key issues in Human Intelligence (HUMINT) (informant direction) collection operations, both overt and covert, … in Signals Intelligence (SIGINT) (wiretaps-eavesdropping) collection operations, …in Geospatial Intelligence (GEOINT) (imagery-mapping) collection operations, …in Measurement and Signature Intelligence (MASINT) (other technical) collection operations."[14]

Information processing and exploitation is included in the core area of intelligence collection. Therefore, information processing is an important part of intelligence work, and theoretically, information processing is separate from intelligence analysis. However, the Intelligence Community tends to view the processing and organization of information as competencies of intelligence analysis or collection. It is not always clear whether information organization and archiving is included in these competencies. This might be due to the close relationship between information processing and collection/analysis, or the lack of a clear definition for information processing throughout the Intelligence Community.

This section has answered the first research question – whether information processing is an important part of intelligence work. Before studying the second research question – whether information-processing and knowledge-organization competencies are a part of the intelligence education, it is necessary to introduce the definitions of information processing and knowledge organization for this study, and their roles in intelligence work.

Definitions of Information Processing and Knowledge Organization and Their Roles in Intelligence Work

Information Processing

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[14] IAFIE, "International Association for Intelligence Education Standards for Intelligence Education Undergraduate and Graduate Programs," 2011, *available at: http://www.iafie.org/?page=IntelEd*.

According to the Oxford English Dictionary online, information processing is "the processing of information (by a machine or an organism) so as to yield new or more useful information."[15] Information processing techniques or methods are employed to process information to yield new or more useful information. The *International Journal of Information Processing & Management*, which reports basic and applied research in information science, computer science, and cognitive science, defines information-processing techniques as: information retrieval; knowledge and distributed intelligence; information representation, classification, extraction, filtering and summarization; question answering; information navigation, browsing and visualization; and human-computer interaction in information systems.[16] Since there is no clear definition for information processing in the intelligence field, I need to provide an operational definition in order to answer the second research question. *Information processing* in the intelligence cycle is defined here as involving data/information representation; information organization, classification, extraction, filtering, summarization, visualization; decryption of encrypted signals; translation of foreign language material; evaluation of information; and distinguishing signal from noise.

Many of these information-processing tasks may be performed by using data/information processing and artificial intelligence software tools. However, effective tools may not be available yet, and therefore, need to be developed. Chen (2005) proposed a need to develop the science of "intelligence and security informatics (ISI)," or "the study of the use and development of advanced information technologies, systems, algorithms, and databases for national security related applications, through an integrated technological, organizational, and policy based approach"[17] in order to deal with the significant information overload problem in law enforcement, criminal analysis, and intelligence communities. Further, Chen and Xu (2006) proposed a research framework addressing the technical challenges facing counter-terrorism and crime-fighting applications, with a primary focus on knowledge discovery from databases (KDD). They identified and incorporated into the framework six classes of ISI technologies: information sharing and collaboration, crime association mining, crime classification and clustering, intelligence text mining, spatial and temporal analysis of crime patterns, and criminal network analysis.[18] Also, Reid (2009a, 2009b, 2011) identified that web mining analysis, using GIS tools, and cataloging (or metadata tagging) are useful competencies for intelligence analysis.[19] Before these information-processing tools are available and are effective enough for their purposes, it is reasonable to assume that some of these tasks will have to be performed by intelligence analysts manually or semi-automatically. Moreover, information-processing tools (such as information filtering, automatic classification, machine translation, automatic speech

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[15] The Oxford English Dictionary online, 2013, available at *http://www.oed.com*.

[16] Information Processing & Management – An International Journal. 2013, *available at: http://www.journals.elsevier.com/information-processing-and-management/*.

[17] Hsinchun Chen, "Introduction to the special topic issue: intelligence and security informatics," *Journal of the American Society for Information Science and Technology* 56:4 (2005): 218.

[18] Hsinchun Chen and Jennifer Xu, "Intelligence and security informatics," *Annual Review of Information Science and Technology* 40 (2006): 229-289.

[19] Edna Reid, "Information professionals as intelligence analysts: making the transition," in *Best Practices for Government Libraries – 2009*, available at: *http://www.lexisnexis.com/tsg/gov/Best_Practices_2009.pdf*; Edna Reid, "Librarians as analysts: improving services," in Joint TKNs annual Conference, June 18, 2009, available at: *http://ntl.bts.gov/networking/PDFs/LibrariansasAnalysts-Reid%20June2009.pdf*; Edna Reid, "A Diverse Universe: Exploring the World of Intelligence Analysts," 2011, available at: *http://dc.sla.org/2011/05/22/a-diverse-universe-exploring-the-world-of-intelligence-analysts/*.

recognition) may not be particularly effective. As indicated in ODNI's definition of professional tradecraft on information processing and exploitation – understanding "capabilities and limitations of information processing and exploitation techniques associated with each INT"[20] – the tools have limitations. For instance, machine translation is "inaccurate; programming fails with low-literacy languages; (is) easily fooled by code terminology; cannot teach, must be used by experienced educator; … cannot replace humans."[21] These tools may have to be trained by experienced users before being applied; therefore, understanding these information-processing techniques may help intelligence analysts better use the tools.

Knowledge Organization

The other competency to be examined is knowledge organization. The definition of knowledge organization can be borrowed from LIS: activities which use knowledge organizing systems (KOS) to organize documents, document representations, and concepts, and involve the interpretation and analysis of meaning.[22] KOS, according to Zeng (2008),

> "models the underlying semantic structure of a domain and provides semantics, navigation, and translation through labels, definitions, typing, relationships, and properties for concepts… Examples of KOS include lists, authority files, gazetteers, synonym rings, taxonomies and classification schemes, thesauri, and ontologies."[23]

KOS functions include "eliminating ambiguity, controlling synonyms or equivalents, establishing explicit semantic relationships such as hierarchical and associative relationships, and presenting both relationships and properties of concepts in the knowledge models."[24] KOS can be used to understand domain knowledge, and to support knowledge discovery, inference, and knowledge fusion. Being able to organize knowledge and develop KOS may help share domain and application knowledge between intelligence analysts and across intelligence organizations.

KOS can be used to support sensemaking. Sensemaking, according to Zhang, who completed a doctoral dissertation study on this topic, is "the task of creating an understanding of a problem or task so that further actions (such as decision making and problem solving) may be taken in an informed manner ... An important part of sensemaking involves making clear the interrelated concepts and their relationships in a problem or task space."[25] Sensemaking is an important process in intelligence analysis and interpretation. Moore, a senior intelligence professional and educator in the United States, defines intelligence sensemaking as

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[20] Office of the Director of National Intelligence, Intelligence Community Directive Number 610: Competency Directories for the Intelligence Community Workforce (2008), G-2.

[21] Steven M. Kleinman, "Barrier to Success: Critical Challenges in Developing a New Educing Information Paradigm," in Intelligence Science Board, *Educing Information – Interrogation: Science and Art Foundation for the Future*, Washington DC: NDIC Press, 2006), 243.

[22] Birger Hjørland, "What is Knowledge Organization (KO)?" *Knowledge Organization* 35:2/3 (2008): 86-101.

[23] Lei Marcia Zeng, "Knowledge Organization Systems (KOS)," *Knowledge Organization* 35:2/3 (2008): 160.

[24] Ibid.

[25] Pengyi Zhang, *Sensemaking: Conceptual Changes, Cognitive Mechanisms, and Structural Representations. A Qualitative Study.* (University of Maryland, College Park Dissertation, 2010), 1.

"the processes by which specialized knowledge about ambiguous, complex, and uncertain issues is created… (by) intelligence Sensemakers… (Sensemaking) goes beyond analysis, a disaggregative process, and also beyond synthesis, which meaningfully integrates factors relevant to an issue."[26]

During the process of sensemaking, sensemakers extract main concepts and relationships from raw data/information, and put them into a knowledge structure to establish an understanding.[27] KOS, especially semantic networks and ontologies, provides knowledge structures to support sensemaking.

Some part of the sensemaking process can be automated. Information-processing techniques, especially information extraction, information retrieval/filtering, and information visualization, can be used to extract and visualize concepts and relationships. For example, mind maps and concept maps can be used to visualize a set of concepts and their relationships.[28]

In intelligence analysis, the process of putting together parts or elements to form a whole – an appropriate model of the target is known as synthesis.[29] Clark (2010) introduces various models used in intelligence analysis.[30] Relationship models (i.e., hierarchy, link, matrix, and network models) used in intelligence analysis can be considered as KOS. Heuer and Pherson (2011) define checklist, network models, mind maps and concept maps as decomposition and visualization tools.[31] Decomposition and visualization are analytic techniques. In the traditional intelligence cycle model, synthesis, decomposition and visualization are all included in the analysis step, therefore knowledge organization competencies are needed in the analysis step.

Since both information-processing and knowledge-organization competencies play an important role in intelligence work, it is natural to ask the second research question – are information-processing and knowledge-organization competencies a part of the intelligence education?

Methodology

To answer the second research, this study analyzes the content of the websites for intelligence-education programs, as well as the courses available in the representative United States intelligence-education institutions, to see whether information-processing and knowledge-organization competencies are taught. Spracher (2009)[32] provided a list of 21 representative intelligence-studies institutions in the United States. The website of International Association for Intelligence Education (IAFIE) listed 19 institutional members. This study takes the 21 intelligence-education institutions in the United States, augmented by the IAFIE institutional

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[26] David T. Moore, *Sensemaking: A Structure for an Intelligence Revolution* (Washington DC: NDIC Press, 2011), xxxv, xxxvi.

[27] Zhang, *Sensemaking: Conceptual Changes, Cognitive Mechanisms, and Structural Representations. A Qualitative Study*. 5.

[28] Heuer, Richards J. Jr. and Randolph H. Pherson, *Structured Analytic Techniques for Intelligence Analysis* (Washington, D.C.: CQ Press, 2011), 76.

[29] Clark, *Intelligence Analysis: A Target Centric Approach*, 60.

[30] Ibid, 60-86.

[31] Heuer and Pherson, *Structured Analytic Techniques for Intelligence Analysis*, 41-85.

[32] Spracher, *National Security Intelligence Professional Education: A Map of U.S. Civilian University Programs and Competencies*, 235-255.

members with an intelligence-education program, and examines their websites to find their intelligence-education programs and courses. There are duplicates in the combined list of institutions. After removing the duplicates, there are a total of 27 intelligence-education institutions in this study. See Appendix B for the complete list.

Data Analysis and Findings

Intelligence-education programs and courses are identified based on their course titles, program requirements or stated elsewhere on their websites. Analysis of the 27 representative intelligence-education institutions and their course subject areas found that many offer intelligence analysis/studies degree/certificate programs (1 doctoral, 11 Master's, 10 Bachelor's, 1 Associate, 23 certificate programs). They also offer degree/certificate programs with major/minor or concentration in intelligence (1 doctoral, 7 Master's, 4 Bachelor's, 3 majors, 5 minors, 9 certificate programs). Both programs have concentrations on both intelligence professional tradecraft and domain areas. Table 2 provides a list of the professional tradecraft, developed by examining these programs and courses. The terms in the taxonomies are directly extracted from those programs and courses, and the hierarchy is developed based on my best understanding of the relationships between the terms. Note that the taxonomy is built based on a bottom-up, data-driven approach and could be incomplete due to the limited sample size.

Table 2. A Preliminary Taxonomy of Education of Professional Tradecraft of Intelligence[33]

Intelligence theory and methods
Intelligence success and failure
Intelligence policy and organization
Intelligence collection (or gathering)
Intelligence collection management
Computer skills (such as database management, information retrieval)
Human intelligence (HUMINT)
Spying
Technical collection of intelligence
Imagery intelligence (IMINT)
Geographic information science and technology
Geographic information system
Geospatial intelligence
Open source intelligence (OSINT)
Measurement and signature intelligence (MASINT)
Signals intelligence (SIGINT)
Sub-orbital platforms
Intelligence operations
Counterintelligence, Counterespionage, & Espionage
Double agents, denial and deception
Foreign denial and deception
Covert actions
Interrogation/elicitation techniques

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[33] Adapted from Yejun Wu, "A preliminary study on the curriculum overlap and gap between LIS education and intelligence education." *Journal of Library and Information Science Education* (in print).

Intelligence information processing
    Application of research tools (data manipulation or artificial intelligence software packages)
    Cryptologic issues
    Digital image processing
    Foreign language (translation)
Intelligence analysis
    Analytics (critical analysis, structured analytical techniques)
    Information modeling and predictive decision making
    Predictive intelligence methods
Intelligence writing
Intelligence briefing
Technologies in intelligence theory, communications, and research

Table 2 shows that information processing has included only three particular components. Moreover, the application of research tools is only included in John Hopkins University's Master of Science in Intelligence Analysis program; cryptologic issues and digital image processing are only included in the National Intelligence University's intelligence related curriculum.

Only two universities (John Hopkins University and Henley-Putnam University) have explicitly or implicitly mentioned any particular intelligence information-processing elements in their intelligence related courses. The Master of Science in Intelligence Analysis program in John Hopkins University has the following objective: "acquire and make use of research tools applicable to the collection and analysis of large volumes of data."[34] This implies that information processing is included in collection and analysis, and is conducted using software tools.

Henley-Putnam University offers the following five courses that have an explicit or implicit component of information processing:

INT 310 Fundamentals of Analysis

"The process of taking raw data and obtaining from it intelligence that can be acted upon involves careful analysis and is an integral part of intelligence work. Students will learn various techniques for analyzing raw intelligence, evaluating source credibility, distinguishing 'signal' from 'noise,' and testing hypotheses."[35] Evaluating source credibility and distinguishing "signal" from "noise" are information-processing competencies.

INT 315 Open Source Research

"Students will learn to apply principles of sound research and evaluation to a wide spectrum of source materials… and to interpret the material obtained from them properly, while keeping potentially large amounts of information organized and accessible."[36] This implies that this course teaches information-organization competency."

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[34] Johns Hopkins University, School of Education, Master of Science in Intelligence Analysis, 2012, available at: *http://www.students.education.jhu.edu/catalog/psl/intelligence.html.*
[35] Henley-Putnam University, Bachelor's of Science in Intelligence Management, 2011, available at: *http://www.henley-putnam.edu/programs/bachelors/intelligence-management.aspx#null.*
[36] Ibid.

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INT 511 Advanced Analytical Methods

 "Advanced forms of analysis require the analyst to adroitly handle information from a variety of sources and disciplines, weighing each according to its inherent strengths and weaknesses."[37] This implies that information handling and weighing is a kind of analytical method.

INT 570 All Source Intelligence

"Professional analysts also use a variety of linking, modeling and data manipulation or artificial intelligence software packages. In this course, we… remain focused on the need and ability to SYNTHESIZE all of this data…"[38] This course includes both components of information processing and knowledge organization.

INT 521 Advanced Intelligence Collection

"This course teaches all-source intelligence collection methodologies as they relate to satisfying national intelligence requirements… It examines the need for a collection-priorities framework; the concept of an integrated collection strategy; and some of the more sophisticated techniques for collecting, processing and exploiting intelligence information."[39] Information processing and exploitation is included in intelligence collection.

One of the reviewers of this paper suggested examining INT 596 Advanced Intelligence Practicum, since the primary text book of the course is Clark's (2010) *Intelligence Analysis: A Target-Centric Approach*. This book introduces synthesis and relationship models, which are knowledge-organization competencies. However, the brief description of the course (see below) does not mention "synthesis" or "intelligence models."

INT 596 Advanced Intelligence Practicum

"This course concerns the Directorate of Intelligence, in other words, that side of the intelligence community concerned with intelligence collection, vetting, analysis, etc… The student will also learn about the Intelligence Cycle, how intelligence is prepared, and how it is used to inform decision and policy makers…"[40]

From the data analysis above, it is found that intelligence information processing is not a separate course in the 27 intelligence-education institutions. It is often, either explicitly or implicitly, included in an intelligence analysis or collection course. Only three universities offer courses that include components of the information-processing competencies. Only one university has been found to offer courses that implicitly include components of the knowledge-organization competency. This number might have been underestimated since it is not easy to identify the knowledge organization competency from brief course descriptions, and the knowledge organization competency is often included in analytic competencies.

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[37] Henley-Putnam University, Master's of Science in Intelligence Management, 2011, available at: *http://www.henley-putnam.edu/programs/masters/intelligence-management.aspx*.
[38] Ibid.
[39] Ibid.
[40] Ibid.

Benefits and Challenges of Strengthening Information-Processing and Knowledge-Organization Competencies

Planning, collection, processing, analysis, and dissemination are all individual steps in the traditional intelligence cycle model. Planning, collection, and analysis are often available as separate courses in the United States intelligence-education programs, while processing is not. The benefit of offering information-processing courses explicitly in an intelligence-education program is that the information-processing competencies are systematically taught and do not rely on the intelligence analysts' talents, especially when the analysts have to process large amounts of data/information and the software tools are not particularly effective. Intelligence analysts are supposed to be educated with all the competencies in the intelligence cycle model. However, it is reasonable to assume that they have stronger competencies of some steps than others. Information processing is a rather technical step, which requires knowledge and skills of computer science, information science, cognitive science, and foreign languages. Intelligence analysts who specialize in information processing understand the strengths and weaknesses of information-processing techniques (such as information retrieval, classification, extraction, filtering and summarization), so are able to use information-processing tools effectively, and may be able to improve those techniques for some specific tasks. In the big data era, intelligence analysts may need to process large amounts of information. Strengthening the information-processing competencies of intelligence analysts and agencies may improve their ability to process and organize large amounts of information effectively and efficiently. Intelligence-education institutions and their students who are strong in information processing may be able to find a special niche in the intelligence analysis market.

Knowledge organization plays an important role in the analysis step, and its content can be covered in an intelligence analysis course. The United Stated Intelligence Community has already built information sharing and collaboration systems, such as Intellipedia, the Terrorist Indentities Datamart Environment (TIDE), and the Homeland Security Information Network (HSIN). However, these systems provide document libraries and document sharing,[41] instead of KOS (such as relationship models). Intelligence analysts can use these systems to search for documents, but may still need to build models to synthesize information during analysis. It is probably unnecessary to offer a separate course on knowledge organization, but it is beneficial to strengthen the knowledge-organization competency in an intelligence analysis course. The benefit of strengthening the knowledge-organization competency is that intelligence analysts can build KOS to support knowledge sharing, knowledge discovery and fusion between intelligence analysts and across intelligence organizations. Sharing KOS may improve the productivity of intelligence analysts.

Strengthening information-processing and knowledge-organization competencies may pose possible challenges to some intelligence education programs. Adding a course in information processing or strengthening knowledge organization in an intelligence analysis course may require an addition of a faculty member to a program. An alternative is to collaborate with a computer science or library and information science (LIS) department. If the intelligence education program is hosted in the same institution as the computer science or LIS department,

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[41] Homeland Security Information Network, 2013, available at: *http://www.dhs.gov/homeland-security-information-network.*

course cross-listing may solve the problem. Five LIS education institutions have just started their intelligence analysis programs.[42] They may be in an advantageous position to meet this challenge.

Conclusion, Limitations, and Future Study

Intelligence information processing is an individual step in the traditional intelligence cycle model, separate from intelligence collection and analysis. Though the intelligence community tends to view information processing and organization as competencies of intelligence analysis or collection. The 27 intelligence-education institutions in this study do not offer separate courses on intelligence information processing. Three universities (i.e., National Intelligence University, John Hopkins University, and Henley-Putnam University) offer intelligence analysis or collection courses that, either explicitly or implicitly, include particular components of the information-processing competencies. One university (i.e., Henley-Putnam University) offers advanced courses that implicitly include components of the knowledge-organization competency.

Strengthening the information-processing competencies of intelligence analysts may improve their ability to process large amounts of information effectively and efficiently. Strengthening their knowledge-organization competency may improve their ability to build and share KOS, and so to improve their productivity. It can be an interesting study in the future to examine whether strengthening intelligence-education with information-processing and knowledge-organization competencies actually improves the general performance of intelligence analysts and intelligence agencies.

There are two major limitations in this study. First, the intelligence-education courses were judged by their titles and brief descriptions to determine whether they include information-processing and knowledge-organization components. Those brief course descriptions may not introduce the components of information-processing and knowledge-organization competencies at all. Courses are best judged by syllabi, which are not available on the Web. In the future, I plan to make efforts to collect syllabi from the deans and department heads of the intelligence education institutions to overcome the limitation. Second, I do not work in the United States Intelligence Community. The observations made from a Library and Information Science perspective may not accurately reflect the reality of information-processing and knowledge-organization work and education in the United State Intelligence Community.

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[42] Wu, "A preliminary study on the curriculum overlap and gap between LIS education and intelligence education."

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Appendix A. A gist of the intelligence analysis job announcement originally posted at *http://jobview.usajobs.gov*

Job Title: Intelligence Research Specialist
Department: Department Of Justice
Agency: Drug Enforcement Administration
Job Announcement Number: F-DEA-NC-11-504419-DEU
Duty Locations: 1 vacancy - Baton Rouge, LA
Duties:

Collects or receives intelligence data from a variety of sources and prepares the materials for review, cataloging, and storage. Evaluates potential sources of information, and addresses significant gaps in data.

Determines and defines essential elements of information required and the most effective method for carrying out data collection efforts. Plans, coordinates, and/or conducts the collection and analysis of strategic and tactical intelligence in support of criminal investigative activities.

Analyzes intelligence reports and data to make decisions or recommendations. Develops strategies for major areas of uncertainty in domestic and international political, social, or economic policies, trends, or situations.

Plans, develops, organizes, and conducts special research studies providing comprehensive assessments of broad, exceptionally complex, or highly sensitive issues within the assigned area. Develops methods of evaluating the validity, accuracy, and reliability of a broad array and high volume of information, for translation into intelligence relevant to the organization. Analyzes the significance and policy implications of issues in the assigned area.

Appendix B. Representative Intelligence-education Institutions.

Intelligece Education Organization	URL
Graduate Degree in Intelligence Studies/Analysis	
Mercyhurst College, Institute for Intelligence Studies	http://mciis.org http://intel.mercyhurst.edu
American Military University	http://www.amu.apus.edu
National Intelligence University	http://www.ni-u.edu
Johns Hopkins University School of Education Division of Public Safety Leadership	http://psl.jhu.edu/programs/msintelligenceanalysis/
Penn State University	http://www.psu.edu http://www.worldcampus.psu.edu/degrees-and-certificates#grad-masters
Henley-Putnam University	http://www.henley-putnam.edu
University of Texas at El Paso College of Liberal Arts, Intelligence and National Security Studies Program	http://academics.utep.edu/Default.aspx?alias=academics.utep.edu/inss#
Undergraduate Degree in Intelligence Studies/Analysis	
Point Park University School of Arts and Sciences Department of Criminal Justice & Intelligence Studies	http://www.pointpark.edu/Academics/Schools/SchoolofArtsandSciences/Departments/CriminalJusticeandIntelligenceStudies/IntelligenceandNatio
Embry-Riddle Aeronautical Univ.	http://prescott.erau.edu/degrees/undergraduate/global-security-intelligence-studies/index.html
Advanced Technical Intelligence Center for Human Capital Development (ATIC), Beavercreek, Ohio	http://www.atichcd.org
Other Degree with Major/Minor in Intelligence	
New Mexico State University	http://www.nmsu.edu/~govdept/graduate-minor-.html http://business.nmsu.edu/wordpress/wp-content/uploads/2008/11/minor-in-intelligence-studies.pdf
Patrick Henry College	http://www.phc.edu/si.php
Neumann College Division of Arts and Sciences	http://www.neumann.edu/academics/divisions/arts_sciences/dean_letter.asp
University of Mississippi Center for Intelligence and Security Studies	http://www.olemiss.edu/ciss/Academics/index.htm
Other Degree with Concentration in Intelligence or Integral Component of Program	
Notre Dame College History and Political Science Department	http://www.notredamecollege.edu/academics/academic-divisions/arts-and-humanities/history-political-science-dept/history-majors/intelligence-studies-emphasis
Georgetown University	http://sfs.georgetown.edu/academics

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School of Foreign Services	
Trinity Washington University School of Professional Studies	http://www.trinitydc.edu/academic-catalog/iss/
West Virginia University College of Arts and Sciences	http://internationalstudies.wvu.edu/major/curriculum/intelNC
Graduate/Undergraduate Certificate in Intelligence	
Air Force Institute of Technology (AFIT) Center for MASINT Studies and Research (CMSR)	http://www.afit.edu/en/CMSR/
California State University (San Bernardino) College of Social and Behavioral Sciences National Security Studies Program	http://nss.csusb.edu
Other Degree with Electives in Intelligence	
University of Maryland School of Public Policy Center for International and Security Studies at Maryland	http://www.cissm.umd.edu
University of New Haven	http://www.newhaven.edu/5941
Yale University Jackson Institute for Global Affairs	http://jackson.yale.edu
American University School of International Service	http://www.american.edu/sis/
Hampden-Sydney College Wilson Center for Leadership in the Public Interest	http://www.hsc.edu/Wilson-Leadership/Military-Leadership.html
Florida International University Institute for Public Policy and Citizenship Studies, Program in National Security Studies	http://casgroup.fiu.edu/ippcs/pages.php?id=2198
US Coast Guard Academy	http://www.cga.edu

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