

Concept Map as “Sign”
**Concept Mapping in Knowledge Organization through a
semiotics lens**

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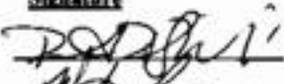
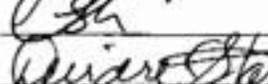
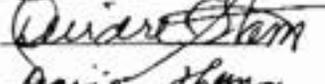
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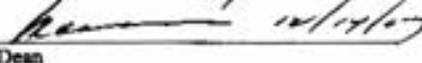
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Abstract

Concept mapping is a technique for visualizing the relationship among concepts. It has provided visual representations of knowledge structures in academic and business settings since the late 1930s. The study of “signs” examines how the meaning of concepts is constructed and understood in language. During the 19th century, two schools of thought provided different interpretations of the term “sign.” Charles Sanders Peirce offered a “triadic” foundation of the term, whereas the second model, developed by Swiss linguist Ferdinand de Saussure had a “dyadic,” or two-part, structure. This study I measured whether the term “sign,” as envisioned by Peirce and Saussure, can be classified using the various terms and forms of concept maps in the field of knowledge organization.

Knowledge organization is a domain concerned with the organization of recorded knowledge to facilitate its retrieval and use. Many researchers in this field have reviewed the use of concept mapping and the study of “sign,” including its philosophical aspects. The importance of semiotics to knowledge organization is in providing a framework for the connection between language and its meaning with regard to knowledge representation. Concept maps in this study are a relationship between the nodes and arcs in the map, in the form of signs. The nodes should be labeled with descriptive text, representing the “concept,” and the arcs represent the type of relationship between those nodes. I examined concept maps found in the printing conference proceedings of the *American Society for Information Science and Technology (ASIS SIG/CR)*, and those of the *International Society for Knowledge Organization (ISKO)* between 1990 and 2006, based on Peirce’s and Saussure’s definitions of the term “sign.”

In this study, the issue this study explained was whether concept maps, as presented in knowledge organization, make use of semiotics theory. The study poses three questions that aim to identify a relationship between the term “sign” and concept maps found in conference proceedings in the field of knowledge organization through a semiotics lens. Firstly, can “sign,” as defined by Peirce and Saussure, be found in the concept maps presented at those conferences? Secondly, can the elements of the term “sign” (as envisioned by Peirce and Saussure in terms of signified and signifier vs. object-sign-interpretant) be compared to the various forms of concept maps researchers employ in research papers published in conference proceedings? And, lastly, can patterns be observed in the terminology employed in the concept maps in knowledge organization conference proceedings?

A review of the 652 papers found in the two series of conference proceedings revealed a total of 327 concepts maps. In the semiotics theory, Peirce’s triadic theory accounted for a total of 148 maps (81 from ISKO and 67 from the *ACR* conferences), representing 42.81% of the maps examined, making it the highest-ranking classification. Additional analysis revealed that the majority of the contributors using concept maps in papers classified under Peirce’s framework were professors who were employed in the United States. I also examined the semiotics nature of the concept maps’ titles based on Dahlberg’s classification, only to discover that the ISKO and the *ACR* proceedings do not reveal the same top themes. At ISKO conferences, Dahlberg’s “object” group was the most dominant. Peirce’s framework counted for 27 out of 67 concept maps in that category. From the *ACR* papers, 18 concept maps were classified into Dahlberg’s

“activity” group, the most dominant one. Eight out of 18 of these maps fell under Peirce’s framework. The highest-ranked and most referred-to term under Peirce’s triadic framework was “knowledge.” No other term in Peirce’s or Saussure’s framework reached this level. Saussure’s dyadic framework, on the other hand, ranks the lowest in the number of concepts maps and the number of terms describing “sign.”

In addition, this researcher compared the major themes found in the two conference proceedings to the discussion of semiotics in knowledge organization, using a chronological analysis of semiotics in the maps’ themes. The majority of the cases reveal two major themes that correlate to the discussion of semiotics in knowledge organization. These were Peirce’s triangulation, and the relationship between concepts. Peirce’s triangulation ranked the higher of the two.

KEYWORDS: Knowledge Organization, Semiotics Theory, Peirce’s Theory, Saussure’s Theory, Concept Mapping, Content Analysis.

DEDICATIONS

I would like to dedicate this work to:

My Mom and Dad:

Thank you for always encouraging me to pursue my education

To my wife:

Without you, I would not reach this point.

To Gary Parker, my father-in-law:

Thank you for your kind words and support. I will always remember you and your inspirations words.

To Fran Parker, my mother-in-law:

Thank you for your support.

To Fang:

Thank you for taking long snoozes on my knee and keeping me awake.

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Chapter 1: INTRODUCTION

1.1 *Background*

The purpose of my research is to understand the use of concept mapping in the field of knowledge organization using a semiotics framework. Concept mapping is a technique for representing knowledge in graphs. It is frequently used in academic conference papers by scholars of knowledge organization (Friedman, 2006). Given the growing popularity of the technique, a better understanding of how knowledge is represented in the academic research environment is necessary. Knowledge organization is a domain concerned with the “ordering of what is known,” particularly for information retrieval (Smiraglia, 2005). Nowadays, with the increasing variety of non-book material, including electronic documents, sound, images, and maps that carry intellectual and physical properties, defining the field of knowledge organization has become more complex (Hjørland, 2003). Semiotics as the study of “signs” entails the use of language, both individually and in groups, to represent knowledge. The study of signs is derived from philosophical speculations on signification and language (Chandler, 2004). According to MacEachren (2004), signs, whether they are treated as dyadic or triadic relationships, can be categorized by a variety of criteria. Many knowledge organization researchers study philosophical semiotics aspects of language to support their particular foci (See Chapter 3). By portraying the concepts inside the maps as signs, semiotics can provide the ability to analyze the relationships among a set of concepts (Friedman, 2006).

In this study I examined the various forms of concept mapping used by presenters at two major conferences in the field of knowledge organization. The two entire series of proceedings examined including: *International Society of Knowledge organization Proceeding (ISKO)* and *Advances in Classification Research (ACR): proceedings of the Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)*. The study framework consists of semiotics theory as defined by Peirce and Saussure. The research methodology I employed was content analysis.

1.2 Research Questions

This study poses three questions that aim to find whether a relationship between “sign” and concept maps in the field of knowledge organization can be found. The research questions are:

1. Can “sign,” as defined by Peirce and Saussure, be found in the concept maps presented in conference proceedings from the field of knowledge organization?
2. Can the elements of the term “sign” (envisioned by Peirce and Saussure in terms of signified and signifier vs. object-sign-interpretant) be compared to the various forms of concept maps?
3. And, can patterns be observed among the terminology employed in concept maps in knowledge organization proceedings?

1.3 *Operational Definitions*

Several definitions were used collecting and analyzing the data. The first definition comes from Saussure's approach to the term "sign," which uses the terms "signifier" and "signified" to represent the "sign." The signifier according to Saussure is a perception of a representation. The signified is the concept or the idea. Peirce's definition in this study will be defined as composed of Representamen, Object and Interpretant. The Representamen stands for the form, not necessarily material in nature, which the sign takes. The object is what the sign refers to, while the Interpretant is the sense made of the "sign." The major differences between Saussure and Peirce are their classifications of the term "sign." Peirce's classification is triadic and consisted of Representamen, Interpretant, and Object which together form a "sign." Saussure is dyadic and consisted of "signifier" - the form that the sign takes; and "signified" - the concept it represents in the spoken language. The term "other" is defined as to all the concept maps and all the signs that do not classify under Peirce nor Saussure theories. The various forms of concept maps this study examined includes: Concept map, Mind map and conceptual map. In this study, concept mapping is defined as a technique for visualizing the relationships between different concepts. In order for a concept map to take part in the study, it is required that the map presents text, image and links illustrating the relationship between the nodes and arcs in the map. The arcs represent the type of relationship between the nodes they represent. The arcs represent the relationship between the nodes. Mind map is defined as a diagram used to represent words, ideas, or text linked to and arranged around a central key word or idea. The most advanced graphic

techniques on our list are the conceptual graphs (CGs). In this study a conceptual graph is a finite, connected, bipartite graph where the two kinds of nodes are concepts and conceptual relations, and where every conceptual relation has one or more arcs, each of which is linked to some concept. For more information on the difference the three types of maps see APPENDIX C.

1.4 Benefits of this study

This research will provide greater insight into the role of “signs” in the specific cognitive procedures employed by knowledge researchers who use concept mapping. In addition, it is the first study that measures the two leading schools of thought’s different interpretations of the term “sign” in the environment of concept maps. The study will open the discussion of whether or not concept maps can be classified and examined in the context of semiotics.

1.5 Organization of this Dissertation

There are nine chapters in this dissertation. This chapter provides an overview of the dissertation and the research questions this dissertation discusses. Chapter two provides an overview on the term “concept” and the philosophy behind semiotics. Chapter three provides a review of the knowledge organization community’s discussion of semiotics and research methodologies. Chapter four presents the methodology of this study. Chapter five discusses the study unit of this study. Chapter six presents the results of the study regarding concept maps found in both conference proceedings. Chapter seven

summarizes the result of semiotics theory regarding the concept maps found. Chapter eight summarizes the chronological analysis between major themes and semiotics discussion in knowledge organization. Chapter nine summarizes the result of the study and provides an agenda for future research.

Chapter 2: INTRODUCTION TO CONCEPT MAPPING AND “SIGNS”

2.1 *Introduction*

This chapter introduces two terms: “concept maps” and “signs.” A concept map is an intuitive visual knowledge representation technique. Concept mapping represents knowledge in two forms: hand-draw maps and electronically monitored display. In comparison signs are essential representations of meaning in the language. They are closely related to concepts and their maps. The study of these signs is called Semiotics, and this study focuses on two dominant models of what constitutes a sign: that of linguist Ferdinand de Saussure and philosopher Charles Sanders Peirce. Peirce’s and Saussure’s theories provide the academic community a framework for the examination of current terminologies and approaches to meanings and rules with regard to language, films, music, and much more. Next, I will review the philosophical aspect of the term “concept.”

2.2 *Philosophy and the term “Concept”*

According to Margolis and Laurence (2005), the term “concept” has become one of art among philosophers because of the diversity of concerns with which it is associated. Adding to the confusion is the fact that the term causes dispute among philosophers, often reflecting deeply opposing positions. The two philosophy schools in conflict here are the analytic school and the postmodern deconstructionist one. The analytic school’s

main areas of investigation are the study of logic and the philosophy of language. Logic (the study of which is the main tool of investigation in this school) is the examination of criteria for the evaluation of arguments, although its exact definition is a matter of controversy in the field (Copi & Cohen, 2005). According to Martinich (1996), the philosophy of language is concerned with the natures of meaning, reference, truth, communication, interpretation, and translation of language. The opposite side, the postmodern and its deconstructionist school, criticizes the notions of "theory," "text," "artifact," and other related ideas. Postmodern philosophers argue that aspects of the text itself undermine its own authority and erase the boundaries and categories asserted by the work. This approach contradicts the analytic school and the rule that says that text has its own true value. I will discuss the two schools by examining selected philosophers from each. Representing the analytic school will be Frege's definition of the term concept, and Peacocke's theory. Barthes' contribution to the subject and the connections he makes with semiotics will be examined to represent the postmodern and deconstructionist school.

Friedrich Ludwig Gottlob Frege was the first to make a distinction between concept and object. He defined a concept (Begriff, 1892) as a function that has a truth-value. An object's value for an argument can be either of the abstract objects "the True" or "the False." According to Frege, the concept *being human* is understood as a function that has the True as value for any argument that is human, and the False as the value for everything else. In Frege's terminology, an object for which a concept has the True value is said to "*fall under*" the concept. Any sentence that expresses a singular proposition is

an expression. The singular proposition is addressed by a proper name or a general term: that definite article that signifies an object together with a predicate. According to Frege, along with a verb, the concept is signified by the general term accompanied by the indefinite article, or an adjective. According to Tarski (1995), this distinction was of fundamental importance in the development of logic and mathematics.

Using Frege's framework, Peacocke (1999) established his own theory of concepts. He defined them as constituents of contents that are associated with singular expressions and logical expressions as well as with predicates. According to Peacocke, a concept can be individuated by providing the conditions a thinker must satisfy in order to possess that concept. He explains:

Concepts C and D are distinct if and only if there are two complete propositional contents that differ at most in that one contains C substituted in one or more places for D, and one of which is potentially informative while the other is not. (Peacocke 1992, 2).

In other words, C and D embody differing modes of presentation. For Peacocke, the account of a given concept is based on its semantic value, which determines the theory of the concept. In comparison to the analytic approach, which addresses a term's value, Barthes (1975), using the postmodern and deconstructionist framework, looks at how language manipulates society's ideology. He defines myth as a reference to the theory of second-degree sign systems and semiotics. More specifically, he looks at the uses of

special language, distinguishing the mythic system from language per se, and makes a distinction between “signify” and “signifier” with regard to myth. (The meaning of signifiers will be discussed more fully below). To “signify” is to represent; a “signifier” is a perception of a representation. For Barthes, the signified is the concept, and the signifier is the acoustic image based on Saussure’s definition (1916/1983). Myth, Barthes explains, encompasses photography, films, reporting, shows, and publicity. Barthes, in his later works, defined the term differently and each time in a different context.

According to Webster (1984, 785), the term “myth” is defined as a traditional story accepted as history; it serves to explain the world view of a people. According to Gaines (2002), semiotics offered specialized tools to address the problem of explaining the term “myth.” Gaines saw semiotics as a unique theoretical position that can serve to draw together linguistic, cognitive, philosophical, historical, social, and cultural perspectives, unlike any other frameworks. Gaines recommended more research about the term “myth” and Peirce’s definition of the term.

2.3 On Concept “Maps”

According to Webster (1984, 725), the term “map” is defined as a representative act, and the process of making graphic representation. “Concept mapping” is a term said to be developed by Novak and Gowin (1984), though in fact it was employed as early as the 1930s. The technique has provided visual representations of knowledge structures in academic and business settings since the late 1980s. Novak and Gowin defined it using three key terms: concept, proposition, and learning. According to these theorists, the label

for most concepts is a single word, although sometimes we use symbols such as “+” or “%.” Propositions are statements about some object or event in the universe. They can be either naturally occurring or constructed. They contained two or more concepts connected with other words to form a meaningful statement. Sometimes these are called semantic units, or units of meaning. The term “learning,” according to Novak and Gowin, stresses the important role of prior knowledge in students’ acquisition of new concepts. They explained that the representation of concepts and their relationships in graphical form provides a visually rich format for representing knowledge in different ways. However, Novak and Gowin did not refer to the philosophical discussion of the term “concept,” nor did they provide a history of the use of concept mapping.

An early publication that used concept maps was Barr’s 1936 work. In this publication, Barr, an art historian and the founding director of The Museum of Modern Art in New York City, used the maps to describe the major movements in art and their influences on the development of the modern abstract art movement. Barr’s maps consist of nodes and arcs, and he adds the additional dimension of time to represent the development of abstract art.

2.4 On Knowledge Representation and Visualization

Many researchers, from the fields of philosophy to cybernetics and knowledge organization, have discussed the subjects of knowledge representation and knowledge visualization. Their discussion focuses on the term knowledge and the problems of

representing it in information systems. The term knowledge can be traced as far back as ancient Greece where it occurs in Plato's *Theaetetus* dialog (360BC). Plato's three measures of the term consist of: Perception, True judgment and True judgment with an account lay the foundations that the term knowledge can be belief. However, nowadays, the term knowledge carries many more aspects, especially in regard to the context of the language. According to Espinheiro de Oliveira (2002), the term "knowledge" is directly connected to the term information, where both terms are documented in two forms: in the written text and in the subject's memory. While Kwasnik's (1999) discussed the term knowledge representation in the field of knowledge organization makes a special note of the term knowledge by making a distinction between observing, perceiving, or even describing things, and truly knowing them. Knowing, according to Kwasnik, is a process of integration of facts about objects and the context in which the object and process exist. Kwasnik does not discuss the role of language with regard to process-involved knowledge.

As mention above the term knowledge can be traced back to Plato's dialogs but so can the term knowledge representation. According to Luigi Borzacchini (1992), *Theaetetus* poses such big problems because its language falls short of representing the knowledge it represents. In the field of knowledge organization, the representation on knowledge-based text in the form of: citation, abstract, bibliographic record, catalog, bibliographic classification schemes and others reflects the object being represented as well as the subject doing the representation was discussed by many. Mai (2001) reported that the fundamental problem in the field is the connection between language and its meaning

with regard to knowledge representation. Mai addressed the problem by examining Peirce's philosophy of the term "sign" to provide better comprehension of the indexing process than traditional procedures have provided. Morrissey (2000) added to the term "knowledge visualization" by examining it in the context of the term "works." She had also examined the term "knowledge visualization" by exploring how scientific works have been organized on the Internet. Gelernter (2007) discussed the visual classifications that are available to digital library collections. She added the term "infoviz" to examine how digital library can organized their classification over the Internet. She outlined four approaches that include: concept maps, tree map, self-organization map (SOM), and Tree-Dimensional representation. While in the field of artificial intelligence many researchers study the term knowledge representation with regard to concept map. In particular, Sowa (1979, 2000) examined the relationship between the terms "knowledge representation" and "concept mapping." Sowa evaluates only one form of concept mapping, "concept graphs." He added another dimension to his investigation by examining Peirce's semiotics philosophy, and found that knowledge representation is a multidisciplinary subject that can be applied to theories and techniques from three other fields: those of logic, ontology, and philosophy. Pfeiffer and Hartley (2000, 3) have criticized Sowa's interpretations of knowledge representation as focusing on declarative knowledge but neglecting to address procedural knowledge.

To sum up, the studies I outlined in this review provide us insight as to why semiotics theories provide us better insight to the importance of the terms knowledge and

knowledge representation in terms of the language we use. However, I did not find any discussion linking the terms: knowledge, knowledge representation and concept maps.

In general terms, concept maps can be considered sophisticated visual “signs.” That is, concept mapping represents knowledge in the form of electronically monitored displays, as signs represent events or things that receive direct attention, or are indicative of other events or things. Unlike the discussion to the term sign, concept map never been examined with regard to rules and classification in the field of knowledge organization. Concept maps consist of text and images, and links, which describe the relationship between the nodes and arcs. The nodes are labeled with descriptive text, representing the "concept," and the arcs represent the type of relationship between them. According to Lambiotte, et al. (1984), the relationship between the nodes and arcs in the map represents the connection between the term knowledge and language. They outline that a relationship between the nodes and arcs can be directed or undirected between two nodes as we experience in the language to the term knowledge. A directed relationship points from one node to another. As illustrated in Figure A1, two nodes labeled “Fruit” and “Tree” might have an arc between them called "grow on," with the arc directed from Apples to Trees, indicating that Apples grow on Trees.

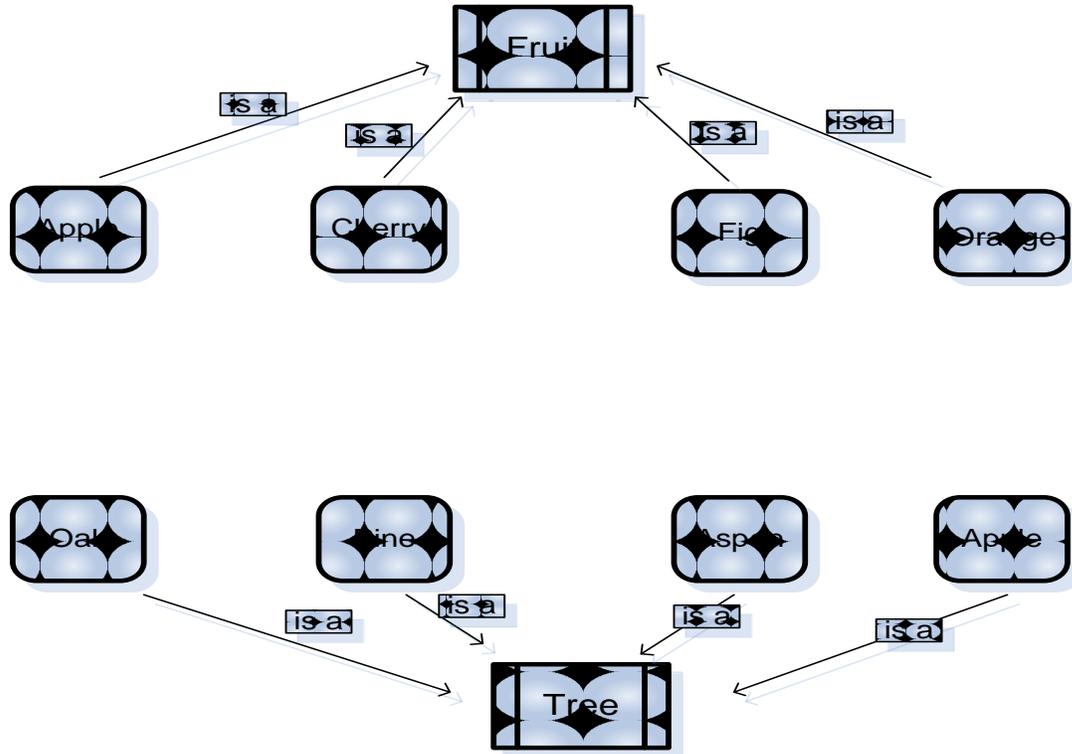


Figure 1. A direct relationship between arcs and nodes in concept maps.

In comparison to the short history of the term “concept mapping,” the term “sign” has been the subject of long philosophical debates in the field of semiotics. The importance of semiotics can be found in a famous quotation by Paddy Whannel: “semiotics tells us things we already know in a language we will never understand” (c.f. Seiter 1992, 111).

2.5 On Semiotics and the term “Signs”

Semiotics, the study of signs, is derived from philosophical speculations on signification and language (Chandler 2004, 5). The first known reference to the term “sign” can be found in ancient Greek, where it appears to be connected to the word *Semeion*, which stands for “mark” or “sign.” Chandler (2004) provides references from Aristotle’s

writing, where Plato's Cratylus Hermogenes urges Socrates to pay close attention to the signifier and signified of the “sign.” The first recorded debate on the meaning of the term took place in ancient Greece between the Stoics and the Epicureans. According to Cobley and Jansz (1997, 13), the debate concerned the differences between the natural and conventional meanings of the term “sign.” The natural perspective saw the sign as a process freely occurring in nature, whereas the conventional view was that signs were part of communication. Cobley and Jansz note that the debate influenced how philosophers interpreted the term “sign.”

In the 19th century, deliberation on the meaning of the term continued in two schools of thought that provided different interpretations. The first was represented by the American philosopher Charles Sanders Peirce, who proposed the study of “sign” as “*semeiosis*,” which aims to study all sign phenomena. Peirce offered a triadic foundation of the term, where anything can be a sign as long as someone interprets it as “signifying” something, referring to, or standing for something other than itself (Peirce 1931-58, 2.302).

Ferdinand de Saussure called the study of signs “*semiology*” --the study of the life of signs in society. He proposed a “*dyadic*” or two-part model of the term “sign.” The “sign,” according to Saussure, is made up of the *signifier* (the mark or sound) and the *signified* (the concept or idea). The terms cannot be conceptualized as separate entities, but rather as mapping from significant differences in the speech act. For Saussure, signs stand for something else, whereas language operates as a sound system of signs.

According to Saussure, words are not merely names that represent things but are expressions that stand for some content. Peirce also discusses the terms “signifier” and

“signified,” but for him, the theory is not about the language, but the production of meaning. Peirce uses a triangular model consisting of object-sign-interpretant. He maintains that a “sign” is anything that stands for something in somebody's mind. The signifier, for Peirce, stands for the *Representamen*, which is the form, not necessarily material in nature, that the sign takes. The signified for Peirce is the *Object*, which is that to which the sign refers. Peirce adds an additional element, the *Interpretant*, which is the sense made of the “sign” (Peirce, 1931-58, 3.399).

2.5.1 Charles Sanders Peirce

According to Peirce’s semiosis model, a “sign” is generated on the basis of another sign, and then another process occurs. This unlimited loop continues to generate additional signs. Umberto Eco uses the phrase “unlimited semiosis” (1976, 121) to refer to the ways in which this could lead (as Peirce was well aware of) to a series of successive Interpretants, potentially ad infinitum.

Peirce’s semiotics also refers to all signs, whether language or non-language, as components of all forms of meaning. He explains that, "All the universe is perfused with signs, if it is not composed exclusively of signs" (1983-1913, 489). For him, signs are not just words, and meaning is not necessarily a product of convention or language (1931-1958, 181-183; 251-252); Peirce proposed the Triadic “sign” which consists of a semiotics triangular representation of signs. The triangle consists of Representamen, Interpretant, and Object and together they form a “sign.” He further classified the *Object*

element into *icons*, *indexes*, and *symbols*. He defines an icon as similar to its subject; iconic signs carry some quality of the thing they stand for, just as a portrait stands for a person. An index is physically connected with its object, an indication that something exists. The last element is the symbol, which is linked by convention with its object. Symbols are conventional, like most spoken and written words, and are subject to a more closed than open interpretation process (Peirce, 1931-58, 2.408). For Peirce, words operate within a conventional and are usually taken to be illustrative rather than verbal signs. The correspondences between index, icon, and metaphor led Jakobson (1915) to study the linguistic instances in the language with special attention to the term symbol. He reported that some words operate as a form of icons and symbols in the language, but those words can not be understood without reference.

The most important part of Peirce's philosophy and classificatory schema consists of his division of signs' conditions. Peirce breaks the three main categories, which include Interpretant, Representamen, and Object, into: (1) Firstness--"the mode of being of that which is such as it is, positively and without reference to anything in itself" (Peirce 1931-58, 2.411); (2) Secondness--"the mode of being of that which is such as it is, with respect to a second but regardless of any third," (2.432) which can be described as the representation or *Vorstellung*, a representation that is made by the perceiving subject of the object-in-itself; and (3) Thirdness--"the mode of being of that which is such as it is, in bringing a second and third in relation to each other" (2.446). Peirce refers to the relationship between the object and the concept of it as a relationship that is expressed as a "sign." According to Peirce (1983-1913, 2.483):

A sign or representamen is something that stands to somebody for something in some respect or capacity. It addresses somebody, which creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the interpretant of the first sign. The sign stands for something, its object. It stands for that object, not in all respects, but in reference to a sort of idea. The relation of an object which is in relation to its object on the one hand and to an interpretant on the other in such a way as to bring the interpretant into a relation to the object corresponding to its own relation to the object.

“Firstness” is the first awareness of a thing separated by our perception from the sensuous manifold. Its existence is either dependent on its being in the mind of some person, or in the form of sense or thought considered by that person. The next category is the "resistance," or an interruption of the initial awareness. This interruption, which calls us to an awareness of our state of awareness, is a Secondness. According to Mai (1991, 599), who cited Hoopes: “secondness is the dyadic mode which tells something about another object.” Thirdness is the relationship between Firstness and Secondness; it is a relationship of linguistic signs. Meaning is not inherent, according to Peirce, but something one makes from signs (Peirce, 1983-1917, 2.489). Expression--verbal, written, or otherwise--is the awareness of awareness, which is the Secondness of Firstness, a Thirdness.

As discussed above, in Peirce's semiotics theory, Representamen, Object, and Interpretant are sub-classified to the Firstness, Secondness, and Thirdness categories. However, Peirce also named Firstness, Secondness and Thirdness with sub titles and sub-attributes for each sub-category. In the case of Representamen category, the firstness is called Qualisign, where the Secondness is called Sinsign, and Thirdness is called Legisign. The Qualisign (Firstness) functions like a sign by the quality of its operators. The Sinsign (secondness), is a specific spatio-temporal thing or event that functions like a sign; and a Legisign (thirdness), means a conventional sign between Qualisign and Sinsign. Under the Interpretant category, which is composed of Firstness, Secondness, and Thirdness classifications, Peirce titled the three categories as Argument, Dicent and Rheme. The Argument (Firstness) is, as the name suggests, the argument and reasoning behind the sign. The dicent is a sign interpreted at the level of secondness. It functions like a logical proposition, which establishes a relationship between constants (a subject [what we are talking about] and a predicate [what we say about it]) and it is either true or false. The rheme is the thirdness structure, thus, in implementing the relationship between the Argument and Dicent, it does not refer to anything "else" but the qualities of the representamen, which are also the qualities of a whole class of possible objects. The last classification is the Object, which consists of Icon (Firstness), Index (Secondness) and Symbol (Thirdness). The icon (Firstness) has a double role between the Object and the Sign. Peirce adds, "every picture is an icon" (2.279). The icon (Firstness) is a sign which itself demonstrates the qualities of its "dynamical object." An index is a sign that demonstrates the influence of its "dynamical object." A symbol is a sign which is interpreted to be a reference to its "dynamical object" but connects the icon (Firstness)

and index (Secondness). Although the many classification Peirce provides to the term sign, Chandler (2004) argues that we rarely mistake a representation for what it stands for, especially when dealing with graphic representation.

Christiansen (1988) and Chandler (1999) represent this relationship in a concept-mapping diagram. Figure 2 represents the “semiotics triangle” classification of signs based on Peirce’s theory.

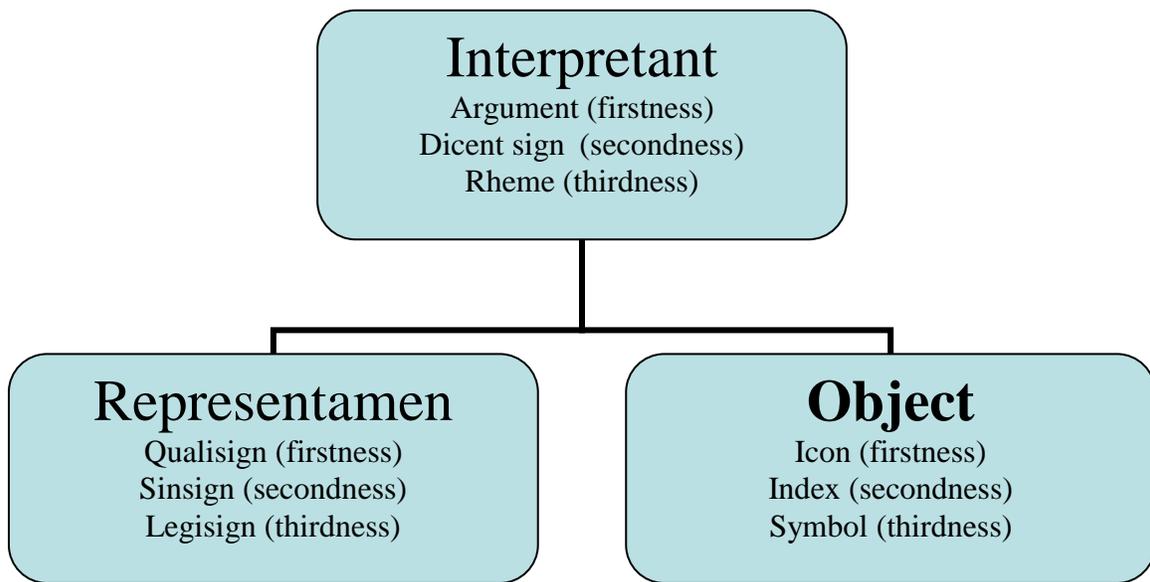


Figure 2. Peirce’s triangle classification of the term sign.

Next, I will examine Ferdinand de Saussure’s interpretation of the term “sign.”

2.5.2 Ferdinand de Saussure

Saussure (1916/1983) examined the relationship between speech and the evolution of language, and investigates language as a structured system of speech signs. He concentrated on the structure of language in which meanings are constituted by words exchanged in governed human speech systems, and offers a “dyadic,” or two-part model, which consists of a signified and a signifier. For him, a “sign” is formed from the union of the signifier and the concept it represents. The connection between them is arbitrary and conventional, but only through their union are significant sounds and ideas articulated. Saussure’s approach looks at the “sign” in terms of a single given timeframe, and, in a diachronic study, compares the same language at different times. Figure 3 represents Saussure’s dyadic approach to the term “sign” (Chandler, 2004, 12). The relationship between the signified and signifier do not connect at any stage as illustrated in Saussure’s dyadic map.

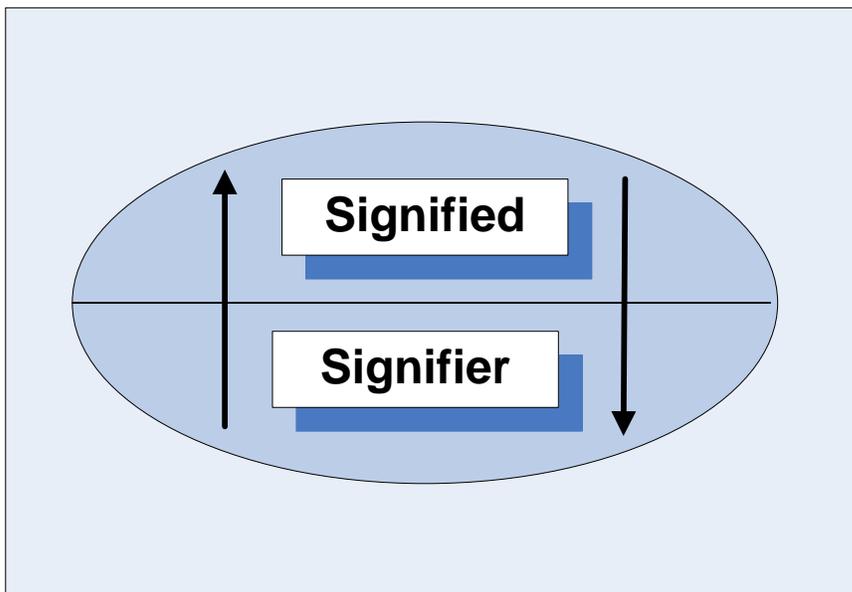


Figure 3 Saussure’s Dyadic semiotics approach to the term sign.

This approach allows Saussure to examine two forms of rules: the first is the patterns existing in the system, and the second is the linear nature of the signifier, which exists because "auditory signifiers have at their command only the dimension of time" (Chandler, 1994). The signifier represents a span, which is measurable in a single dimension" (Chandler, 1994, 21) -- that of time. Saussure draws a distinction between language (*langue*) and the activity of speaking (*parole*). For him, language is a system of signs that evolves from the activity of speech. It is a link between thought and sound, and provides a means for thought to be expressed as sound. In order for language to occur, thoughts have to become ordered, and sounds have to be articulated. For Saussure, a linguistic sign is a combination of a concept and a sound-image.

Meaning, in Saussure's theory, arises within the language system through *relations of association and opposition* (Saussure, [1916]1983, 119):

Two signs, each comprising a signification and a signal, are not different from each other, but only distinct. They are simply in *opposition* to each other. The entire mechanism of language is based upon oppositions of this kind.

There are two types of relationships between the signifier and signified: *syntagmatic* and *paradigmatic*. The former operates through linear ordering and restriction (e.g., in the phrase "The department chair," the syntagmatic association of "department" restricts the possible interpretations of "chair"). Paradigmatic relationships express similarities of

sound or meaning between signs. In fact, signs acquire their meanings only through these structural relations (Saussure, [1916]1983, 113):

A language is a system in which all the elements fit together, and in which the value of any one element depends on the simultaneous coexistence of all the others. In a given language, all the words which express neighboring ideas help define one another's meaning.

This, he goes on to say, applies not only to words, but also to sounds and more complex structures such as grammatical units.

The major difference between the two thinkers lies in the fact that Peirce examines how meanings and representations come about, while Saussure examines the structure of the system in which meanings and representations take place. That is, a Peircian question would be “how are meanings produced in an individual?” while a Saussurian one would be “what is the structure of language through which an individual finds himself to be represented as an individual?” (Sebeok, 1994, 157). Chandler (1999, 65) summarizes the differences between Peirce and Saussure with regard to the term “sign” as follows: the roles of spoken word vs. the written, of the signifier and signified, of time and of language and its meaning. Additional major difference between Peirce and Saussure was discussed by Silverman (1983). According to Silverman, Peirce's classification is based on comparison (kind of sign), on performance (or ground of comparison) and on thought (or the kind of object that is being compared). Saussure on the other hand saw that

‘language’ has ‘organized thought coupled with sound’; and ‘each linguistic term is a member, an “articulus” in which an idea is fixed in a sound and a sound becomes the sign of an idea.’ (Saussure, [1916]1983, 114). More recent scholars continue to examine the term “sign.” This study will review the following works that deal with the term: Morris (1938), Barthes (1975), Eco (1976), and Sebeok (1977).

2.5.3 Social value and the role of the individual

Scholars continued to study the term “sign” throughout the 20th century. Morris (1938), considered to be Peirce’s follower, divided it into three different parts: Syntactic, Semantic, and Pragmatic, which can all interact. The term “syntactic” stands for the study of the relationship between the systems, whereas “semantic,” refers to the relationship between the system of markers and other things. The “pragmatic” aspect Morris proposes is the study of “the relation of signs to interpreters” (Morris, 1938, 6). In support of this, he proposed adding the category “interpreters,” which comes from the field of human behavioral psychology, to Peirce’s categorization. For Morris, all behavior is goal seeking: the organism selects a desirable object (orientation), performs appropriate actions (manipulation), and fulfils its desire (consummation). Morris (1938) asserts that signs signify when an interpreter reacts to their appearance as though he or she had interpreted the semantic content. This is a behaviorist account of the sign-interpreter-signified communication triangle. It shows that the only connection between the appearance of the sign and its semantic content is the production of behavior, and it is therefore dependent on the culturally-determined disposition of the interpreter. This

behavior is the only means of assessing whether communication at the semantic level has taken place.

Barthes (1975) added additional dimensions to the term “sign” by analyzing it in the context of denotation. The term denotation in Barthes writing is concerned with the reference that a sign has to its objects, and the objects are collectively known as the denotation of the “sign.” According to Chandler (1999), denotation produces the illusion of transparent language, and of the signifier and the signified as being identical. Barthes discusses “denotation” and “connotation” in the context of the relationship between the signifier and signified, as used in Saussure’s definition of “sign.” He notes that Saussure’s model focuses on the term “denotation,” but that it does not offer an explanation of it by addressing the term “connotation.” Barthes argues that, in photography, connotation can be analytically distinguished from denotation (1977, 15-31, 32-51). However, he marks several shifts in the meanings of signified and signifier, in particular in his work *The Pleasure of the Text* (1973) where he extends the idea that the body, as text and language, is an object of desire.

Umberto Eco (1976) presented yet another point of view, finding that the problematic nature of the term “sign” consists of the sign function, the denotation, the connotation, and the interpretant. He introduces the *referential fallacy* --stating that the fact that a sign exists does not necessarily imply that its object also does. This notion contradicts Saussure’s and Peirce’s sign interpretation theories, which Eco criticizes for lacking accurate meaning (1976, 60). Eco proposes instead the term “sign production,” which he

maintains is a social activity. Its social nature allows for subjective factors to intrude in each individual act of semiosis. He then goes on to describe semiosis as a four part system, as follows: (1) conditions or objects in the world; (2) signs; (3) a repertoire of responses; and (4) a set of correspondence rules between signs and objects, and between signs and responses (Littlejohn, 1999, 71). In addition, Eco provides four stages of analysis of how people use signs. The first stage is recognition, occurring when a person sees a sign as an expression or as something tangible. Next is ostension, which happens when a person uses an example to represent something. The third phase is replica, the use of arbitrary signs in combination with other signs. The last use of sign is invention, which is a new way to organize a code (Littlejohn, 1999, 72). Eco also incorporates in his discussion the terms “denotation” and “connotation” discussed by Barthes (Eco, 1976, 86). Eco supports his “sign production” by establishing the “theory of codes.” These are sets of correspondence rules used by a person or a group within a society. Eco’s work necessitated revising the theory of semiotics. Sebeok (1977) extended the purview of the discipline to include non-human signaling and communication systems, raising some of the issues addressed by philosophy of the mind. He insisted that all communication was made possible by the relationship between an organism and its environment.

These scholars (Morris, Barthes, Eco, and Sebeok) have included social value and the role of the individual in society as essential elements of the term “sign.” Morris (1938) added the role of the “interpreter” as an essential part of the social impact of the term, whereas Barthes (1975) critiqued Saussure with regard to the terms “connotation” and “denotation.” Eco (1976) discussed the role of the theory of codes as part of the definition

of the term “sign production,” where the codes are sets used by a person or group.

Sebeok (1963) studies the semiotics aspect of signs as communication systems between animals, by raising the subject of the mind as an important part of language. Table 1 summarizes the different approaches I reviewed to the term “sign.”

Name	Year	The Sign Components
Charles Sanders Peirce	(1839-1914)	Triadic sign: Interpretation, Representamen and Object
Ferdinand de Saussure	(1857-1913)	Dyadic sign: Signified and Signifier
Morris, Charles, W.	(1901-1979)	Proposed triadic sign – in terms of Syntactic, Semantic, and Pragmatic.
Barthes, Roland	(1915-1980)	Discussed the dyadic “sign” in terms of denotation and connotation.
Sebeok, Thomas, A.	(1920-1991)	The study of semiotics to include non-human signaling and communication systems.
Eco, Umberto		Proposed the term sign as “sign production.”

Table 1 summarized the five major semiotics theorists reviewed in this chapter.

2.6 Summary

Concept maps, widely used in academic and business settings, provide visual representations of knowledge structures. Signs, essential representations of meaning, are closely related to concepts and their maps. The study of these signs is called Semiotics, a term that was developed by the ancient Greeks. According to Culler (1981), the major contributors to the study of semiotics in the modern times are Saussure and Peirce. Crow

(2003) maintained that these two theorists were concerned with structural models of the sign, and concentrated more on the relationship between its components than any ancient theorists ever did. Chandler (2004, 3) finds that modern scholars in various disciplines still study Peirce's and Saussure's models:

Semiotics involves the study not only of what we refer to as "signs" in everyday speech, but of anything which "stands for" something else. In a semiotics sense, signs take the form of words, images, sounds, gestures and objects.

Peirce's and Saussure's approach to the term "sign" and the study of semiotics are different. Peirce referred to his general study of signs, based on the concept of a triadic sign relation, as "semiotics." He began writing about the topic in the 1860s, around the same time that he devised his three-category system. He eventually defined semiosis as an "action, or influence, which is, or involves, a cooperation of three subjects, such as a sign, its object, and its interpretant" (Peirce, 1958). He breaks the three main categories into subcategories, which consist of Firstness, Secondness and Thirdness.

For Saussure, the term "sign" represents a "signifier" (significant) - the form that the sign takes; and the "signified" - the concept it represents in the spoken language. Taking the example of a tree, for Saussure the signifier stands for the letters "t-r-e-e," and the signified stands for the concept of tree. Other signifiers could indicate the same concept, and the same signifier could refer to other things; in each case, we would have a different sign. The relationship between the signifier and signified consists of the arbitrary nature

of the sign and the linear nature of the signifier. For Saussure, language can be divided into “langue” (the system of language, the language as a system of forms) and “parole” (the combination and use of those forms). According to Culler (1985) Saussure’s theory is interested in “langue,” in general rules and codes, rather than “parole,” particular cases of language in action.

Saussure and Peirce share a basic understanding of the structure of the sign, which consists of signified and signifier. The signified stands for the concept (or mental content) represented by the signifier, whereas the signifier is the physical embodiment of a sign; in other words, it is the actual material form in which the sign appears. Peirce adds an additional element, the Interpretant, which is the sense made of the sign (Peirce 1931-58, 3.399).

Peirce’s and Saussure’s theories provide the academic community a framework for the examination of current terminologies and approaches to meanings and rules with regard to philosophy of language, interpretation of arts (films and music), the classification of knowledge and much more. In the next chapter I will review the field of knowledge organization research that uses the study of sign.

Chapter 3: THE USE OF “SIGNS” IN KNOWLEDGE ORGANIZATION

3.1 *Introduction*

Knowledge is organized by humans to facilitate information retrieval, which involves the use of recorded knowledge. According to Hjørland (2003), in the Library and Information Science community, knowledge organization means the organization of information in bibliographical recordings, including citation indexes, full-text records, and electronic documents over the Internet. Smiraglia (2005) defined knowledge organization as the construction of theories and tools for the storage and retrieval of documentary entities. Those tools, including catalogs, indexes, and databases, have been constructed to allow the manipulation of and retrieval of surrogate records that represent recorded knowledge. However, records can also comprise non-book material including sound, images, and maps, all of which carry intellectual and physical properties as discussed by many in the knowledge organization community, such as Smiraglia (2004), Svenonius (2005), and Rafferty and Hilderley (2004).

Hjørland recognized Cutter, Berwick, and Richardson, among others, as the major contributors to knowledge organization in the 1900s. E. C. Richardson emphasized that the classification of books in libraries is fundamentally informed by the organization of knowledge, such as that represented in new documents. “In general the closer a classification can get to the true order of the sciences and the closer it can keep to it, the better the system will be and the longer it will last” (Richardson, 1964, 33). Richardson

saw a direct relationship between the practice and the mind of the organizer, as did other pioneers of the time. Nowadays, more data is being produced and it is stored in a greater variety of formats; works may be digital or electronic as well as print or other more traditional physical formats. This means that classification has become much more complex. In addition, the ability of the independent home user to publish creates more work that can be harder to classify and organize within single scheme than the pioneers in the field envisioned. The search for “true order” in science and in knowledge organization in particular is still insolvable, making it hard to create a direct relationship between practice and the mind of the organizer. As a result, modern thinkers see the field as more complex.

Anderson (1996) saw the goal of knowledge organization as providing for every type and method of indexing, abstracting, cataloging, classification, records management, bibliography, and creation of textual or bibliographic databases that aim for information retrieval. Beghtol (2001) saw the field as a science that studies the relationship of a system to its culture, where decisions about the kinds of relationships that belong in the system are made from without. Dahlberg (2006) summarized the subject by stating that the field of knowledge organization is the science of structuring and systematically arranging knowledge units, or concepts. This structure is completed by assigning worth to inherent knowledge elements, according to the contents of referents of all kinds. Hjørland (2003) added additional elements to the debate. He found the field an interdisciplinary mix of linguistics, philosophy, semiotics, and sociology. Modern scholars tend to examine the actors in the environment, adding the role of culture to the processes

involved in organizing knowledge. Many modern researchers explore the domain of semiotics in order to examine new approaches to the organization of knowledge.

3.2. Knowledge organization and the term “signs.”

In the field of knowledge organization, numerous researchers use Peirce’s and Saussure’s definitions of the term “sign” to support their particular focus of study. Many of them have studied the semiotics aspect of the term with relation to meaning. I will review studies conducted by Smiraglia (2000, 2001, and 2002), Buckland (1984), Mai (2001), Thellefsen (2003, 2004), Raber and Budd (2003), and many others.

Buckland’s (1984) work, considered a milestone in the field, considers the term “information-as-thing.” He made a distinction between the nature of “information” and that of “document.” Just as he used semiotics to analyze the term “information,” his interrogation of the precise nature of the term “document” examines the term “natural sign” in order to present the subject of things that are informative but without communicative intent. Buckland’s definition to the term “information” opened the discussion on the rule of language in the field of knowledge organization.

Blair (1990) continued the discussion on the importance of language in the field of information retrieval. He based his arguments on Wittgenstein’s philosophy of game language, and the theory of cybersemiotics. Wittgenstein’s philosophy is known for working out the language-reality connection by determining what is required for

language, or language usage, to be about the world. Blair argued that words and expressions should be explained before they can be used in information retrieval, and that combined with Wittgenstein's philosophy, semiotics can provide a better theoretical understanding for practitioners than universal theory aiming to resolve the problem of information retrieval by using computing algorithmic. As Blair has shown, the largest problem in searching and information retrieval is that indexers and searchers do not participate in the same language game.

Warner (1990) found that information science scholars need to address the semiotics framework and their attributes to the language. According to Warner, information science literature has functioned predominantly by Anglo-American rules, whereas semiotics was developed in Europe by the structuralist movement. Warner identified the signifier, as opposed to the sign and signified that Saussure's theory proposes, as the most dominant distinction between written language and that of computer programs.

Suominen (1998) discussed the nature of semiotical documentary language as a better way to manage the retrieval of documents in today's multi-layered cultural environments. In order to address these problems, Suominen applied Saussure's sign theory. This allowed him to earmark the view that the content representation of documents can address the problem of organizing knowledge and instead suggests that notion of (semiotics) documentation as better communication channel to organize today's knowledge in the diverse environments.

Smiraglia (2000 and 2001) discussed both Peirce's and Saussure's definitions of the term "sign" in contrast to the nature of the term "works." According to Smiraglia, "works" contain representations of recorded knowledge. An analysis of Saussure's "sign" shows that it and Smiraglia's "works" share similarities with regard to time and the dyadic structure that they necessarily hold. Smiraglia found that analyzing the *signifier* (the mark or sound) and the *signified* (the concept or idea) enabled him to extrapolate additional information about the term "works." Smiraglia defined the term "work" thus (2001, 129):

A work is a signifying concrete set of ideational conceptions that finds realization through semantic or symbolic expression. That is a work embraces a set of ideas that constitute both the conceptual (signified) and image (signifier) components of a sign. A work functions in society in the same manner that a sign functions in language.

The signified of the term "work" relates to the term "utilizes," whereas its signifier holds the semantic content of terms as they apply to the various cultural perspectives representative of various communities. Using semiotics analysis, Smiraglia found the term "work" to be an important part of information retrieval and knowledge organization. He believed a comprehensive understanding of it can help librarians and other experts to understand better how to control and retrieve information and knowledge.

Mai (2001) discussed the direct relationship between semiotics and indexing. He maintained that the process of indexing involves the interpretation and representation of

documents: this activity is highly dependent upon social and cultural context. He believed that the literature reveals a lack of deep discussion on the last step of classification that produces the subject entry in the catalog, meaning the presentation of the record.

According to Mai, Peirce discussed how the meanings of various words and expressions are produced in individual settings. He argued that Peirce's definition provides a more descriptive analysis of the process of indexing and classification that indexers must necessarily go through to achieve their objectives. Mai claimed Blair did not examine Peirce's definition of the term "sign" in the context of indexing and classification.

Raber and Budd (2003) matched the term "information" to Saussure's definition of the term "sign," and they explore the theoretical possibilities of the term "information." Saussure's semiotics provided Raber and Budd with a framework within which they assert that the term "information" can, indeed, hold cultural phenomena that was not ruled by Buckland. Radford and Radford (2004, 66) recommend that instead of searching for the meaning of the term "information," it would be better to find the relationship between the terms "signifier" and "signified," as Saussure proposed in his dyadic sign model.

Furner (2004), who analyzed Buckland's definition, made additional distinctions between Buckland's "signal" and his "message," finding that Buckland drew his terms from the philosophy of language. He maintained that Buckland's category of "information-as-knowledge" (where the concept of information is understood to designate messages) came from two fields: the mathematical theory of communication, and semiotics. Furner

(2004, 423) found that Buckland used “signifier” and “signify” in his definition of information-as-knowledge in order to make his case for information-as-thing. Furner found that the term “information” required no category or label in order to be differentiated from other terms in the field.

Thellefsen and Thellefsen (2003 and 2004) found that applying general language theory to a scientific or specialized field like knowledge organization required a theory of the nature of special language and terminology. He studied special language as serving a specific purpose in the field of knowledge organization. This sub-language is defined by the community in which it evolves, in order to communicate knowledge in an unambiguous way. In order to start an investigation, he recommended that one should first consider the epistemological bases of the situation under study, where the knowledge domain involved creating vocabularies in information systems that served as a process of categorization for the basic terms of one’s research. The process of categorization, according to Thellefsen, involved subject analysis and descriptions where special language exhibits special rules. In his investigation of the term “special language,” he considered that of “terminology,” applying Peirce’s principles of the maturity of a knowledge domain relevant to any particular investigation. “Terminology,” according to Thellefsen, includes documents, document surrogates (the bibliographic record), and subjects. He also asserted that the added value of analysis of the term, and of special language in the context of knowledge organization, is to aid in vocabulary control in the thesaurus environment.

Thellefsen (2004) also discussed the term “knowledge profile” in the field of organization. He defined it as way to identify the epistemological basis, both scientific and nonscientific, of a domain. He used Peirce’s framework to establish the term. According to Thellefsen, providing a more established way of examining knowledge profiles in the field will provide a better understanding of the domain and allow users to better interact with the knowledge.

Baiba (2005) examined the role of linguistic activity of language in the field of knowledge organization. Using activity theory, she analyzed semiotics theories and determines the similarities of knowledge organization methods and tools. She found that a document may have different representations depending upon the information it contained, and that an analysis of the linguistic aspect of the document’s meaning may provide additional elements that have never been studied before.

Søren (2006) examined the semiotics connection between Blair’s (1990) work and Peirce’s philosophy, and finds that meaning and signification do not have much to do with informational bites. The clash between the two views (the informational, which consists of sciences, and the semiotics, consisting of the humanities) means they will never obtain a full view of the subject and object. Søren suggested a replacement for the current foundations of information science, in the area of information retrieval, that will address the semantic production of meaning but also provide informational view of the subject.

In a study focused on indexing, Biagetti (2006) added Morris's philosophy (1938) to the discussion on semantic indexing, for a better understanding of subject indexing in the field of knowledge organization. According to Biagetti, the indexing process is linked to the Pragmatic aspects of Morris's theory, which can assist in the process of indexing and classification. By examining Morris's philosophy, Biagetti added an additional dimension not examined in the context of semantic indexing: the pragmatic approach. Further, Biagetti supported Morris's approach by examining multi-modal indexing.

Sheng-Cheng (2006) studied "user behavior" in accessing information, and found that Peirce's semiotics framework provides a way to study the lack of a holistic approach to information-seeking behavior. Sheng-Cheng established three principles to determine the consequences of a systematic inquiry for information access: the judgment of the access, the relationship of the steps of the inquiry, and the pragmatic dimension of the nature of the behavior.

Warner (2007) used analogy between Saussure's sign theory to Shannon's theory of information to report its usefulness in respect to full-text retrieval. Warner evaluated Saussure's theory regarding indexing, searching and retrieval and compared it to Shannon's theory regarding a more accurate measurement of the frequency of occurrence of word and sequences in information retrieval episodes. Warner reported that by combining Saussure and Shannon theories into one paradigm to evaluate full text retrieval sequences of more than one word in chronological order produced a weakly chain of cohesive units.

3.3 Summary

In the field of knowledge organization, many researchers have discussed the importance of language by addressing the term “sign” to support their particular study. Some, including Buckland (1984), Raber and Budd (2003), Smiraglia (2000, 2001 and 2002), Thellefsen (2003 and 2004), and Furner (2004), used semiotics to examine the meaning of words, expressions, sentences, and texts. Others used it to examine the procedures of knowledge organization. These include Mai (2001), Biagetti (2006), and Sheng-Cheng (2006). Next, I will report on the characteristics of research in the field of Knowledge Organization.

3.4 *The Characteristics of Research in the Field of Knowledge Organization.*

According to Budd (2001), Hjørland (2003) and Smiraglia (2002), the emphasis on epistemology in both research and practice has influenced knowledge organization research. Epistemology is the investigation into the grounds and nature of knowledge, epistemological theories seek to discover the nature, origins, and limits of human knowledge. Hjørland (2003) outlined the history of epistemological research in knowledge organization, suggesting an evolution from empiricism, rationalism, and historicism to pragmatism.

Empiricism is a theory of knowledge that emphasizes human experience as the source of all knowledge. This doctrine was first explicitly formulated by John Locke in the 17th century. He argued that the mind is a tabula rasa ("clean slate") on which experiences

leave their mark. In contrast, the rationalism school of thought proposed that reasoning is the basis of all knowledge. According to Bourke (1962), rationalists argue that the criterion of truth is not sensory but intellectual and deductive. The historicist view is that beliefs can be understood only in relation to the whole moral and local conditions and peculiarities that influence the results in a decisive way. G.W.F. Hegel, Karl Marx, and Karl Popper all supported the historicism movement, which emphasized the importance of history as way to acquire new knowledge. The pragmatism movement shows that truth is the practical efficacy of knowledge. The term “pragmatism,” first used by C.S. Peirce in 1878, describes a doctrine that determines value through the test of consequences or utility.

According to Hjørland, the search for epistemology in knowledge organization is based on the view that the way knowledge is created, used, organized, and shared depends on cultural context and the perspectives on which it is constructed. Smiraglia (2005) reported that the knowledge organization community shares principles and tools that are aggregated by general consensus. However, he found no single formal theory in the field of knowledge organization. As a result, Smiraglia proposed that theory in the field needs to come directly from research, while Hjørland recommended that it needs to be generated from technological perspectives, namely, by following the activity theory framework. The root theory can be traced to Vygotsky's cultural-historical psychology, where the unit of analysis is an activity directed at an object that motivates the activity, giving it a specific direction. Activity theory holds that any activity is composed of a subject and an object, mediated by a tool. A subject is a person or a group engaged in an

activity. An object (in the sense of "objective") is held by the subject and motivates activity, giving it a specific direction. The mediation can occur through the use of many different types of tools, material as well as mental, including culture, ways of thinking, and language. For Hjørland, activity theory provides a framework for his claim that different communities have different needs with regard to the knowledge and research methods they employ.

In terms of semiotics in the field of knowledge organization, there is no formal consensus on a particular research methodology that should be used. The majority of the researchers use empiricism as their preferred methodology of analysis and they base theoretical discussions on empirical derivatives. These new “empiricists” include Smiraglia (2001), Hjørland (2007), Thellefsen (2004), and Mai (2002).

The next chapter will present the methodology of this exploratory study, in which I will report on the relationship between concept mapping and “sign” by examining if the knowledge organization researchers apply the term “signs” in their concept mapping.

Chapter 4: METHODOLOGY

4.1 *Introduction*

The knowledge organization researchers discussed in Chapter 3 employed concept maps and semiotics to present the ideas, findings, and domain-specific terminology used in their respective studies. The discussion and employment of concept maps in the various forms used in the field of knowledge organization have not been studied. This community has had only minimal discussions on the relationship between concept mapping and the term “sign.” I have found only two studies that make direct reference to the relationship between the two: Priss (2000) and Friedman (2006). Both were presented at ISKO conferences.

Using formal concept analysis, Priss (2004) examined the correlation between the formal structure of programming language and concept mappings with regard to Peirce’s definition of the term “signs.” She found that the semiotics aspects of Peirce’s theory have not yet been systematically applied to examining the framework of knowledge representation.

Using content analysis, Friedman (2006) examined the sixth and eighth ISKO conference proceedings with regard to Peirce’s definition of the term “sign.” He found that concept mapping was a standard element of cognitive processing at both events. He asked what relationship existed between the styles and procedures of concept mapping employed in

ISKO proceedings and Peirce's definition of measurable "signs." Friedman did not find any significant or meaningful relationships between Peirce's Thirdness category and Interpretant classifications with regard to concept mappings identified in the two proceedings.

Neither Priss nor Friedman examined Saussure's "dyadic" approach to the term "sign." In fact, I have yet to find a comprehensive study comparing Peirce's and Saussure's definitions of the term, as used in concept mapping within knowledge organization. The use of Peirce's and Saussure's classifications in two different schools of thought has never been directly addressed. Therefore, the aim of this study is to perform such a comparison.

4.2. *Study Methodology*

Similar to the work of Priss (2003) and Friedman (2006), this study used content analysis of the proceedings of the *International Society of Knowledge Organization (ISKO)* and *Advance in Classification Research (ACR)* proceedings of the *Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)* to measure the possible theoretical and conceptual differences between Peirce's and Saussure's frameworks. (I review the conference proceedings in knowledge organization below). Although content analysis has its roots in the study of mass communication, according to Marsh (2006), many in the field of information science (including knowledge organization) use it as their preferred research methodology.

Berelson (1974) defined content analysis as a research technique for the objective, systematic, and quantitative description of the manifest content of communications. A different definition is provided by Krippendorff (2002), who maintained that content analysis is a “research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use” (Krippendorff, 2002, 18). Stemler (2001) provided a more a general description, reporting that content analysis extends beyond simple word counts, providing an alternative method to examine the nature of categorizing the data. In this study, I will use Stemler’s definition in counting all terms found under the classification of Peirce’s and Saussure’s definitions of the term “signs.” Next, I will review the area of investigation.

4.3 The Area of Investigation

I chose to examine the entire conference proceedings in the domain of knowledge organization that are available in publication. This includes the *International Society of Knowledge organization (ISKO) Conference proceedings* and *proceedings of the Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)* titled in this study (*ACR*). No formal investigation was conducted to such length but one can easily find that concept maps are more often used in conference proceedings than in other academic publications. A simple explanation of this phenomenon is that, at conferences, researchers have to fully explain explicit terms and concepts in a specified by relatively short of time and space. In order to convey their information succinctly, they submit papers that use concept mapping as a

substitute for extended text. Employment of concept maps helps researchers to present their findings and ideas in a different way, by providing a different alternative to their text. I chose two major conference proceedings that includes: *Advances in Classification Research (ACR): proceedings of the Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)* is an annual meeting, whereas the *International Society of Knowledge Organization's* conference (ISKO) is biannual. Both conferences had their inaugural proceeding in the same year: 1990. The last printed publication of the Advances of Classification Research (ACR) proceedings of the ASIS&T SIG/CR workshop held in Philadelphia, P.A. on November 17, 2002. Although the workshops still occur, no workshops proceedings have yet been scheduled to be published.

4.4 *The Study Procedure*

This is survey research that examines the entire population of conference papers in the field of Knowledge organization. The study progressed through the following four steps: in the first stage examined the entire contents of both sets of conference papers to discover whether the terms in the concept maps could be identified and classified according to Peirce or Saussure definitions of “sign.” The second stage measured the “most-frequently used” terms in Peirce’s triangle and Saussure’s dyadic classifications in the concept maps. The terms were classified according to Saussure’s definition of Signifier and Signified, and Peirce’s definition of Representamen, Interpretant, and Object. During the third stage, cross-proceedings analysis was conducted to discover

possible relationships between Peirce's triangle model (Representamen, Interpretant, and Object) and Saussure's dyadic model (Signifier and Signified) to the maps' terms. And in the last stage, I examined the most-used format of maps in the two entire conference papers. This study will not measure coordination conjunctions terms and correlative conjunctions terms. According to Raimes (2005, p309-310) correlative conjunctions are terms such as "and," "but," "or," "nor," "so," and "yet." Examples of correlative conjunctions are "either," "or," "not only," "but," etc. Next, I will review the categories that were assigned in this research.

4.5. Assigned Categories

In order to conduct our content analysis methodology, the following categories were assigned to this research:

- Peirce's triadic model of the "sign"
- Saussure's dyadic model of the "sign"
- Representamen – the form which the "sign" takes
- Interpretant – the sense made of the "sign"
- Object – what the "sign" refers to
- Signifier – the form the "sign" takes
- Signified – the concept the "sign" represents
- Other – Concept maps that do not apply Peirce's or Saussure's frameworks

4.6 Study Limitation

A limitation of this study is its lack of examination of the meaning of terms presented in the concept maps. According to Busha and Harter (1980), content analysis researchers often tend to disregard the context that produced the text, as well as the state of meaning of the results after it is produced. I did not examine the meaning and language structure of the terms found in concept mappings in either proceeding. Although both Saussure's and Peirce's theories discuss the meaning of the signs in the language beyond their classification, this study did not examine the linguistic and logical nature of terms found in the authors' concept maps. Future research will be needed to address the subject.

Chapter 5: THE UNIT OF STUDY: KNOWLEDGE ORGANIZATION DOMAIN

5.1 Introduction

According to Schutt (2001), a unit of analysis is a level of social life on which a research question is focused such as individuals, artifacts or even social interactions,. In our study the unit of analysis is the knowledge organization domain. I selected the most dominate conference meeting in the domain of knowledge organization. The two conferences are: (1) *the Advance in Classification (ACR), Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)*, holds an annual meeting and (2), those of the biennial international conferences of the *International Society for Knowledge Organization (ISKO)*. In this chapter I describe the contents of the proceedings as forming our unit of study. I first examine our unit of measurement by analyzing the conference presenter characteristics (occupation and country of employment). In addition, I examine the titles of their papers using Dahlberg's classification system for knowledge organization literature. I then conducted cross tabulation in order to examine the relationship between the author characteristics and Dahlberg's classification.

5.2 The Conference Proceedings as the Unit of Study

I examined the entire contents of the published proceedings of the two conferences that took place during the period from 1990 to 2006, a total of 22 meetings, during which 652

papers were presented. *ACR* contained 158 papers and *ISKO* proceedings contained 494 papers. Table 1 presents the record of both proceedings, including conference title, location, editor(s), and number of papers presented in each meeting from 1990 to 2006. Note that the last printed *ACR* occurred in 2002. The meetings continue but the proceedings are no longer published.

	ISKO	Title	Location	Editor	Number of papers	ACR	Title	Location	Editor	Number of papers
1990	The 1 st	Tools for knowledge organization and the human interface	Darmstadt, Germany	Fugmann, R. (Ed.).	30	The 1 st	Value I	Toronto, CA	Susanne M. Humphrey and Barbara H. Kwasnik	19
1991						The 2 nd	Value II	Washington, D.C.	Fidel, R. and Knwnsik, H	14
1992	The 2 nd	Cognitive paradigms in knowledge organization	Madras, India	Neelameghan, A., et al., (Eds.).	30	The 3 rd	Value III	Pittsburgh, PA	Fidel, R. et.al.	12
1993						The 4 th	Value VI	Columbus, OH	Fidel, R. et.al.	11
1994	The 3 rd	Knowledge organization and quality management.	Copenhagen, Denmark	Albrechtsen, H., & Ørmager, S. (Eds.)	22	The 5 th	Value V	Alexandria, VA	Beghtol, C. et.al.	20
1995						The 6 th	Value IV	Chicago, IL	Schwartz, R.P.	14
1996	The 4 th	Knowledge organization and change	Washington, DC	Green, R. (Ed.).	49	The 7 th	Value VII	Baltimore, MR	Solomon, P.	8
1997						The 8 th	Value VIII	LOCATION		11
1998	The 5 th	Structures and relations in knowledge organization	Lille, France	Mustafa El Hadi, W., Maniez, J., & Pollitt, A. S. (Eds.).	65	The 9 th	VIII	Pittsburgh, PA	Jacob, E.	8
1999						The 10 th	Value X	Washington D.C	Albrechtsen, H. and Mai, J-E.	8
2000	The 6 th	Dynamism	Toronto,	Beghtol, C.,	69	The	Value	Chicago, IL	Kwasnik, B.	16

		and stability in knowledge organization	Canada	Howarth, L., & Williamson, N. J. (Eds.).		11 th	IX		et.al.	
2001						The 12 th	Value IIX	Washington D.C	Efthimiadis, E.N.	6
2002	The 7 th	Challenges in knowledge representation and organization for the 21st century	Granada, Spain	López-Huertas, M. J. (Ed.). (2002).	82	The 13 th	Value	Philadelphia, PA	Beghtol, C.et.al.	11
2003										
2004	The 8 th	Knowledge organization and the global information society	London, England	McIlwaine, Ia C. (Ed.).	54					
2005										
2006	The 9 th	Knowledge organization for a global society	Vienna, Austria	Budin, G., Swertz, C. and Mitgutsch, K.	51					

Table 2. The complete list of all the conference proceedings from both organizations

Next, I examine the characteristics of authors who presented at the conferences.

5.3 Author characteristics

I examined the country of employment and line of work of the authors who submitted their research papers to the two conference proceedings. I first examined the type of work the researchers identified themselves as performing. This was classified into three categories: professor, practitioner and student. I found no major differences between the two conference proceedings regarding the relative proportions of presenters' occupations. In both conference series, the majority of the authors were professors: a total of 456 professors were identified out of 653 authors representing 70% of all the authors who

submitted their papers to both conferences. Table 3 provides a breakdown of the *ACR* conference proceedings according to author occupation.

	Professor/Practitioner/Student
ACR #1	Professor = 63%, Practitioner=26% and Student=11%
ACR #2	Professor = 78.5%, Practitioner=7% and Student=14.5%
ACR #3	Professor = 75%, Practitioner=16.6% and Student=8.33%
ACR #4	Professor = 88.8%, Practitioner=11.1% and Student=
ACR #5	Professor = 81.81% and Student=18.18%
ACR #6	Professor = 80%, Practitioner=15% and Student=5%
ACR #7	Professor = 79%, Practitioner=7% and Student=14%
ACR #8	Professor = 54%, Practitioner=18% and Student=28%
ACR #9	Professor = 62%, Practitioner=13% and Student=25%
ACR #10	Professor = 62%, and Student=37%
ACR #11	Professor = 63% and Student=33%
ACR #12	Professor = 67% and Student= 18%
ACR #13	Professor = 85% and Student =7%

Table 3. The classification of *ACR* presenters according occupation.

Table 4 represents the *ISKO* presenters' occupation.

	Professor/Practitioner/ Student
ISKO #1	Professor = 60%, Practitioner=20% and Student=20%
ISKO #2	Professor = 60%, Practitioner=20% and Student=20%
ISKO #3	Professor = 78%, Practitioner=13%, and Student=9%
ISKO #4	Professor = 64%, Practitioner=24% and Student=12%
ISKO #5	Professor = 80% Practitioner=18% and Student=2%
ISKO #6	Professor = 79%, Practitioner=6% and Student=15%
ISKO #7	Professor = 85%, Practitioner=11% and Student=4%
ISKO #8	Professor = 75%, Practitioner=11% and Student=14%
ISKO #9	Professor = 80%, Practitioner=8% and Student=12%

Table 4. The classification of *ISKO* presenters according occupation

In addition, I analyzed the country of employment of each researcher. I found a major difference in the participants' nationalities between the two conference proceedings.

During the period under examination, most of the presenters at *ACR* were American-based, whereas *ISKO* mainly had European-based presenters. Table 5 presents the top-

ranked occupations and countries of employment of the authors at each *ACR* conference.

	Top Country of Employment	Professor/Practitioner/ Student
ACR #1	USA = 83%	Professor = 63%
ACR #2	USA = 85%	Professor = 78%
ACR #3	USA = 83%	Professor = 75%,
ACR #4	USA = 66%	Professor = 88%
ACR #5	USA = 63%	Professor = 81%
ACR #6	USA = 85%	Professor = 80%
ACR #7	USA = 86%	Professor = 79%
ACR #8	USA = 82%	Professor = 54%
ACR #9	USA = 75%	Professor = 62%
ACR #10	USA = 62%	Professor = 63%
ACR #11	USA = 100%	Professor = 67%
ACR #12	USA = 54%	Professor = 82%
ACR #13	USA = 64%	Professor = 85%

Table 5 The top-ranked professions and countries of employment of presenters at *ACR* conference proceeding

Table 6 provides the top countries of employment of presenters and their occupation throughout ISKO conference proceedings.

	Top Country of Employment	Professor/Practitioner/ Student
ISKO#1	Germany=37%	Professor = 60%
ISKO#2	Germany=36.6%	Professor = 60%
ISKO#3	Italy =59%	Professor = 78%
ISKO#4	Denmark = 26%	Professor = 64%
ISKO#5	USA= 37%	Professor = 80%
ISKO#6	USA =39%	Professor = 79%
ISKO#7	Spain =22%	Professor = 85%
ISKO#8	USA = 33%	Professor = 75%
ISKO#9	USA = 42%	Professor = 80%

Table 6. The top-ranked professions and countries of employment of presenters at *ISKO* conference proceeding

Whereas most of ACR presenters were Americans, I found that the majority of presenters at ISKO conferences were professors who worked in four European countries: Spain, France, Germany and Denmark, while later conferences (2002-2006) saw the emergence of a new major contributing country, the US.

It is interesting to note that in the early ISKO conference proceedings (ISKO # 1,2,3, and 4), the majority of presenters came from the host country. For example, the first ISKO conference proceeding took place in Germany, where the majority of the presenters also came from representing 37%. This trend changed over time: In the last ISKO conference (#9, Vienna, Austria) the majority of the presenters came from the United States with 42%.

To sum up, I examined the entire population of the two conference proceedings to report that the ISKO held more authors and number of papers than ACR. The majority of the contributors to *ACR* were United States-based professors, whereas at ISKO they were professors from European academic institutions. Future studies should address the issue of country of employment and line of work of the participants who contribute to knowledge organization conferences. Next, I will report on the result of the conference papers' titles using Dahlberg's classification.

5.4 Analysis of the Dahlberg's classification

This researcher employed Dahlberg's classification of knowledge organization literature to understand better the topical distribution of papers found in the two conference

proceedings. Dahlberg's (2006) examination of the *journal Knowledge Organization* led her to develop 10 subfield-classification entities that applied specifically to that journal's domain. In order to set the 10 categories, Dahlberg defined the term "knowledge" as references to the facts and individually that existed in field of knowledge organization (2006, p. 12). She then distinguished between the four elements of "knowledge:" knowledge elements, knowledge units, larger knowledge units, and knowledge systems. Knowledge elements are defined as the characteristics of concepts, whereas knowledge units refer to the way I delimit the measurement of knowledge. The third category, larger knowledge units, is defined as a concept-combination between text and definitions. Knowledge systems, Dahlberg's last category, exist when knowledge units are planned and arranged in a cohesive structure.

Dahlberg's ten categories, or theme groups, are (1) general-form concepts (2) theories and principles (3) object classification systems and thesauri (4) activity process (5) property attributes (6) persons (7) institution (8) technology and production (9) application and determination and (10) distribution and synthesis. The first group, general-form concepts, classifies only kinds of documents, which include bibliographic works, conference proceedings, etc. The second category refers to theories and principles regarding indexing and classification in the field of knowledge organization. The next group, "object," addresses classification systems and thesauri that deal with the classification of the object. "Activity process," which is the fourth category, involves methods of classifying and indexing. The fifth category deals with the property attributes of indexing and classification. The next, and sixth category is "person," which deals with

subject-related systems, mainly taxonomy. The seventh group deals with related systems and is titled “institution.” The next class involves concepts from fields (mainly technological) that are related to knowledge organization; the title of this class is “technology and production.” The ninth classification, “application and determination,” covers the methods of the field as applied to document forms and subject contents. It also covers intellectual products in the field. “Distribution and synthesis,” which is the last group, addresses the environment of the field and its social organization, as well as issues of education, law, economics, and service. According to Dahlberg, the first category and last three categories have been found successful in organizing the knowledge organization research entities framework (2006, p. 14). Table 7 sum-up Dahlberg’s ten classification entries.

	Category title:	Function:
1.	General-form	Contains only kinds of documents in the field that capture bibliographies, conference proceedings etc.
2.	Theories and principles	On theories in the field
3.	Object classification	On concepts and concept classes and their elaboration
4.	Activity process	On methods and activities of classing and indexing
5.	Property Attributes	On universal systems
6.	Persons	On object related systems: taxonomies
7.	Institution	On subject related systems
8.	Technology and production	On concepts from other fields relating externally to the field
9.	Application and determination	On methods of the field as applied to document forms and subject contents
10.	Distribution and synthesis	The social environment with regard to knowledge organization

Table 7 Dahlberg ten categories.

I analyzed the 652 papers by fitting them into Dahlberg’s (2006) 10 subfield-classification entities. Table 8 summarizes the entire series of ISKO proceedings, analyzing each one according to Dahlberg’s classification.

ISKO	General form	Theories	Object	Activity	Property	Persons	Institution	Technology	Application	Distribution
#1		2	8	3	3	2	3	8	1	
#2		1	8	4	5		3	8	1	
#3	1	2	6	2	2		2	3	4	
#4	1	7	8	5	3	5	3	8	6	3
#5	1	4	25	12	2	2	6	8	5	
#6	2	8	14	7	5	5	4	9	13	2
#7	3	4	14	4	2	6	7	12	2	
#8	1	13	21	5	4	3	2	11	19	1
#9	2	1	7	6	4	9	2	13	7	
Total	12	42	115	48	30	32	32	90	40	7

Table 8 A summary of the ISKO proceedings according to Dahlberg’s classification

A major difference emerged between the theme groups of titles from ISKO and those from *Advances in Classification Research (ACR)*: proceedings of the *Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)*. Most of the titles of ISKO papers fell into two major groups: “Object,” which ranked at the top, and the “technology” group, which was rank second. Under Dahlberg’s classification, articles classified under “object” group discuss concepts and classification in knowledge organization domain. In every ISKO conference proceeding examined for this study, “object” appeared at least five times or more. The second-highest ranking group, “technology,” based on Dahlberg’s classification discusses concepts from other fields that directly relate to the field of knowledge organization. The “technology” group had strong presence throughout the conference proceedings except during the third ISKO (1994) conference, where none of the papers were classified under

this group. Table 9 represents the top three groups based on Dahlberg’s classification I found in the ISKO proceedings.

Dahlberg's classification	Object	Technology	Application
ISKO # 1	26%	26%	3%
ISKO # 2	26%	26%	3%
ISKO # 3	27%	13%	165
ISKO # 4	16%	16%	8%
ISKO # 5	39%	7%	7%
ISKO # 6	20%	12%	22%
ISKO # 7	20%	17%	2%
ISKO # 8	18%	20%	14%
ISKO # 9	14%	25%	13%
Total	24%	20%	12%

Table 9 A summary of the three leading groups based on Dahlberg classifications found in the ISKO proceedings.

Table 10 summarizes the entire range of article titles from the *ACR* proceedings according to Dahlberg’s classification.

ACR	General form	Theories	Object	Activity	Property	Persons	Institution	Technology	Application	Distribution
#1		2	3	8	2	1		3	3	
#2	3	3		4	2			4	2	1
#3	1	1		1			1	4	2	1
#4		1	1	1	1		1	3	1	
#5			3	5	2	1	2	4	3	
#6	1	1	1	4	1	1	1	3	2	
#7		1			1		1	2	3	
#8	1		2	4	3	1	1	1	2	
#9			4	2	1			3	2	
#10	1	1	1	1	2	1	1		1	
#11			2	2	3	1	3	1	2	
#12		1	2	1		1	1	1		
#13		1	2	1	1	2	1	2	1	
Total	7	12	22	36	19	9	14	31	24	2

Table 10 The entire range of paper titles from *ACR* proceedings, analyzed using Dahlberg’s classification

The most dominant group-theme classification in the *ACR* proceedings was “activity component” which appeared in 12 out of 13 conferences. According to Dahlberg, the “activity” group holds on the methods and actives for classifying and indexing entities. In the second place was the group “technology”, which was one of the top groups in ISKO. The third group “application” discusses methods of the field applied to classify documents and data classes. Table 11 summarizes the top three groups found in *ACR*.

Dahlberg's classification	Activity	Technology	Application
ACR # 1	25%	15%	15%
ACR # 2	28%	28%	14%
ACR # 3	8%	25%	16%
ACR # 4	9%	27%	9%
ACR # 5	25%	20%	15%
ACR # 6	24%	20%	14%
ACR # 7	12%	28%	37%
ACR # 8	36%	9%	18%
ACR # 9	25%	12%	25%
ACR # 10	12%	12%	12%
ACR # 11	12%	6%	12%
ACR # 12	16%	16%	6%
ACR # 13	9%	9%	9%
Total	20%	17%	13%

Table 11 A summary of the three leading groups according to Dahlberg classifications found in the ACR.

Although the ISKO and ACR proceedings shared the group “technology,” in ISKO this was the top-ranked classification, whereas an analysis of the ACR showed it was only the second-highest ranking. Another difference between the conference proceedings was with regard to the “activity” group: in ACR this was the highest-ranking term, but in ISKO it was a relatively distant sixth place. Next, I will apply cross tabulation analysis on the three categories examined.

5.4 Cross Tabulation

I conducted cross tabulation analysis on the three categories (country of employment, occupation and Dahlberg’s classification) to see whether similar patterns could be found. First, I analyzed 652 papers by fitting them into the two categories: Country of employment and Dahlberg’s classification. Figure 4 summarizes the entire series of ISKO proceedings according to the two major categories: Country of employment and

Dahlberg's classification. Additional notes need to be addressed to Figure 4. The figure represents the top 18 major counties who contributed more than 3 papers or more.

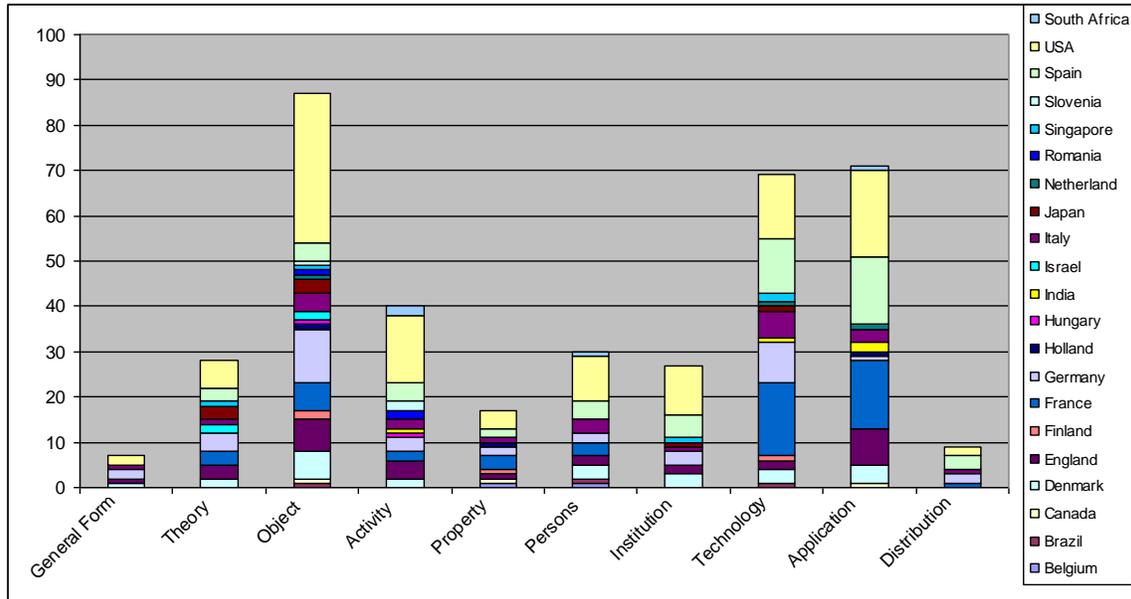


Figure 4 represents ISKO's cross tabulation.

This researcher found that the majority of contributors were American authors presenting a total of 116 contributed papers. In the second place was Spain with 52 contributed papers and third place France with 49 papers. Figure 5 presents the top contributed countries based on Dahlberg's classification.

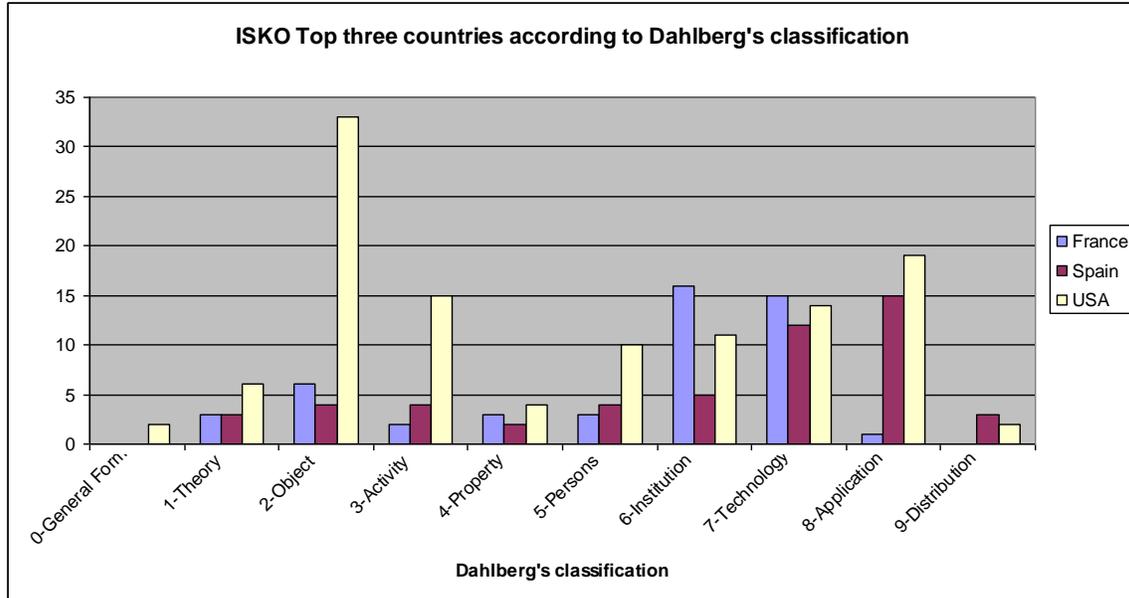


Figure 5 top contributors countries according to Dahlberg’s classification at ISKO.

The top Dahlberg classification among the American contributors was the group “object,” while the Spanish authors’ top group was “application.” The leading group from France was “technology.” Overall, the top group “object” was ranked at the top of ISKO conference proceedings held by American contributors. Next I examine the *ACR* cross tabulation.

Figure 6 summarizes the entire series of *ACR* proceeding according to the two majors categories: Country of employment and Dahlberg’s classification.

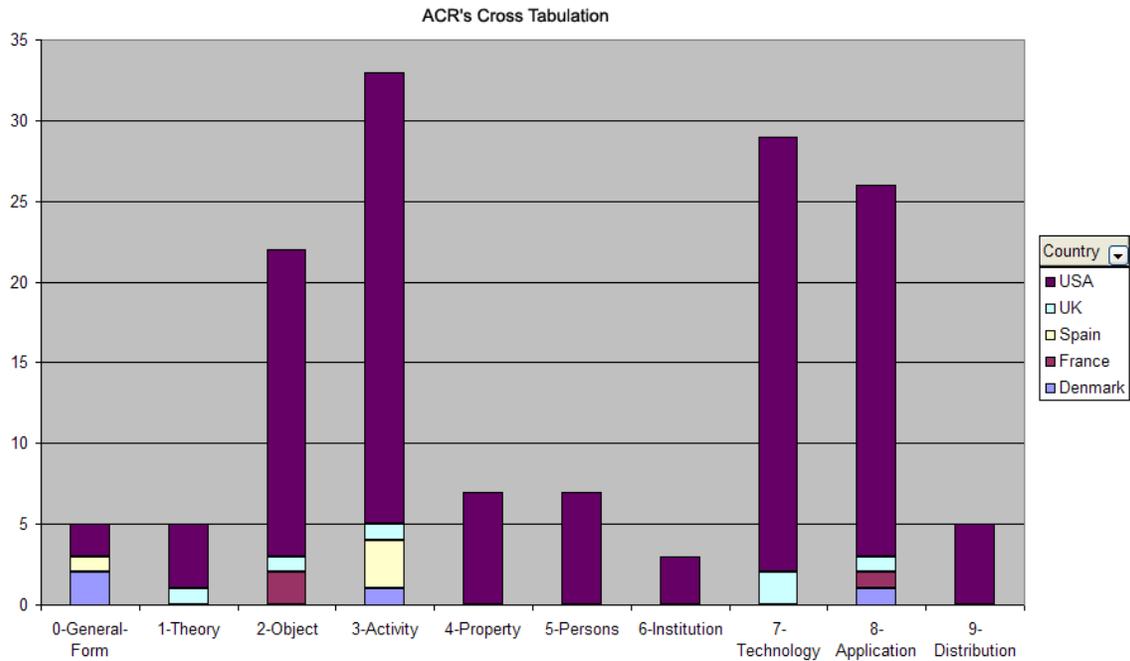


Figure 6 represents ACR's cross tabulation

I found the leading nationality of employment among the ACR participants was Americans who support Dahlberg's "activity" group. The second leading group of contributors was from the UK where the leading Dahlberg's classification was "technology." In Figure 7 summarizes the top leading counties of employment and their group classification according to cross tabulation.

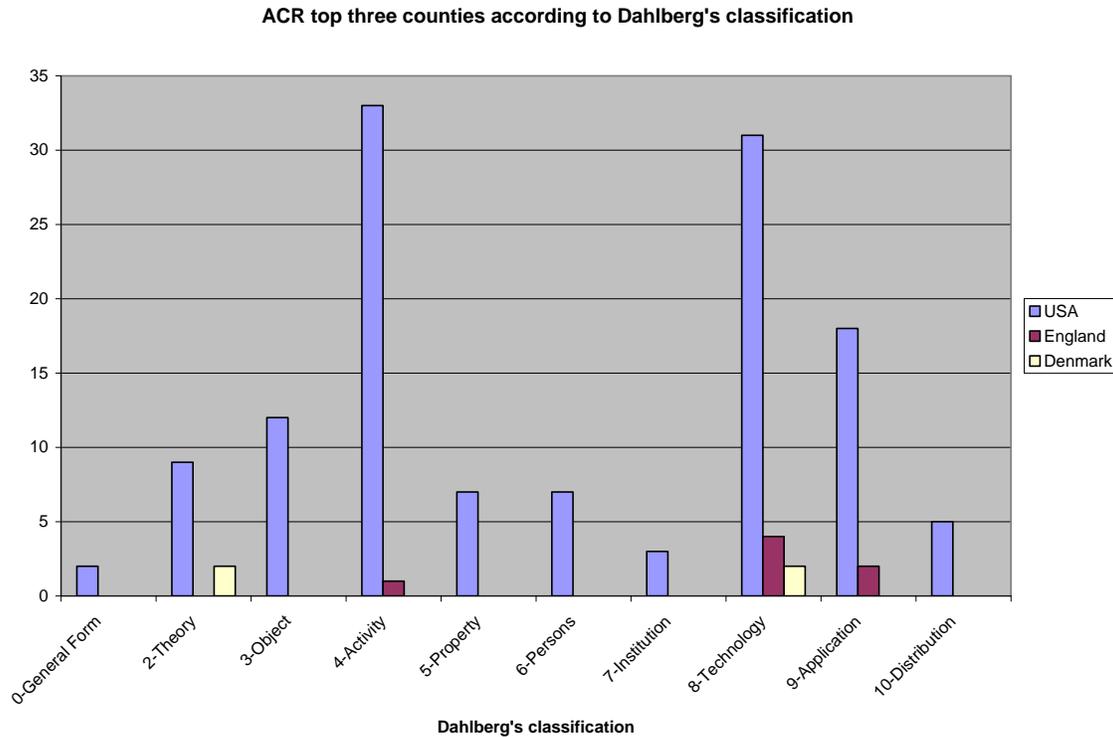


Figure 7 Summary of ACR top counties according to Dahlberg’s classification.

I found that the majority of contributors were American researchers presenting a total of 125 papers to *ACR*. In second place is the UK with 6 contributed papers and in third place is Denmark with only 4 papers.

It is interesting to note, in both conference proceedings the researchers from the USA had a stronger presence than any other countries. In the ISKO conference proceedings cross tabulation demonstrates that many American researchers’ papers were classified under Dahlberg’s “object”. In *ACR* the American’s based contributors lead the way with “activity” as the leading group. I did not find any study that examines the effect of country of employment on the authors’ subject of research. In addition, I found the

leading professional under both conference proceedings was professors. I see more need for future research to analyze the relationship between the country of employment of authors and their respective subject of research.

To sum up, although Dahlberg's classification aims to categorize manuscript and book titles in the field of knowledge organization, I applied it to the titles of the papers from two conference proceedings. It is interesting to note that while Dahlberg asserts that the first category and last three categories have been found to be the most dominate this was not supported by our findings. I found, in fact, that while the group "technology," which was ranked at the top of ISKO conference proceedings and second in the *ACR*, appears on Dahlberg's list of most popular groups. However the groups "activity" and "object," are not in Dahlberg's top five. Dahlberg's classification has never been examined with regard to its application to the nature of titles of papers from knowledge organization conference proceedings. I conducted cross tabulation to report that in both conference proceedings, the leading country of employment was USA. The leading group in ISKO was "object", while in *ACR* was "activity." Additional studies applying her categories to the classification of titles of conference papers are needed in order to evaluate the strength of this use of the scheme.

5.6 Summary

In the first stage of this study, I reviewed the entire ISKO and *ACR* conference proceedings from 1990 through 2006, which included a total of 652 papers. I examined

the occupation and country of employment of the presenters, and found that in both conference series the participants were largely professors. However, a difference emerged between the conferences with regard to the presenters' countries of employment. In the *ACR*, the majority of the presenters was from institutions in the United States, whereas at *ISKO*, the majority was Europeans. Since this researcher did not find any studies discussing the characteristics of knowledge organization presenters, future studies should address the issue of country of employment and line of work of those who contribute to conferences in this field. In order to learn more about the nature of titles of the papers presented in the conference proceedings, I examined these entities based on Dahlberg's classification. I found that in *ISKO*, the group "object" ranked at the top, while in the *ACR* the top ranked group was "activity." Interestingly, while Dahlberg stated that her first and last three categories have been the most dominate, our report indicated that only *ISKO*'s top-ranked group, "technology," was also ranked highly by Dahlberg, while the top ranked groups in *ISKO* and *ACR* "activity" and "object" did not make the list of terms that she considered important in knowledge organization. Dahlberg's classification has never been examined with regard to its application to the titles of papers presented in knowledge organization conference proceedings. Additional studies examining Dahlberg's categories are needed in order to evaluate the durability of using the scheme to analyze the titles of papers found in such conferences. Next, Chapter 6 will report on the concept maps found in both conference proceedings.

Chapter 6: THE CONCEPT MAPS FOUND IN THE KNOWLEDGE ORGANIZATION DOMAIN

6.1 Introduction

The term “concept map” has been used in academic and business settings since the late 1980s, referring to visual representations of knowledge structures and argument forms. In this chapter, I examine the concept maps found in the *Advances in Classification Research (ACR)*: proceedings of the *Special Interest Group for Classification Research of the American Society for Information Science and Technology (ASIS SIG/CR)* and *International Society for Knowledge Organization (ISKO)* conference proceedings. First I will describe the characteristics of the creators of the maps by looking at their occupation and country of employment. I then examine the concept maps by applying Dahlberg’s classification. In a third step, I carry cross tabulate the paper titles and the concept map title’s by examining patterns in the creators’ countries of employment, their occupation, and the Dahlberg classification into which their maps fall.

6.2 Conference Proceedings as the Unit of Study

A review of the 652 papers showed 327 concept maps between the two conferences. Out of the 158 papers in the *ACR* conferences, 125 concept maps were found. In the *ISKO* conference series, 202 concept maps were found in 494 papers. In addition, I

measured the number of concept maps used by presenters in their papers and the number of maps each presenter used in his/her paper. A summary of the total number of papers, number of presenters, and number of maps from both conferences is presented in Table 12.

ISKO	Number of Papers	Number of presenters using concept maps	Number of Maps
1990 Vol. # 1	30	26%	36%
1992 Vol. # 2	30	30%	49%
1994 Vol. # 3	22	22%	50%
1996 Vol. # 4	51	18%	40%
1998 Vol. # 5	65	30%	63%
2000 Vol. # 6	69	18%	36%
2002 Vol. # 7	81	19%	36%
2004 Vol. # 8	53	22%	44%
2006 Vol. # 9	51	36%	50%
Total	452	101	202
Average	50.22	11.22	21.88
ACR			
1990 Vol. # 1	19	44%	52%
1991 Vol. # 2	14	21%	42%
1992 Vol. # 3	12	41%	100%
1993 Vol. # 4	11	45%	163%
1994 Vol. # 5	20	30%	90%
1995 Vol. # 6	14	29%	65%
1996 Vol. # 7	8	38%	112%
1997 Vol. # 8	11	9%	9%
1998 Vol. # 9	8	37%	125%
1999 Vol. # 10	8	50%	112.5%
2000 Vol. # 11	16	37%	50%
2001 Vol. # 12	6	50%	150%
2002 Vol. # 13	11	9%	36%
Total	158	48	125
Average	12.15	3.69	9.61

Table 12 A summary of the number of concept maps in both conference proceedings.

Overall, this researcher found 202 concept maps in the ISKO papers in comparison to *ACR* ones; the 494 papers presented at ISKO conferences during the period under review had 202 concept maps representing 45%, compared to only 125 maps at *ACR* representing 81%. However, a closer look at the number of papers and the number of concept maps per conference in both proceedings reveal that the *ACR* conferences showed a higher percentage and a closer relationship between the number of concept maps and the number of papers per conference than the ISKO conferences did. The average number of papers presented at each *ACR* conference was 12.15, and the average number of concept maps was 9.61, meaning that 79% of *ACR* papers had concept maps, whereas at ISKO only 47% did. Table 13 summarizes the two conference's proceedings regarding the number of papers presented, the number of concept maps, and the ratio between the two.

ISKO	Papers	Concept maps	Frequency of Concept Maps per Conference
1990 Vol. # 1	30	11	36%
1992 Vol. # 2	30	24	80%
1994 Vol. # 3	22	11	50%
1996 Vol. # 4	51	20	40%
1998 Vol. # 5	65	41	63%
2000 Vol. # 6	69	25	34%
2002 Vol. # 7	81	20	28%
2004 Vol. # 8	53	24	44%
2006 Vol. # 9	51	26	51%
ACR	Papers	Concept maps	Frequency of Concept Maps per Conference
1990 Vol. # 1	19	10	52%
1991 Vol. # 2	14	6	42%
1992 Vol. # 3	12	12	100%
1993 Vol. # 4	11	18	163%
1994 Vol. # 5	20	18	90%
1995 Vol. # 6	14	9	65%
1996 Vol. # 7	8	9	112%
1997 Vol. # 8	11	1	9%
1998 Vol. # 9	8	10	125%
1999 Vol. # 10	8	9	112.5%
2000 Vol. # 11	16	8	50%
2001 Vol. # 12	6	9	150%
2002 Vol. # 13	11	6	54%

Table 13 summarizes the differences between the two conference meetings.

Overall, although the ISKO proceedings included more concept maps, the ratio of the number of concept maps to the number of papers per conference indicated that the *ACR* presenters embrace more concept maps per paper than the ISKO presenters. The reason for the difference is the relatively larger number of papers presented during each ISKO conference event: recall that the ISKO proceedings included 494 papers compared to only 158 papers at *ACR* conferences. I examined two factors with regard to the number of concept maps in the both conferences. Firstly, I determined which particular conference

used the smallest number of concept maps, and then I calculated the percentage of maps used at particular conferences. With regard to the first factor, I found that during ISKO # 1 (2000), presenters used only 11 concept maps in 30 papers, meaning that a mere 36% of papers included such a map. In *ACR* Vol. 8 (1996), the proceedings yielded only one concept map out of 11 papers. This represents the smallest percentage of papers that included a map, 9.09%, in the entire series examined. I found no similar patterns between the two conferences proceedings with regard to highest numbers of concept maps. The fourth *ACR* conference (1997) yielded 18 concept maps out of 11 papers, yielding a map-to-paper ratio of 163%. In comparison, the fifth (1998) ISKO conference proceedings included 66 papers with 41 concept maps, meaning that 63% of papers had a map, the highest percentage in ISKO. Overall, compared to ISKO, the majority of the *ACR* events show a higher relationship between the number of papers and the number of concept maps. Eleven out of 13 *ACR* conferences have a 50% or greater direct correspondence between the number of papers and the number of concept maps. In the ISKO series, however, only three (ISKO # 2, 5 and 9) out of the nine conference proceedings had concept maps in more than 50% of the papers. Next, I examined the statistical emergence use of concept maps over time in both conference proceedings.

In order to calculate the rate of growth or decline in the number of concept maps in the conferences, I employed the compound annual growth rate (CAGR) formula:
$$= (\text{End Value}/\text{Begin Value})^{(1/n)} - 1$$
. I found that for concept-map growth at ISKO conference proceedings' rate was 10.03%, whereas the *ACR* show a negative growth in map usage of

-3.85%. More studies are needed to address the issue of use and popularity of concept maps in the academic environment and in particular in conference proceedings by the authors. One reason is the large number of ISKO papers and concept maps in comparison to ARC. A visual representation of the growth and decline rate of concept maps in the ISKO and *ACR* conferences can be found in Figure 8, which shows the number of concept maps presented per conference.

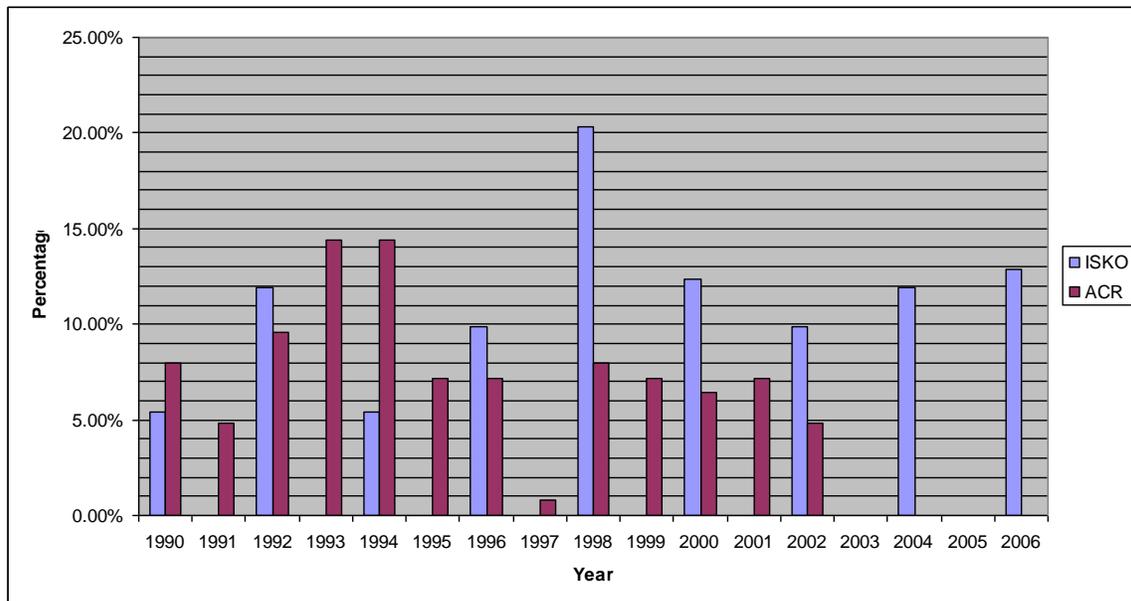


Figure 8. The percentage of maps per conference.

Next I analyzed the proceedings to find the number of authors who included concept maps as part of their papers. I also examined the type of strategy those authors most often employed with regard to the number of concept maps in their papers, and found that the majority of researchers used a single-map-per-paper strategy to present their findings. A total of 109 out of 327 concept maps were employed in a single-map-per-paper strategy in both proceedings. The fifth ISKO (in 1998) shows the highest numbers of authors, 12,

who included this single-concept-map strategy in part of their paper. In comparison, in the *ACR* conferences the highest occurrence of the single-concept-map-per-paper strategy was during the 2000 event, when 4 authors entailed this method as part of their paper.

Figure 5 represents the number of times the single-map strategy was embraced throughout the years under review.

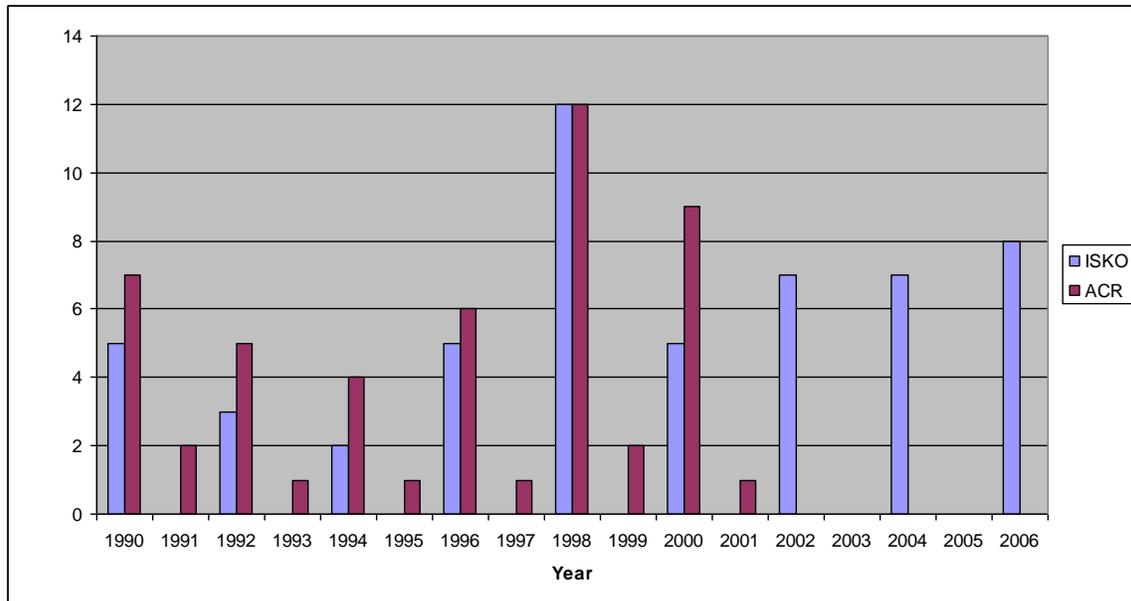


Figure 9 The number of times a single map per paper was used in both proceedings.

As a result, this researcher can summarize that in both conference proceedings, the predominant research practice was a single-map-per-paper. Since I never interviewed the authors of those concept maps nor found additional studies on the subject, I recommend additional studies as to why single-map-per-paper is the preferred method by researchers.

In a nutshell, our analysis revealed that although there were more concept maps presented at ISKO conferences, at *ACR* there was the average ratio of concept maps to papers was higher than at the ISKO conferences. On the other hand, when the number of

concept maps is measured using the CAGR formula, the *ACR* series showed a decline over time, with a growth rate of negative 3.85%. In comparison, ISKO showed inconsistent growth in the use of such maps, with a positive growth of 10.03% during the same period. In addition, as indicated in Figure 8, concept maps were solidly represented at every single ISKO conference. Overall, the concept maps from both conference proceedings indicated that researchers incorporate concept mapping as part of their papers, and saw it as a viable element of their presentations. At *ACR*, the average ratio of concept maps to papers was higher than at ISKO between the number of concept maps and the number of papers in a given conference event. In particular, during *ACR* meetings # 3, 4, 7, 10, and 12 conferences, the number of concept maps per paper presented above 100%, exceeding to the number of papers. However, the *ACR* events fluctuated, showing inconsistency regarding the number of papers with concept maps and the number of maps in each paper. At ISKO, on the other hand, a calculation of the CAGR, compound annual growth rate formula, shows a positive 10.03% growth rate in the number of concept maps used over the series. Overall, in both conference proceedings, concept maps had a strong presence, and as Friedman (2006) indicated, it is apparent that concept mapping is a viable element of cognitive processing by ISKO researchers. Next I examined the makeup of the group of authors who created those concept maps as our next step.

6.3 Characteristics of the Concept Map Creators

I studied the characteristics of the authors who included concept maps as part of their

papers by examining their country of employment and line of work. The type of work was divided into three categories: professor, practitioner, and student. This researcher found no major differences between the two conference proceedings regarding the occupation of the presenters. In both series, the majority of the researchers who employed concept maps as part of their papers were professors: they created 227 out of 327 total maps in the proceedings examined. In addition, I examined the country in which the researchers worked. In both series, the majority of the participants who employed concept maps as part of their presentation were United States-based professors. This trend had a stronger impact at the *ACR* events, where throughout, the majority of the presenters worked in the U.S., in contrast to the *ISKO* presenters, who were a more international group. Table 14 shows the top-ranked country of employment and top-rank occupation to the concept-map creators at each *ACR* meetings.

	Number of presenters using Concept maps	Top Country of Employment	Top Occupation	Total number of maps
ACR#1	4	USA=75%	Professor = 63%	10
ACR#2	3	USA=100%	Professor = 78.5%	6
ACR#3	5	USA=80%	Professor = 75%	12
ACR#4	5	Canada = 40%	Professor = 88%	18
ACR#5	6	USA = 50%	Professor = 81%	18
ACR#6	4	USA 50%	Professor = 80%	9
ACR#7	3	Germany =66%	Professor = 79%	9
ACR#8	1	Canada = 100%	Professor = 54%	1
ACR#9	3	USA =66%	Professor = 62%	10
ACR#10	4	Denmark =50%	Professors = 62%	9
ACR#11	6	USA = 83%	Professors = 63%	8
ACR#12	3	USA =66%	Professor = 67%	9
ACR#13	3	USA =100%	Professor = 82%	6

Table 14 *ACR* presenters according to profession and country of occupation.

Unlike at the *ACR*, at the majority of the ISKO conferences, the United States-based presenters who used concept maps did not have a lead over other countries' researchers. Out of 101 ISKO concept-maps presenter, only 21 worked in the United States. Researchers from Germany ranked in the second place, with 10 concept maps. Table 15 shows the top-ranked country of employment and top-ranked occupation of the concept maps creators in each and every ISKO conference.

	Number of presenters include Concept maps as part of their paper	Top Country of Employment	Top Occupation	Total number of maps
ISKO#1	6	Germany =75%	Professor = 60%	11
ISKO#2	10	Sweden =66.6%	Professor = 60%	24
ISKO#3	4	France = 60%	Professor = 78%	11
ISKO#4	12	Germany = 40%	Professor = 64%	20
ISKO#5	17	France=36%	Professor = 80%	41
ISKO#6	13	USA = 33%	Professor = 79%	25
ISKO#7	12	USA = 50%	Professor = 85%	20
ISKO#8	12	Spain = 50%	Professor = 75%	24
ISKO#9	16	USA = 21%	Professor = 80%	26

Table 15 ISKO concept-map creators according to profession and country of occupation.

Of course, the International ISKO conferences usually require papers to be presented in English; therefore, not supporting to that the language of the majority of papers using the concept maps was English. Out of the 327 concept maps, only two concept maps used languages other than English: those two concept maps were in Chinese and Spanish. In both cases, the authors presented their work at ISKO in English.

To sum up, the majority of the contributors to both conference proceedings are United States-based professors who used concept maps to illustrate their findings. Future studies should address the issue of country of employment and line of area of research of the participants who contribute to knowledge organization conferences, as well as the factors that influence the use of concept maps. Next, I examined the content of the maps by employing Dahlberg's classification.

6.4 Analysis of the Dahlberg classification of the concept maps

I employed Dahlberg's classification in order to better understand the nature of the titles of the concept maps found in the two conference proceedings. I measured the 327 concept maps by classifying them into Dahlberg's (2006) 10 subfield-classification entities. Table 16 summarizes the entire ISKO proceedings by analyzing each conference proceeding according to Dahlberg's classification. In each row represent the number of terms found in each conference proceedings according to Dahlberg's classification ten classification's schema. Table 16 summarizes the concept maps found in each ISKO proceedings according to Dahlberg's classification. The number inside each cell represents the number of maps found and classified under each Dahlberg's category.

ISKO	General form	Theories	Object	Activity	Property	Persons	Institution	Technology	Application	Distribution
#1			3	3	1					
#2	1	2	8	7	4		1	1		
#3	1	1	3	3		3	1		1	
#4		1	4	3	5		2	4	2	
#5		2	12	8	1	1	1	12	4	2
#6	3	1	5	5	1	5		5	3	
#7		2	8	2	3	2	2	2		2
#8		3	5	5	6	1	3	4		
#9		3	9	6	2	2	2	3	1	
Total	5	13	51	39	19	17	12	30	12	4

Table 16 A summary of the entire ISKO proceedings according to Dahlberg classification.

In the ISKO proceedings, the most dominant group-theme classification was Dahlberg’s group “object.” At every ISKO conference, this classification appeared at least twice. I also found that a major difference emerged between the theme groups of the concept maps from ISKO and those from the *ACR* conferences. In the second place at ISKO was the group “activity,” which discusses the methods and activities of classes and their explanation. In the third place I found the group “technology” which stands for concepts from other fields related externally to the field of knowledge organization. Table 17 summarizes the entire range of concept maps found at *ACR* conference events according to Dahlberg’s classification.

ACR	General form	Theories	Object	Activity	Property	Persons	Institution	Technology	Application	Distribution
#1					6	2		2		
#2			1	1	1	1		2		
#3		1		4	3	1		1	1	
#4		4	2	3	1	4	1	2	1	
#5		2	2	3		4	2	4	1	
#6	1		1	2	2			3	1	1
#7		1	1	1	2	2	1	1		
#8				1						
#9		2	1			2		2	2	
#10		1	1	2		2		2		2
#11				1			4	2	1	
#12			2	2	1			2	2	
#13			6							
Total	1	13	17	20	15	18	8	21	9	3

Table 17 A summary of the entire ACR events according to Dahlberg classification.

The most dominant group-theme classification in the ACR events was “technology and production,” which appeared in 11 out of 13 conferences. Maps classified under this group display concepts from fields related to, but external to, knowledge organization. The second highest category was “activity” which stands for methods and activities of classifying and indexing. The third ranked group was “object” which stands for concept and their classes explanation.

Although the ISKO and the ACR conference events do not reveal the same top themes, I found similar patterns regarding Dahlberg’s “activity” group in the top three most-used categories, and in the “object” group. At ISKO, “activity” was ranked in second place, and in ACR it was also ranked second. The “object” group was ranked third in ACR and first in ISKO. The top-ranked group overall in both conference events was “object,” under which 68 maps were classified (ISKO 51 and ACR 17).

It is interesting to note that this researcher found similar relationships between the titles of the papers (as discussed in Chapter 5) and the titles of the concept maps throughout the two sets of conference proceedings. A dominant group-theme classification appeared in both cases: in ISKO the most dominant group was “object,” whereas in the *ACR* meetings it was “activity.” I did not find any study that examined the nature of concept themes in knowledge organization conferences and their influence on authors and concept map creators.

To sum up, then, although Dahlberg’s classification aims to categorize manuscript and book titles in the field of knowledge organization, I applied it to the titles of the concept maps from the two sets of proceedings. Dahlberg’s assertion that the first category and last three categories have been found to be the most dominate classification group in the knowledge organization literature was not supported by our findings. I found, in fact, that the group “object,” which was ranked at the top of ISKO conference proceedings and third in the *ACR* events, did not appear among in the top four categories in Dahlberg’s most popular groups. Similarly, the group “activity,” which ranked third in at ISKO and second place in the *ACR* meetings, never made it to the top four as ranked by Dahlberg. Her classification has never been examined the nature of concept maps in knowledge organization conference proceedings, nor has it been analyzed regarding the framework of semiotics theory. Furthermore, I found the same top rank groups in Dahlberg’s classification in the conferences papers and the concept maps. Dahlberg’s “activity” group ranked in second place in both *ACR* paper and concept-map titles. The same type of ranking was found in the ISKO proceedings, where the top ranked “object” group

dominated the titles of both papers and concept maps. As a result, I recommend additional studies applying Dahlberg's categories to the classification of concept maps, in order to evaluate the validity of this use of the scheme in knowledge organization conference proceedings.

6.5 Cross tabulation analysis

I conducted cross tabulation analysis on the three categories, as follows: each conference's presenters' country of employment, their professional occupations, and the Dahlberg classifications of their paper titles and those papers' concept-map titles. Table 18 summarizes ISKO conference's number of papers, number of concept maps, top country of employment of presenters, and the top Dahlberg classification of the papers and of the concept maps contained within them.

ISKO	1990	1992	1994	1996	1998	2000	2002	2004	2006
1. Number of papers	30	30	22	51	65	69	81	53	51
2. Number of concept maps	10	24	11	20	41	29	20	23	26
3. Top Country - employment	Germany=37%	Germany=36%	Italy=59%	Denmark=26%	USA=37%	USA=39%	Spain=22%	USA=33%	USA=42%
4. Top Occupation of paper	Professor=60%	Professor=60%	Professor=78%	Professor=64%	Professor=80%	Professor=79%	Professor=85%	Professor=75%	Professor=80%
5. Top Dahlberg classification – paper	Object and Activity=20%	Object and Technology=26%	Object= 27%	Object= 30%	Object= 41%	Application=23%	Object=35%	Application=25%	Technology=20%
6. Top Dahlberg classification - concept maps	Object and Activity=20%	Object= 33%	Persons=36%	Property=25%	Object and Technology=29%	Object, Activity and Technology=20%	Object=43%	Property=25%	Object=30%
7. Top country –employment concept map	Germany=75%	Sweden=66%	France= 60%	Germany=40%	France= 36%	USA= 33%	USA= 50%	Spain= 50%	USA= 21%

Table 18 summarizes ISKO conference’s cross tabulation.

Next, Table 19 summarizes ACR conference’s number of papers, number of concept maps, top country of employment of presenters, and the top Dahlberg classification of the papers and of the concept maps contained within them.

ACR	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2001	2002	2003
1. Number of papers	19	14	12	11	20	14	8	11	8	8	16	6	11
2. Number of concept maps	10	6	12	18	18	9	9	1	10	9	8	9	6
3. Top Country - employment	USA = 85%	USA = 83%	USA = 50%	USA = 85%	USA = 85%	USA = 62%	USA = 81%	Professor = 62%	USA = 75%	USA = 56%	USA = 66%	USA = 54%	USA = 64%
4. Top Occupation of paper	Professor = 78%	Professor = 75%	Professor = 66%	Professor = 55%	Professor = 57%	Professor = 62%	Professor = 81%	Object = 50%	Professor = 62%	Professor = 37%	Professor = 66%	Professor = 81%	Professor = 85%
5. Top Dahlberg classification - paper	Activity and Technology = 28%	Technology = 33%	Technology = 27%	Activity/Tech hnology = 25%	Activity = 42%	Application/Activity = 37%	Activity = 36%	Application/Technology/Property = 25%	Property = 25%	Activity = 18%	Theory/Tech nology = 16%	Technology/Institution = 18%	Theory/Tech nology = 9%
6. Top Dahlberg classification - concept maps	Technology = 33%	Activity = 33%	Theories/Persons = 22%	Persons/Tech hnology = 22%	Technology = 33%	Property and Persons = 22%	Object = 100%	Persons = 20%	Activity/Persons = 22%	Institution = 50%	Property/Inst itution = 22%	Object/Acti vity = 20%	Object = 100%
7. Top country - employment concept map	USA = 75%	USA = 100%	USA = 80%	Canada = 40%	USA = 50%	USA = 50%	Germany = 66%	Canada = 100%	USA = 66%	Denmark = 50%	USA = 55%	USA = 66%	USA = 21%

Table 19 summarizes cross tabulation to ACR events.

I first analyzed the country of employment of the authors by the title of their papers and the concept maps presented at ISKO and ACR conferences. The top country of employment by ISKO authors was the United States, which counted for 117 out of 452 overall presenters. Most ACR presenters—48 of 158—were employed in the U.S. as well. The majority of ISKO presenters who used concept maps worked in the United States also, with out 103 of 202 concept maps creators claiming this country of employment. Interestingly, a tally of ISKO conference presenters shows that the top-ranked country with regard to concept-map creation was Germany, which came out top in three conference proceedings (ISKO 2 and 4). Still, though, out of the 202 concept maps found in the ISKO proceedings, Germany-based researchers contributed only 23 out of 202 maps. United States-based academics led at ACR, with 81 concept maps out of 125. The second-ranking country in that conference group was Canada, whose researchers used

only 11 concept maps.

Overall, researchers from the United States contributed the majority of papers and concept maps to both conference proceedings. At ISKO, they were responsible for 117 out of 494 papers and 103 out of 202 total maps. In *ACR* conferences, American academics again stole the show, with 99 papers and 91 concept maps. Next, I examine the profession of contributors to both conference proceedings.

I also examined the occupation of the authors of the papers and concept maps in both conferences proceedings. At the *ACR* meetings, 63% of participants were professors, whereas at ISKO, out of 652 authors 53% presenters were professors. Similarly, most of the concept-map creators were professors too. Next I contrast the Dahlberg classifications of the papers and of the concept maps.

This researcher analyzed the Dahlberg classifications of the papers and the concept maps by analyzing their titles. Most of the titles of the ISKO papers fell into two major groups: “object,” which ranked at the top (with 107 papers falling into this group), and the “technology” group, which ranked second (with 83 papers). At *ACR* the most dominant group-theme classification was “activity” which appeared in 12 out of 13 conferences, and with 37 papers classified under it. In the second place at those conferences was the group “technology”, which also appeared in ISKO’s top groups. The third group, with 48 papers, was “application,” a label applied to work that discusses methods of knowledge organization, and which is applied to classify documents and data

classes.

With regard to concept maps, at ISKO the most dominant Dahlberg group-theme classification was “object,” which appeared 51 times over 202 maps, representing 25%. In second place I found the category “activity,” and third was the group “technology.” The most dominant group-theme classification in the *ACR* meetings was “technology” which appeared in 21 out of 125 maps, representing 18%. Next was “activity” which stands for methods and activities of classifying and indexing. The third-ranked group was “object” which stands for concepts and their classification.

Overall, this cross tabulation enabled us to conclude that the top country of employment of paper authors and concept maps creators at both of these conferences was the United States. At *ISKO*, Americans contributed 117 papers to the conference out of a total of 494 papers overall, while *ACR* showed 98 American presenters who contributed 159 papers. I also found that the majority of the contributors were professors: At *ISKO*, out of 652 contributors, 355 were identified as professors, and at *ACR*, 104 out of 158 participants had that same title. With regard to concept maps, the majority of the contributors in both conferences (78 out of 202) were also U.S.-based professors.

I found no difference with regard to the concept maps creators and paper authors between the two conference proceedings. United States-based professors were the most highly represented group at both conference series and for both types of contribution. At *ISKO* conferences, Americans led with 38% of concept maps creators. At *ACR*,

professors from U.S. institutions created by 72% concept maps makers. The majority of those who included concept maps in their papers were professors. At *ACR*, 74% of the concept-map presenters were professors, while at *ISKO* 81% of the professors counted for concept maps creators.

I also found a similar pattern between the Dahlberg classifications of the papers and of the concept maps. Most of the titles of the papers at *ISKO* fell into two major groups: “object,” which ranked at the top, and the “technology” group, which was second. I found that the concept maps and the papers had the same leading group-theme, “object,” which appeared 11% of all paper titles and 25% in concept maps found in *ISKO*. In the second place was the category “activity,” and “technology” was third. Things were different at the *ACR* conference meetings, where the most dominant group-theme classification was “technology,” followed by “activity,” and then “object”.

With regard to concept maps, at *ISKO* the most dominant Dahlberg classification was the group “object,” which appeared 25% of all the maps. In the second place I found the category “activity,” and third was “technology.” In contrast, the most dominant group-theme classification in the *ACR* events was “technology” which appeared in 23% of all the maps. The second ranked category there was “activity” (standing for methods and activities of classifying and indexing), and in third place was “object.”

Summarizing, the conference proceedings share similarities with regard to the origin of their contributors (most were based in the USA), but differences emerged when

analyzing paper and concept-map titles according to Dahlberg's classification. At *ISKO*, the dominant group-theme was "object," whereas at the *ACR* events, the group "activity" was found to lead. I also found similar patterns when applying Dahlberg's classification to the titles of the papers and the concept maps. At more than one *ISKO* conference, the titles of the papers and those of the maps share Dahlberg's group theme "object." A similar finding emerged upon an examination of the *ACR* events: more than one recorded paper and concept map titles that shared the "technology" group-theme. The terms "object" and "technology" ranked at the top in both conference proceedings. I did not find any study examining researchers' concept-map themes in relation to their paper titles. However I did not examine the number of concepts per map. The reason for not counting the number of concepts found in each map is that some of the maps made it impossible to count the number of concepts they represents In order to address this problem, those maps were represented under the category "other" on which I will report in Chapter 7.

To sum up, then, although Dahlberg's classification aims to sort manuscripts and book titles in the field of knowledge organization, I applied it to the titles of the concept maps found in the two conference proceedings. It is noteworthy that while Dahlberg declares her first category and last three categories to be the most popular ones, while I found that the groups that ranked at the top at the *ISKO* and *ACR* conference proceedings ("object" and "activity"), did not appear on her most-popular-groups list. Dahlberg's classification has never been examined with regard to its application to the nature of paper titles or concept maps in knowledge organization conference proceedings. I conducted cross

tabulation to report that in both conference series, the leading country of employment was the United States, and most presenters were professors. This researcher found that the main difference between the conference proceedings was in their dominant group-theme. The concept maps found in *ISKO* were mainly classified under the “object” group, in which maps discuss the elaboration of concepts and classes. A comparison of the titles of papers and of concept maps in the proceedings reveals that the group “object” was the leading Dahlberg theme in more than one conference. In the *ACR* events, the theme group “technology” was shared by both paper and concept-map titles. Concept maps and papers classified in this category discuss concepts from other fields relating to knowledge organization. I recommend additional studies applying these categories to the classification of conference paper and concept maps titles in order to evaluate the strength of this use of the scheme.

6.6 Summary

I reviewed the entire publications of *ISKO* and *ACR* conference meetings from 1990 through 2006. These included a total of 652 papers, which in turn yielded 327 concept maps. 125 concept maps were found in 158 *ACR* conference papers; whereas in *ISKO* showcase 494 papers with 202 concept maps. More maps were presented at the *ISKO* conferences than at the *ACR* meetings. However, a more in-depth analysis reveals that at *ACR*, the ratio of the number of concept maps to the number of papers was higher than at *ISKO*, indicating that the *ACR* series had more concept maps per conference. I also measured the Compound Annual Growth Rate (CAGR) of the number of concept maps at

both conference proceedings, and can report that ISKO showed a positive growth rate of 10.03%. The most-used strategy used by authors showed that the a single concept map-per-paper was the most popular approach in both conference proceedings with a total of 109 maps of 327. It was maximized in the 1988 ISKO (#5) conference, where 12 presenters used only one map per paper. I found that, in both conference series, the most used approach by authors was the single-map-strategy. However, since I never interviewed the authors of those maps, nor found research papers that analyzed the ISKO or *ACR* conferences with regard to the use of concept maps, I recommend additional studies examining why the single-map-per-paper strategy is most often used.

I then examined the country of employment and the occupation of the researchers who used concept maps. The majority of the contributors were professors based in the United States. This trend was evident in both conference proceedings but especially in the *ACR* meetings, where United States-based professors were in the majority throughout.

In order to learn more about the nature of the concept maps, I examined the major themes of the 652 papers and 327 concept maps found, using Dahlberg's classification. This analysis revealed that the paper and the concept maps titles presented different themes according to which conference series they came from. The major themes of the maps found in *ISKO* were classifiable under the "object" group, where maps discuss the elaboration of concepts and classes. At *ACR*, the maps' major theme was "technology." Concept maps classified under this category discuss concepts from other fields related to the subjects of representation, grammar problems, and terminology. The group "object"

was not ranked among the top four categories Dahlberg outlined to be the most popular. I conducted cross tabulation between the authors' occupation, the authors' country of employment, and Dahlberg's classification to report that American-based professors were in the majority throughout the two series of conferences. At the *ISKO* meetings, the American-based professors used concept maps that can be classified under Dahlberg's "object" group. In the *ACR* events, they again led the way, using "activity," the second most dominant group under Dahlberg's classification.

I found an additional similarity between the two conference proceedings regarding their leading group theme. At both *ISKO* and *ACR*, and in more than one conference meeting from each of the two series, the titles of the papers and the titles of concept maps share the same top Dahlberg classification. At *ISKO*, the top-ranked group "object" was shared by both the titles of papers and of concept maps more than once. At *ACR* the top group theme, "technology," had the same distinction.

Cross-tabulation analysis revealed that the conferences share similarities with regard to the characteristics of the participants and their principal occupation. I also found parallels with regard to Dahlberg's classification, where similar themes appear in the top three in both conference proceedings. This finding indicted that there is a link between concept-map titles and paper titles. I recommend additional studies examining conference proceedings for this relationship. Next, Chapter 7 discusses the semiotics analysis of the concept maps of both conference proceedings.

Chapter 7: SEMIOTICS IN KNOWLEDGE ORGANIZATION CONCEPT MAPS

7.1 Introduction

This chapter presents the results of a study in which I analyzed the use of Saussure's and Peirce's semiotics theories as applied in the concept maps presented in the proceedings of the *International Society for Knowledge Organization (ISKO)* and those of the *Advance in Classification Research (ACR)*, the *American Society for Information Science and Technology (ASIS SIG/CR)* conferences. I will first report on the characteristics of the concept maps from both proceedings, according to an analysis using semiotics theory (Saussure, Peirce and other). Then I will report on the conference presenters' characteristics (country of employment and profession), and Dahlberg's classification of their work based on the semiotics theory with which the work is found to conform. In the third section, I describe Saussure's and Peirce's theories by assessing their application to the concept maps presented in the ISKO as well as the ACR events. The fourth section reports the number of terms found in Peirce's and Saussure's respective frameworks that define the signs within concept maps, looking at each framework separately.

7.2 Concept maps and semiotics theory

In order to examine the concept maps found in the *ISKO* and *ACR* conference proceedings using semiotics theory, the concept maps (125 from *ACR* and 202 from

ISKO) were classified into three categories: Peirce's triadic theory, Saussure's dyadic theory, or "other," as defined in Chapter 4 (pp. 51). APPENDIX B illustrates how each framework was evaluated. Peirce's sign theory was used to classify a total of 148 concept maps (81 from *ISKO* and 67 from the *ACR* conferences), representing 46% of the maps examined, making it the highest-ranking classification. The second-highest ranked category was "other," with a total of 117 maps (85 were from the *ISKO* proceedings and another 32 were from *ACR*), representing 35%. The category "other" stands for concept maps that do not apply to Peirce's or Saussure's frameworks. The third and lowest-ranked category was Saussure's, with only 62 maps (36 from *ISKO* and 26 from the *ACR* conferences) representing 18% of the total number of concept maps. Table 20 represents how many maps from each of the conference proceedings matched Peirce's semiotics theory, Saussure's theory, or some other framework.

	Peirce	Saussure	Other	Overall
ISKO # 1	27%	27%	36%	11
ISKO # 2	45%	8%	45%	24
ISKO # 3	27%	36%	36%	11
ISKO # 4	50%	20%	30%	20
ISKO # 5	48%	7%	43%	41
ISKO # 6	28%	28%	44%	25
ISKO # 7	45%	10%	45%	20
ISKO # 8	37%	20%	41%	24
ISKO # 9	34%	23%	38%	26
ACR # 1	55%	33%	11%	9
ACR # 2	42%	28%	28%	7
ACR # 3	41%	8%	50%	12
ACR # 4	50%	11%	38%	18
ACR # 5	50%	16%	16%	18
ACR # 6	66%	33%		9
ACR # 7	44%	11%	44%	9
ACR # 8	100%	---	---	1
ACR # 9	37%	25%	37%	8
ACR # 10	27%	45%	27%	11
ACR # 11	50%	16%	33%	6
ACR # 12	44%	33%	22%	9
ACR # 13	100%	----	---	3
Total	148	62	117	327

Table 20 The semiotics theory represented in the maps from both conference meetings.

A summary of the total number of concept maps from both conferences is presented in

Figure 10.

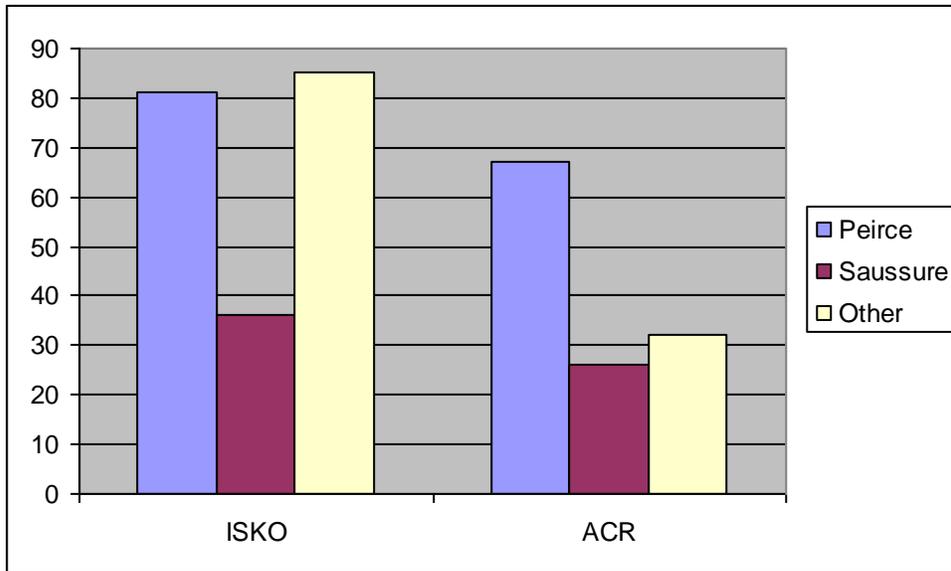


Figure 10. Total number of Concept maps presented in both proceedings.

Overall, Peirce’s framework provided the largest number of concept maps from the proceedings examined. Saussure’s framework never achieved a “privileged status” in any proceeding. In fact, its use was especially minimized in both *ACR* and *ISKO* conference meetings, wherein the majority of the maps employed were related to Peirce’s theory of “sign.” Only 18% of the maps could be classified within Saussure’s theory. It is interesting that the category “other” overcome Saussure’s in classifying the concept maps: In *ISKO*, a total of 83 maps were classified under “other,” and 32 maps from the *ACR* events were found to fit that category representing 35%. Next I will describe the characteristics of the concept-map creators based on the semiotics classification of their work.

7.3 Analysis of the concept-map creators according to semiotics theory

I first examined, according to semiotics theory, the authors who used concept maps, by examining their country of employment, their occupation and Dahlberg-theme-group that their work fell into. The first category was occupation, which was divided into three sub-categories: professor, practitioner, and student. In all three categories Peirce's framework counted for the majority of concept maps. Out of 101 ISKO presenters that used concept maps in their papers, 34 presenters used Peirce's framework. Out of 34 researchers 23 were professors, 7 were practitioners, and 4 were students. At the *ACR* conference meetings out of a total 48 presenters, 23 contributors used Peirce's theory in their concept maps. Out of the 23, 17 of these were professors, 4 were practitioners, and the other 2 were students. In addition, I examined the country of employment of each map creator. The majority of the participants who used concept maps that were classified using Peirce's framework were United States-based professors. Out of the two conference series studied, this trend had the strongest impact on the *ACR*, where the majority of the presenters worked in the U.S. throughout. In contrast, the ISKO presenters were a more international group. Table 21 presents the characteristics of the concept-map creators at *ACR* who used Peirce's framework.

Events	The percentage number of presenters using Peirce's framework in their concept maps out of total number of presenters	Top Country of Employment of those who used Peirce's framework out of total number of presenters	Top Occupation of those who used Peirce's framework out of total number of presenters	The percentage number of concept maps that used Peirce's framework out of total number of map found per conference	Total Number of presenters using concept maps per conference	The percentage number of Maps per conference
ACR#1	50%	USA =66%	Professor=66%	55%	6	52%
ACR#2	66%	USA=100%	Professor=100%	42%	3	42%
ACR#3	50%	Germany = 66%	Professor =33%	41%	6	100%
ACR#4	42%	Canada, Germany =66%	Professor =100%	50%	7	163%
ACR#5	33%	USA = ½	33%	50%	6	90%
ACR#6	25%	USA =25%	Professor =100%	44%	4	65%
ACR#7	100%	Germany and USA= 33%	Professor =100%	22%	2	112%
ACR#8	100%	USA=100%	Professor =60%	100%	1	9%
ACR#9	33%	USA = 100%	Professor=100%	40%	3	125%
ACR#10	50%	USA=100%	Professor=50%	44%	4	112.5%
ACR#11	40%	USA =75%	Professors=50%	62%	5	50%
ACR#12	33%	USA = 100%	Professor=100%	44%	3	150%
ACR#13	100%	USA =100%	Professor=100%	100%	1	54%

Table 21. ACR concept-map presenters according to profession and nationality

As in the ACR conferences, more ISKO concept-map creators came from the United States than from any other country. Out of 34 presenters used Peirce's framework, 21 worked in the USA. Table 22 shows the top-ranked country of employment, and the professions of the ISKO presenters who used concept maps.

Conference	The percentage number of presenters using Peirce's framework in their concept maps out of total number of presenters	Top Country of Employment of those who used Peirce's framework out of total number of presenters	Top Occupation of those who used Peirce's framework out of total number of presenters	The percentage number of concept maps that used Peirce's framework out of total number of map found per conference	Total Number of presenters using concept maps per conference	The percentage number of Maps per conference
ISKO#1	37%	Germany =25%	Professor=66%	80%	8	20%
ISKO#2	44%	Sweden and Germany =22%	Professor=50%	29%	9	44%
ISKO#3	40%	France =40%	Professor=50%	54%	5	50%
ISKO#4	30%	Germany = 66%	Professor=33%	35%	10	37%
ISKO#5	26%	France=60%	Professor=60%	19%	19	64%
ISKO#6	41%	USA = 40%	Professor=40%	44%	12	42%
ISKO#7	41%	USA = 80%	Professor=40%	45%	12	24%
ISKO#8	25%	Spain =30%	Professor=33%	37%	12	44%
ISKO#9	28%	Denmark = 50%	Student=75%	33%	14	51%

Table 22. ISKO concept-map presenters according to profession and nationality

Additional studies are needed to address why those particular countries and those particular professions rank at the top regarding Peirce's semiotics theory. Additional research is needed to address the connection between the researcher's characteristics and their use of semiotics framework in their concept maps.

To sum up, this researcher found that the majority of the contributors in both conference proceedings who supported Peirce's framework in their concept maps were United States based professors. Future studies should address the connection between Peirce's theory and the country of employment and line of work of the participants who use concept maps in knowledge organization conference papers. Next, I will report on the content of the maps by employing Dahlberg's semiotics-theory classification.

7.4 Dahlberg's classification according to semiotics theory

I employed Dahlberg's classification to measure the semiotics theory in order to understand better the nature of the concept maps found in the two conference proceedings. I measured the 327 concept maps by classifying them into Dahlberg's (2006) 10 subfield-classification entities and then marked them according to semiotics theory. Table 22 summarizes the entire ISKO proceedings by analyzing each conference proceeding according to Dahlberg's classification. The number found in each cell represents the number of maps found in each Dahlberg's categories.

ISKO	General form	Theories	Object	Activity	Property	Persons	Institution	Technology	Application	Distribution
#1			2. Peirce	2. Peirce 2. Saussure	1. Peirce	3. Peirce		1. Peirce		
#2	1. Other	2. Peirce	8. Other 1. Peirce	5. Peirce 11. other	3. Other 1. Peirce		1. Peirce	1. Other		
#3			1. Other 2. Peirce	1. Other 2. Peirce 3. Saussure		1. Peirce 4. Other	1. Saussure		1. Peirce	
#4		1. Peirce	2. Other 4. Peirce	1. Peirce 2. Other	3. Other 2. Saussure 3. Peirce		1. Peirce 2. Other	3. Peirce 4. Other	i. Saussure 2. Other	
#5		2. Saussure 1. Peirce	2. Other 9. Peirce 3. Saussure	3. Other 3. Saussure 2. Peirce	1. Peirce	1. Peirce	1. Other 2. Peirce	6 Saussure 6. Other 4. Peirce	1. Saussure 3. Other	
#6		1. Peirce	5. Peirce 2. Saussure	3. Peirce 2 Other 1. Saussure	1. Other 1. Peirce	1. Saussure 5. Peirce 6. Other		2. Saussure 3. Other 5. Peirce	1. Other 2. Saussure 3. Peirce	
#7		1. Other 3. Peirce	5. Peirce 1. Other	2. Other	2. Saussure	1. Peirce 2. Other	2. Other	2. Saussure		1. Peirce
#8		1. Saussure 2. Peirce	3. Peirce 1. Other 1. Saussure	2. Other 2. Saussure 2. Peirce	4. Other 3. Other 3. Peirce	1. Peirce	1. Other 1. Saussure 1. Peirce	1. Other		
#9		2. Peirce 1. Saussure	3. Peirce 3. Other 2. Saussure	4. Other 1. Saussure 3. Peirce	2. Other	2. Other	1. Saussure 2. Other	1. Saussure 2. Other	1. Other	1. Other
Total	1	13	51	43	21	18	14	29	12	2

Table 23. Summary of the entire ISKO proceedings according to Dahlberg's classification.

At *ISKO*, the most dominant group-theme classification was “object,” as discussed in Chapter 6. Peirce’s framework counted for 27 out of 51 concept maps classified under this category, the biggest classification into a single Dahlberg group. Table 23 summarizes the entire range of *ACR* events according to Dahlberg’s classification.

ACR	General form	Theories	Object	Activity	Property	Persons	Institution	Technology	Application	Distribution
#1					3. Peirce 1. Other 2. Saussure	2. Saussure		1. Other 1. Peirce		
#2			1. Saussure	1. Saussure	1. Other	1. Peirce		1. Other 1. Saussure		
#3		2. Peirce 1. Saussure		2. Peirce 2. Other	4. Other 2. Peirce				1. Other	
#4		3. Other 1. Peirce	2. Peirce	1. Peirce 2. Other 3. Saussure		2. Peirce 2. Other	1. Peirce			
#5		1. Peirce 2. Saussure		3. Peirce		2. Other 2. Peirce	2. Saussure	2. Other 2. Peirce		
#6			1. Other	1. Other	1. Peirce 1. Saussure			3. Peirce	1. Other	1. Peirce
#7								1. Other		
#8		1. Other		1. Peirce	1. Other 2. Peirce	2. Other	1. Other	1. Other	1. Saussure	1. Other
#9		1. Peirce 2. Other	1. Saussure			1. Saussure 1. Peirce		1. Saussure	2. Peirce	
#10		1. Other	1. Saussure	1. Other		2. Peirce		1. Saussure		2. Other
#11				2. Other			2. Peirce 1. Other 1. Saussure	1. Other 1. Peirce	1. Peirce	

#12			2. Other	2. Peirce	1. Other			1. Other	2. Saussure	
#13			6. Peirce							
Total	0	13	14	18	15	17	8	14	8	4

Table 24. Summary of the entire ACR conferences according to Dahlberg’s classification.

At ACR, the most dominant group-theme classification was “activity,” as discussed in Chapter 6. In this category, Peirce’s framework counted for 8 out of 18 concept maps classified under this category, marking the biggest classification into a single Dahlberg group.

Although the *ISKO* and ACR conference meetings do not reveal the same top themes, I found that only *ISKO* and Dahlberg’s “object” group was dominant in concept maps developed using Peirce’s framework. Under the “object” category, Peirce’s framework counted for 27 out of 67 concept maps. In ACR and Dahlberg’s most dominant group counted for “activity” with 18 maps. Under this category, 8 maps were classified under Peirce’s framework.

It is noteworthy that out of 327 concept maps that 149 presenters used to demonstrate their findings, only 57 presenters used more than a single concept map in their papers. 36 *ISKO* presenters used more than one concept map, and at ACR, 21 presenters did so. In the majority of the cases in both conferences, those researchers used more than one semiotics framework to illustrate findings. As a result, neither Peirce’s nor Saussure’s framework is used consistently in the work of those who employed more than one concept map in a single paper. A follow study is needed to measure what is the

frameworks behind a group of authors who exhibited a multiple-map-per-paper strategy in their paper, in order to learn more about why these 57 presenters varied the framework that they used when developing their maps.

To sum up, Peirce's framework achieved dominant in both conference proceedings. A total of 148 concept maps were found that represented Peirce's framework, which was the largest classification (81 from *ISKO* and 67 from *ACR*), represent 46% of the maps examined. Further analysis reveals that the majority of those who employed Peirce's framework in their concept maps were professors from United States academic institutions. In addition, I applied Dahlberg's classification to examine the semiotics framework from the two conference proceedings. I found that the group "object," which ranked at the top of *ISKO* conference proceedings regarding book titles, also ranked at the top under Peirce's framework that counted for 52% maps found under this category. This finding also emerge in the *ACR*, where the top category "activity" rank at the top as reported in Chapter 6. Under this category, the Peirce's framework counted for only 41% concept maps to the overall category.

In addition, I found that 38% of the presenters used more than a single concept map to illustrate their findings. 35% in *ISKO* and 43% at *ACR* presenters used more than one map in a single paper. In the majority of the cases in both conferences, those researchers used more than a single semiotics framework to illustrate research findings. As a result, those researchers did not show consistency with regarding to the outline the concept creator regarding the outline of their maps. Future studies should address how concept

map creators choose a framework, which should show why these 38% presenters exhibit different framework in their concept maps. Next, I examine the signs and the terms found inside the concept maps, according to semiotics theory.

7.5 Analysis the signs according to Saussure's and Peirce's frameworks

I also measured the “signs” found in inside the concept maps by applying Peirce’s and Saussure’s frameworks to them. The doctrine of the term “signs” was discussed in chapter 2, where I examined the schools of thought that follow the two different theorists. Analyzing the conferences (of both *ISKO* and *ACR*), I found 299 terms identifying “signs” as defined in Peirce’s framework, whereas an analysis using Saussure’s framework produced a total of 161 terms. Under Peirce’s triadic theory, the most-used term was “knowledge,” appearing in 12 concept maps. This term constitutes 5.43 % of all terms linked to the term “signs” in the maps. The second most-used term was “organization,” which occurs in 10 concept maps and represents 4.52% of the total terms found under Peirce’s definition of “sign.” The third most-used terms were “bibliographic” and “ontology,” appearing in 5 maps each in both conference proceedings, and representing 3.62% of total terms. “Sentence” was the fourth most-used term, at 2.01%.

Saussure’s framework, on the other hand, produced a total of 161 terms defining the “sign” in concept maps. The highest-ranked map terms found using Saussure’s framework are “system,” “document,” and “index,” appearing in 4 maps each

representing 2.86% of the total terms found. The second most-used terms were “ontology” and “theory,” appearing in 2 maps each at level of 2.01%. Table 22 provides a summary of the findings according to Peirce’s and Saussure’s frameworks and the relationship of terms that represent or define “signs.” Table 24 presents the top 5 terms with total number of terms and their percentage overall.

	Term	# of times	%
Peirce	1. Knowledge	12	5.43%
	2. Organization	10	4.52%
	3. Bibliographic	5	2.26%
	4. Ontology	5	2.26%
	5. Sentence	4	2.01%
Saussure	1. System	3	2.64%
	2. Document	3	2.64%
	3. Indexing	3	2.64%
	4. Ontology	2	2.01%
	5. Theory	2	2.01%

Table 24. The most used terms defining “signs.”

As observed previously, Peirce’s framework provides the larger number of concept maps. It also provides the largest percentage of terms that describe “signs” inside those maps with total of 299 terms. It is interesting to note that although I found similar terms in both Saussure’s and Peirce’s sign categories, the top 10 most-used terms did not share any similar terms. Next, I examined the terminology used by researchers in their concept maps, with respect to Peirce’s triadic and Saussure’s dyadic frameworks.

7.6 Measurement of Peirce’s and Saussure’s classifications of signs

I separated the measurements of terms found under Peirce and Saussure classifications of “signs” into two sections (6.3.1 and 6.4.1). In the first step, I will report on Peirce’s classification with regard to “signs” observed in concept maps from both conferences. APPENDIX A provides a full coverage on those findings.

7.6.1 The measure of the Peirce classifications of signs

This researcher began our investigation with the term “representamen,” which is also known as “the form the sign takes” (Peirce 1931-58, 3.399). Within both the ISKO and the ACR events, the term most used to describe the “representamen” category is “knowledge,” representing 5.43 % of 229 terms found in the conferences. The second most-used term was “organization,” with 3.62%. The third most frequently used term, at 3.62%, was “bibliographic,” appearing in 8 concept maps both sets of proceedings. Table 25 presents the most-used terms found under the classification “representamen” in the conference meetings.

The term	# of times	%
Knowledge	12	5.43%
Organization	10	4.52%
Bibliographic	8	3.62%
World Wide Web	5	2.14%
Model	4	1.81%
Ontology	4	1.81%
System	4	1.81%

Table 25. The most-used terms according to Peirce’s “Representamen.”

While the terms “knowledge,” “organization,” and “bibliographic” were the top-ranking terms in ISKO proceedings, the term “World Wide Web” came in first in the *ACR* proceedings. Table 26 shows the list of top terms found in each conference. Appendix A provides the list of all terms found within Peirce’s Representamen category.

ISKO		
The term	# of times	%
Knowledge	12	5.43%
Organization	10	4.52%
Bibliographic	8	3.62%
Ontology	4	1.81%
System	4	1.81%
Model	4	1.81%
ACR		
World Wide Web	5	5.21%
Recipient	4	3.23%
Information	4	3.23%
Citation	4	3.23%
User	3	1.81%
Visual	3	1.81%
Thing	3	1.81%

Table 26. The representation of “Representamen” in the two conference meetings.

Although both conferences share similar terms, the *ACR* most-used terms, which included “World Wide Web,” “recipient,” and “citation,” did not appear in ISKO terminology. It is interesting to note that the top terms found describing the “representamen” were also found among the terms describing Peirce’s “sign,” as described above, with special attention to the top term “knowledge” (which both classifications rank at the top). The next classification we considered according to Peirce’s triangulation definition was the term “object.”

The “object,” according to Peirce, stands for what the sign refers to (as discussed in Chapter 2). A total of 238 terms were examined using Peirce’s definition. The term most-used to describe the “object” in both ISKO and the *ACR* was in fact “object,” coming in at a 6.2% level of concentration. The second most-used term was “document,” at 4.1%. The third most frequently used term was “knowledge,” which represented 3.4% of the 238 terms found in the conferences. Table 27 represents the most-used terms found under “object.”

The term	# of times	%
Object	9	6.2%
Document	7	4.1%
Knowledge	5	3.4%
Feel	4	3.64%
Information	4	3.4%
Library	4	3.4%

Table 27. The most-used terms referring to “object,” according to Peirce’s theory

While the term “object” ranked at the top of ISKO conference proceedings, in *ACR* it ranked third. The term “feel” was ranked at the top in *ACR*, while it did not appear in ISKO terminology at all. Table 28 presents the difference between ISKO and *ACR* regarding the top-ranked terms.

ISKO		
The term	# of times	%
Object	6	3.05%
Knowledge	5	2.54 %
Information	4	1.81 %
Document	4	1.81 %
Library	4	1.81 %
Ontology	3	1.36 %
System	3	1.36 %
ACR		
Feel	4	3.64%
Document	3	2.73%
Object	3	2.73%
Process	2	1.82%
Area	2	1.82%
Extraction	2	1.82%
World Wide Web	2	1.82%

Table 28. The representation of “Object” in the two conferences.

Interestingly, out of nine concept maps presenting the term “object,” six of the accompanying papers cite Peirce’s semiotics-triangle map as part of the presentation of the map. This indicates that Peirce’s is the most-illustrated semiotics theory in the concept maps used in the two knowledge organizations’ conferences. Appendix B4 provides the list of the terms found within Peirce’s Object category. The next classification is the “interpretant.”

The “interpretant,” according to Peirce, is the meaning obtained by decoding and interpreting the “sign.” In the *ISKO* conferences examined, the most-used term to describe “interpretant,” is “knowledge,” which occurred at a rate of 5.43% of total terms used in the concept maps employed. In the *ACR* events, “knowledge” appears only once. The second most-used term found, “index” (including “indexer” and “indexing”),

occurred at a rate of 4.52% of total words used in both proceedings. The third most used term is “term(s)” at 3.62%. Table 29 presents the most-used terms, from both conference proceedings, fitting Peirce’s “interpretant” scheme.

The Interpretant	The term	# of times
Knowledge	12	5.43%
Index (indexer) (indexing)	10	4.52%
Term (s)	8	3.62%
Model	8	3.62%
Document	7	3.01%
Types	4	2.26%
File	4	2.26%

Table 29. The most-used terms according to Peirce’s “Interpretant”

Table 30 presents the top six most-used terms in *ISKO* and *ACR* conferences.

ISKO		
The term	# of times	%
Knowledge	12	5.43%
Index (indexed, indexing)	10	4.52%
Term (s)	8	3.62%
Model	4	1.36%
Document	4	1.36%
File	4	1.36%
Representation	4	1.36%
ACR		
Document (s)	3	2.88%
Recipient	3	2.88%
Index (indexed, indexing)	2	1.92%
Engine	2	1.92%
SeACR _h	2	1.92%
Information	2	1.92%
Subordinates	2	1.92%

Table 30. The division of the two conferences with regard to Peirce’s Interpretant category.

Some observations stand out. The first is that the term “knowledge” ranks top in the primary terms used at *ISKO* conferences, whereas in the *ACR* meetings, it was not even within the top ten. The term “index” showed a high ranking in both proceedings. While in *ISKO* the term ranked in the second place and appeared in the form of “index,” in the *ACR* events it ranked fourth, appearing in the form of “indexing.” Another term that did not reach the most-used list in *ISKO* proceedings was “document.” However, it ranked at the top in the *ACR* meetings. Appendix B6 provides the list of the terms found within Peirce’s Interpretant category.

Overall, the most-used category under Peirce’s triadic framework was “object,” which represented a total of 239 terms. The “representamen” category contained the fewest terms, as few as 229 out of a combined total of 698 terms in all three categories. With regard to the most-used terms categorized under it, the “Interpretant” category displays the biggest differences between the *ISKO* and the *ACR* meetings. The only term that both conferences share at the top of the rankings was “index” and its variants, “indexed” and “indexing.” Special note was made of the Object category. In using it, most researchers from both conference proceedings quoted Peirce’s semiotics triangle map as part of their papers’ concept-map presentation. Additional note should be taken of the most popular term: “knowledge.” This term ranked at the top in two elements of Peirce’s triadic classifications: part of Representamen and Interpretant. Under “object’s” classification, the term “knowledge” ranked in the top three. It appears particularly popular in the *ISKO*

conference proceedings. Overall, the term “knowledge” appeared 41 times under Peirce’s theory. Figure 12 summarizes the top 3 terms found under Peirce’s triadic framework:

Representamen, Object, and Interpretant.

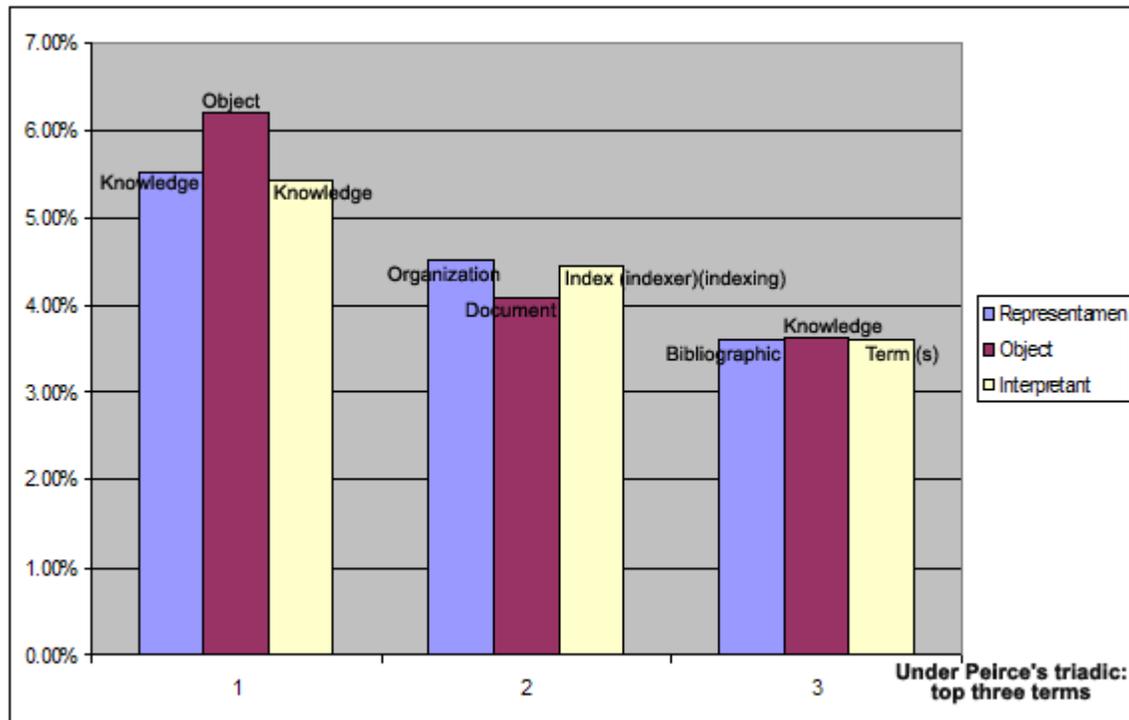


Figure 11 summarizes the top terms found under Peirce’s triadic framework.

Next, I examined Saussure’s framework vis-à-vis the terminology used by presenters in their concept maps.

7.6.2 Measurement of signs classified according to Saussure’s theory

Saussure offered a “dyadic” or two-part model of the sign that consists of a “signifier” and a “signified.” The “signifier” stands for the form the sign takes. This researcher

located 69 terms describing the “signifier” as a single concept that the concept maps represented. The terms “books”, “classification,” “scheme,” “customer,” “renting,” and “optical disc” were the most-used ones. Together, the terms occurred at a concentration level of 2.17% of all the terms employed in the concept maps under Saussure’s classification. Table 31 summarizes the top 6 most frequently used terms describing the “signifier,” as observed using Saussure’s semiotics framework.

The term	Number of times	percentage
Book	2	0.90 %
Classification	2	0.90 %
Scheme	2	0.90 %
Customer	2	0.90 %
Renting	2	0.90%
Optical Disc	2	0.90 %

Table 31. The most used terms describing the “signifier” according to Saussure

In both the *ISKO* and *ACR* conference meetings, a total of 76 terms were classified under Saussure’s “signifier” categorization. The following terms ranked in the first place (although they appeared only two times more than the other terms I found in the proceedings). The terms: “book,” “classification,” “scheme,” “customer,” and “information” appeared twice each in *ISKO*, but never emerged in the *ACR* proceedings. The only two terms which appeared twice in *ACR* but never in *ISKO* were the terms “renting” and “optical disc.” The rest of the terms appeared only once between both conference proceedings. Table 32 represents the most-used terms found in *ISKO* and *ACR*, appearing only two times each.

ISKO		
The term	# of times	%
Book	2	2.17%
Classification	2	2.17%
Scheme	2	2.17%
Customer	2	2.17%
Information	2	2.17%
ACR		
Renting	2	2.17%
Optical Disc	2	2.17%

Table 32. The “signifier” according to ISKO and ACR.

The terms “book,” “classification,” “scheme,” and “customer” ranked at the top of ISKO’s most-used terms, while the terms “renting” and “optical disc” were top-ranked in the ACR events. Appendix B6 provides the list of the terms found within Saussure’s Signifier category. Next, I examined the “signified” and the terms classified within that category.

According to Saussure, the “signified” represents the concept behind the “sign.” I observed 89 terms describing the “signified” - 63 out of these 89 were found in *ISKO*, and 26 were from *ACR*. Table 33 represents the top terms representing the “signified” found in the conference meetings.

The term	# of times	%
Object	6	4.84 %
Information	4	3.23 %
Thesaurus	3	2.42 %
Public	3	2.42%
Science	2	1.61%
Inhabiting	2	1.61%

Table 33. The most-used terms describing the “signified” according to Saussure.

The top term found under the signified was “object,” which appeared 6 times, representing 4.84% of the total number of terms. In the second place was “information” with 4 appearances. The terms “public” and “science” appeared in the ISKO proceedings, whereas the term “inhabiting” was found in the *ACR* events. Table 34 shows the top five terms found in both conferences with regard to Saussure’s “signified.” A full list of all the terms under Saussure’s “signified” classification can be found in Appendix B7.

ISKO		
The term	# of times	%
Object	5	4.44%
Public	2	2.17%
Miscellaneous	2	2.17%
Thesaurus	2	2.17%
Knowledge	2	2.17%
ACR		
Inhabiting	2	5.56%
Theory	1	2.78%
Object	1	2.78%

Table 34. The division of the two conferences examining Saussure’s “signified”

With regard to Saussure’s scheme, the *ISKO* and *ACR* conference meetings shared only one term, “object.” However, analysis using Peirce’s framework showed closer resemblance between the two conferences concerning the terms found in the concept maps. The number of maps found to match Saussure’s dyadic model and the low number of matching terms found in the *ACR* publications indicate that most researchers who have published in *ACR* neither discuss nor use Saussure’s framework. The term “object” was the only one that appeared at the top of the most-used terms in both proceedings. Figure 12 summarizes the top 3 terms found under Saussure’s framework.

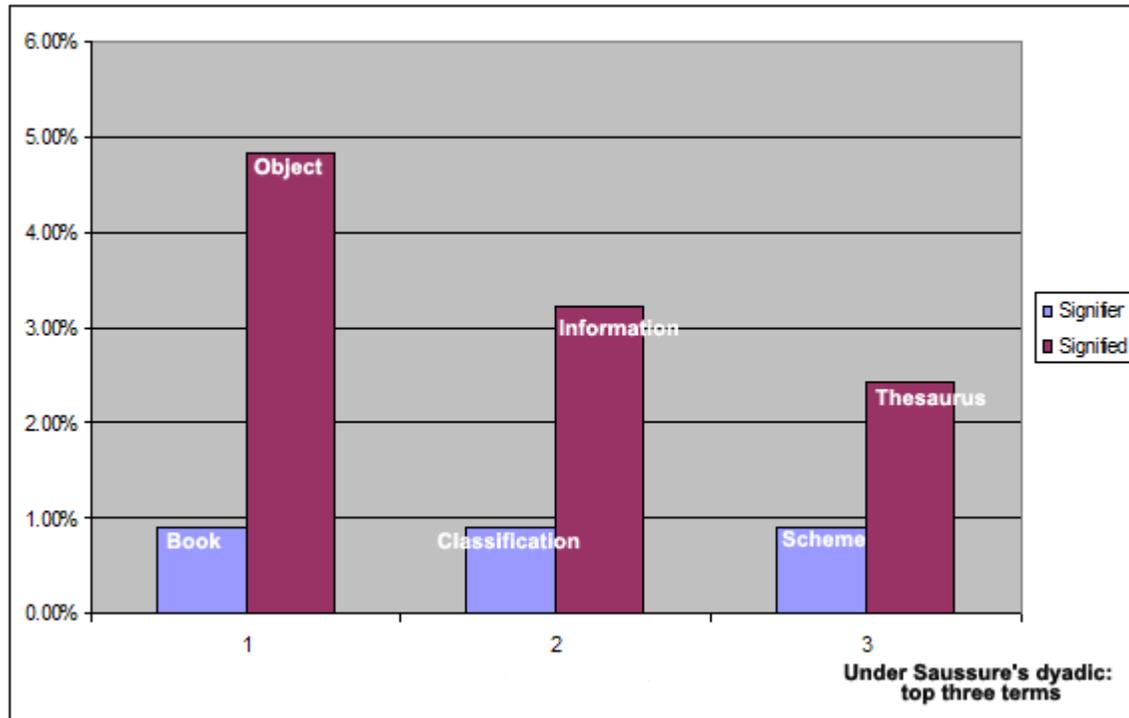


Figure 12 Top terms found under Saussure framework: signifier and signified.

I encountered three major issues regarding the contrast between Saussure’s theoretical classification and that of Peirce. The first issue regards the small number of concept-map terms that could be classified as either Saussure’s “signifier” or “signified.” A total of 152 terms were found to fit Saussure’s scheme, in contrast with the 698 terms (Representamen 229, Object 238, and Interpretant 231) found to fit Peirce’s triadic scheme. The second issue I encountered was the lack of similarity found between *ACR* and *ISKO* under Saussure’s framework, compared to the number of similarities encountered when using Peirce’s scheme. In the *ACR* events, only 34 out of 122 maps can be classified under Saussure’s framework. This represents 27.86% of a total of 83 concept maps found. The third factor to emerge was the presence of the term “object” at the top of the list in both conference proceedings. Saussure never discusses nor defines

this term in his philosophy or its dyadic classification. Next, I examine the difference between Peirce's and Saussure's frameworks by comparing the terms found in the concept maps.

7.7 The comparison between Saussure's and Peirce's classifications

Although Peirce's and Saussure's approaches to the term "sign" and to the study of semiotics are different, they share the same ideas regarding the role of the "signifier" and "signified." To Saussure, the "signifier" and "signified" are the main components of "signs," whereas Peirce adds an additional element to the "signifier" and "signified": the term "interpretant," which stands for the sense made of the "sign." Although Peirce and Saussure never met, Noth (1995, p. 43) and Chandler (2004, p. 24) argued that both philosophers shared basic definitions of the term "sign" concerning the role of the "signifier" and "signified," as discussed in Chapter 2. In order to evaluate this difference, a comparison was made of the terms this researcher found in the concept maps in the ISKO and the ACR conference meetings. I measured the seven most-used terms in both frameworks to find similarities and differences between the two main components of the term "signs" in the form of "signifier" and "signified" vs. "representamen" and "object." The first comparison was made between "signifier" and "representamen." Table 35 represents the top 6 terms in both cases.

Top six terms	Signifier	Percent	Representamen	Percent
1.	Book	0.90 %	Knowledge	5.43%
2.	Classification	0.90 %	Organization	4.52%
3.	Scheme	0.90 %	Bibliographic	3.62%
4.	Customer	0.90 %	World Wide Web	2.14%
5.	Renting	0.90 %	Model	1.81%
6.	Optical Disc	0.90 %	Ontology	1.81%

Table 35. A comparison between terms found in Saussure’s Signifier and Peirce’s Representamen.

No similar terms found between Saussure’s “signifier” and Peirce’s “representamen” Frameworks. Consideration should be given to the meaning of the terms in the concept maps. Those concepts represent a meaning the researchers intends to convey, according to *Webster’s Dictionary* (1991, pp. 737). Saussure’s philosophy addressed the question of meaning of concepts and their relationship by stating that language is essentially relational and that all meaning is produced through a linguistic system based on differences between each signs, rather than on identities. On the other hand, Peirce states that meaning cannot be produced outside of or prior to a semiotics system. For Peirce, every representamen is, and can only be, mediated by another representamen, by referring to the interpretant rule in the triadic theory of “sign.” In knowledge organization, many researchers examine the meaning behind terms by examining their relevance. Hjørland (2005) defined the term “relevance” as a search for similarity between terms, if and only if they serve as a means to a given purpose. Smiraglia (2007) examined Wilson’s *Two Kinds of Power* to report that “relevance” is an important tool in knowledge representation in the knowledge organization domain. Smiraglia defined “relevance” as conceptual tools used in knowledge organization, knowledge representation and information retrieval. Wilson (1973) discussed the methodological concept of relevance by outlining two approaches to examining the nature of the term

“relevancy.” The first method consists of psychological relevance, where personal issues constitute sets of concerns. According to Wilson, psychological relevance deals with actual usage and effects on people who use the concepts. The second method is the study of logic, where the aim is to help answer the questions raised. Based on Wilson, logic’s relevance depends on the bearing logic has on a matter on which the subject has his or her own preferences. I recommend an additional study that examines the issue of “relevance” as shown in researchers’ concept maps at conference proceedings. Next, I compared the terms found under the classification of “signified” and “object.”

The “signified,” according to Saussure, stands for “what the concept represents” (Chandler, 2004, 6). The “object,” according to Peirce, stands for what the “signs” refer to (as discussed in Chapter 2). Table 36 compares the top 6 terms used to represent the “signified” and the “object.”

Top six terms	Signified	Percent	Object	Percent
1.	Object	4.84 %	Object	6.2%
2.	Information	3.23 %	Document	4.1%
3.	Thesaurus	2.42 %	Knowledge	3.4%
4.	Public	2.42%	Feel	3.64%
5.	Science	1.61%	Information	3.4%
6.	Inhabiting	1.61%	Library	3.4%

Table 36. The “signified” and “object” comparison.

Overall, I found only one term, “object,” that made the most-used list for the term “object” in both theories (Saussure’s “signified” and Peirce’s “object”). In both cases, the term was ranked at the top of the list. For Peirce, the term “object” stands for what the “sign” represents, whereas Saussure did not define nor discuss the term directly. This

researcher did not find any in-depth studies that examined the relationship between the “sign” and “object” in Saussure’s philosophy in comparison to Peirce’s object classification. The only report I found that compares the topic of “object” in Saussure’s philosophy to the relationship between the sign and the object was published by Nerlich and Clarke (1997). They found that a direct relationship existed between the “sign” and “object” in the context of how society adapts the use of the “signs” over time. They based their argument on the fact that the meaning of the “sign” is made possible by patterns rather than by correspondence between “a name and thing” (Saussure 1983, p. 66), the same is true of the existence of the “object” in today’s society (Nerlich and Clarke, 1997, p.20-22). According to Nerlich and Clarke, the relationship between the “sign” and “object” outlines the complexity of Saussure’s language system and its direct relationship to today’s world. However, they did not compare it to Peirce’s object category. In the field of knowledge organization, I did not find papers that defined or discussed the nature of the term “object.” Future studies are needed to address the topic of “object” and its meaning in context of concept maps and in knowledge organization conferences. Next, I examine the format of the concept maps presented at ISKO and ACR meetings.

7.8 The measurement of the form of the concept maps

In addition to studying the significance of particular “signs” in Peirce’s and Saussure’s sign theories, I analyzed if the concept maps used most often by presenters in the two conferences by researchers can applied to three types of maps. To illustrate the procedure this researcher made between the three forms of the concept maps found in the two

conference proceedings, APPENDEX D illustrates how each form was evaluated. I found three main classifications: concept maps, mind maps, and conceptual graphs (as defined in Chapter 3). I examined 327 maps that applied to Peirce, Saussure and other classification. Table 37 presents the findings.

	Concept Maps	Mind Maps	Conceptual Maps
<i>ISKO</i>	128	23	51
<i>ACR</i>	78	13	34
Total 327	206	36	85

Table 37. The form of concept maps most used.

The most-used map format was that of the concept map. 62% of all maps used fall into this category. Additional analysis revealed that in presentations that used Peirce’s or Saussure’s classificatory schemes, concept maps were the most-used strategy. As the preferred method of displaying scientific information in *ISKO* and *ACR* conferences, concept maps provide the researchers easy use of graphics and text, which other map types do not provide. It is interesting to note that most researchers added further graphic representations to their maps, without providing detailed explanation of their meaning. This apparent oversight should be examined in future studies.

Overall, concept mapping can be considered a technique of representing knowledge in graphic mode or with discipline-specific terminology. This study found that the most-used mapping format in both conference proceedings was the concept map. Based on Friedman (2006), the concept-mapping model was found to be a standard element of

cognitive processing in selective *ISKO* conference proceeding. In this study, I found that concept mapping was not only a standard method but that it also applied to both Peirce's and Saussure's classifications schemes.

7.9 Conclusion

In conclusion, I found that Peirce's framework achieved dominant status regarding the number of concept maps that can be classified under it: A total of 148 concept maps out of 327 were found to match this schema. Breaking the data down further, Peirce's framework was the basis for 81 maps from *ISKO* and 67 from the *ACR* conferences, representing 46% of the maps examined. The second-highest ranked category was "other," with a total of 115 maps. The third and lowest-ranked category was Saussure's, with only 64 maps, or 19% of the total. I also found that, in both conference proceedings, the top country of employment of researchers whose work supported Peirce's theory was the USA, and they were mostly professors. I also classified the semiotics theory in the maps using Dahlberg's classification, in order to understand better the nature of the concept maps. I found that at *ISKO*, the Dahlberg group "object" was the leading category that could be applied to conference paper and concept map titles.

My analysis also showed that the majority of the concept maps under this category matched Peirce's theory: 52% of concept maps classified under this category, the biggest classification into a single Dahlberg group. This was the biggest count when the *ISKO* paper and concept map titles were examined. In *ACR* the most dominant group-theme

classification was “activity,” as discussed in Chapter 6. In this category, Peirce’s framework counted for 38% for all the concept maps and was rank as the top classification into a single Dahlberg group under *ACR* conference proceedings.

In addition, I examined the “signs” found in the concept maps in both conference proceedings that matched with Peirce’s triadic theory than Saussure’s dyadic theory. Peirce’s theory was classified to 148 maps (81 from *ISKO* and 67 from *ACR* conferences) representing 42% of the total number of concept maps found between both conference proceedings. I also found that Peirce’s framework provides the most-used and the largest number of terms. A total of 698 terms fall under Peirce’s “triadic” foundation. Saussure’s dyadic framework was ranked lowest in regard to the number of maps counted, at only 18%, and only 89 terms from the maps can be classified into Saussure’s “signifier” and “signified.”

Additional evidence showed that both *ACR* and *ISKO* proceedings lacked references to Saussure’s framework. Out of a total of 125 maps, only 20% could be said to adhere to this theory, where as at *ISKO* only 17% of total number the maps used Saussure’s dyadic framework.

The most-used term under Peirce’s triadic classification was “knowledge,” which appeared at the top of several categories, including the Representamen and interpretant categories, whereas in the “object” classification, the term ranked in the top three. Under

Saussure dyadic theory, I found that the most prevailing term, ranking at the top of signified category, was the term “object.”

Although throughout this study I contrasted Peirce’s and Saussure’s respective principles regarding “signs,” I also measured the similarities between them with regard to their “signifier” and “signified,” and “representamen” and “object.” While Saussure divides the “sign” into “signifier” and “signified,” Peirce called the signifier a “representamen” and the term “signifier” he defined as “object.” I compared the terms that paralleled Saussure’s signifier to those that paralleled Peirce’s representamen, finding no similar terms. The next step was to compare the term “signified” to the term “object.” I found that they were present in the concept maps researchers used that were guided by both frameworks examined in this study. I did not find any in-depth philosophical discussion on the relationship between Saussure’s “signifier” and Peirce’s “object.” I recommend that future studies need to address the philosophical and pragmatic meaning of the term “object” in the semiotics paradigm and in knowledge organization.

Overall, I found that the majority of concept maps researchers used applied to one dominant model – Peirce’s triadic theory. A total of 148 concept maps out of 327 were classified using Peirce’s framework, representing 45% of the overall maps found in both conference proceedings. Saussure’s dyadic model applied to only 62 maps representing only 18%. The “other” category ranked second with 35% of all the concept maps counted, that hold no philosophical framework.

I also examined the major themes in the concept maps, using Dahlberg's ten-part classification. Dahlberg, who designed her classifications based on the knowledge organization field, come up with ten groups that capture subject headings in the field of knowledge organization. I found that, when using these divisions, the leading classifications in *ISKO* and *ACR* were different. I found that in the *ISKO* conference proceedings, the concept maps' leading theme was concept classes and their elaboration, or "object," whereas in the *ACR* proceedings, the leading theme was concepts from other fields relating to this field, which Dahlberg calls "technology." This additional evidence suggests that differences between the two conference proceedings did not only show up in the lack of evidence of Saussure's semiotics theory, they were also revealed using Dahlberg's classification.

This researcher also found that majority of researchers who presented at the two conference series used a single concept map per paper to illustrate their ideas. I found that the fifth *ISKO* (in 1998) shows the highest percentage of 31% of total presenters/authors who used this single-map strategy.

My recommendation is additional studies and encouragements to other researchers to review concept maps using various other theoretical frameworks to determine whether there is a theoretical framework best suited to Knowledge Organization. Additional studies needs to address what theoretical framework can fit the other category. I hope that other researchers may be tempted to examine (as I did not) the techniques used to draw concept maps vis-à-vis Peirce's and Saussure's respective theories of graphic

representation. In addition, I recommend additional studies to examine the relevance of the terms in the maps to the context of the semiotics framework and conference proceedings by employing two methodologies: psychologies and logical frameworks.

Chapter 8: CHRONOLOGICAL ANALYSIS

8.1 Summary

This dissertation's objectives were to examine whether the concept maps from authors who presented papers at two major knowledge organization conference series could be classified according to either Peirce's or Saussure's theory of signs. Concept mapping is a technique for representing knowledge in graphs. This study defines concept maps as diagrams that show a relationship between nodes and arcs; the nodes should be labeled with descriptive text, representing the "concept," and the arcs show the type of relationship between the nodes. The study of "signs" examines how the meaning of concepts are constructed and understood in language. I examined the relationship of two dominant schools of semiotics, Peirce's and Saussure's, to concept maps. This was accomplished by examining whether or not "signs," as defined by those theorists, can be found in the papers of authors who used concept maps at the *ACR* and *ISKO* conference proceedings. In our examination of the two proceedings, I found many concept map themes. These are: concept map as road map; the representation of a large amount of data in a single map; the presentation of the relationship between concepts and their classification in knowledge organization; Peirce's triangulation; and the addition of human figures to concept maps.

8.2 The concept map as road map

Many of the concept maps used a road-map theme. Authors used those maps to provide directions through the data that followed, which usually started at one point and ended at another (the outcome). An example of such map is included in Glasgow's (1990) *ACR* paper "Imagery and classification." Her diagram illustrates how imagery classification comes from two different perspectives: the sensory store, and the user. Figure 13 shows Glasgow's concept map as road map.

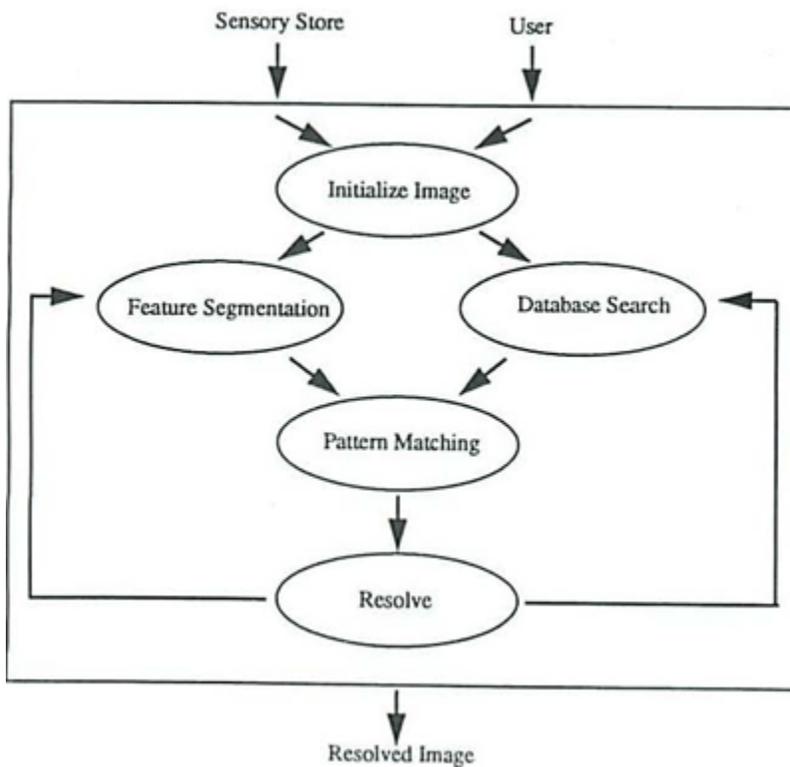


Figure 13 Glasgow's concept map (1990).

Glasgow is among many researchers who have used this theme to illustrate their findings. An extreme example can be found in a paper Soergel presented at *ACR* #12 (2001), "The many uses of classification: Enriched thesauri, ontologies and taxonomies as knowledge sources," in which the concept map was used to illustrate a road map of the term "instructional design." Figure 14 shows Soergel's map.

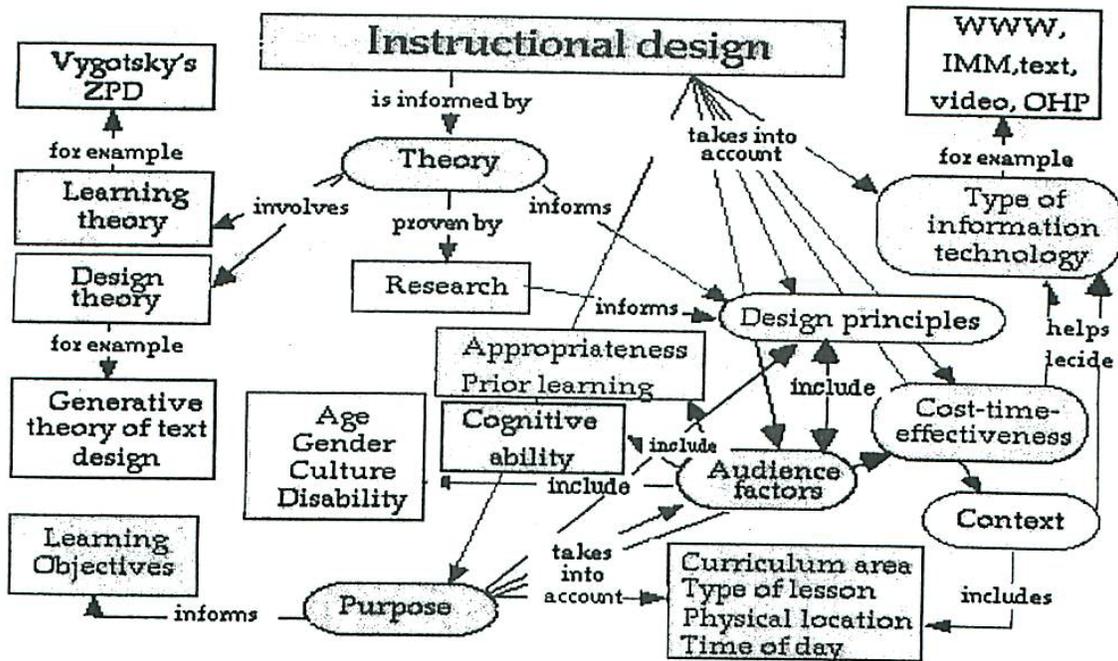


Figure 14 Soergel's (2001) concept map

8.3 The capture of a large quantity of data in a single concept map

The second major theme I found was that the maps tended to illustrate a large quantity of data, as authors attempted to describe in the text. For example, at *ISKO* # 3 (1994), Fulvio et.al presented a paper on the CNR research project's data banks. Their single concept map captures the entire project environment, something they did not discuss in their paper. Figure 15 shows Fulvio et.al. multiple data points concept map.

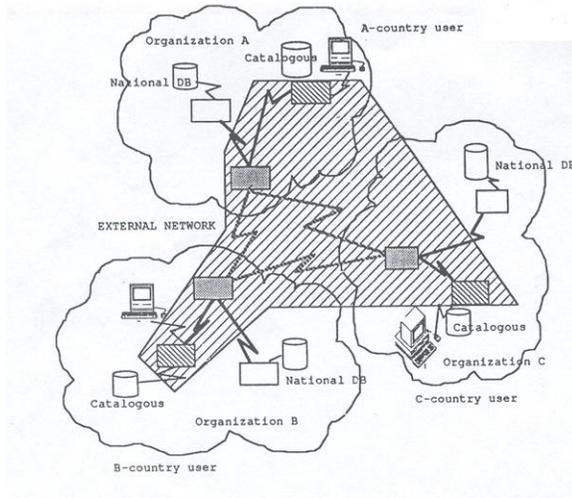


Figure 15 Fulvio et. al (1994) concept map.

8.4 The relationship between concepts and their classification in concept map

This theme relates to how authors used concept maps to examine the relationship between concepts and their classification in a single environment. An example is included in Ana Pérez-López’s paper titled “Application of the cantor set theory in making decisions about the collections development” presented in ISKO # 7. In her map the concepts of collections, references cited, and scientific production was surrounded by were described in a single environment. Figure 16 shows Pérez-López et.al’s concept map.

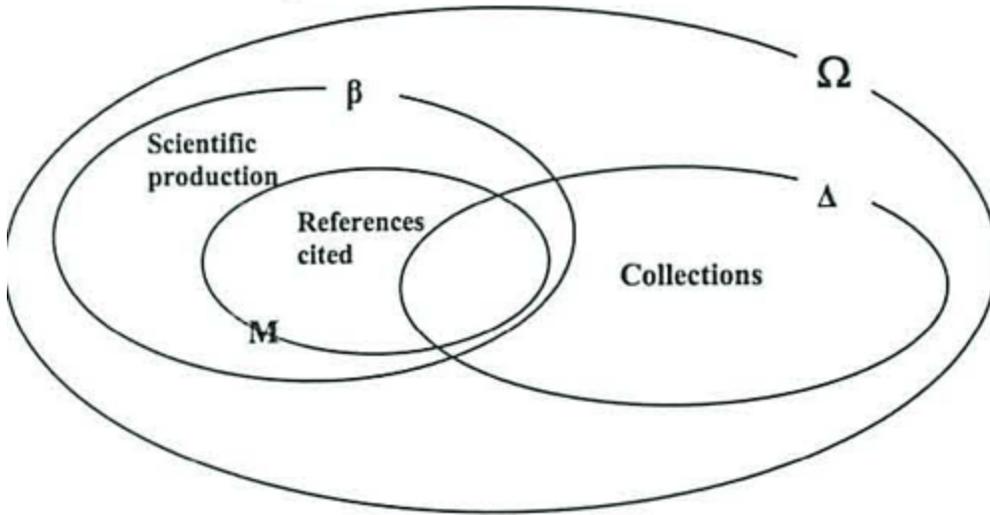


Figure 16 Pérez-López et.al's concept map, representing the relationship between concepts.

Others use concept maps to present the relationship between the concepts and their classification without any reference to the environment. This is exemplified by Mineau's (1993) concept map, in which the representation of a sentence was classified into three attributes: the cat, love, and the presumption of the cat. Figure 17 shows Mineau's concept map.

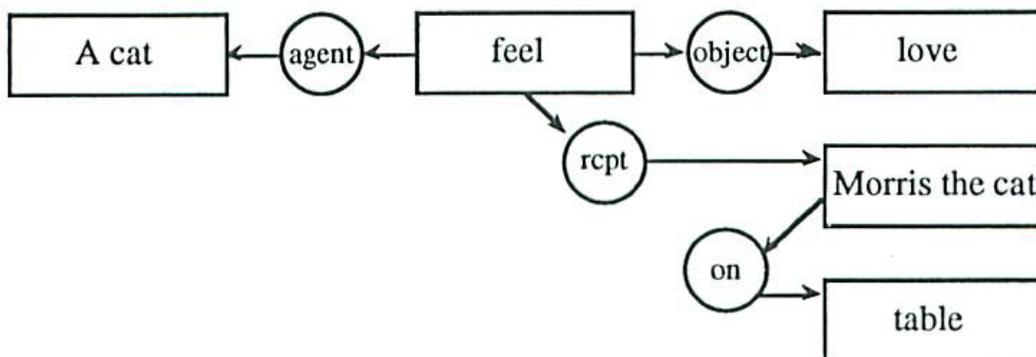


Figure 17 Mineau's concept map representing the relationship among concepts.

Overall, under the “relationship between concepts” theme, I found two major approaches. In the first, concepts were displayed in a single environment. The majority of the maps, however, used the second approach, which was to describe the relationship between concepts and their classification without any discussion of environment.

8.5 The triangulation concept-map theme

As discussed in Chapter 7, I found many concept maps were classified under Peirce’s triangulation of sign to organize their findings in the map. An example of this approach can be found in Furner’s work, presented at ACR # 12 (2002). This researcher used six concept maps that described, in the form of triangulation, the relationship between seeker, indexer, and the context of citations. Furner does not refer to Peirce’s triangulation, instead arguing only that this type presents more logic, consistency, and completeness than others. Figure 18 represents Furner’s first three concept maps.

Figure 2. Co-citation, co-relevance, and co-indexing relationships.

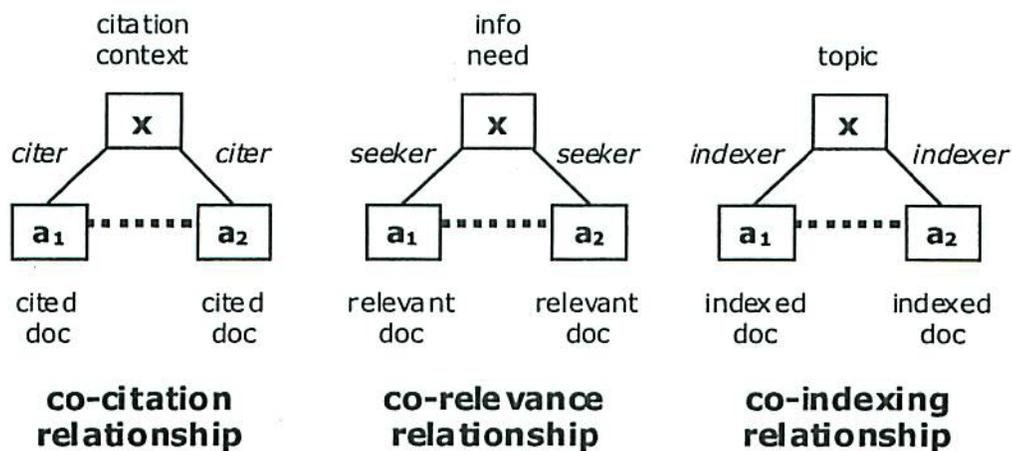


Figure 18 Furner's first three of six concept maps.

8.6 Addition of human figures to concept maps

The last theme that I found was that of the addition of human figure(s) to the maps, a practice that authors used to illustrate transaction better. An example of this theme is illustrated in a map by Breder et. al. (1996), that includes two illustrate human figures.

Figure 19 shows Breder et. al's human-figure concept map.

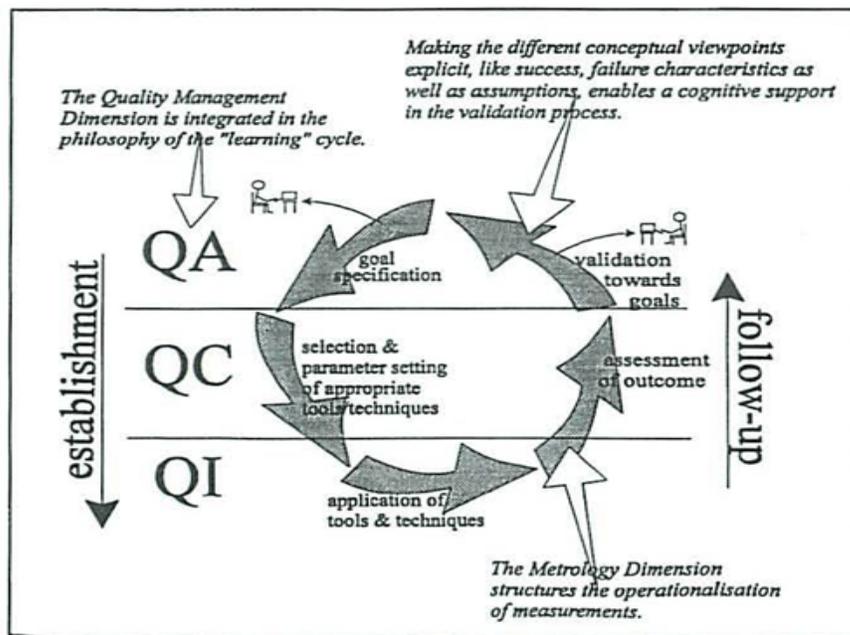


Figure 2: The KAVIAR learning cycle in view of the quality assessment framework.

Figure 19 shows Breder et. al's human-figure concept map.

In summary, I found five major concept-map themes: concept map as road map; the capture of a large quantity of information in individual maps; the relationship between concepts and their classification in the field; Peirce's triangulation; and the inclusion of human figures as part of the maps. Next, I will make a comparison between the major

themes I found and the semiotics literature in knowledge organization.

8.7 The semiotics discussion in knowledge organization literature

In our examination of the semiotics framework found in knowledge organization literature (as discussed in Chapter 3), I will review the major contributors who discuss the semiotics framework as part of their findings. This researcher will apply chronological analysis in order to compare the discussion of semiotics in knowledge organization to the major themes found in the concept maps. Table 38 condenses the body of literature on semiotics. Each entry shows the relevant authors' last name, the short version of their paper title, and the year of publication.

Author's last name	Short-title	Year
Blair, D.C.	<i>The language and representation in information retrieval</i>	1990
Warner, J.	<i>Semiotics, information science, documents and computers</i>	1990
Suominen, V.	<i>Structures and Relations in Knowledge Organization</i>	1998
Smiraglia, R.P.	<i>i. Words and works; Signs, symbols and canons: The epistemology of the work. ii. Musical works as information retrieval entities: Epistemological perspectives</i>	2001 and 2002
Mai, J-E.	<i>Semiotics and indexing: An analysis of the subject-indexing process.</i>	2001
Raber, D. and Budd, J.M.	<i>Information as sign: semiotics and information science.</i>	2003
Thellefsen, M.	<i>Concepts and terminology reflected from a LIS perspective. How do we reflect meanings of concepts?</i>	
Søren, B.	<i>The foundation of LIS in information science and semiotics.</i>	2006
Warner, J.	<i>Linguistics and information theory: Analytic advantages</i>	2007

Table 38 A summary of the major contributors in the field of knowledge organization to semiotics.

Overall, the eight authors were classified chronologically, in order to compare their discussion to the concept maps' themes influenced by semiotics involvement. That analysis is next.

8.8 Chronological analysis of semiotics and concept maps' themes.

I examined whether there was a direct relationship between the discussion of semiotics frameworks in knowledge organization and major themes found in concept maps from both conference proceedings. Table 39 presents the findings between the theoretical discussion and the form of concept maps found in both conference events.

Name	Semiotics framework	Concept maps theme
i. Blair, D.C. (1990) ii. Warner, J. (1990)	Discusses the lack of dialogue on the subject of semiotics in the field of knowledge organization.	i. Peirce’s Triangulation – Galinski, C. (ISKO # 1, 1990) ii. Relationship between concepts – Czap, H. (ISKO # 1, 1990)
Suominen, V. (1998)	Discuss the importance of semiotics in documentary language	i. Relationship between concept- Gruselle, J-P. (ISKO # 5 1998)
Smiraglia, R. P. (2000 and 2001)	Discusses the definition and the relationship of the term “sign” and the term “work”.	i. Relationship between concept – Smiraglia, R.P. (ISKO # 6)
Mai, J-E. (2001)	Finds direct relationship between indexing and Peirce’s semiotics	i. Peirce’s Triangulation – Galinski, C. ((ISKO # 1, 1990) i. Peirce’s Triangulation – Kent (ISKO # 7)
Raber, D. and Budd, J.M. (2002)	Searches for the meaning of the term “information” by applying Saussure’s dyadic to the term “sign”.	i. Relationship between concepts – Mineau (ACR # 4, 1993) ii. Furner (ACR # 12, 2002)
Thellefsen, M. (2004)	Defines the term “knowledge profile” by using Peirce’s framework	i. Peirce’s Triangulation – Priss (ISKO #6, 2004).
Søren, B. (2006)	Examine the semiotics connection between Blair’s (1990) work and Peirce’s philosophy	i. Peirce’s Triangulation – Thellefsen (ISKO # 9, 2006)
Warner, J. (2007)	Studies the analogy between Saussure’s sign theory to Shannon’s theory	i. Relationship between concept – Simon (ISKO # 9, 2006)

Table 39. Represents the comparison between the semiotics discussion and major themes found in the two conference proceedings.

The majority of the cases reveal two major themes that correlate to the discussion of semiotics. The first, Peirce's triangulation, matches Blair (1990), Mai (2001), Thellefsen (2004) and Søren (2006), who all discussed Peirce's triangulation theory in their papers. The Concept maps theme that matched Peirce's theory include those by Galinski (*ISKO* # 1, 1990) which was published around the same time as Blair's paper. The next article that discussed Peirce's semiotics framework was by Mai, and it matched Kent's illustrative concept maps found in his paper published in *ISKO* # 7, 2000. Further analysis revealed that the semiotics framework in Thellefsen's (2004) article can be matched to the concept map illustrate by Priss to present her findings. Priss paper and concept maps was presented at *ISKO* #6 in 2004. The next article examined was by Søren (2006). I found a match to Søren's discussion in the form of concept map that was presented by Thellefsen in this paper during *ISKO* # 9 in 2006.

The second type of match I found is the relationship between concepts and their classification. Warner's 1990 paper discusses the lack of semiotics in knowledge organization, falls into this category, and matches the form of concept maps found in Czap's paper in *ISKO* # 1 (1990). Czap's content map demonstrated the relationship between the concepts as discuss in Warner's paper. The next article I reviewed was by Suominen (1998). It matches concept maps created by Gruselle, which were presented his paper in *ISKO* # 5 (1998), and show the relationship between concepts. Smiraglia (2000-2001) illustrates the semiotics framework by creating his own concept map(s), presented

at *ISKO* # 6, 2000. The last article reviewed was another by Warner (2007). It was found to match to Simon's paper that used concept map to illustrate his findings and was shown at *ISKO* # 9 in 2006.

The two most dominant themes that emerged out of the five overall matched the semiotics framework discussed by major knowledge organization researchers. These two themes were Peirce's triangulation, and the relationship between concepts. Peirce's triangulation ranked higher than any other theme I examined, including Dahlberg's classification. I recommend more studies to examine if the five themes I found should be used to analyze future conference proceedings. Next, Chapter 9 summarizes this dissertation study.

Chapter 9: SUMMARY AND FUTURE RESEARCH

9.1 Summary

Concept maps have been used in academic and business settings since the late 1930s, beginning with Barr's 1936 work. In this publication, Barr, an art historian and the founding director of The Museum of Modern Art in New York City, used the maps to describe the major movements in art and their influence on the development of the modern abstract art movement. Concept maps provide visual representations of knowledge structures and argument forms. Concept mapping represents knowledge in the form of electronically monitored displays, as signs represent events or things that receive direct attention, or are indicative of other events or things. Unlike the semiotics framework, which aims to examine the meaning of concepts, concept maps provide researchers the ability to illustrate major concepts by providing visual representations of the concepts discussed, using text and images in the same context. In order to understand the nature of concept maps as a technique in the field of knowledge organization, I examined whether the concept maps found in the two major conference proceedings in the field can be measured in terms of Peirce's and Saussure's definitions of the term "sign." The importance of the study of "sign" to knowledge organization field was discussed by numerous researchers. Many of them have studied the semiotics aspect of the term "sign" with relation to the meaning of concepts, while others have examined the semiotics procedures of knowledge organization. Mai (2001) reported that the fundamental problem in the field of knowledge organization is the lack of connection

between language and its meaning in the circumstance of knowledge representation. To address the problem, three papers in particular in the field of knowledge organization made a major contribution in the discussion of the importance of semiotics theory. The first discussion of semiotics appeared in Buckland's (1984) work—considered to be a milestone in the field—which suggests the term “information-as-thing.” Buckland used semiotics to analyze the term “information.” He raised the question what is the precise nature of the term “document” by examining the term “natural sign” in order to present the subject of things that are informative but without communicative intent.

The next milestone occurred between 2000 and 2002, where three major works, two by Smiraglia (2000 and 2001) and one by Mai (2001) argued that the direct relationship between the field of knowledge organization and semiotics. Mai discussed the relationship between semiotics and Peirce's theory to indexing while Smiraglia examined the nature of term “works” in relation to semiotics meaning. Mai added that by examining Peirce's philosophy and the term “sign” to provide better comprehension of how meaning of various words and expressions are produced in individual setting. Both researchers used concept maps to illustrate their philosophical findings.

Additional analysis revealed that the majority of the contributors using concept maps in papers classified under Peirce's framework were professors employed in the United States. I also examined the semiotics nature of the concept map titles based on Dahlberg's classification, and discovered that the ISKO and ACR proceedings reveal different top themes. In the ISKO under the titles of the papers and the titles of the maps

Dahlberg's "object" group was the most dominant. Under that category, Peirce's framework counted for 27 out of 67 concept maps. In *ACR*, 18 concept maps were classified under Dahlberg's "activity" group, which was the most dominant classification. 8 out of 18 of these maps fell under Peirce's framework. The highest-ranked and most referred-to term under Peirce's triadic framework was "knowledge." No other term in Peirce's or Saussure's framework reached this level. Saussure's dyadic framework, on the other hand, ranks the lowest in the number of concepts maps and the number of terms describing "sign."

I applied Dahlberg's classification to the titles of the papers and the concept maps which revealed to us that most of the papers and concept maps can be classified as "object" or "activity." This indicates that KO researchers are focusing on particular themes that Dahlberg did not address. Dahlberg's classification has never been examined in the context of conferences proceedings and professional papers.

The importance of this study was to examine for the first time the nature of and the impact of concept maps in the field of knowledge organization, and the concept maps' relationship to one of the most established frameworks in the field: semiotics theory. Using concept maps to measure semiotics theory in knowledge organization papers provided us the ability to measure the terminology and concepts KO researchers used in their illustrations of their findings. This study marks the first empirical comparison between the two leading semiotics theories, those of Peirce and Saussure, by analyzing

concepts and their relationship to “sign” found in knowledge organization researchers’ concept maps.

9.2 Future Studies

Future studies should review concept maps using various theoretical frameworks to determine whether there is one that is best suited in the field of knowledge organization, and examine its relationship to classification and in particular concept maps classification.

I also recommend determining the relevance of the concepts found in the concept maps in the two major conference proceedings (ISKO and ACR) to knowledge organization. Hjørland (2005) and Smiraglia (2007) reported on the importance of the term “relevance” in information science and knowledge organization in particular. Wilson (1973) recommends two approaches to the investigation of the relevance of terms: psychological tests, and logic tests. Examining the relevance of the terms and concepts found in the concept maps could provide a deeper understanding of the context of the terms in order to grasp better the framework of the two conferences. Secondly, this researcher recommends examining the nature of the term “object” by analyzing why so many knowledge organization researchers discuss the term, and the philosophical framework behind it. An examination of the term “object” will provide a better understanding of the nature of the term in the knowledge organization environment and in particular in the context of concept maps.

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APPENDIX A

The following tables (Tables 42 and Table 49) represents the top most used terms found in ISKO and Advances in Research. Table 42 represents top 50 terms found in ISKO and ACR describing Peirce’s “signs.” Table 43 represents Top 50 terms found in ISKO and AC describing Saussure’s “signs.”

Rank	# of Times	Percentage	Term
1	12	5.43%	Knowledge
2	10	4.52%	Organization
3	8	3.62%	Bibliographic
4	5	2.26	Ontology
5	4	2.01	sentence
6	4	2.01	Visual
7	4	2.01	Concept
8	4	2.01	Index
9	3	1.36	Visual
10	3	1.36	Representation
11	3	1.36	File
12	3	1.36	Authority
13	3	1.36	User
14	3	1.36	Sign
15	2	0.90	Process
16	2	0.90	Triangle
17	2	0.90	Structure
18	2	0.90	Digital
19	2	0.90	Class (es)
20	2	0.90	Types
21	2	0.90	Document
22	2	0.90	Image
23	2	0.90	World
24	2	0.90	Kaviar
25	2	0.90	XML
26	2	0.90	cycle
26	2	0.90	architecture
27	2	0.90	Creation
28	2	0.90	Information
29	2	0.90	Communication
30	2	0.90	Semiotics

31	1	0.45	nutshell
32	1	0.45	parameter
33	1	0.45	expectation
34	1	0.45	innovation
35	1	0.45	dictionary
36	1	0.45	networks
37	1	0.45	interdisciplinary
38	1	0.45	Text
39	1	0.45	Traveling
40	1	0.45	Fight
41	1	0.45	artefact
42	1	0.45	Water
43	1	0.45	World Wide Web
44	1	0.45	suppliers
45	1	0.45	Software
46	1	0.45	matrix
47	1	0.45	employment
48	1	0.45	work
49	1	0.45	Text
50	1	0.45	subclass

Table 42. The Top 50 terms found in ISKO and ACR applying to Peirce's "signs."

Next Table (43) represents the Top 50 Terms found in ISKO and ACR identifying under Saussure's sign.

Rank	# of Times	Percentage	Term
1	3	2.64	System
2	3	2.64	Document
3	3	2.64	Index (indexing and indexer)
4	2	2.01	Relationship
5	2	2.01	Knowledge
6	2	2.01	Ontology
7	2	2.01	View
8	2	2.01	Language
9	2	2.01	User
10	1	0.89	Sign
11	1	0.89	Works
12	1	0.89	Abstract
13	1	0.89	Design
14	1	0.89	Intelligence
15	1	0.89	artificial
16	1	0.89	Author
17	1	0.89	Interface
18	1	0.89	Category
19	1	0.89	Amazon
20	1	0.89	operating
21	1	0.89	sense
22	1	0.89	eideia
23	1	0.89	artefact
24	1	0.89	science
25	1	0.89	Network
26	1	0.89	Data
26	1	0.89	Practice
27	1	0.89	Interaction
28	1	0.89	record
29	1	0.89	Subject
30	1	0.89	Components
31	1	0.89	Web
32	1	0.89	D1, D2, D3
33	1	0.89	Start
34	1	0.89	Explore
35	1	0.89	Collections
36	1	0.89	Person
37	1	0.89	Debate
38	1	0.89	Transportation

39	1	0.89	Common
40	1	0.89	Extensible
41	1	0.89	Generic
42	1	0.89	search
43	1	0.89	instance
44	1	0.89	XML
45	1	0.89	architecture
46	1	0.89	dictionary
47	1	0.89	T1
48	1	0.89	level
49	1	0.89	innovation
50	1	0.89	natural

Table 43. The Top 50 terms found in ISKO and ACR applying Saussure's "signs."

Table 43 represents the Top 25 terms classified under Peirce's Representamen in ISKO

Rank	# of Times	Percentage	Term
1	12	5.43%	Knowledge
2	10	4.52%	Organization
3	8	3.62%	Bibliographic
4	4	1.81%	Ontology
5	4	1.81%	Model
6	4	1.81%	Sentence
7	3	1.63%	Visual
8	3	1.63%	Concept
9	3	1.63%	Information
10	3	1.63%	Memo
11	3	1.63%	User
12.	3	1.63%	World Wide Web
13	2	0.98%	Unite
14	2	0.98%	digital
15	2	0.98%	kaviar
16	2	0.98%	world
17	2	0.98%	agent
18	2	0.98%	process
19	2	0.98%	image
20	2	0.98%	Document
21	2	0.98%	File
22	2	0.98%	architecture
23	2	0.98%	Types
24	2	0.98%	Subclasses
25	1	0.45%	interdisciplinary

Table 43. The Top 25 terms classified under Peirce's Representamen in ISKO

Table 44 represents the Top 25 terms classified under Peirce's Representamen in ARC.

Rank	# of Times	Percentage	Term
1	5	5.21%	World wide Web
2	4	3.23%	Cat
3	4	3.23%	Citation
4	3	2.88%	User
5	3	2.88%	Visual
6	3	2.88%	Thing
7	3	2.88%	Superordinates
8	3	2.88%	Memo
9	2	1.92%	Language
10	2	1.92%	Order
11	2	1.92%	View
12.	2	1.92%	Record
13	2	1.92%	Subject
14	1	0.96	Recorded
15	1	0.96	Shared
16	1	0.96	Components
17	1	0.96	Data
18	1	0.96	Set
19	1	0.96	Result
20	1	0.96	Decision
21	1	0.96	Classification
22	1	0.96	Natural
23	1	0.96	Experience
24	1	0.96	Network
25	1	0.96	Cluster

Table 44. The Top 25 terms classified under Peirce's Representamen in Advances in Classification Research

Table 45 represents the Top 25 terms classified under Peirce's Object in ISKO

Rank	# of Times	Percentage	Term
1	6	3.62%	Object
2	5	2.46%	Knowledge
3	4	1.81%	Document
4	4	1.81%	Information
5	4	1.81%	Library
6	3	1.36%	Ontology
7	3	1.36%	System
8	3	1.36%	Visual
9	3	1.36%	File
10	3	1.36%	Authority
11	3	1.36%	Thing
12	3	1.36%	Representation
13	3	1.36%	Types
14	3	1.36%	Triangle
15	2	0.90%	Digital
16	2	0.90%	Communication
17	2	0.90%	Semiotics
18	2	0.90%	Digital
19	2	0.90%	Class
20	2	0.90%	User
21	1	0.45%	Process
22	1	0.45%	Structure
23	1	0.45%	Right
24	1	0.45%	Science
25	1	0.45%	Main

Table 45. The Top 25 terms classified under Peirce's Object in ISKO

Table 46 represents the Top 25 terms classified under Peirce’s Representamen in ARC

Rank	# of Times	Percentage	Term
1	4	3.64%	Feel
2	3	2.73%	Document
3	3	2.73%	Object
4	2	1.82%	Process
5	2	1.82%	Area
6	2	1.82%	World Wide Web
7	2	1.82%	Extraction
8	2	1.82%	Corpus
9	2	1.82%	Supra
10	2	1.82%	Thesaurus
11	2	1.82%	Income
12	2	1.82%	Trauma
13	2	1.82%	Hollow
14	2	1.82%	Viscous
15	2	1.82%	company
16	1	0.96%	Problem
17	1	0.96%	Endocarditic
18	1	0.96%	Access
19	1	0.96%	Dance
20	1	0.96%	Data
21	1	0.96%	Schedule
22	1	0.96%	Food
23	1	0.96%	keyword
24	1	0.96%	processor
25	1	0.96%	Cluster

Table 46. The Top 25 terms classified under Peirce’s Representamen in ARC

Table 47 represents the Top 25 terms classified under Peirce's Interpretant in ISKO

Rank	# of Times	Percentage	Term
1	12	5.43 %	Knowledge
2	10	4.52%	Index (indexed, indexing)
3	8	3.62%	Model
4	8	3.62%	Term (s)
5	4	1.81%	Document
6	4	1.81%	File
7	4	1.36%	Types
8	4	1.36%	Representation
9	4	1.36%	Interpretant
10	4	1.36%	Ontology
10	3	0.90%	techniques
11	3	0.90%	research
12	3	0.90%	library
13	3	0.90%	Visual
14	3	0.90%	Architecture
15	3	0.90%	Thing
16	3	0.90%	XML
17	3	0.90%	Concept (s)
18	2	0.45	R1, R2, R3
19	2	0.45	Image
20	2	0.45	Data
21	2	0.45	Macro
22	2	0.45	Topic
23	2	0.45	scientific
24	2	0.45	noise
25	2	0.45	source

Table 47. The Top 25 terms classified under Peirce's Interpretant in ISKO

Table 48 represents the Top 25 terms classified under Peirce's Interpretant in ACR.

Rank	# of Times	Percentage	Term
1	3	2.88%	Document
2	3	2.88%	Recipient
3	2	1.92%	Term (s)
4	2	1.92%	Index (indexed, indexing)
5	2	1.92%	Engine
6	2	1.92%	Search
7	2	1.92%	Information
8	2	1.92%	Subordinates
9	2	1.92%	Letter
10	2	1.92%	Files
11	2	1.92%	A2
12	2	1.92%	Cited
13	2	1.92%	Relevant
14	2	1.92%	Summary (ing)
15	1	0.96%	perspective
16	1	0.96%	economic
17	1	0.96%	Literature
18	1	0.96%	subclass
19	1	0.96%	Retrieval
20	1	0.96%	cataloging
21	1	0.96%	digital
22	1	0.96%	university
23	1	0.96%	Domain
24	1	0.96%	historical
25	1	0.96%	monitor

Table 48. The Top 25 terms classified under Peirce's Interpretant in Advances in Classification Research

Table 48 represents the Top 25 terms classified under Saussure in ISKO

Rank	# of Times	Percentage	Term
1	2	2.53%	Classification
2	2	2.53%	Scheme
3	2	2.53%	Customer
4	2	2.53%	Information
5	2	2.53%	Science
6	2	2.53%	Library
7	2	2.53%	Item
8	2	2.53%	Engine
9	1	1.27%	Bibliographic
10	1	1.27%	Record
11	1	1.27%	Creation
12	1	1.27%	Theory
13	1	1.27%	Display
14	1	1.27%	Care
15	1	1.27%	Support
16	1	1.27%	Activity
17	1	1.27%	Webpage
18	1	1.27%	Type
19	1	1.27%	Main
20	1	1.27%	Courses
21	1	1.27%	Digital
22	1	1.27%	Noesis
23	1	1.27%	Artefact
24	1	1.27%	Clues
25	1	1.27%	Amazonas

Table 48. The Top 25 terms classified under Saussure in ISKO

Table 49 represents the Top 25 terms classified under Saussure's Signifier in ACR

Rank	# of Times	Percentage	Term
1	2	4.76%	renting
2	1	4.76%	Optical disc
3	1	2.38	Greenhouse
4	1	2.38	Gases
5	1	2.38	Purpose
6	1	2.38	Type
7	1	2.38	cited
8	1	2.38	paper
9	1	2.38	conceptual
10	1	2.38	analysis
11	1	2.38	contact
12	1	2.38	document
13	1	2.38	vector
14	1	2.38	analog
15	1	2.38	digital
16	1	2.38	problem
17	1	2.38	syntactic
18	1	2.38	completed
19	1	2.38	person
20	1	2.38	muscles
21	1	2.38	red
22	1	2.38	wine
23	1	2.38	thesaurus
24	1	2.38	hour
25	1	2.38	bird

Table 49. The Top 25 terms classified under Saussure's Signifier in ACR.

Table 51 represents the Top 25 terms classified under Saussure's Signified in ISKO

Rank	# of Times	Percentage	Term
1	5	5.68 %	Object
2	4	4.55 %	Information
3	3	3.41 %	public
4	2	2.27 %	display
5	2	2.27 %	knowledge
6	2	2.27 %	organization
7	2	2.27 %	miscellaneous
8	1	1.14 %	thesaurus
9	1	1.14 %	Bibliographic
10	1	1.14 %	OPAC
11	1	1.14 %	discovered
12	1	1.14 %	practices
13	1	1.14 %	database
14	1	1.14 %	world
15	1	1.14 %	database
16	1	1.14 %	safe
17	1	1.14 %	environment
18	1	1.14 %	level
19	1	1.14 %	motor
20	1	1.14 %	engine
21	1	1.14 %	motor
22	1	1.14 %	ideational
23	1	1.14 %	hierarchy
24	1	1.14 %	Works
25	1	1.14 %	instantiation

Table 51 The Top 25 terms classified under Saussure's Signified in ISKO

Table 52 represents the Top 25 terms classified under Saussure’s Signified in ACR

Rank	# of Times	Percentage	Term
1	2	5.56 %	Inhabiting
2	1	2.78 %	theory
3	1	2.78 %	Object
4	1	2.78 %	citing
5	1	2.78 %	agricultural
6	1	2.78 %	Core
7	1	2.78 %	citing
8	1	2.78 %	paper
9	1	2.78 %	indexing
10	1	2.78 %	object
11	1	2.78 %	electronic
12	1	2.78 %	print
13	1	2.78 %	input
14	1	2.78 %	text
15	1	2.78 %	dark
16	1	2.78 %	feedback
17	1	2.78 %	respiratory
18	1	2.78 %	muscles
19	1	2.78 %	Thesaurus
20	1	2.78 %	wages
21	1	2.78 %	mammal
22	1	2.78 %	Hour
23	1	2.78 %	User
24	1	2.78 %	Sign
25	1	2.78 %	Company

Table 52. The Top 25 terms classified under Saussure’s Signified in ACR

APPENDIX B

To illustrate the form of a concept map, I will illustrate three concept maps types based on Saussure and Peirce sign theory and the “other” category. Figure 20 will present a concept map according to Saussure’s work. In this example, the representation of the stop sign is signified by the graphic image of a stop “sign,” and the signifier is represented in the words “stop sign.” The second example, in Figure 21, illustrates Peirce’s approach in the form of a concept map, which is composed of Object, Representamen and Interpretant. The Object in the map is represented by a graphical image of a stop “sign.” The Representamen is embodied in the word indicating that cars must stop here, and the Interpretant is represented by individual comments about the need to react to the “sign.” The third example, in Figure 22, illustrates the Other category.



Figure 20. Concept Mapping Example according to Saussure’s theory

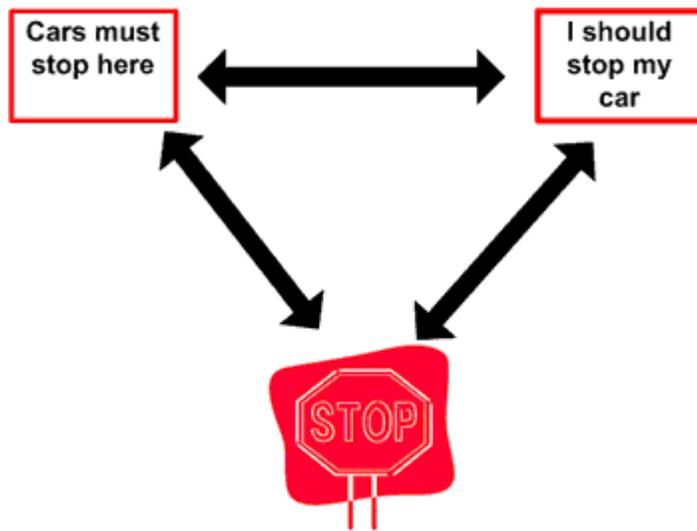


Figure 21. Concept Mapping Example according to Peirce's theory

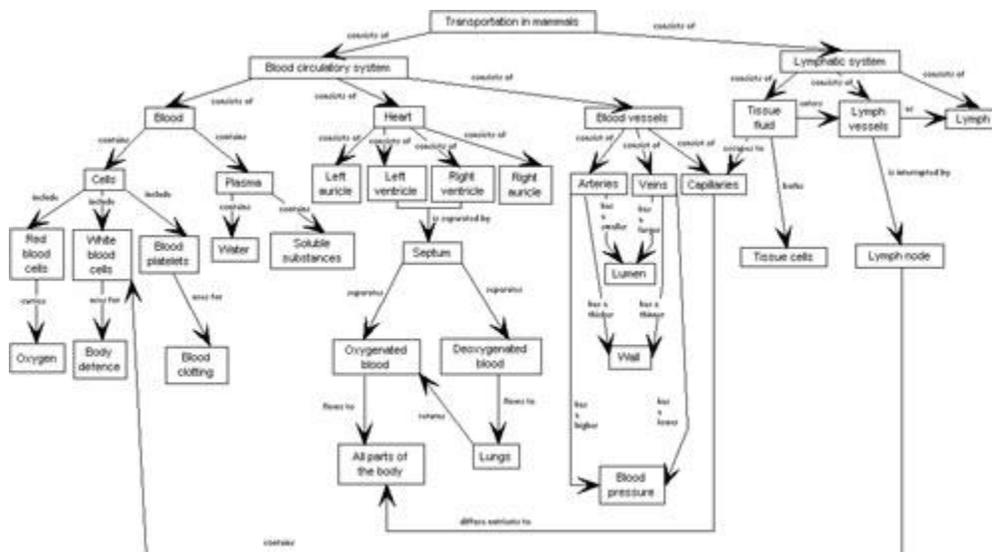


Figure 22. Concept mapping example according to the Other category.

APPENDIX C

The following examples show the scenario in terms of a concept map, then a mind map, and lastly, a conceptual graph. In this study Concept mapping consists of text, images, and links, all of which describe the relationship between specific nodes and arcs yielding the semiotics essence of any given presentation. The nodes are labeled with descriptive text, representing the "concept," and the arcs represent the type of relationship between them. A mind map is a diagram used to represent words, ideas, tasks or other items linked to and arranged around a central key word or idea. According to Buzan (1991), the mind map diverges from concept maps by employing image-centered diagrams that represent semantic or other connections between portions of information, unlike the concept map structures described above. The most advanced graphic techniques on our list, of course, are the conceptual graphs (CGs). Conceptual graphs, according to Sowa (1984), are a system of logic based on the existential graphs of Charles Sanders Peirce and the semantic networks of artificial intelligence. The expressivity and intuitiveness of CGs have led to their use as an intermediate language for translating computer-oriented formalisms to and from natural languages. As a graphic representation, the conceptual graph serves as a readable but formal design and specification language, such as programming and database languages. In the third analysis I collected the formats of the maps according to the three concepts previously defined. The following Figures 23-25 illustrate the three different mapping techniques to be examined in this study, including: concept mapping, mind mapping, and conceptual graphs. The maps are based on the following scenario: John is going to NYC by riding the MTA bus. The four concepts presented in this script are: [Go], [Person: John], [City:

NYC], and [Bus]. The following examples show this scenario in terms of a concept map, then a mind map, and lastly, a conceptual graph.

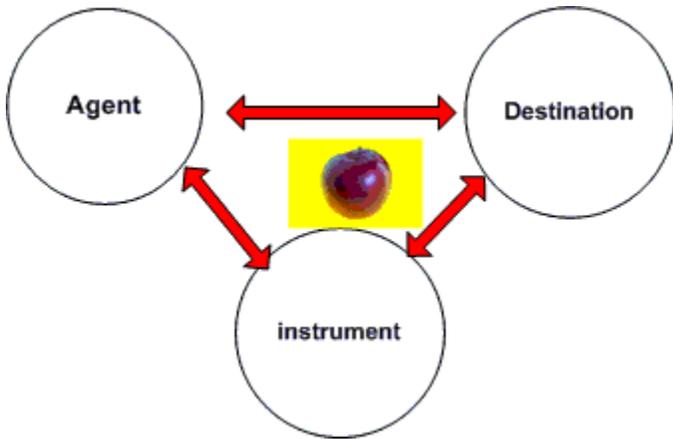


Figure 23. Concept Mapping Example

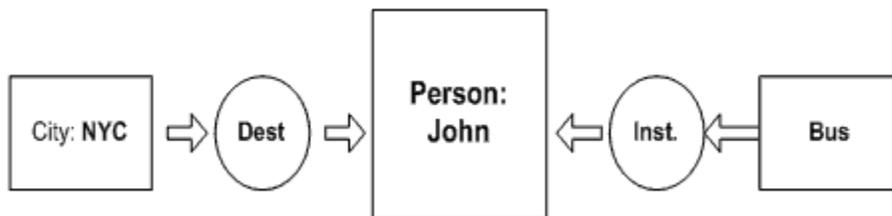


Figure 24. Mind Mapping Example

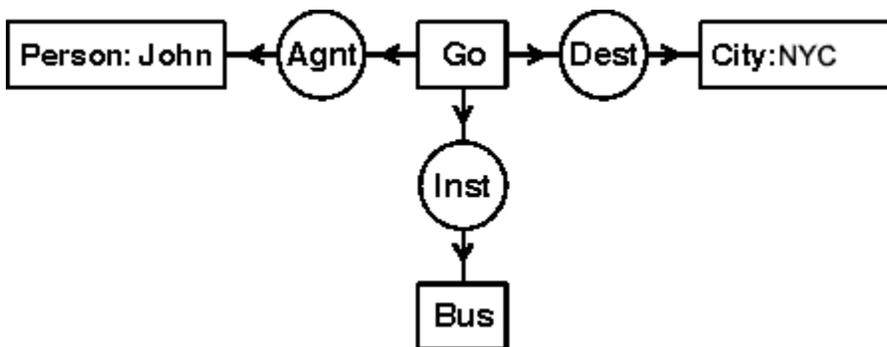


Figure 25. Conceptual Graph Example.