

TOWARD A MODEL OF INTERCULTURAL WARRANT: A CASE OF  
THE KOREAN DECIMAL CLASSIFICATION'S CROSS-CULTURAL  
ADAPTATION OF THE DEWEY DECIMAL CLASSIFICATION

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## ABSTRACT

### A MODEL OF INTERCULTURAL WARRANT: A CASE OF KOREAN DECIMAL CLASSIFICATION'S CROSS-CULTURAL ADAPTATION OF THE DEWEY DECIMAL CLASSIFICATION

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I examined the *Korean Decimal Classification (KDC)*'s adaptation of the *Dewey Decimal Classification (DDC)* by comparing the two systems. This case manifests the sociocultural influences on KOSs in a cross-cultural context. I focused my analysis on the changes resulting from the meeting of the two cultures, answering the main research question: "How does *KDC* adapt *DDC* in terms of underlying sociocultural perspectives in a classificatory form?" I took a comparative approach and address the main research question in two phases. In Phase 1, quantities of class numbers were analyzed by edition and discipline. The main class with the most consistently high number of class numbers in *DDC* was the social sciences, while the main class with the most consistently high number of class numbers in *KDC* was technology. The two main classes are expected to differ in semantic contents or specificities. In Phase 2, patterns of adaptations were analyzed by examining the class numbers, captions, and hierarchical relations within the developed adaptation taxonomy. Implementing the taxonomy as a coding scheme brings two comparative features of classifications: 1) semantic contents determined by captions and quantity of subordinate numbers; and 2) structural arrangement determined by ranks, the broader category, presence and the order of subordinate numbers. Surveying proper forms of adaptation resulted in the development of an adaptation taxonomy that will serve as a framework to account for the conflicts between and harmonization of multiple social and cultural influences in knowledge structures. This study has ramifications in theoretical and empirical foundations for the development of "intercultural warrant" in KOSs.

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# Chapter 1 Introduction

## 1.1. Introduction and background

Knowledge organization (KO) research is based on the belief that diverse sociocultural contexts contribute to multiple viewpoints embedded in a knowledge organization system (KOS) to the extent that one sees KOS as a sociocultural product, that is not only formed by human interest and capabilities but is also influenced by the surrounding environment. For instance, “cultural warrant” is a concept commonly understood as a foundation of classification, and it emphasizes cultural conditions in a certain time and place.<sup>1</sup> The KOSs in multiple viewpoints that reflect social, cultural, historical, political, and technological variations of knowledge have recently started to receive scholarly attention.

In addition, as advances in information communication and technology (ICT) break national, social, and cultural boundaries, use of classification systems also crosses social and cultural borders. Libraries in countries outside North America, for instance, have adopted the *Dewey Decimal Classification* () for organizing their library collections. In a trend of globalization, however, the question of proper localization of information systems beyond translation or assimilation is still in dispute. In reaction to globalization, indigenization of interoperable information systems is actively discussed. As such, cross-cultural environments make it imperative for classification research to address knowledge as a sociocultural product.

Because classification is socially constructed, it carries its own assumptions about the world and may have significant consequences not only for the knowledge user but also for society. Recognizing these sociocultural influences, KO research has examined how multiple

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<sup>1</sup> “The concept of cultural warrant implies that a knowledge organization system is more likely to be useful and appropriate for those who are members of a culture and that it is less likely to be useful and appropriate for those who belong to a different culture, at whatever level of society that culture or domain may reside.” (Beghtol 2002, p. 45).

sociocultural viewpoints are realized in KOSs by taking a variety of methodological approaches—e.g., domain analysis. Knowledge is based on both the nature of known things (ontological) and how humans process knowledge (epistemological). Although many KO scholars investigate both the ontology and epistemology of individual domains to construct valid KOSs, research regarding sociocultural aspects takes mostly an epistemological approach, because epistemology itself is culturally assumed.

There are also criticisms pointing out a prevalent relativism of contexts and epistemologies in KO suggesting that this tendency restricts development of generally accessible KOSs regardless of context and epistemology. To avoid the pitfall of extreme relativism, social and cultural contexts and epistemologies need to be thoroughly examined. For sociocultural contexts to be framed in pluralistic perspectives rather than relative perspectives, the comparative approach to KOSs in different contexts is useful. Comparative thinking leads to the acknowledgement of different conceptual schemes from different cultures, which may, in turn, effectively make each culture acutely aware of its own historical and contingent nature.

In recent KO research, along with the notion of cultural warrant, sociocultural influences have received attention through discoveries of categories and/or their relationships in KOSs that result from social and cultural factors. Applying empirical and interpretative methods such as tracing changes to the composition of a KOS, those KO studies mostly aim to reveal the dynamics and evolution of knowledge structures according to the sociocultural changes in one society or one culture (Salah et al. 2012; Tennis 2012). Such studies also explore multiple perspectives in organizing knowledge derived from diverse sociocultural contexts.

Some problematic issues, however, are raised during the construction and utilization of various KOSs because each reflects a different sociocultural perspective. On the one hand, for

such systems to reflect a certain domain or cultural view, it is possible that the systems will have limited accessibility—fewer users will be able to use a particular culturally targeted system. On the other hand, any systems aiming to accommodate diverse cultures and different perspectives are likely to satisfy no one due to the difficulties of managing myriad and often incompatible differences.

Therefore, one challenge in developing a KOS is to make it accessible to as many users as possible while satisfying the needs of intended users. Also, given the increasing cross-cultural use of classification, it is no longer true that current classification systems exist for only one society or one culture. However, few KO studies have illustrated how two cultures are reconciled through conflict and harmonization within a KO structure beyond pointing out the need to recognize and identify sociocultural perspectives.

Along with this interest in sociocultural issues in classification systems, KO scholars have studied such research themes for the general library classification schemes such as *DDC*, Library of Congress *Classification*, and Universal Decimal Classification (UDC). From the long history of KO in the context of library and information science (LIS), these library classification systems have been exemplars encompassing many KOS characteristics. While I also address the focus of KO or classification research on library classification systems in this study, it should be noted that library classification schemes do not represent all kinds of KOSs. To clearly differentiate these schemes from all other KOSs, what follows is a brief description of library classification scheme development.

The general library classification scheme is based in rationality and pragmatism: its aim is a logical taxonomy using symbolic language in order to provide access to knowledge to library users. More importantly, library classification schemes were intended to situate, for end users,

distinctions among different disciplines. Books were the primary mode of instantiation.

Emphasizing the practical purpose of library classification schemes, Rafferty (2001) pointed out that classification theorists who contributed to their development have achieved “discipline epistemology” in identifying main class structures to simplify access to knowledge in books or documents for library users (p. 182).

As global use of library classification systems increase, more than one cultural perspective may exist in a system. In cross-cultural environments, the knowledge structures of classification systems should reflect multiple sociocultural viewpoints, because the KOS is intended to meet the needs of multiple cultures. Sociocultural influences on KOSs may also come from historical changes to the society a KOS serves, because sociohistorical changes result in different concepts and different relationships among those concepts over time. Changes in KOSs induced by sociocultural influences may include both classificatory principles and cultural features. Examining the *Korean Decimal Classification (KDC)*’s adaptation of the *DDC* by comparing the two systems reveals many instances of this phenomenon. The *KDC*’s adaptation of the *DDC* illustrates the sociocultural influences on KOSs in a cross-cultural context, as revealed in an in-depth investigation of sociocultural influences. This was achieved by situating a KOS (the *KDC* in this case) in a cross-cultural environment and examining the dynamics between two classification systems designed to organize information resources in two distinct sociocultural contexts. The following paragraphs will briefly discuss related concepts and issues relevant to sociocultural influences in KOSs, followed by a detailed description of the study and its significance.

## 1.2. Description of the study

*DDC* is a well-known and widely used library classification scheme. The *Dewey Decimal System*, an American KOS, interacts with other cultures in two ways: (a) it accommodates cultural diversity within its system for diverse users and (b) it has been adopted as the foundation for organizing library collections in other countries and is often adapted to meet local needs. The latter occurs frequently. *DDC*'s disciplinary structure is considered preferable because (a) demands for organizing library collections by academic disciplines is high and (b) it is easier to build a classification system based on an existing structure. While modern academic disciplines have their roots in Western culture, many countries around the world have also adopted Western academic disciplines and education systems. Information professionals in these countries find the *DDC*'s principles and disciplinary structure useful for managing national knowledge to serve national interests and facilitate international exchange of information.

A national classification scheme for South Korea since its first publication in 1964, the *KDC* is an example of an adaptation of *DDC* that is deployed in a different sociocultural context. Because of American influence on the development of South Korean librarianship in the post-Korean War period, the *KDC* follows most of the fundamental principles and features of *DDC* such as the decimal principle, ten main class structures, and divisions (i.e., subclasses) found mainly in language and literature. The sequence of main classes in *KDC* remains almost the same as that of *DDC*. The one exception is the language class, which moved from fifth place in the *DDC* to eighth in the *KDC* (Table 1-1).

<i>DDC</i> 23 Class number	<i>DDC</i> 23 Subjects	<i>KDC</i> 6 Class members	<i>KDC</i> 6 Subjects
000	General Works, computer science and information	000	General works
100	Philosophy and psychology	100	Philosophy
200	Religion	200	Religion

300	Social Science	300	Social sciences
400	Language	400	Natural sciences
500	Pure science	500	Technology & engineering
600	Technology	600	Arts
700	Arts & recreation	700	Language
800	Literature	800	Literature
900	History & geography	900	History

Table 1-1 Classes of the *DDC* and the *KDC*

Despite its *DDC*-like characteristics, *KDC* has some classes, tables, and numbers that are easily distinguishable from their *DDC* counterparts. This is partly because *KDC* borrows other classifications' categories and structures, including those of *LCC* for some divisions in the social sciences and *UDC* for certain subcategories in medicine. Other subclasses are from the *Nippon Decimal Classification* (*NDC*; the Japanese national classification). Still, *KDC* revisions have continuously attempted to ensure the system's suitability for local needs. This involves making changes that reflect aspects of Korean culture and South Korea's history of social and academic development. For example, *KDC* had a major revision in its main class structure and added a new table for religions in order to meet local needs involving various religions (Oh & Yeo 2001). It also underwent a major change in the subject of architecture. In previous editions of *KDC*, architecture as engineering (540) and architecture as art (610) were separate, similar to *DDC* categories of architecture as construction of buildings (690) and architecture as art (720). However, the new sixth edition of *KDC* has merged architecture as art (610) into architecture/construction (540). This merger of two divisions reflects the fact that architecture is closer to engineering in the Korean conception of the discipline.

Because *KDC* was independently developed as the Korean national classification scheme using the basis of the *DDC* principles, Korean culture appears in *KDC* as a proper reflection of cultural warrant. At the same time, *KDC* also inherits some cultural features of *DDC*. In *KDC*'s adaptation of *DDC*, it either aligns with *DDC* or reflects specific aspects of Korean culture. In

this study, I examine the adaptation of a popular classification scheme to accommodate local culture when conflicting and harmonizing cultural warrants merge into an intercultural warrant. The study, therefore, is designed to answer the following question: “How does *KDC* adapt *DDC* in terms of underlying sociocultural perspectives in a classificatory form?”

In comparing the two systems, it was assumed that the efforts to meet local needs were realized through *KDC*'s adoption as well as adaptation of *DDC*. Based on this assumption, analysis was conducted in two phases. The first phase was intended to identify variations between the two schemes; in the second phase the primary aim was to understand and interpret variations resulting from the sociocultural differences identified in the previous phase. This was achieved by comparing the knowledge structures of the two classification schemes and identifying the quantity of class numbers representing concepts in each of the individual main classes.

The second phase was an in-depth examination of the differences between the two schemes, and examining changes made during *KDC*'s adaptation of *DDC* to reflect certain cultural or sociocultural dynamics. Findings from the first phase were used to identify two main classes for analysis showing significant and multifarious differences caused by sociocultural influences. Differentiating between *DDC*-like and Korean-specific characteristics occurred during the second phase. As there were influences by both American and Korean sociocultural needs in the *KDC*'s semantic contents and structure, concepts represented by class numbers the relationships among them were manually examined.

### 1.3. Significance of the study

Cultural studies of Information Communication Technologies have four progressive categories in their research streams: (1) identifying cultural differences, (2) explaining why they

are different, (3) managing the application of the discovered differences in information systems, and (4) studying the influences of information systems on culture (Leidner 2010). The present study is conducted to fulfill the first two categories. Its goal in comparing classifications is not only to identify differences between the *KDC* and the *DDC* but also to explain how they are different through consideration of different sociocultural contexts and the cross-cultural adaptation of a KOS. Major results and findings are expected to contribute to the last two categories. The examination of *KDC*'s attempts to address sociocultural differences in a KOS can provide useful information for potential solutions to issues in managing cultural diversity in a KOS. Furthermore, identified sociocultural/cross-cultural factors in this study may lead to future research on relations of a KOS to users or society in cross-cultural environments.

This in-depth examination of sociocultural differences and contextualization of KOSs will contribute to the development of an analytical framework of sociocultural contexts. Comparative studies of KOSs, especially those involving research on sociocultural influences, will uncover various cases on the role of context in KOSs, which appear as differences in knowledge structures. Therefore, sociocultural differences and their context will provide significant research data that can be used to create a framework for future studies of sociocultural context in KO.

In addition, this study is intended to provide a theoretical foundation for the development of KOSs in cross-cultural environments. Further studies of various cases of cross-cultural contexts may be expanded to consider not only adaptation but also translation and adoption of one KOS into another. It will certainly evolve into a robust research stream in cross-cultural KOSs.

## 1.4. Next chapters

The remainder of the study consists of five chapters. Chapter 2 reviews the relevant literature in four groups: (1) social and cultural aspects of KOSs, (2) the four categories of KO research relating to culture, (3) comparative studies in library and information science (LIS), and (4) KO and related studies on cross-cultural use of *DDC* and its influence on the development of *KDC*.

Chapter 3 discusses methodological approaches to the current study, starting with the discussion of the research question. Because the nature of this study is comparative, comparative methods and their limitations in research design are discussed. Following discussion of the research design, the subsequent section addresses the study's analytical tools, quantitative and qualitative content analyses and their strategic application.

Chapter 4 reports the quantitatively descriptive findings from the first phase analysis. Due to a huge data set, the description relies mainly on visualizations, such as graphs. Chapter 5 describes the findings from the second phase analysis, explaining the coding schemes and the results that arose from qualitative coding. Starting with the coding process, the coding schemes and results are described and illustrated with major examples.

Chapter 6 discusses interpretations of noticeable findings. In answering the research question, this chapter discusses interpretations of the findings in both phases, discussing the major patterns of sociocultural influences uncovered through comparison of the two systems. The second part of the chapter examines the notion of intercultural warrant as a major contribution of the study. The last chapter summarizes the study, its limitations and implications for future studies.

## Chapter 2 Literature Review

### 2.1. Introduction to Literature Review

As South Korea modelled its education and library on American systems in recovering from the Korean War, the country adopted *DDC* as the foundation for its own *KDC*, but sought changes to meet the national and sociocultural needs of Korean society. This study is intended to examine the sociocultural influences of that adaptation as reflected in the localized *KDC*.

*Sociocultural* means “involving aspects of social and cultural factors” according to *Webster’s New World College Dictionary* (Agnes 2013). Because the KO literature has rarely defined sociocultural influences analytically, I take an approach to sociocultural influences in KO literature in accordance with the dictionary’s definition. Thus, this section attempts to review KO studies addressing aspects of social and cultural factors respectively instead of trying to base an analysis on sociocultural influences using a specific term that rarely occurs in KO literature. Although social and cultural factors are deeply interrelated, these concepts will be explored individually due to lack of use of the combined concept term.

Through culture, we learn how people understand themselves and interpret the world. Societies generate the rules and regulations governing human social behavior. This differing emphasis is seen in the distinctions of ‘cultural anthropology’ and ‘social anthropology’. Broadly, cultural anthropology focuses more on an understanding of the rules of behaviors, language, material creations and ideas about the word, while social anthropology emphasizes social institutions and their interrelationships. Social anthropology studies the organizing principles of social life both in ways that govern and are challenged by individual behavior (Monaghan and Just 2000). With a view toward structuralism, the concept of culture discernible from society is well illustrated in Lévi-Strauss’s definition of culture:

Culture is neither natural nor artificial. It stems from neither genetics nor rational thought, for it is made up of rules of conduct, which were not invented and whose function is generally not understood by the people who obey them. Some of these rules are residues of traditions... Other rules have been consciously accepted or modified for the sake of specific goals. Yet there is no doubt that, between the instincts inherited from our genotype and the rules inspired by reason, the mass of unconscious rules remains more important and more effective; because reason itself... is a product rather than a cause of cultural evolution. (Lévi-Strauss 1985, 34)

In Strauss's definition, culture is a product of or results from the accumulated traditions of either social forces or individual motivations. "Culture" has a different emphasis than "society"; society embodies social structures as major influences on human behavior, while culture is the unconscious result of human behavior. Bourdieu (1977), however, interrelates culture and society by looking at society and culture as complementary forces. In doing so, he explains that social structure influences one's habitus, and the manifestation of habitus makes the shared experiences among individuals or groups of individuals explicit, which results in their becoming indicators of culture. Given this closely associated relationship between social and cultural factors, this study is designed to examine a comparison of two KOSs while taking their sociocultural backgrounds into consideration.

This chapter will review previous writings that shed light on the importance of social contexts for KOSs, especially those that highlight the epistemological stance of the study, as well as related contemporary KO studies impacted by such theoretical discussions. I will also examine several major perspectives regarding cultural contexts in the KO literature: culture as domain, culture and ethics, and indigenous KOSs. Further, as another epistemic factor that will shape the methodological approach of the study, intercultural comparative studies will be introduced focusing on how sociocultural contexts are conceptualized in these studies. The chapter will conclude with an examination of the cross-cultural use of *DDC*, the background on *KDC*, and

related studies of *KDC*'s adaptation of *DDC*.

## 2.2. Social Influences in KO

Technological advances in information systems and an explosive amount of information have become available in recent decades, and improving the efficiency and efficacy of KOSs is critical to information scientists. Meanwhile, discussions of social, political, and cultural influences on KOSs continue to be a foundational aspect of KO.

Hjørland (2012) and Smiraglia (2014) examine the challenges facing KO in the Internet era and the value of efforts to catalog and classify “recorded knowledge.” It might seem that there is no need for KO or even Library and Information Science (LIS), given the large number of search engines that make it possible to search for and access information with a few keywords or mouse clicks. Searching for information is no longer the exclusive domain of traditional information services such as libraries. Lester and Wallace (2007) define knowledge as something that constitutes decision making — acquiring information is not enough to make a person knowledgeable. Fulfillment of the need for knowledge could begin in a search for information, but knowledge can only be obtained through a synthesis of information. To synthesize information, we need contexts from which information can be found. Mere information retrieval is not what satisfies users' needs, nor does it replace what libraries and other information services contribute to society.

It is a common perception — I will go so far as to call it a misperception — that what we do in the information field is to provide information, as though we simply hunt for the right datum to answer a question. “Five,” we might say — well, “five what?” a user might ask of us. However, without context, no datum is truly useful, meaning that what we do is far more complex than the mere provision of facts. Information scientists are more complex as a social structure than any search engine could be (with all due respect to Google™ and Yahoo™, or even Freebase™). In fact, what we do is attempt to comprehend potential human information requirements, and then we collect artifacts from which the correct informational instructions can be extracted, synthesized, and

communicated. We provide context, and we filter it through our own expertise (Smiraglia 2014, 10).

The relationship of knowledge to social contexts has emerged as a research stream in recent years. Hjørland's "Lifeboat for Knowledge Organization" ([http://www.iva.dk/bh/lifeboat\\_ko/home.htm](http://www.iva.dk/bh/lifeboat_ko/home.htm)) lists five ways to use the term "social classification": division of a population into social classes, social bias in classification reflecting how social/cultural contexts are reflected in (any) classification, social organization of knowledge (institutional) as contrasted to intellectual organization of knowledge (scientific), classification in the social sciences, and collaborative (or distributed) classification like folksonomy. Among those five, the second and third meanings of social classification are associated with the social influences on KO systems (KOSs) and will be further considered below. Any bias in a society is inevitably reflected in KOSs constructed within the society, as the KOSs reflect their social context. Also, knowledge is organized by social organizations and/or institutions in order to fulfill their needs. In contrast, the intellectual organization of knowledge consists of descriptions or representations of parts of the world, as in scientific discovery. This does not necessarily imply that scientific discovery is immune to social influence, but it is understood as a contradictory concept to social needs in organizing knowledge in Hjørland's distinction of intellectual organization of knowledge and social organization knowledge. The distinction of intellectual and social organization of knowledge is not implying that one is closer to world truth over the other. This matters in KO, because they are projected from different epistemic stances: intellectual organization of knowledge is from a realist perspective and social organization of knowledge is from a constructivist perspective.

Thus, research on social influences in KO theorizes that KOSs, regardless of their intended purpose to meet the needs of individual institutions or society in large, are socially

constructed to serve as tools for social/institutional purposes, reflecting bias in social contexts. The notions of socially organized knowledge and social contexts reflected in KO have a long history. The following is a review of the works by KO theorists that influence the epistemic stance of this study.

### **2.2.1. KO as Social**

#### **2.2.1.1. Theory of scientific and educational consensus: Henry Evelyn Bliss (1929)**

Henry Evelyn Bliss is one of the most influential figures in KO. Dahlberg (2006), the founder of the International Society for Knowledge Organization (ISKO), shares a behind-the-scenes look at naming the Society with the term used by Bliss in his works *The Organization of Knowledge and the System of the Sciences* (1929) and *The Organization of Knowledge in Libraries and the Subject-Approach to Books* (1933). Bliss's writings, books, and classification systems influence many aspects of KO, such as the traditions of classification based on science (Beghtol 2010; Hjørland 2008), faceted structures of classifications (La Barre 2000), and social and economic values of KO (Andersen and Skouviq 2006; Gnoli 2008). While his philosophy of classification impacts all those aspects of KO, this section will focus on his beliefs and epistemological stance, and his influence on other contemporary KO scholars' works, especially those considering social influences.

Among classical KO theorists, Bliss (1929) was the first to directly articulate the relationship between classification as a KOS and social organization. Despite his beliefs in scientific knowledge as the most stable form of knowledge that was believed to be universal truths, he also recognized the role of organizing knowledge in social communities, so that social organizations would be driven by reason derived from knowledge. Broughton (2008) pointed out that Bliss viewed the pursuit of an appreciation of knowledge as avoiding unnecessary conflict between the rational, the empirical, and the bibliographic perspectives of knowledge. Bliss did

not restrict himself to only one epistemological approach; rather, his epistemological stance is dynamic. His position regarding a natural order of things can be extrapolated to examine the ways in which society determines “how the order is manifested” in human knowledge. Thus, his approach to classification is based primarily on the view that the order of knowledge is determined by a scientific and educational consensus of society. This principle is also called the “theory of scientific and educational consensuses” by Beghtol (2010). Many contemporary scholars laud Bliss’s writings as some of the most profoundly theoretical approaches to classification (Broughton 2008; Garfield 1975; Hjørland 2008). In *The Organization of Knowledge and the System of the Sciences* (1929), Bliss addressed numerous relevant concepts and principles in organizing knowledge derived from a range of communal minds such as public, commercial, educational, scientific, moral, and institutional thought.

Bliss’s *The Organization of Knowledge and the System of the Sciences* has been critical in spreading his key ideas regarding KO, whether implicitly or explicitly. His views and discussion of classification within social contexts have been revisited by many contemporary KO scholars. Broughton (2008, 47) describes Bliss’s ideas of the KOS’s relationship to social contexts: “While there is a theoretical basis to his ideas of ordering, the part played by society in determining the nature and form of subjects and/or disciplines is given considerable weight”. Andersen and Skouviq (2006, 303) also give credit to Bliss’s formation of a theoretical foundation for KO relative to social organizations, saying, “Bliss tries to show how forms of social organization constitute knowledge organization and, consequently, how we cannot think of knowledge organization as an isolated activity”.

Broughton’s overview of Bliss’s work (2008) recognized a communal mind that is not limited to the scientific, but applies to all kinds of communities. Beghtol (2010, 1050) also

highlights Bliss’s recognition of this consensual and communal mind in every domain: “He believed that, over time, human beings would grow toward increasing agreement about the answers to fundamental questions that were asked not only in science but also in every other area of human enquiry (e.g., religion, aesthetics, and sociology)”. Gnoli also referred to Bliss’s notion of social consensus, describing KO’s expanded influence in everyday life and society as an interdisciplinary domain (2008, 140).

Any discussion of the notion of social contexts and communal minds leads to a consideration of the role of organizing knowledge in society. Social organizations embody a consensus of the opinions and interests of their members, which lead correspondingly to large bodies of knowledge, thought, and objectives. Knowledge and information, the assets of a community and vital to its continuing growth and development, should then be organized accordingly in order to support that community’s objectives and activities. In other words, (1) organization of knowledge reflects a collective’s practices or activities; and, (2) knowledge needs to be structured to correspond to the collective’s interests and objectives (Figure 2-1). Given the ways in which social organization influences and, to a large degree, determines organization of knowledge, KOSs cannot be isolated from social organization.

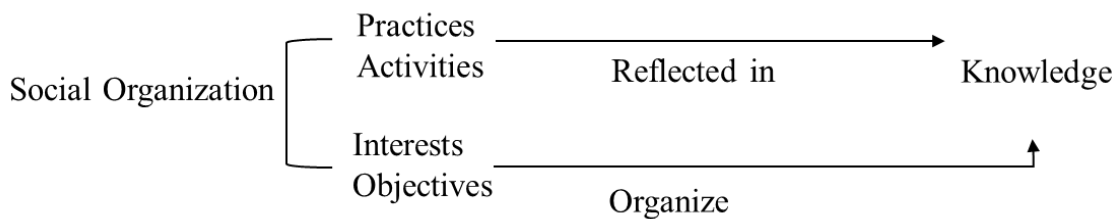


Figure 2-1 Knowledge and Social Organizations

**2.2.1.2. Social epistemology as theoretical foundation for LIS: Egan and Shera (1952)**

During the development of library education in the United States, the Graduate Library School (GLS) at the University of Chicago, a premier academic institution, took a lead role in

formalizing librarianship as an academic discipline. In a landmark article, Margaret Egan and Jesse Shera of GLS set out their case for a theoretical foundation for the study of librarianship. That article “The Foundation of a Theory of Bibliography” (Egan & Shera 1952) is recognized as a critical work that first suggested a new discipline, social epistemology. As a theoretical foundation of LIS, social epistemology concerns an understanding of how society achieves a perceptual (knowing) relationship to its environment, through “analysis of the production, distribution, and utilization of intellectual products”. They also suggested a methodological framework to reflect collective views of society in bibliographic practices. Among contemporary LIS and KO scholars, their work is credited for three major contributions: identifying the ultimate goal of library and bibliographic services; providing a theoretical framework for the study of library and information science with subsequent frameworks of information-seeking behavior, knowledge organization, and bibliometrics; and the initial use of the term “social epistemology” (Furner 2004).

It is necessary to discuss these scholars’ fundamental understanding of the social dimensions of knowledge relative to KO. Egan and Shera (1952) began with a statement about the fundamental problems of bibliographical organization research by pointing out that the limited range of bibliography constrains observation of the total flow of communication in society. The central concepts in such a view are “society” and “communication.” “Society” indicates a construct that involves complicated relationships and interactions between groups or individuals and is certainly a notion beyond individuals. In the works of Egan and Shera (1952) and other KO scholars (e.g. Furner 2002) dealing with social epistemology, the basic foundation for all theories, arguments, and discussions in KO is a macrocosmic or collective perspective.

According to Egan and Shera (1952), microcosmic perspectives of bibliography focusing on individuals are economically wasteful and intellectually frustrating, because a microcosmic approach to bibliography, as a separate tool, satisfies only a few people with urgent needs. This limited range hinders the provision of bibliographic services to a society, as there is no overarching scheme that encourages not only production and consumption, but also the interaction of intellectual properties through all parts of society. This view can be found in their presumptions regarding human beings, compared to other disciplines, seen in Table 2-1.

Discipline	Presumption
Economics	Acquisitiveness is an ineradicable aspect of human nature, and it creates forms and processes (money, products, exchange, etc.).
Sociology	Man is inherently gregarious and seeks to examine the forms and processes of gregariousness (culture, religion, education, etc.).
Social Epistemology	Man is naturally and continuously curious about his environment and seeks to extend his knowledge in his efforts to control his environment (form and processes).

Table 2-1 Presumptions on Human Nature (Egan and Shera 1952)

Table 2-1 shows certain presumptions of human nature in each discipline. These key beliefs distinguish social epistemology as a new and separate discipline. Social epistemology's view on human nature implies the unavoidable relationship of a person to his or her environment and the relationship of his or her knowledge to that environment. Egan and Shera's (1952) discussion ends with a proposal for social epistemology as a theoretical foundation for an information scholarship. With a macrocosmic approach to bibliography, social epistemology is a study of cognitive behaviors at the social level, one no academic field had attempted to address at that time (Furner 2004). After Egan's passing in 1959, Shera attempted to disseminate their ideas by providing a framework for social epistemology (1960, 1968, and 1970). In 1970, he stated, "I want today, however, to direct your attention away from the individual and to society,

because it is the social context of the library with which we as librarians must ultimately be concerned, even though we must work through the individual to achieve the social end” (Shera 1970, 82).

Whereas “social” implies a collective, macrocosmic approach to and study of environments, “communication” concerns the perspective of actions, activities, or activism of knowledge. Bibliography is “one of the instrumentalities of communication and communication itself as an instrumentality of social organization and action” (Egan & Shera 1952, 125). Further, “bibliography must be looked upon as being, in effect, the roadbed over which the units of graphic communication move among the various parts of society as they make their contribution to the shaping of societal structure, policy, and action (Egan & Shera 1952, 125)”. These statements indicate a belief that a socio-communicative conception of bibliographical activities and organizing knowledge is critical as a theoretical foundation for bibliographic research (Andersen 2006). According to this point of view, bibliographic organization needs to be studied relative to the total environment: physical, psychological, and intellectual. In recognizing bibliographical activities as part of social communication in a broader sense, Egan and Shera emphasized the importance of the relationship between communicative action and KO.

Egan & Shera’s 1952 work has been revisited continually in further exploration of the term “social epistemology” (e.g. Zandonade, 2004; Furner, 2004). In addition to their influence on modern-day scholars with the concept of social epistemology and methodological approaches appearing as current LIS sub-areas, their notion of bibliography as a communicative instrument for society implied the role of KOSs not only as a means of enabling search and retrieval, but also as a social system enabling communicative action within a given society.

#### **2.2.1.3. Socio-cognitive (domain analytic) approach: Hjørland (1997 and 2002)**

In a similar vein to the idea of social epistemology as suggested by Egan and Shera,

Hjørland also contemplated cognitive behaviors beyond the individual. In his book *Information Seeking and Subject Representation: An Activity-Theoretical Approach to Information Science* (1997), he provides theoretical foundations for information-seeking behaviors and KO based on activity theory. His view on activity theory defines knowledge as a product of human activity associated with the division of labor in society. The understanding of knowledge and organizing knowledge is based on the notion that human cognition is not achieved solely through individual development. Rather, a person's development of cognition is a result of biological, cultural, and individual development. Therefore, meanings of terms are determined by their use in social groups (Hjørland 1997) and, in this definition, terms also have socially negotiated meanings (Hjørland 2009, 1,593). Meaning, concept, and knowledge conveyed through communicative interactions are thus ecological and social, so we cannot assign meaning bibliographically within KOSs simply by studying individuals' cognition. Hjørland stresses the need for the study of collective thought in individual knowledge domains or discourse communities to design better KOSs. This idea is similar to Bliss's (1929) belief in the role of KO relating to social organizations. Also, building on Egan and Shera's (1952) view of bibliography as a communicative instrument, Hjørland attempts to demonstrate the relationship between the social organization of knowledge and human communicative activities.

Since his 1997 work, Hjørland has further developed and disseminated his theory and framework. As an alternative to internal movements that focused on the individualistic or universal human mind, he introduced cognitive aspects at the social level in information science and suggested a socio-cognitive view of KO (1997 and 2002). The socio-cognitive view questions the individualism of the cognitive view, which disregards the contexts and interactions present in a community.

Hjørland's socio-cognitive view is closely associated with his acknowledgment of epistemology as a theoretical foundation for KO and Information Retrieval (IR). The individual view of cognitive behavior presumes a universal human mind – studies of individuals are believed to be representative of all human beings by excluding contextual factors, whereas social and ecological views of cognitive behavior allow for different perspectives from diverse social groups. His socio-cognitive view, thus, is considered similar to the philosophical discussion of Egan and Shera's social epistemology (Zandonade 2004). Hjørland's socio-cognitive viewpoint and Egan and Shera's social epistemology are both based on collective views and communicative actions in organizing knowledge. In addition, Hjørland suggests a theoretical framework and methodology for information science — a domain-analytic approach, which investigates how domain-specific communities understand concepts and communicate by using their own terminology (Hjørland 2002).

### **2.2.2. The Impact on contemporary KO field**

Much of the KO literature concerning the social aspects of knowledge and KO is influenced by major works of these KO theorists - the theory of scientific and educational consensus by Bliss (1929), the social epistemology of Egan and Shera (1952), and the socio-cognitive view of Hjørland (2002). Their emphases on the social aspects of knowledge and KO bring attention to communicative activities of collectives; such views have contributed to building theoretical foundations for KO scholars concerning the significance of context.

#### **2.2.2.1. Metatheoretical assumptions**

According to Hjørland (1998, 607), in information science a lack of theory exists; even some specific approaches such as algorithmic retrieval or citation-based retrieval are not claimed as theories, but termed 'metatheoretical assumptions'. Metatheoretical assumptions are more like philosophical views, thus more general than theories. They are assumptions made to generate

specific theories and are often recognized in the elaboration of concepts by use of certain terms in texts. In this study, I examine metatheoretical assumptions from the texts of KO studies and related concepts regarding the impact of social influences on KOSs.

*Philosophical shifts from ontological to epistemological*

Andersen (2004) affirms that information seeking is a collective activity, given that a social organization engages in document production according to the demands of the organization. As a result, knowledge-organizing activity should be shaped by its connection with the social form. Budd (2002) also recognizes collaborative activity in needing information and maintains that knowledge is influenced socially, referring to Susan Suleiman's (1980) claim that reading is essentially a collective phenomenon. Those collaborative activities such as the production, mediation, and dissemination of knowledge reflect the ideas and worldviews of a certain group, community, and society, implying that different views are at play in organizing knowledge.

Such perspectives are opposed to universal, modernistic, and positivistic views, and at the same time bring more attention to epistemology as a basis of KO. There have been evident shifts "from classification-as-ontology, in which everything is defined as it is, to a more contemporary notion of classification-as-epistemology, in which everything is interpreted as it could be" (Mai 2010, 711). Given that classification is one type of KO, Mai's assertion could be interpreted to say that there are shifts from KO-as-ontology to KO-as-epistemology. In the "Introduction" to *Cultural Frames of Knowledge*, edited by Smiraglia and Lee, Olson (2012, ix) points out a dramatically increasing interest in epistemology in KO literature: "I gave my first presentation about epistemology at the 1996 biennial international conferences of ISKO at the Library of Congress in Washington . . . At the 2010 ISKO conference in Rome, the conference was

organized into two tracks, one of which was almost exclusively about epistemology, nearly half of the conference, and was the more heavily attended track. What happened in those 14 years?”

This attention to epistemology, which allows multiple viewpoints on organizing knowledge, resulted in a split between stable, universal kinds of KOSs and dynamic, pluralistic, and their domain-specific counterparts (Mai 2010). The distinction between the ontological and the epistemological approaches in KO could shed light on KO’s foundation regarding social and cultural conditions beyond technological advances. KO is not merely about structuring knowledge for retrieval; understanding of knowledge is the understanding of the world, with knowledge not as truth but as it exists in relation to environments, natural as well as social. According to Hjørland and Hartel (2003), knowledge is based on both the nature of known things (ontological view) and how humans process knowledge (epistemological view). Gnoli (2008, 140-141) maintains that “Human knowledge is thus a product of both the world itself and of human interests and capacities”; he also posed a long-term research question on how to respect multiple viewpoints: “One outstanding claim of the epistemological approach is that KO can be different to different communities”. Many KO scholars investigate epistemology of a certain domain, with special attention to the social and cultural aspects of organizing knowledge in order to construct valid KOSs. Hjørland (2008, 16), for example, advocates for the domain-analytic approach to KO and states that “domain analysis is a sociological-epistemological standpoint”. In this sense, KOSs should reflect the needs of a community or purposes of a given group. In other words, this approach represents current epistemological thought and simultaneously gives room for the interplay of multiple viewpoints in KO, maintaining that no universal KOS meets all needs.

### *Contextualization*

Along with the increasing interest in epistemology, the importance of context in organizing knowledge and information retrieval has also been discussed. Mai (2010) dismisses the claim that one best system can serve everyone, and emphasizes the importance of contextuality in KOSs. He stated that there is a plurality of bibliographic systems with different contexts, meaning that there are also plural epistemological stances. Olson (2009) explores the historical aspects of theoretical foundations for classification at various times and notes that no neutral classification exists through the historical transitions of classifications. According to her, Sayers (1926) and Bliss (1929) imply that even natural classification adhering to the natural order (ontology) must overlap with purposive classification (epistemology) in some ways. Thus, no classification scheme comes without social and cultural conditions.

I posit that the epistemological approach allows for multiple viewpoints in KOSs. Cultural diversity can also be understood as involving multiple viewpoints; the cultural aspect of KOSs will be discussed in the second part of this literature review.

#### **2.2.2.2. Empirical and practical works**

As discussed above, there have been attempts to acknowledge and theorize about social influences on KOSs. In the form of conceptual study, they are shedding light on the importance of epistemology and contextuality in KOSs. However, not many studies have examined the metatheoretical assumptions empirically in the context of KOS research and development. Since KO, as a discipline, has been developed upon the strong foundation of not only theory but also practice, it is also necessary to discover what the acknowledgment of social influences in KO brings to bear on practice.

The following section focuses on two approaches of the empirical studies derived from the metatheoretical assumptions discussed earlier: 1) the analysis of KOSs in social contexts and 2) the domain analytic approach in social contexts.

*The analysis of KOSs in social contexts*

KO researchers examine socially structured knowledge by considering how KOSs have manifested that knowledge. In these studies, the metatheoretical assumptions are that KOSs will inevitably reflect social contexts. These studies not only relate KOSs to social contexts but also illuminate novel perspectives, often unnoticed or taken for granted, with critical views regarding those systems.

Bowker and Star's *Sorting Things Out: Classification and Its Consequences* (1999) is an influential work concerning the social dimension of organizing knowledge. The researchers take an anthropological approach to classification, investigating classification schemes as foundational structures of human societies. The natural inclination of humans' classifying leads to the fact that a systemic classification designed by and for many kinds of people — who each classify things in their own way — is ultimately the result of conflict and negotiation among groups. The authors attempted to reveal the assumptions underlying classification systems and the consequences of these assumptions by investigating examples of practical classifications such as Nursing Intervention Classification (NIC) and International Classification of Diseases (ICD). An example of NIC showed how a classification system organizes and is organized by an interest group, in this case nurse practitioners. NIC aims to make the range of nursing activities visible through classification, legitimizing the work of nurses. These classifying activities have been critical to the nursing profession because they allow the real work of nurses to be recorded, verified, and rewarded by measuring the cost of each activity. Like other classification schemes

that render work visible, NIC carries some challenges, such as over-specifying what a nurse should do. It also has positive consequences, such as making nurse-practitioners an organized occupation, creating a basis for a scientific domain, and developing a tool for organizing work practices.

The consequences of classification may also involve political and ethical problems, as shown in the case of ICD. For example, different cultures have different ways of defining the moment of birth. That difference causes conflict in creating a definition in ICD. Political concerns and definitions, and particularly the role of the US government in controlling the discussion around the definition of birth and personhood, have put this topic into the realm of affairs of the state (Bowker & Star 1999). In other words, ICD reflects the charged political and ethical atmosphere surrounding controversial topics, forcing some definitions to be abandoned or silenced and others to appear exotic or overly convoluted. Bowker and Star tested how social knowledge is organized and what impact it has on society through these classification systems.

While the importance of organizing social knowledge is recognized in every discipline, many studies of socially organized knowledge manifested in existing bibliographic classifications and re-confirming the inevitable relations between KO and social context exist. These studies not only stress social context in organizing knowledge but also discuss the responsibilities of KO scholars and practitioners to improve the systems by continuously questioning existing bibliographic classification systems within their social contexts.

#### *Critiques on the mainstream classifications- universal is problematic*

The early acknowledgement of social context by KO theorists such as Bliss (1929) and Egan and Shera (1959) has inspired critical approaches to classification revealing embedded

social and cultural bias. Many scholarly works are critiques of mainstream classification systems over three decades (e.g., Olson 1998). Those critiques were mostly of *DDC*, *LCC*, and *UDC*.

## Gender

One of the major critiques of mainstream classification schemes is derived from feminist epistemology. Olson applies feminist theory to deconstruct the existing standards and subject representations of marginalized voices (1996; 2002; 1998). She examines the presumptions of Cutter's (the creator of the *Expansive Classification*, which provides a basis for the top categories in the *LCC*) and Dewey's (the founder of the *DDC*) principles for organizing knowledge, stating their belief that "[a] universal language is necessary to overcome diversity for effective subject retrieval (2013, 140)". The example of revealing the problems of universal classification systems shows a number of works containing feminist themes combined are found to be only partially represented in both *LCC* and *DDC*. Kublik and Olson (2009) attempt to make adaptation of *DDC* for a feminist/women's perspective as a particular social context. To identify the gaps and instances of bias in *DDC* relating to women's studies, they link each of about 5,000 descriptors in a Women's Thesaurus developed by librarians and subject specialists to one or more *DDC* numbers and make the assessment of each link for goodness of fit, based on coextensiveness, reflection of gender, and rhetorical space. Although this expansion can't be realized because of legal issues, the project is meaningful as a prototype for future improvements. Fox (2015) applied discourse analysis to explore gender oppression in *DDC*, and examined its possible consequences or interplay in social contexts through the survey of legal and medical documents.

## Non-western epistemologies

The major critiques on universal classification systems also look at diversity. As the fourth peak period of immigration in the United States, large-scale immigration began in the 1970s (Hipsman & Meissner 2013). Correspondingly, criticism arose of major classification systems around underrepresented cultures, bringing attention to non-western and indigenous epistemologies. Questioning the treatment of non-western materials in *LCC* and the *DDC* - African literature, history, languages, and African studies; Melanesian geography, ethnography, and languages; Asia and the Pacific; Arab-speaking countries -; the critiques challenge the mainstream classification schemes' treatment of non-western materials as being underrepresented (Olson 2001).

“The power of social influences is most easily seen in classification outside of one’s own society (Olson 2009, 4809).” Following the critiques on mainstream classifications, the holistic analysis of social contexts manifested in the classification systems in a certain time and space was carried out within broader social and cultural backgrounds. The second part of the literature review will address studies relating KOSs to cultural contexts in much more depth.

## Socio-technical changes

With recent socio-technological changes, socially organized knowledge, as in social network sites or the Web 2.0 environment, has become one of the most popular topics. Research on social tagging (or folksonomy) is actively produced, reflecting social contexts more directly in organizing knowledge by engaging not with expert catalogers but users as amateur catalogers. Unlike standardized classification systems, user-contributed tags are not constrained by authority control. However, Kipp & Campbell (2006) and Olson & Wolfram (2008) identify the patterns of Zipf-distribution for social tagging terms, showing that some major terms are dominantly

showing and a long tail of other terms appear infrequently. This pattern of social tagging is likely to prohibit preserving diverse social and cultural perspectives in user-produced KOSs. The emerging social technical change, like social tagging, will not guarantee a better reflection of social contexts through its use alone. Therefore, KO research consistently calls for the studies of social contexts manifested in KOSs, regardless of the type of system – e.g. traditional or emerging - and of the impacts social contexts have on KOSs.

*The analysis of social groups in a domain-analytic approach*

Those studies revealing social and cultural contexts in classification systems and suggesting desired directions lead to studies of social and cultural groups. Analysis of social and cultural groups aims to provide practical solutions for constructing classification systems that meet the needs of particular groups. Analysis of a certain group is similar to domain analysis, given its shared purpose of organizing knowledge with a certain epistemological angle. Theories and concepts are products of particular domains, so those domains should be analyzed to better understand their users (Hjørland 2013a). Smiraglia (2012, 111) also argues that a domain “must be a group with a coherent ontology, which implies a shared epistemology”. Domain analytic studies in KO not only examine the needs and perspectives of a certain group but also implement the analyzed results in the development of KOSs. User-oriented approaches and Cognitive Work Analysis are exemplary domain analytic studies examining a certain social group.

User-oriented approach

User studies, claimed to examine users’ perspectives to be reflected in information systems, have generated a couple of successful examples for user-oriented systems in KO. However, Hjørland (2013b) maintains that such examples are not user-friendly systems as in a user-centered revolution (Nahl 1996; 2003), but reflections of domain knowledge as in a socio-

cognitive approach that represents the perspectives and language from the activities of a certain social group. For instance, the Book House system developed for information retrieval of fiction in Danish is one successful example based on users' preferences and cognitive views in the KOS. The system abandoned many traditional approaches, which are document oriented, and adapted users' requests as a focus (Pejtersen 1989). This could be an improvement over traditional document oriented approaches possibly because of its specific purpose and because the user group for a specific domain, in this case fiction readers, was targeted. Smith (2011) targets the user group for a domain that is appropriate for a specific purpose: medical information thesauri and patient/consumer language. There is still no consensus in defining what user studies are in KOSs, especially in relation to the socio-cognitive/domain analytic approach. It would be, however, desirable that a KOS aiming to fulfill the needs of a specific social group considers not the individual-cognitive aspects of the users being expected to be universally applicable, but the socio-cognitive aspects including the perspectives and language of the group.

#### Cognitive Work Analysis

Mai (2008) proposes that the notion of actor and the notion of domain are also needed for a contextual, human-centered approach to the design of KOSs, in acknowledgement of the recent trends of classification research's understanding of contexts in which KOSs functions. Thus, he suggests the application of Cognitive Work Analysis (CWA) (Vicente 1999; Rasmussen, Pejtersen & Goodstein 1994) as a methodological framework for analysis of actors' activities, domains, and preferences in accordance with the socio-contextual and domain analytic approaches. The CWA framework sees information interactions of actors in the context of purposive activities. Among many studies applying CWA in information science, Holland (2006) investigates the use of corporate publications by researchers in forest science, oceanography, and

fishery science to provide recommendations for the design of information systems related to the structure and representation of data about corporate publications. Soglasnova & Hanson (2015) apply CWA to evaluate social responsiveness and relevance of terminology used in a specialized thesaurus constructed for a community legal clinic library.

## 2.3. Cultural Aspects of KOS

### 2.3.1. Culture and Knowledge

Knowledge plays a critical role in making a decision leading to possible actions, whether it is an individual or group decision/action. So, the need for and pursuit of knowledge are inevitable, regardless of the form of delivery, exchange, and flow. However, the channels, forms, and ways in which knowledge is generated, stored, and transferred can be culturally influenced. Also, because culture shares *thoughts, attitudes, beliefs, and values* (Hofstede 1994), the ultimate goals or values in pursuing knowledge can be culturally different. Those shared values, beliefs, and thoughts are transmitted socially and become a lens through which people understand and interpret the world. They consist of such things as practices, competencies, ideas, schemas, symbols, norms, institutions, goals, constitutive rules, artifacts, and modifications of the physical environment (Fiske 2002, 85). The cultural lens can be unique in treating knowledge and the goals and values of knowledge such as in Sahlins' (2004, 11) claim that "culture does not determine history but organizes it." Culture leads people who share social epistemology to understand the world. This shared epistemology also allows shared perceptions, which organize the shared knowledge.

#### 2.3.1.1. KOSs as cultural artifacts

KO scholars and practitioners have attempted to capture many aspects, lenses, and screens of reality and reflect them in KOSs. All KOSs are language based, although some use

symbols for systematic representation of knowledge. Language is innately a product of culture. The relationship between languages and cultures implies how we understand the relationship between KOSs and cultures. According to Whorf's (1956) hypothesis, language applies a screen or filter to reality. Boas (1966) claims that various languages classify experience differently and linguistic categories might impose themselves on the thoughts of their speakers. If the linguistic categories include knowledge structures in any sense, knowledge structure, organization, and classification would reflect the views of the language speakers. For instance, just as language consists of content (words) and relationships (grammar), most KOSs also have the same two parts. Olson (2009) suggests that there is an essential construct of classification affected by social and cultural conditions: semantic contents and structures. The semantic contents of classification, such as terminology, synonyms, and antonyms, can apparently represent the interests of a certain group, depending on its political, cultural, and moral context. Likewise, the structure of the classification system, such as hierarchy, results from cultural and intellectual infrastructure. Tennis (2011) also attempts to separate semantics and structure in the context of a classification scheme. According to him, semantics is a definition of classes, while structure is a representation of relationships. I shall examine these two concepts separately to reveal underlying assumptions of KOSs in the methodology chapter.

#### **2.3.1.2. Cultural diversity in pursuing knowledge**

Cultural diversity arising from different social structures implies various values for knowledge across cultures. If we look at the highly prioritized value in knowledge generated from social discourses, 'seek truth and avoid error' is generally understood as a primary goal. A large number of anthropological reports show that diverse cultures share a common feature in that they recognize the value of truth as their epistemic goal (Maffie 1995). However, Mulder (1996) maintains that it is at least possible for there to be a society in which members value

epistemic goals other than truth. One example is ancient China, where dominant thought (i.e., the classicism) promoted learning centered on morality-seeking in context with no mention of pursuing truth (Lee 2016, 127-128). In Hongladarom's (2002) claim of the need for "cross-cultural epistemic practices", he illustrated the difference in epistemic goals across cultures using an example of how the Thai pursue knowledge. In Thai, knowledge is valuable in relation to social hierarchy and succession of traditions. It is echoed by Mulder (1996, 140-141) stating "To have relatively more knowledge entitles one to equivalently more respect and position, and, correspondingly, people in higher positions are thought to have knowledge—or at least they are expected to behave as if they know. Knowledge is a personal attribute that is beyond research or discussion." Hongladarom emphasizes that epistemic goals can vary, given that values for knowledge can vary across cultures. This implies that cultural consideration should contribute to the task of social epistemology that Egan and Shera (1952) envisioned as a discipline that examines the role of knowledge in society.

### **2.3.2. Culture in KOSs**

Despite the inevitable relationship between culture and organizing knowledge, there is a lack of consensual elaboration of KOSs addressing culture. Beghtol (2002, 903) raises the issue of culture as a foundational warrant for KOSs. She emphasizes the importance of equipping information systems with the cultural conditions of groups, stating, "A system that has not been established on an appropriate cultural warrant will not be adopted for information search and retrieval because information seekers will find that it does not match their accepted view of how the world works". The KO literature, however, lacks comprehensive accounts for the epistemic stances of knowledge organization regarding cultural contexts, which leads to practical implications.

### **2.3.2.1. Culture as domain**

Many major KO scholars now support multiple viewpoints, post-modern views, and multicultural contexts in organizing knowledge. In an effort to provide an overview of cultural pluralism in KO, the Information Organization Research Group at the University of Wisconsin-Milwaukee published a collection of essays titled *Cultural Frames of Knowledge* (Smiraglia and Lee 2012), addressing diverse viewpoints in cultures, methods, and epistemologies - referred to as 'domain analytic.' In this collection, Smiraglia (2012) concluded that culture provides us with epistemological lenses: perceptions are shaped by definable social domains and perceptions shape epistemology – how we know what we know. In accordance with both the social epistemology of Egan and Shera and the socio-cognitive approach by Hjørland, culture is regarded as domain wherein human activities take place and customs, habits, languages, and perceptions are shared.

### **2.3.2.2. Culture and ethics**

The two challenges of classification discussed in an earlier section – ethnographic and formal (Star & Bowker 1999) - bring ethical concerns as a third challenge of classification. Depending on the purposes of classification systems or political and social strategies of dominant user groups, a particular culture becomes dominant and other cultures become exotic or “the stepchild.” In addition, the dynamics of economic, social, political, and technological changes leading to conflicts and movements of social/cultural classes call for rigorous ethical assessments of classification systems sensitive to the changes. Even the determination of sameness and difference, upon which classification is built, is reliant on the perception of mainstream user groups (or mainstream culture). This post-modern viewpoint is elaborated by Foucault (1966) as in his claim, “thought can yield resemblance only within the visible parameters of an immediate domain (Smiraglia 2012, 12)”.

Those ethical concerns for organizing multiple viewpoints are also followed by the discussion of the concept of cultural warrant proposed by Beghtol (2002). Cultural warrant, as discussed in Chapter 1, reflects man-made products and human activities such as languages, traditions, logic, and habits in certain times and places. As different cultures possibly have conflicts from misunderstanding each other's perceptions, the KOS based only on a certain cultural warrant can also cause negative effects, depending on the cultural background of domain user groups. Those conflicts arise when different cultures co-exist in a shared social structure, and ethical concerns for organizing diverse cultures become an important matter going forward to mitigate them. Oh and Yeo (2001) discussed the conflicts caused by cultural differences in *DDC*, and suggested an option for the *DDC* class Religion (200) for nations, such as South Korea, in which religious diversity predominates. They propose contracting the divisions on Christianity, 220-280, into one division, 220, and allowing more room for religions originating in Asia while maintaining the overall order of religions in the *DDC*.

### **2.3.2.3. Indigenous KOSs**

The movements of repatriation of social and cultural assets for indigenous people in the late 20<sup>th</sup> century have called for indigenous librarianship to enable indigenous people to have better access to their knowledge (Ghaddar & Caidi, 2014). According to Turner (2015), in the 19<sup>th</sup> and 20<sup>th</sup> centuries museums collected indigenous cultural assets not as contributions for use by indigenous people, but as material culture for research on communities whose worldviews differ from the Eurocentric perspective. Recent efforts by libraries and museums support access to indigenous knowledge in their own worldviews for use by indigenous peoples. Therefore, indigenous epistemologies become an issue when organizing indigenous knowledge. A goal of indigenous KO, as a field of practice and scholarship, is to build KOSs that reflect unique

indigenous cultures and avoiding a certain cultural slant<sup>2</sup> of major classification systems such as *DDC* and *LCC*.

Brian Deer Classification, the Canadian indigenous classification system created in the 1970s, has been applied, evaluated, and re-constructed to serve the Maori in recent scholarship of indigenous KOSs (Doyle 2006; Cherry & Mukunda 2015), and has been followed by a suggestion of building subject headings for Maori as well (Lilley 2015). Also, in a study of constructing a thesaurus that reflects American Indian worldviews consisting of spiritual, physical, social, and the mental constructs, the authors (Littletree & Metoyer 2015) stress indigenous ways of understanding and perceiving the world as different from an Eurocentric one. They also argue that there are rich opportunities in indigenous KOSs, as an investigation of relationships among information, knowledge, and wisdom.

The indigenous KOSs for the Maori in New Zealand and for the American Indians are systems outside of major KOSs in a certain national boundary. The studies of indigenous knowledge have broader implications in maintaining cultural and intellectual assets of a particular local environment, regardless of their colonization by the West. For example, Lwoga, Ngulube, & Stilwell (2015) use two terms, indigenous knowledge and local knowledge, interchangeably in their study of indigenous KOSs for agriculture in Saharan Africa, because they aim to build a KOS reflective of local environments without reference to whether the community members are inhabitants or not. Overall, while maintaining cultural and intellectual

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<sup>2</sup> In this section, I used the term ‘slant’ as a particular point of view, avoiding ‘bias’ that projects unfair treatment. This use of term ‘slant’ in KO is from José Augusto Chaves Guimarães’s presentation at the conference ‘Global and local knowledge organization’ in Copenhagen, August, 2015.

diversity, indigenous KOSs aim to better reflect “prioritized issues of importance to the peoples in use and their structuring of social relations (Cherry & Mukunda 2015, 552)”.

In recent indigenous KO research, there also have been attempts made to develop suggestions in organizing knowledge, with an emphasis on the importance of indigenous KOSs. Gilman (2006) emphasized cultural and intellectual diversity through securing access to indigenous knowledge. *Classification and Cataloging Quarterly* published a special issue in 2015 addressing indigenous KOSs. In the special issue, Parent (2015, 704-705) argues that “the possibilities for connecting information through digital means now come close to resembling the knowledge structure built over the entries by Indigenous culture”, so “we need to be mindful of access points, cultural differences, and appropriate vocabulary” so not to lose the value of indigenous knowledge.

Doyle (2006) highlighted the need for building culturally appropriate KOSs that lead to the preservation of local communities, foundations for cross-cultural understanding, and even invigoration of local cultures against knowledge structures that assimilate one another. She conducted a case study evaluating an indigenous KOS for the Maori and suggests methodological approaches in five steps:

- (1) collect existing Indigenous library classifications and subject headings
- (2) conduct interviews with the creators and users of those classifications and subject headings to determine design principles and usability
- (3) undertake a collaborative project with an Aboriginal community that intends to describe Aboriginal collections from an Aboriginal perspective
- (4) reflect on the principles that informed the collaborative research
- (5) present a case study of the use of the classifications and subject headings that is a proof of concept (p. 6)

Howarth & Knight (2015) encourage participation of community members in describing local-based handcraft collections and suggest an “*Indigenous approach* to creating surrogates

that focuses on the inherent *value* of an object to a storyteller, an individual, a community” (p.593) as complementary with KO specialists’ functional ways of describing.

#### **2.3.2.4. KOSs of distant cultures**

Indigenous KOSs emphasize the importance of organizing knowledge to the social relations of the people in use. In a similar vein, but with further implications, there are studies of KOSs of eastern cultures – Indian and Chinese. These studies investigate the epistemologies of nonwestern or ancient knowledge structures, with implications for the current KOS.

Neelameghan and Raghavan (2012) examined Indic cultural frames and found the commonality of thoughts and unity of ideas across domains as its characteristics. Simply put, many concepts and the relations among concepts in the Indic culture are trans-disciplinary; e.g. the concept of *taaLa* is used as rhythm in music, cadence in dance, height in sculpture, and area in architecture. This trans-disciplinary character is aligned with 1) Ranganathan’s proposition of seminal mnemonics - sequencing of concepts acceptable across domains in Colon Classification- and 2) PMEST (Personality, Materials, Energy, Space, and Time), as a basic frame for knowledge representation, implemented in faceted classification. From Ranganathan’s approach to classification, which is deeply rooted in the Indic culture, the authors see the feasibility of developing a universal framework in overcoming the confusions caused by sociocultural differences in expressing subjects.

On the other hand, Lee (2012a) analyzed the epistemic foundation in the very first Chinese bibliographic classification – constructed immediately before the beginning of the Common Era. She identified several major design principles in the scheme reflective of the epistemological frame of the time, e.g., classicist morality and government functions. Studying

the orthodox point of view that influenced the knowledge structures of early China, she implies the dynamic relations between knowledge creation and knowledge structures. Beyond the discovery of the epistemic foundation differing from the modern/westernized classification, Lee (2012b) suggests considering the Chinese approach, especially its principles of holistic and correlative thinking – which are not part of the current systems – as an alternative way of organizing information in current and future systems. Her research on classification (2010, 2012a, 2012b, 2016) viewed it as not just an objective scheme for retrieval but as social process via the accumulated experiences in Chinese imperial society.

Studies of KOSs in other cultures are a rarity in recent KO literature. However, there are a small number of studies examining KOSs in other cultures, not examinations of general features or principles in understanding epistemic standpoints, but comparisons of the knowledge structures of different cultures over a certain domain – e.g. religion, musical instruments, or gender studies. These will be discussed in the next section.

## 2.4. Cross-cultural comparison of KOSs

Clifford Geertz (1973, 89) describes culture as “an historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life”. It is not an individually-construed concept, rather it is a context for behavior, which reinforces and codifies social structures involving economics, politics, and relations through socially-agreed upon patterns. His notion of culture echoes the concept of social epistemology (Egan & Shera, 1952), and theories of social and educational consensus (Bliss, 1929). While culture embraces a broader scope of symbols and emphasizes historical transmission, Geertz’s description of culture also implies that an iterative relationship exists between *culture*, as a system of inherited conceptions expressed in symbolic forms, and *social*

*structure*, involving economics, politics, and relations through socially-agreed upon patterns. As such, the close associations of social structure and culture are embedded in studies of culture. Comparative studies of multiple nations especially need to take a holistic approach to culture, as complex systems interacting with social systems, resulting in the sociocultural view in the comparison of national cultures.

In light of the international use of *DDC*, some have called for modifications to reflect other cultures in *DDC*, cultures that have been ignored or misrepresented (McConnell 1985; Oh and Yeo 2001). However, the continual development of *DDC* is intended to meet the needs of its main user groups in the United States, whose culture functions as the cultural warrant of the scheme. It is entirely different when a different nation adopts *DDC* and seeks to adapt the scheme to accommodate its own culture. In other words, it is impossible that the cultural warrant of the new scheme simply be an adjustment of the original one; it must focus on the culture of the adopter. The need to accommodate the adopter's culture in the inherited cultural features of *DDC* requires an understanding of both cultures. The adopter's culture can be distinctly supported in comparison with the inherited culture supported by the original scheme. In this study, comparison of two classification systems takes a cross-cultural comparative approach to the *KDC*'s adaptation of *DDC*. This section will address the principles of comparative studies, previous comparative studies in LIS and KO, and conclude with brief background descriptions of *DDC* and *KDC*.

#### **2.4.1. Comparative studies**

Conflicts in action, thought, and values between different cultures may exist because of a lack of understanding. However, differences between cultures do not have to be problematic. Rather, they may present opportunities to enhance self-understanding and improve mutual understanding. Because of their value for understanding the self and others, comparative studies have been favored for a long time. Comparative studies have been performed across disciplines

not only as they apply to observable cultural differences but also as a mechanism toward a clearer understanding regarding the underlying values of people, society, and culture.

Why and how does a comparison of different cultures enlighten understanding of ourselves and each other? For one thing, presuppositions are derived from an acceptance of multiple cultures. That multiplicity allows us to think comparatively regarding ourselves and others. A different system of thought helps to expose our own limitations, and comparative thinking makes the previously unthinkable or unthought in some ways thinkable by uncovering those limits (Xie 2001). The crucial point here is that different cultures have different conceptual schemes and systems of classification, each of which may effectively make the other culture acutely aware of its own historical and contingent nature.

Comparative research in the social sciences and humanities refers to the study of multiple societies, countries, cultures, systems, institutions, and social structures and is carried out through systemic comparison of phenomena over time and space (Hantrais 2009). The comparative approach became a systematic method in the nineteenth century with use by leading figures such as Alexis de Tocqueville, Emile Durkheim, Karl Marx, Max Weber, and John Stuart Mill. Since the late 1980s, many countries have started to call again for comprehensive studies of adjacent countries to understand not only those countries but also dynamism among those countries, particularly within international organizations such as the European Union, United Nations, UNESCO, WHO, and OECD (Hantrais 2009).

In terms of the unit of analysis, comparative studies are usually classified into cross-national, cross-societal, and cross-cultural comparisons. Nation or country as a unit of analysis is convenient in defining territorial boundaries and administrative/legal structure clearly, but can be confusing when national borders shift. Moreover, the within-nation differences such as diversity

of population, regional characteristics, and competing institutions in one country could be ignored (Xie 2012). Society as the unit of analysis is not as clearly defined as a nation. This usually calls for a certain degree of commonality in socioeconomic, political, and cultural criteria. Society as a unit of analysis depends on sets of criteria. For example, Durkheim compared subsets of society as characterized by age, sex, or family type. Social systems such as schools, business firms, or local communities are also frequently used for analysis as sub-systems of a society (Hantrais 2009). Ultimately, cultures are far too broad and complex. In cross-cultural psychology, culture is all-encompassing, both representing shared practices and meanings within particular groups, and constituting an independent variable “producing differences among groups” (Lyons and Chryssochoou 2000, 136-7). As a unit of analysis, culture is often closely associated with a linguistic entity studied by linguists and ethnologists. In general, culture serves as a framework for organizing, analyzing, and interpreting actions, motives, attitudes, and values (Hantrais 2009).

#### **2.4.1.1. In LIS**

In Library and Information Science (LIS), Lor (2012) advocates for International Comparative Librarianship (ICL). He addresses theoretical, methodological, and practical issues concerning comparative research in LIS and redefines related concepts applicable to ICL. Although texts for comparative research in social sciences show commonality with ICL in almost every concept, ICL delimits the object of inquiry to cross-national libraries and library-related information systems.

While lacking common terminologies, methodologies, and theories, there are comparative studies of different countries regarding libraries or information-related systems. This section discusses approaches to conceptualization of culture in LIS literature.

Some studies on international comparisons aim to discover trends across cultures/countries. These studies are more likely to broaden understanding of certain systems within an intercultural environment. Thus, they find critical perspectives not identified within domestic-only observation, thereby expanding the boundaries of information-related systems. For example, Wilkinson & Thelwall (2012) observed topical trends in nine months of Tweets in English from the UK, US, India, South Africa, New Zealand, and Australia and uncovered international imbalances, especially in tweets of news media: the tweets and re-tweets on news media mostly show US trending topics regardless of a Twitter user's national background. Vaughan & Chen (2015) also discovered US-centric search results in Google Trends through a comparison with the major Chinese Web search service, Baidu Index.

Assuming the existence of cultural differences, there have been attempts to identify differences across cultures. These studies, considering nationalities or nations as cultural boundaries, examined information behaviors, information-related services/systems (Liu & Huang 2005; Shachaf, Meho & Hara 2007; Yoon 2008). Beyond exploration of observed cultural differences, Hara, Shachaf, & Hew (2010) reveal West-centered studies of Wikipedia and suggest sensitivity to other cultures.

In intercultural communication, many comparative studies of Eastern and Western countries have applied binary frameworks differentiating the two cultures. One such framework is high context (HC)/low context (LC) communication, which serves as one of the critical factors used to determine cultural characteristics. HC communication filters more information on reality and relies on shared experiences. Meanwhile, LC communication raises awareness on structures of reality, relying on explicitly expressed contexts. Hall (1976) demonstrated these two different

contexts of communication by characterizing North Americans as more likely to use LC communication and East Asians as more likely to use HC communication.

Qing (2008) takes such distinction of language codes under consideration as one of the cultural influences on different patterns of knowledge integration in the East and West. According to Qing, explicit knowledge can be codified and transmitted in formal and systemic language, whereas tacit knowledge is more personally expressed in nature, related to action, commitment, and highly involved in a specific context. Given that tacit knowledge is hard to verbally code and demands shared experiences or contexts for communicators, HC communication-dominated cultures like those in China are likely to integrate tacit knowledge more efficiently than LC communication-dominated cultures, such as those of the United States.

Hofstede's five dimensions (1994) of culture - Power Distance Index (PDI), individualism (IND)-collectivism, masculinity (MAS)-femininity, Uncertainty Avoidance Index (UAI), and long-term orientation (LTO) have long been widely used for finding patterns of cultural differences. Among those five, Individualism/Collectivism presents distinguishable differences between East and West; many comparative studies in LIS also apply Hofstede's cultural dimension theory emphasizing the dichotomous distinction of individualism and collectivism (Yang 2007; Stvilia Al-Faraj, & Yi 2009; Kim, 2013). On the other hand, Park et al. (2015) examine the influences of cultural characteristics of the US and South Korea, each representing individualism and collectivism, on intentions of uploading Wikipedia articles. They suggest, as a result, that the effects of cultural characteristics may be weakened with the more self-oriented nature of Web 2.0 applications like Wikipedia.

As such, individualism/collectivism and HC communication/LC communication have often been understood as mutually exclusive and opposing extremes. However, they are not separated as extreme poles; rather they coexist in any culture. Lim & Ahn (2015) suggest avoiding the dichotomous approach, which presupposes a static view in the study of cultures in the field of intercultural communication. Rather, culture is a complex of traditional behavior successively learned by each generation (Mead 1937) and an open system, which interacts with various systems (e.g., educational, economical, and political) within the society as well as with other cultures.

Instead of a dichotomous distinction of East and West, some LIS cross-cultural comparative studies seek to understand the subsystems of national cultures. For example, Kaba & Osei-Bryson (2013) investigated the influence of national culture on individuals' perception of ICT (Information and Communication Technology) in Quebec and Guinea. The distinguishing factors of these two cultures are economy and social status – whether industrialized, developing, or less economically developed, as adoption and dissemination of ICT in a nation is deeply associated with socio-economic issues. On the other hand, in studying the cultural, educational, and geopolitical forces that produce and shape university library consortia, Perushek & Douglas (2014) take an interpretative approach with historical contexts such as imperial traditions of China, relations of Hong Kong with China and the UK, and US development of democracy.

Furthermore, in understanding culture as a complex interaction with various social systems, such as education, economics, and political systems, cross-cultural comparative studies in LIS develop their own frameworks to understand sociocultural factors, in order to reveal causal relations between national cultures and information systems. In examining the influence of culture on digital libraries of the first wave in European national libraries – France, Portugal,

Scotland, and Britain, Dalbello (2008) combines the theories of culture and organizational rationality, social choice systems, and strategies of organization behavior to generate the framework of her analysis on histories from interviews with policy makers and developers of the digital libraries. Relly (2010) synthesizes literature into three areas – political, cultural, and economic - in order to identify the impact of nations' statutes in adoption of ATI (Access To Information) legislation. Specifically, the variables examined for culture are perceptions of corruption, structural pluralism (ethnic and religious fractionalization), and social rights, specifically women's rights.

#### **2.4.1.2. In KO**

Few KO scholars have conducted cross-cultural comparative studies. There are some studies that situate KOSs in cross-cultural environments, which appear largely in two directions: 1) investigating knowledge structures of a culture, those not covered normally in Eurocentric KOSs, and 2) comparing linguistic or semantic issues of KOSs of different cultures that would promote trans-cultural/trans-linguistic use of KOSs. Because KO studies tend to examine either knowledge structures or systems, studies aimed at promoting access to knowledge cross-culturally either go deeper to assess knowledge structures of one particular culture, non-mainstream culture among those involved, e.g., access to Maori heritage materials (Liew 2005), or seek development of universal KOSs that can be used across cultures, e.g., the conceptual model of the Functional Requirements for Subject Authority Data (FRSAD) (Mitchell, Zeng & Žumer 2014).

Not many studies compare KOSs in different cultures, particularly in terms of national cultures. One such study by López-Huertas (2008) compares knowledge representation and organization of gender studies in Spain and Uruguay. There are also some comparative studies of

culture *as context*. Lee (2015) organizes several definitions of cultures, which influence knowledge structures, into 1) nationality or geographic region, 2) context, 3) collective phenomenon, and 4) human-made part of human environment. Culture as context is, for example, culture based on a shared religion such as Islam or Hinduism. Neelameghan and Iyer (2002) examine patterns of multicultural and multilingual databases for diverse spiritual and religious materials to mitigate the difficulties of communication through KOSs across culture, faith, and linguistic boundaries. López-Huertas (1997; 2013) also compares classifications of musical instruments in three cultural regions: the West (what she calls the Occidental region), the Indian subcontinent (Hindu), and Eastern Asia. She identifies ways in which cultural context affects terminology, concept identification and naming, categorization, focus of themes, and citation order.

However, even when comparing the different KOSs of different cultures, authors tend not to identify their studies as comparative. Cultural dimensions, as in Hofstede (1984), are not discussed, nor are cultural factors/contexts investigated, leading to the conclusion that no comparative studies of causal relations or correlations between sociocultural factors and KOSs have been conducted.

#### **2.4.2. *DDC* and *KDC***

This subsection discusses the cross-cultural use of *DDC*, background on *KDC*, and related studies of *KDC*'s adaptation of *DDC*.

##### **2.4.2.1. Cross-cultural use of *DDC***

*DDC* as a general KOS: The *DDC* was devised on Baconian epistemology; main classes are listed in the reverse order of Bacon's basic forms of human intellectual production - reason, imagination, and memory (Wiegand 1998). The Introduction to *DDC* 22nd edition introduces its

principles – “Arabic numerals, categories, hierarchies, and network of relationships among topics” - and its purpose – “make it ideal as a *general knowledge organization tool*.” The *DDC*’s goal of being used worldwide is also revealed in OCLC’s (*DDC*’s owner) description of its basic structures – “ten main classes covering *the entire world of knowledge*.”

Aiming for worldwide application, *DDC* is currently the most widely used bibliographic classification system: libraries in more than 135 countries use *DDC* itself or adapted versions of *DDC* to organize and provide access to their collections. Not only are *DDC* numbers featured in the national bibliographies of more than 60 countries, but various types of libraries also use the numbers to share bibliographic records through WorldCat, or OCLC’s Online Union Catalog (OCLC 2011).

Despite worldwide use of *DDC*, this system is maintained in a US bibliographic agency, the Library of Congress (LC). The Dewey editorial office in LC analyzes American national literature to detect trends that should be reflected in it. At the same time, revisions aim for cooperation with international institutions regarding subjects and concepts across nations to be covered in *DDC*.

Adaptation of *DDC* worldwide: *DDC*, first published in the United States in 1876, was quickly adopted by many western countries, then used by many libraries in non-western regions. At first, the developed countries took a lead on devising classifications (*DDC* included) to organize library collections. Then, some non-western countries also adopted library classifications such as *DDC*. Because of cultural differences, however, non-western countries that adopted *DDC* have found it necessary to make modifications. These include not only translation, but also changes to make the classification scheme more culturally appropriate. Thus,

the culture of a developing nation strongly affects the adaptations made to *DDC* for use within the country, despite a shared foundation of basic classificatory principles and structure.

Martin (1996) summarizes uses of *DDC* in Asia Pacific, where half of the world's population resides in a region of broad economic, political, and cultural diversity. Despite this reality, many national bibliographies in Asia-Pacific are built on identical *DDC* main classes. Because Western European and American influences have been placed in the development of modern librarianship in East Asia (Yu 2008), many East Asian countries developed local classification schemes based on the *DDC* or localized the *DDC* to meet local needs. Some libraries in East Asia use mixed classification systems: local classifications for the materials in their languages and *DDC* for Western language materials (Martin 1996).

With the lead of western European and North American countries in academic disciplines, the current modern bibliographic classifications in developing or newly developed countries all have structures parallel to those in the western academic disciplines. Therefore, it is hard to identify pure influences of culture unless one goes back to old times - at least pre-nineteenth-century. In current libraries' use of *DDC*, there are two main trends regarding the treatment of national cultures: 1) the authors of contemporary *DDC* editions incorporate diverse national and local knowledge in their system, in order to be reflective of knowledge structures across cultures, and 2) Non-western countries' national classifications adapt or borrow *DDC*'s main concepts but localize it to meet their needs.

The first type of interaction requires domain-analytic approaches: a thorough examination of other cultures by studying languages, recorded knowledge, etc. On the other hand, the second

type of interaction demands the domain-analytic approaches with comparison of cultures of the adopting/adopted countries.

#### **2.4.2.2. *KDC*: development of modern classification.**

Most of the South Korean literature on *KDC* focuses on functional structures. Even a few studies of *KDC* with social or historical backgrounds describe only the directly associated facts such as editors, revision histories, and use of the systems (Chung 2007; Oh 1992, 1995, 2012). There is little discussion of *KDC* contextualized within the historical library developments in South Korea in general, which obscures a foundational understanding of *DDC*'s influence on *KDC*'s establishment. This section briefly introduces related historical facts regarding *KDC* and some previous studies of *KDC* in both English and Korean.

Before *KDC*: South Korea owed much of its traditional cataloging practices to the Chinese cataloging system for classics, history, philosophy, and literary works. During the period of Japanese rule (1910-1945), Japanese library practices were introduced in Korean libraries, and Japanese cataloging rules, as well as classification systems, were adopted. *DDC* was introduced into Japan with modifications in 1889, resulting in the Nippon (Japan) Decimal Classification (NDC) in 1928 to meet Japanese needs for both Japanese and foreign books (Ishiyama 1986). South Korea's independence from Japan in 1945 became an important turning point for Korean librarians. They were motivated to develop their own tools for bibliographic control. That included a classification system and cataloging rules.

Recognizing that the Japanese library system was inappropriate for Korean materials, the National Library of South Korea, under the leadership of Park Pongseok, published the Chosun Decimal Classification (CDC), which became the most widely used classification system in early

1950s South Korea. *CDC* seems to be based upon the format of *DDC* or *NDC* system. However, the main classes of *CDC* are somewhat different from those of *DDC* or *NDC* (Table 2-2).

	<i>CDC</i>		<i>DDC</i>
000	Generalities	Generalities	Generalities
100	Philosophy Religion	Philosophy	Philosophy
200	History Geography	History	Religion
300	Language Literature	Social Sciences	Social Sciences
400	The Arts	Natural Science	Language
500	Social Sciences Education	Engineering Technology	Natural Science
600	Politics, Law Economics	Industry	Technology Applied Science
700	Natural Science	The arts	Fine Arts Recreation
800	Engineering Technology	Language	Literature
900	Industry Transportation	Literature	History

Table 2-2 The comparison of *CDC*, *NDC*, and *DDC* (Cho, 1995)

In the post-Korean War period, international institutions like UNESCO, and the George Peabody College in Tennessee, were actively involved in rebuilding the education system in South Korea. Part of this process involved the assistance of librarians and library educators in the Peabody team to establish a library school and mutual cooperation with the American Library Association (ALA) and other library associations in the United States. The influence of American libraries also can be seen in the general preference for *DDC* during this time, as opposed to traditional Chinese library practices (Cho 1995).

Establishment of *KDC*: After librarianship in South Korea acquired a legislative base through the passage of the Library Law in 1963, the publication of the first edition of *KDC* followed in 1964. While *KDC* has been updated with several major revisions, at this time the Korean Library Association also made efforts to be part of international librarianship; international cooperation supported by institutions like IFLA raised awareness of some critical international issues in organizing national materials. At the 'IFLA World Wide Seminar' in Seoul in 1976, addressing the problems of western KOSs applied to eastern publications, it was suggested to approach the problems in applying western systems to eastern materials as an exchange of ideas rather than looking for only western solutions. Anderson stated "UBC (Universal Bibliographic Control) will be realized not by inter-Western but international library cooperation (1976, 165)".

Comparison of *KDC* and *DDC*: as *KDC* is now used as a national classification system in South Korea, there are general texts introducing various aspects of the system (Oh, Bae, and Yeo 2002; 2009). Recent Korean works analyzing *KDC* address more functional and systemic issues, such as evaluating or updating classificatory structures and coverage for subject areas (Kim 2009; Yeo, Lee, and Oh 2008; Yeo, Park, Hwang, and Oh 2008; Oh, Bae, and Yeo 2008; Kim 2009; Kwak 2009). In evaluating and making suggestions for the desired direction of *KDC* changes, the authors also compare *KDC* with *DDC* or *NDC*. Their comparisons, however, mostly consider structural problems within *KDC*, without sociocultural concerns.

In one analysis (Oh 2012), some parts of *KDC*, such as schedules of main classes or notations, were compared with *DDC* to see 1) the influences of *DDC* on *KDC*, and 2) the unique characteristic of *KDC*. Although the comparison was not designed for comprehensive analysis of sociocultural differences between *KDC* and the *DDC*, it shows the possibility of comparison as

an analytical tool for studying sociocultural issues in adaptation of classification. Kwasnik & Chun (2004) conducted another comparative study of *KDC* and *DDC* by investigating both semantic contents and structures of the two classifications. In this study the framework of comparing two different knowledge structures is offered. However, their findings are limited to only some observed phenomena from intentionally selected parts of *KDC*, not leading to contemplation of sociocultural factors of South Korea and North America.

## 2.5. Conclusion

There is a long history of considerations of sociocultural contexts in KO: more specifically recognition of multiplicity in epistemologies, call for the needs of studies on that matters, and the efforts to address the diversity. Despite the necessity of addressing diversity in KO, research shows few explorations of differences in knowledge and applications of established KO frames to different sociocultural contexts. Comparative approaches bring about discovery of insights in the problems caused by sociocultural differences in KOS and the attempts to address them. Findings are presented through examinations of classification systems that have been developed and used in practices and contemplate theoretical and practical implications to develop the framework of addressing cross-cultural uses and adaptations of KOSs.

## Chapter 3 Methodology

### 3.1. Introduction

The goal of this study is to examine sociocultural influences in the adaptation of an American library classification, namely *Dewey Decimal Classification* (DDC), into *Korean Decimal Classification* (KDC) for libraries in South Korea. It takes the stance that a KO system (KOS) is not merely a means of enabling search and retrieval, but is also a social system that embodies the epistemic stances and in turn facilitates as well as restricts communicative actions within a given society. More specifically, the goal, format, categories, and structure of knowledge in a KOS reflect a society's worldview as well as its values. With this assumption in mind, I employed an analytical taxonomy based on the acculturation model constructed by Berry (1997) to examine changes made to the original classification system due to the sociocultural needs of the adapter society. The acculturation model, a structured method for examining immigrants' adoption of a new culture, provides a useful scheme for analyzing the sociocultural influences in the adaptation of a KOS developed for use by one culture into another KOS intended for use in a different culture.

*DDC* was selected for this study because it is the most widely used library classification and the most popular base on which many other classification systems around the world are built. I choose *KDC* with confidence that *KDC* has been localized in the adaptation of *DDC*. *KDC* exhibits numerous differences from *DDC* across multiple editions, despite American influences in early development of education and librarianship in South Korea after Korean War. Over about 60 years of fast growth, South Korean libraries have made significant efforts to adopt and localize *DDC* to meet the needs of South Koreans. It is thus reasonable to think that the changes made from *DDC* to *KDC* largely reflect the sociocultural differences between the American and

Korean societies. Under such an assumption, differences between the two schemes were identified and then analyzed as a case presenting sociocultural influences in cross-cultural adaptation of KOSs.

The remainder of this chapter describes the research question, research design, research technique, and components of the present study. Research questions consist of one main research question and two sequential agendas leading to two phases of the study respectively. Research design addresses critical components of the comparative method applied to the present study of two classification schemes. Content analysis as a research technique is followed in consideration of characteristics of classification research. Lastly, components of the study are laid out in answering a research question regarding comparative research design and content analysis of classifications.

### 3.2. The research question

This study is designed to examine the influences of society and culture on *KDC*'s adaptation of *DDC*. Thus, the analysis focuses on the changes resulting from the meeting of the two cultures, answering the main research question: "How does *KDC* adapt *DDC* in terms of the underlying sociocultural perspectives in a classificatory form?" A comparative approach was applied to address the main research question in two phases: first, starting with a quantitative comparison of *KDC* and *DDC* to measure the degrees of variation between them by main class; second, performing an in-depth, qualitative examination of the variations to understand which differences are the results of sociocultural influences. For the second phase, I examined the two main classes that exhibiting the highest degrees of variation according to the analysis done in the initial phase.

### **3.2.1. Phase 1: Identifying differences between *KDC* and *DDC***

The first phase set out to measure the degrees of variation between the two schemes by applying quantitative content analysis. The objective of the analysis was to compare the knowledge structures of the two classification schemes in terms of the quantity of class numbers that represent concepts and their relationships in each of the individual main class.

In a decimal classification system, each class represents a broad subject. Although *KDC* and *DDC* arrange their classes slightly differently, the ten classes representing broad subjects do match. Thus, I specifically look for variation within each of the ten matching main classes between the two classification schemes. Doing so, it assumes: *KDC*'s adaptation to meet its sociocultural needs is observable in its changes of class numbers from *DDC* within main classes.

Smiraglia, Scharnhorst, Salah, and Gao (2013) suggested that the application of a quantitative approach and visualization to classification research permits observation of changes in classification such as size, composition, growth, and distribution. Thus, comparing the compositions of the main classes and distributions of concepts in *KDC* and *DDC* reveal the differences in their knowledge structures empirically. Furthermore, in the study's second phase I examined degrees and patterns of variation to select two main classes presenting the most different compositions and distributions between the two schemes for an in-depth understanding.

### **3.2.2. Phase 2: Examining in-depth the differences to understand sociocultural influences**

In the second phase, a qualitative analysis on represented concepts and their relationships follows, examining the changes made during *KDC*'s adaptation of *DDC* in reflection of a certain culture or sociocultural dynamic. In Phase 2, *KDC*'s adaptation of *DDC* was analyzed by examining concepts and their relationships represented by terms and classificatory structures.

With two selected main classes from Phase 1 showing the most significant and interesting differences between the two schemes, *DDC*-like concepts were differentiated from those unique to Korean culture, the former an inheritance from *DDC* and the latter a result of efforts to meet Korean sociocultural needs. The analysis was facilitated by a taxonomy of adaptation. The taxonomy is based on Berry's acculturation model (1997), developed to analyze immigrants' adoption of the new culture in their host countries. I modified the model into an adaptation taxonomy to understand *KDC*'s attempt to localize *DDC* while taking advantage of the latter's widely known features. This differentiation includes semantic and structural differences; I developed and applied the second coding scheme observing in which way the classificatory variables in semantic and structural differences exhibit the differentiations. Two frameworks as coding schemes will be detailed in a later section.

### 3.3. Research design

#### 3.3.1. Comparative research

Through comparison of cultures, categories of knowledge become more distinct, enabling scholars to identify cultural suppositions. To implement comparative mixed methods in this study, there are some critical considerations, from the value of the comparison regarding the goal of the research to the decision on the comparators. In his book *International and Comparative Librarianship*, Lor (2012) discusses a set of critical questions to be asked in evaluating comparative research design. Those evaluative questions are suggestive for taking all required components of comparative studies under consideration. The following table (3-1) consists of modified questions with the added answers for my research.

Decision	Questions
Rationale	Question (Q): Do the authors explain why a comparison was thought necessary or useful?

Quantitative vs. qualitative approach	<p>Answer (A): The reason for conducting a comparison is to reveal differences between two classification schemes that bear sociocultural influences.</p>
	<p>Q: Do the authors adopt a predominantly quantitative or qualitative approach? Or a mixed methods approach? In that case, does one approach predominate?</p>
	<p>A: This research adopted a mixed methods approach that first explores patterns in massive data quantitatively and then examines selected parts of data in-depth qualitatively.</p>
Number of cases and variables	<p>Q: Is this a study of a single country? If so, does it qualify as a comparative study? How many countries are compared? How many variables are studied?</p>
	<p>A: Only two countries are compared. In this study, variables are not mandatory components in the planning stage.</p>
Selection of cases	<p>Q: Do they choose a most similar systems (MSSD) or most different systems design (MDSD)? [MSSD is to compare systems sharing more similarities so that a few differences stand out and the impact of differences can be examined. MDSD is to compare different systems to examine common characteristics shared among systems and the causal relations of common characteristics across different systems.] Given the aims of their study, is this an appropriate strategy?</p>
	<p>A: While <i>Korean Decimal Classification</i> is an adaptation of <i>Dewey Decimal Classification</i> and the two share a common broad structure, <i>KDC</i> has its own unique features designed for its social and cultural needs. The study will be a Most Similar Systems Design (MSSD), which allows researchers to see the unique differences.</p>
Unit of analysis	<p>Q: Is the unit of analysis about which data is collected appropriate to the level of analysis? Do they use the same unit of analysis in all the cases studied? Are the conclusions to which they arrive based on data at the appropriate level of analysis?</p>
	<p>A: the unit of analysis in the current study is concept in phase 1, which investigates the variation of concepts in terms of category and structural relationships. In phase 2, the unit of analysis is an</p>

	occurrence of socio-cultural differences between the classification schemes.
Level of analysis	<p>Q: Do the authors clearly identify the level of analysis? Is analysis at the macro level (e.g. groups, systems, structures) or at the micro level (e.g. individual employees or patrons; searches; citations, journal titles)?</p> <p>A: This research will be conducted at the macro level, because the cases focus on the systems.</p>

**Table 3-1 Questions in evaluating comparative research design (Lor, 2012)**

Because comparison lets researchers see what is thinkable or unthinkable in one culture, it also accounts for what could be issues in the interaction of the cultures involved. Because the classification schemes are in different languages, language could be an obstacle in the comparison. Data collected for *KDC* had English translations for the three-digit class numbers at section level. However, the comparisons of conceptual understandings through class numbers sometimes requires examining subordinate numbers to those numbers which are not in English. This comparative study thus required the researcher not mere fluency in both languages but also the ability to ascertain contextual or heuristic use of the languages because many concepts have no counterpart in other cultures. To contextualize terms in one language but not another, contextual information was available including the researcher's language skills and other textual resources such as classification notes and dictionaries.

### 3.4. Research technique

#### 3.4.1. Content analysis

Content analysis is a research technique commonly applied in social sciences. Content analysts in social sciences generally investigate texts in pursuit of meanings behind human actions and/or communication. According to Krippendorff (2012), the framework of content analysis has six components, incorporated in one complete content analysis: a body of text, a

research question, context, analytical context, inferences, and validating evidence. A body of text is a representation of symbolic interactions and the most common data for content analysis. Through examining a body of text, researchers should be able find an answer to their research questions. Thus, a body of text is unitized, sampled, and analyzed in view of the research question. Contexts are conditions accounting for emerging patterns from data analyzed, referring to the worldview of the analyst or environmental factors where the texts are situated.

The other three components emphasize more explicitness and transparency of content analysis. The analytical context is an operational construct for data analysis, which could be derived from data itself or the existing theory. Whatever the analyst applies, the analytical context needs to be justified for the purpose of the research and may need revising over the whole process of analysis. The point is that it should provide a certain structure or scheme for data coding. Researchers naturally make their inferences based on their own background and knowledge, through either the construction of the analytical context or interpretation of descriptive statistics. Lastly, because content analysis follows scientific reasoning to answer the research question, the analyst needs to validate the evidence derived from the analysis.

Although many scholars in social sciences have utilized content analysis, its procedures vary depending on its purpose and the characteristics of data. Basically, the assumption on language and the social reality for content analysis is that language is reflexive of reality, which is observable independent of the interpreter (Hardy et al. 2004). Whether the nature of content analysis is more likely quantitative or qualitative is still debatable. However, it is usually said that content analysis needs both quantitative and qualitative perspectives (Krippendorff 2012; Berg 2004).

Reduction to manageable or countable units of data is a common quantitative tactic. Thus, quantitative content analysis usually applies basic descriptive statistics such as counting frequencies and calculating portions. On the other hand, qualitative researchers count on their worldview and domain knowledge in reducing data to manageable units and in interpreting data. Even in reporting descriptive statistics, they cannot simply conclude without contextualization of data. For example, qualitative researchers believe that the importance of a certain concept cannot be measured solely by a frequency count, and thus advocate for conducting data analysis with more contextual information such as types of sources, tone of words described, other words appearing together, and so forth.

In short, content analysis can blend both quantitative and qualitative approaches. Of course, an individual analysis can be more qualitative or more quantitative, depending on the researcher's worldview, the research questions, and data. A study's leaning towards more quantitative or qualitative approach is the strategic choice of the researcher.

### **3.4.2. Classification Research and Content Analysis**

As discussed earlier, classification research has considered and examined sociocultural contexts of classification. Andersen & Skouvig (2006), for example, maintains that a classification system needs to be responsive to social and cultural changes. Others have suggested changes in classification to disclose silenced voices in a social group (Olson 1998, 2002; Olson & Schlegl 2013).

Classification research also has applied various approaches of content analysis to examining meanings through empirical analysis of text-based data derived from classification schemes. This section will focus on content analysis in classification research, because classification has distinct features from other text-based data. While other types of texts

normally used for content analysis, such as transcripts or documents, are mostly narrative or have concepts implicitly expressed in synthetic uses of words like sentences or document structures, classification consists of concepts and their relationships as basic elements in a formalized structure. KO scholars have examined classification schemes in unique ways regarding its features attributing to concept theory. Largely, there have been two major methodological approaches to classification research: how well the classification represents its warranted concepts and how well the concepts are populated by classes, divisions, and subdivisions (Smiraglia 2016).

In classification research, *warrant* means the rationale that determines the criteria for the scope and organization of knowledge and justifies the classificatory structure of a classification scheme. One of the most prevalent types of warrant is literary warrant, originating from library practices of constructing a classification scheme based on the contents of literature in library collections. Other types of warrant have also been identified in KOS research, such as user, institutional, ethical, and cultural warrants. They constitute the theoretical and practical foundations for classification schemes, either as a single warrant or in combination.

KO scholars such as Tennis (2006, 2007), Olson (2001), and Fox (2013) have examined changes to warranted concepts through textual and structural analysis of the concepts. These studies tested how a certain concept has been changed and shifted as KOSs evolve. Tennis (2006) used the term *ontogeny* to describe the notion of changing concepts in continuous modifications of a KOS. *Ontogeny* is a biological term that refers to the evolutionary process of an organism during its lifespan. The ontogeny of a certain concept can be construed through diachronic and synchronic analysis (Tennis, 2007). Diachronic analysis is vertical and historical because it traces changes over time. Synchronic analysis examines the intension and extension of

the concept by revealing its relationship to other concepts at one point. Tennis (2007) concluded that structural changes present hierarchical and syndetic relationships between concepts, and textual changes show choices of different words and forms.

Some recent studies take a different approach to examine KOSs. Salah et al. (2012) applied a quantitative approach in examining the appearance of entire classification systems that change over time. They investigated and illustrated changes in the degree of complexity and composition of UDC by counting UDC numbers. The researchers, which used massive amounts of data, presupposed that UDC numbers reflect the rules of classificatory structures properly. Also, Smiraglia, Scharnhorst, Salah, and Gao (2013) suggested that the application of a quantitative approach and visualization permits observation of changes in classification in terms of size, composition, growth, and distribution. They illustrated a quantitative comparison of UDC strings in UDC Master Reference File, OCLC WorldCat, and the university library in Leuvento. This analysis empirically presented the populations of class by different uses and implied positive possibilities for scientific methodology by using data from classification schemes.

Despite differences in the former and the latter methodological approaches to classification schemes, both look for meaning underneath a body of texts in examining classificatory representations of concepts. More qualitative analysis of warranted concepts over time through textual and structural analysis and more quantitative analysis of populated concepts through changes in distribution, size, or growth, have been discussed. The former approach, with in-depth understanding of certain concepts, and the latter approach to classification in macrocosmic view both look for transitions of knowledge structure qualitatively and quantitatively.

### 3.4.3. Strategic application of content analysis

As each perspective has its own advantage, researchers in social sciences have started to apply both jointly in the so-called *mixed methods research design*. The quantitative approach can accommodate large amounts of data and validate theories or model generalizable trends, but this approach may fall short when accounting for complex variables explaining causalities of specific cases (Collier, Brady, and Seawright 2010). On the other hand, the qualitative approach, which addresses a small number of cases in-depth, usually attempts to provide detailed explanations of a certain phenomenon with context-sensitive factors a researcher develops from a theoretical lens; it does not generate or validate generalizable patterns, as they are case-focused (Brady, Collier, and Seawright 2006). It is suggested that strategic application of these two approaches reinforces their advantages and cancels out some of their disadvantages (Jick 1979), hence social science researchers now classify the mixed methods approach as a separate design with its own definition and taxonomy (Glik, Parker, Muligande, & Hategikamana 1986; Stechkler, McLeroy, Goodman, Bird, & McCormick 1992; Morse 1991; Miles & Huberman 1994; Crewsell 1994, 1999; Caracelli & Greene 1993; Creswell & Miller 1997). Literature in mixed methods research design (Schrodtt 2006; Munck 1998) maintains that the joint use of quantitative and qualitative methods is not only complementary but also more powerful. Benefits from the use of multiple methods can sometimes be recognized intuitively. For example, when reading common sources in our daily life such as news, sports coverage, and documentaries, it seems more persuasive if individual stories support statistical trends (Creswell and Clark 2007).

The use of mixed methods research varies depending on the goals and purposes of studies, and four elements- implementation, priority, integration, and theoretical perspectives- are considered depending on the types of mixed methods design (Creswell et al. 2003).

Implementation of mixed methods research design largely divides into sequential or concurrent

types, determining whether quantitative and qualitative analyses are carried out in a sequence or simultaneously. Priority in mixed methods research design refers to the distribution of the weight on either quantitative or qualitative methods. Integration of quantitative and qualitative approaches involves deciding which component of research particularly incorporates both approaches, from research question, design, data collection, and data analysis, to interpretation of results. Theoretical perspectives in mixed methods research design basically call for further actions either in the follow-up research contributing to theory building or in practical application of real cases – which is transformative (Greene and Caracelli 1997). The theoretical lens can be either implicit or explicit, and occur in any stage of the research, such as formulating the purpose and questions, selecting data, applying the theoretical framework, and interpretation.

This study is also designed to take advantage of the idea of seeing the world in multiple ways, providing empirical evidence as well as deep relational insight. In this study, quantitative analysis preceded qualitative, which allowed the researcher to first examine a large data set and then identify interesting patterns (Figure 3-1). Priority is given to the qualitative phase, which was intended to generate more detailed explanations. This is called sequential explanatory design; the initial quantitative phase of this design is used to identify compelling cases (i.e., two main classes in *KDC*) related to the research question, so the results of the quantitative analysis guide the purposeful sampling for a primarily qualitative study. This sequential explanatory design of mixed methods research is straightforward and easy to implement because the data collection and analysis fall into separate stages. However, the length of time involved in the entire research process can be longer than concurrent types of mixed methods research design.

In this study, the integration of the two methods occurred in the main research question asked. In the first phase of the quantitative analysis, data was analyzed descriptively in order to

generate the empirical evidence leading to interpretation. In the qualitative phase, the inquiry was more exploratory and in-depth, with a strong emphasis on description and interpretation and a thematic focus on understanding a central phenomenon. This study is designed to answer the research question through both quantitative and qualitative analyses, in sequence. The adaptation taxonomy based on Berry’s acculturation model was explicitly used as an analytic tool for qualitative data coding, contributing to categorization of changes made as a result of sociocultural influence in an in-depth, exploratory study.

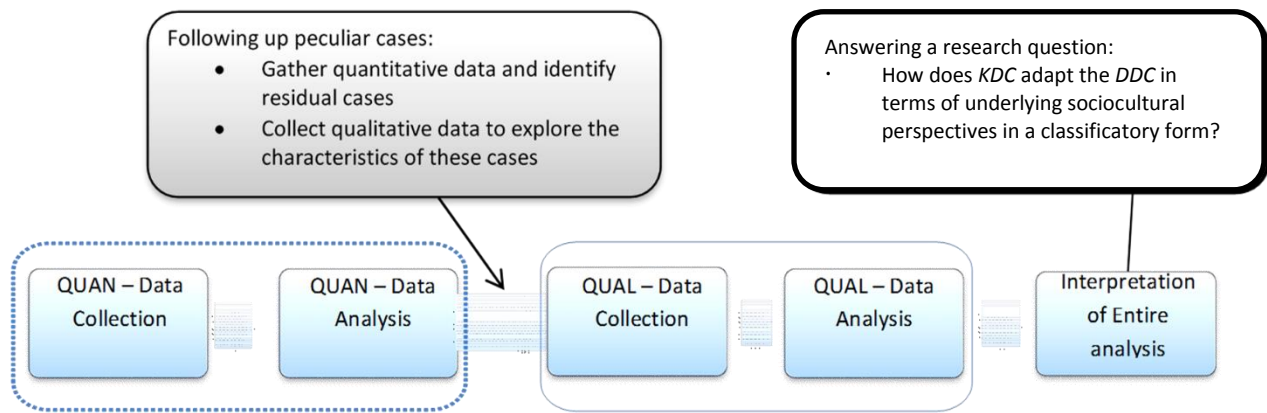


Figure 3-1 Sequential explanatory design of the study

### 3.5. Components of content analysis

As mentioned, a mixed methods research design was strategically applied, using both quantitative and qualitative methods in two phases. Table 3-2 below describes the methodological procedures for each phase. Applying Krippendorff’s six components of content analysis to the study, Phase 1 and Phase 2 contain different sets of six components (Table 3-2).

Krippendorff’s Six components of content analysis	Phase 1	Phase 2

A body of text	Range and texts: Class numbers from the six selected editions of <i>KDC</i> and <i>DDC</i>	Range: Selected classes presenting distinctive differences from the first phase in only recent editions of <i>KDC</i> and <i>DDC</i> Texts: Class numbers, hierarchies, terms and notes illustrating the concepts for targeted terms and relational structures between terms
Research Objectives	<i>To compare the knowledge structures of the two classification schemes, in terms of the quantity of class numbers that represent concepts and their relationships in each of the individual main classes</i>	<i>To examine changes made during KDC's adaptation of DDC in reflection of certain cultural or sociocultural dynamics</i>
Worldview	Positivistic	Interpretative
Analytical context (theories/frameworks/variables)	Size, composition, growth, and distribution of the ten main classes representing different subject areas	The taxonomy of adaptation - framework modified from Berry's fourfold acculturation model; classificatory differences such as knowledge categories and structures
Inferences (interpretations/statistics)	Descriptive statistics	Interpretation of differences between the two schemes
Validating evidence	Number of classification records from each class	Coding patterns

Table 3-2 Six components of content analysis for Phase 1 and Phase 2 in Krippendorff's (2012) taxonomy

### 3.5.1. Phase 1.

Through the comparison, *KDC* was examined to identify similarities to and differences from *DDC*. Through analysis of the populations of *KDC* and *DDC* classes by size, composition, and distribution, it was possible to discover differences through a macrocosmic lens. The analysis is expected to identify empirical evidence of *KDC*'s adaptation of *DDC*.

### 3.5.1.1. Data collection

To compare knowledge categories and structures of *KDC* and *DDC*, all class numbers from a total of six digital editions of *KDC* and eight digital editions of *DDC* were collected and compared. Given the massive quantity of *DDC* class numbers, Online Computer Library Center (OCLC), owner of the *DDC*, was contacted to obtain datasets containing the electronic records representing the *DDC* class numbers. Through this process, it was learned that only *DDC* 20th to 23rd editions were available in usable digital forms. Other editions of *DDC* are also available in digital forms – pdfs, but are not appropriate for manipulation of class numbers for purposes of this study. For *KDC*, electronic datasets containing records representing individual class numbers used in a recent study of the *KDC* (Jeon 2015) were obtained. The language of these data sets is Korean, therefore referred English captions is provided in the paper copies of *KDC* editions. For the first phase of quantitative analysis requiring extraction of entire class numbers, only the 20th, 22nd, and 23rd editions of *DDC* were used, which correspond with the 4th, 5th, and 6th editions of *KDC* (table 3-3).

	<i>DDC</i> : Full editions	Years	<i>KDC</i> : Full editions	Years
	16th	1958	1st	1964
	17th	1965	2nd	1966
	18th,19th	1971, 1979	3rd	1980
Data for	20st	1989	4th	1996
Phase 1	22nd	1996, 2003	5th	2009
	23rd	2011	6th	2013

Table 3-3 Editions of *DDC* and *KDC* included for comparison

This phase was intended to compare the distributions of concepts in the main classes. As the order of *KDC* main classes are partially different than that of *DDC* (table 3-3), I matched them first by broad discipline (i.e., represented by a main class) then compared topics within each individual class.

<i>DDC</i> – Subjects ( <i>KDC</i> - Subjects)	<i>DDC</i> – Class number	<i>KDC</i> – Class numbers
General works, Computer science and Information (General works)	000	000
Philosophy and psychology (Philosophy)	100	100
Religion (Religion)	200	200
Social sciences (Social sciences)	300	300
Language (Language)	400	700
Pure Science (Natural sciences)	500	400
Technology (Technology & Engineering)	600	500
Arts & recreation (Arts)	700	600
Literature (Literature)	800	800
History & geography (History)	900	900

Table 3-4 Classes of *DDC* and *KDC* - matched disciplines

### 3.5.1.2. Instruments and analysis

For the first phase, a quantitative content analysis was applied to the collected classification data. The epistemological stance of this phase is closer to empiricism, which makes “inductions from collections of observational data” (Hjørland & Hartel 2003, 240). Without making assumptions about the targets to be observed, researchers believe only what they observe. This approach is also positivistic in seeking common patterns of the phenomenon. In this phase, class numbers (three-digit integers only) from the two classification schemes were used as data. In the analysis of Phase 1, visualizing observed results was the most effective analytic strategy to reveal hidden patterns in the collected data. For instance, the size/growth of classes in the two classifications were compared and changes tracked by various measures, such as main classes or publication years. To do that, counts of three-digit integers of class numbers were calculated excluding auxiliary numbers, of each main class and then visualized to identify

patterns of similarities and differences between systems. Patterns of differences were revealed phenomenologically, not unlike aerial photographs of a large landscape. Types of difference, location and coverage were helpful in expanding or modifying the coding scheme in comparing class numbers one-on-one.

### **3.5.2. Phase 2**

In the second phase, similarities and differences between *KDC* and *DDC* observed through Phase 1 were selectively analyzed. Two main classes exhibiting the most differences between the two classifications in Phase 1 were selected. The concepts and their relationships were then coded by reading all terms and hierarchies, and categorized according to the adaptation taxonomy explained below. This qualitative content analysis is expected to categorize individual concepts and relationships into various strategies of adaptation in the attempt for *KDC* to meet local sociocultural needs. Application of the adaptation taxonomy for the initial coding resulted in developing the second coding scheme, which examines the comparable classificatory variables. Following this was an examination of ways in which the two schemes emerge in comparing *KDC* and *DDC*.

#### **3.5.2.1. Data collection**

Based on the results of the quantitative comparison of *KDC* and *DDC* in Phase 1, the two main classes that exhibited the most differences were selected. The data scope of the first phase was the six most recent editions of *DDC* and *KDC*, in examining the constancy in the distribution of the main classes. Only the most recent editions –*KDC* 6 and *DDC* 23 - were used for the second phase of qualitative analysis. The two selected main classes from *DDC* 23 and *KDC* 6 revealed the different concepts and their relationships regarding the framework

developed for examining the adaptation strategies as required to adopt *DDC* and/or localize it to meet Korean information needs.

### **3.5.2.2. Instruments and analysis**

The coding scheme was applied to both the class numbers and captions representing the concepts and hierarchical relationships between them. Basically, the essential elements of classification affected by social and cultural conditions are semantic contents and structure (Kwasnik & Chun 2004). The semantic contents of classification can represent the perspective of a certain group of people, depending on its political, cultural, and moral contexts. So, likewise, the structure of classification results from the cultural and intellectual infrastructure. Tennis (2012) clarifies that semantics is a definition of categories, while structure is a representation of semantic relationships (e.g., hierarchical relationships) among concepts. These two should be examined separately to reveal underlying assumptions. This informed an examination of hidden patterns through the analysis of specific examples conducted in Phase 2, described in Chapter 5.

The coding scheme applied is the taxonomy of adaptation, which is a modification of Berry's (1997) acculturation model. It was adjusted during the coding process and the adjustment will be described as results of analyses in the next chapter. Berry's theoretical model has been used widely to explain how individuals from a certain cultural background react when in contact with another culture and the cultural and psychological changes resulting from their reaction. The model consists of two dimensions: the retention or rejection of an individual's minority or native culture, and the adoption or rejection of the dominant or host culture. Four acculturation strategies emerge in the intersection of the two dimensions (see Figure 3-2):

1. Assimilation: the person completely adopts the new dominant culture and puts little emphasis on maintaining ties with the heritage culture.

2. Integration: the person endeavors to embrace the dominant culture while trying to maintain connection with the heritage culture, such as speaking their native language and connecting with peers of the same ethnicity.
3. Separation: the person is interested only in maintaining the heritage culture and tends to avoid the dominant culture.
4. Marginalization: the person does not maintain the heritage culture or participate in the dominant culture.

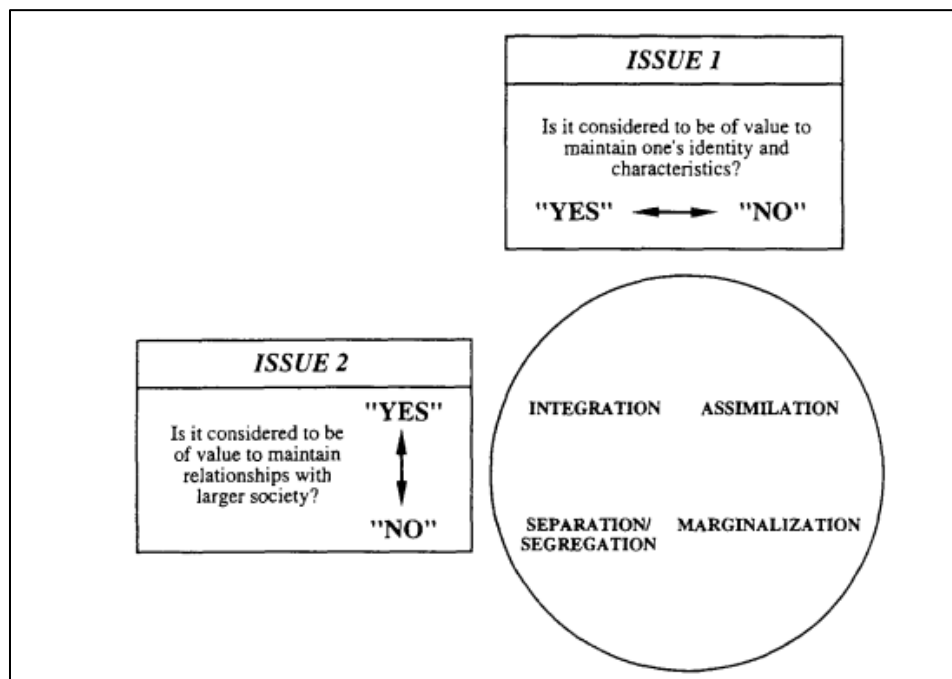


Figure 3-2 Acculturation strategies by Berry (1997)

Berry's fourfold model is applicable at either the group level or the individual level. However, his model mostly focuses on increasing identification with one's own cultural community when the identification is negative or discriminatory as one consequence of intercultural contact. In the current study, *KDC* makes changes from the interaction of cultures to increase validity and usefulness within its own culture. Also, previous application of the acculturation model theoretically entails a two-way change process. In this study, the adaptation

is not a two-way process of change because only *KDC* has borrowed from *DDC*, never the other way around. Thus, the fourfold model has been slightly modified to create an adaptation taxonomy. Basically, application of the taxonomy explains the similarities and differences progressively.

Another study consulted in devising the adaptation taxonomy was Elsass and Veiga (1994), which took advantage of the simplistic aspect of Berry's acculturation model to analyze the integration of organizational cultures. They applied a force-field approach to the four acculturation strategies to account for the effective blending of organizational cultures. (The force-field approach is Lewin's (1951) theory that behavior is the outcome of a dynamic interaction of opposing forces.) The model suggested by Elsass and Veiga explains the acculturation processes of cultural differentiation and organizational integration. Thus, in their modified model, forces of organizational integration are substituted for maintaining relationships with the host culture or the larger society, and forces of cultural differentiation are substituted for

maintaining one's native cultural identity (see Figure 3-3).

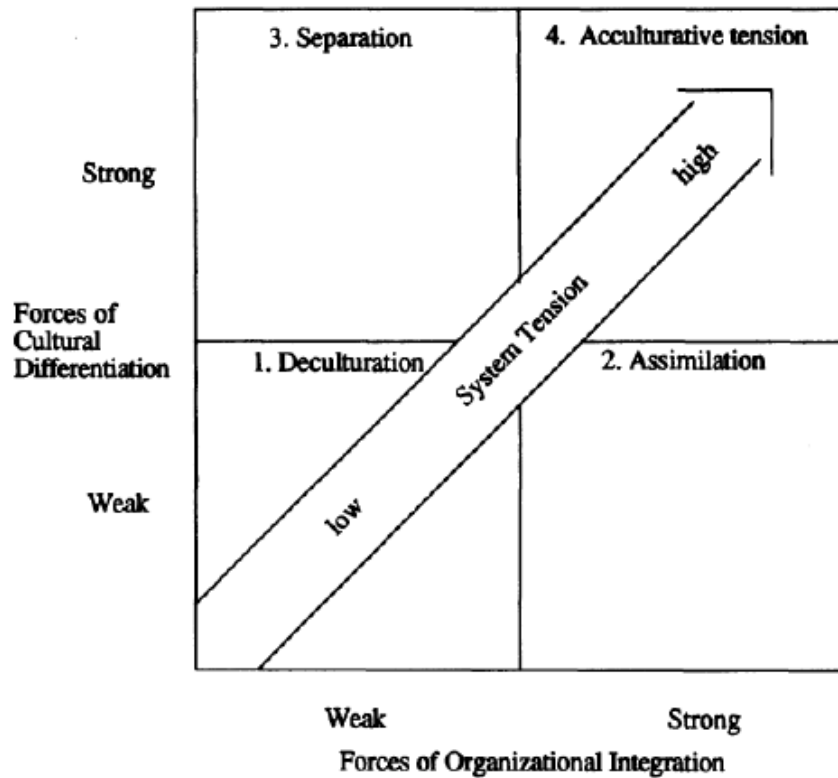


Figure 3-3 Elsass and Veiga (1994)'s force-field analysis of acculturation model

This force-field analysis based on the original acculturation model stresses two forces in direct opposition: cultural differentiation, when new employees or members of an organization keep their own cultures, which conflict with that organization's culture, and organizational integration, when the organization tries to embrace all members in the unified cultural norms of the organization. Thus, deculturation occurs when both forces are weak, so that no tension exists between them and no one culture is dominant. Assimilation occurs when forces of organizational integration are stronger than those of cultural differentiation, and separation occurs when forces of cultural differentiation are stronger than organizational integration. Lastly, when both forces are in opposition, acculturative tension becomes very high. According to Elsass and Veiga

(1994), acculturation in this theory is more likely a pathway of dynamic forces that balance the two major forces. Thus, balanced states are not static outcomes; forces are dynamic, resulting in different modes of acculturation. This ongoing process of balance and rebalance should finally reach an acculturation mode.

In the modified version, for the case of *KDC* adapting *DDC*, localization is a goal of the ideal balance from systemic tensions between two forces. The forces of indigenization replace the forces of cultural differentiation in the intention to meet local needs and the forces of standardization replace the forces of organizational integration with the intention to take advantage of a popular classification. The indifference strategy occurs when neither *DDC*-like nor Korean culturally specific features appear. Absorption occurs when only *DDC*-like features appear; nativization occurs when only Korean culturally specific features exist; and localization tension arises when both characteristics appear together and are integrated in some way. As this study is designed to examine the differences between *KDC* and *DDC* by applying the coding scheme, each caption in the data taken from the selected classes in the *KDC* received a code representing one of the four strategies (Figure 3-4).

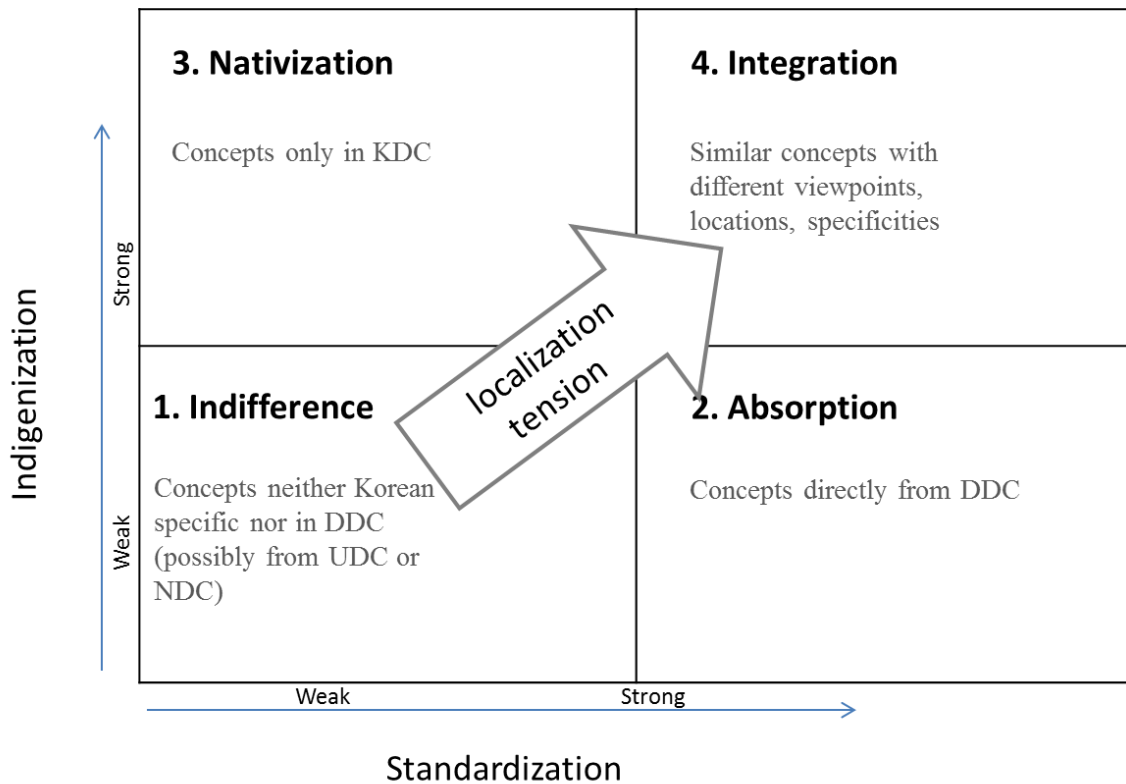


Figure 3-4 Acculturation framework in comparison of *KDC* and *DDC*

1. Indifference: This strategy neither takes advantage of *DDC* as a popular library classification nor satisfies Korean local cultural needs; it also can be named *others* in terms of following no particular culture. The importance of this strategy in measuring the blending of the two cultures is comparatively low.
2. Absorption: This strategy can be defined as a direct import of a *DDC* concept into *KDC*. Conceptual equivalence determines this state of *DDC*-like, both in terminological and structural evidence. For terminology, the concept in *DDC* can be translated directly into its counterpart in *KDC*; and for structure, the relationship between the two equivalent concepts also should be equivalent.
3. Nativization: This code is used for Korean culturally specific concepts, in other words, concepts not in *DDC* but only in *KDC*.

4. Integration: In *KDC*, the integration strategy reflects both Korean culturally specific and *DDC*-like concepts together in harmony. There are some concepts that reflect being *DDC*-like, but that partially differ from *DDC*. As the partial differences from *DDC* can be considered features that only *KDC* has, these concepts belong to the integration strategy.

The five degrees of interlanguage equivalence specified by ISO 5964 (ISO 1985) seems to provide a useful tool for measuring the integrated concepts. These are: exact equivalence (inter-linguistic synonymy), inexact equivalence (inter-linguistic quasi-synonymy, with a difference in viewpoint), partial equivalence (inter-linguistic quasi-synonymy, with a difference in specificity), single to multiple equivalence (too many terms or not enough terms), and nonequivalence. *Inexact equivalence* and *partial equivalence* mean that the concept in the two languages is similar though not exactly the same. In other words, the concept has conceptual elements from both the original language and the target language. Inexact equivalence accounts for the case where two concepts can be directly translated but are used in different situations due to different viewpoints, while partial equivalence accounts for the case where two concepts are similar but have different specificity.

In the coding process, each strategy of the adaptation was determined not only by the technical differences – matchiness of terms or structures – but also in view of Korean social and cultural needs. While certain differences such as subjects related to religions or languages are obvious, requiring no external references, others had documentary support such as *KDC*'s manual for new changes for their sociocultural relevance.

As a coding scheme, the taxonomy was applied to analyze interactions between two tensions of indigenization and standardization by distinguishing the concepts taken directly from *DDC* (i.e., *DDC*-like) and from the concepts stemming from Korean culture. Additionally, an open coding style of analysis was performed (Pickard 2007) to find unexpected patterns. To clarify those unexpected results, a combination of inductive and deductive thinking was required to balance between the use of the taxonomy and open coding.

Initial coding with the taxonomy of the adaptation brought about the development of the second coding scheme. Initial coding focused on cases exhibiting similarities and differences from social and cultural views of *KDC* and *DDC*. To determine the adaptive strategies used as the initial coding scheme, however, it was necessary to compare ways in which the two classification schemes represent differences and similarities. Tracking all these classificatory features such as captions, locations, hierarchies, etc., turned up patterns for the matching of terms and structures. This matching of terms and structures echoed the discussions of semantic contents and structures as essential constructs of classification affected by social and cultural conditions (Olson 2009, Tennis 2011) in Chapter 2, the literature review. Thus, discovered classificatory features in the initial coding were categorized into semantic contents and structural arrangements. Specifically, common patterns of differences in captions, hierarchy, locations, and order of subordinate concepts were found. Those patterns were variables accounting for semantic contents and structural arrangement, listed below (Table 4-5). The scheme, with these two categories of semantic contents and structural arrangements, was developed with the observed patterns from the comparison of the two classification schemes in the initial coding. Thus, those categories—semantic contents and structural arrangements—and variables for each category were framed as the scheme of observability of adaptation.

Categories	Variables – Coding numbers
1) Semantic contents	<p><b>a) Captions*</b></p> <p>Whether the captions match</p> <ol style="list-style-type: none"> <li>1. Exact match</li> <li>2. Inexact (viewpoints) According to ISO 5964 (ISO 1985)'s degrees of interlanguage equivalence, inexact equivalence accounts for the case where two concepts can be directly translated but used in different situations due to different viewpoints. e.g. <i>KDC 384</i> (customs of birth, majority, wedding and funerals)/ <i>DDC 392</i> (customs of life cycle and domestic life) &amp; <i>DDC 393</i> (death customs)</li> <li>3. Partial According to ISO 5964 (ISO 1985)'s degrees of interlanguage equivalence, partial equivalence accounts for the case where two concepts are similar but have different levels of specificity. e.g. <i>KDC 563</i> (generation of electric power)/ <i>DDC 621.31</i> (generation, modification, storage, transmission of electric power)</li> <li>4. No match e.g. <i>KDC 335</i> (problems of living) is close to the <i>DDC 363</i> (other social problems and services), given topical coverages by the listed subordinate concepts. But, the captions of two class numbers do not share any semantic content.</li> </ol> <hr/> <p><b>b) Quantity of subordinate class numbers</b></p> <p>Whether the ranges of topical coverage match</p> <ol style="list-style-type: none"> <li>1. Exact match</li> <li>2. <i>DDC</i> class number has more subordinate numbers than the <i>KDC</i>'s</li> <li>3. <i>DDC</i> class number has fewer subordinate numbers than the <i>KDC</i>'s</li> </ol>
2) Structural arrangement	<p><b>a) Rank (division/section)</b></p> <p>Whether the hierarchical locations match</p> <ol style="list-style-type: none"> <li>1. Exact match</li> <li>2. The matched <i>DDC</i> number's rank is higher than the <i>KDC</i>'s e.g. <i>KDC 326</i> (commerce (Trade), transportation, communications)/ <i>DDC 380-389</i> (commerce, communications &amp; transportation) - the <i>DDC</i> has a whole division for this topic)</li> <li>3. The matched <i>DDC</i> number's rank is lower than the <i>KDC</i>'s e.g.</li> </ol>

	<i>KDC 563 (generation of electric power)/ DDC 621.31(generation, modification, storage, transmission of electric power)</i>
	<b>b) The broader category</b> Whether broader categories match <ol style="list-style-type: none"> <li>1. Match</li> <li>2. No match</li> </ol>
	<b>c) Subordinate concepts</b> Whether subordinate concepts match <ol style="list-style-type: none"> <li>1. Match</li> <li>2. Partial match</li> <li>3. No match</li> </ol>
	<b>d) Order of subordinate concepts</b> Whether the arrangements of subordinate numbers match <ol style="list-style-type: none"> <li>1. Match</li> <li>2. Partial match</li> <li>3. No match</li> </ol>

Table 3-5 Observability of adaptation

*\*In the case of class numbers at division level, such as 310, 320, 330...etc., the DDC has separate captions for both the division level and section level of class numbers, while the KDC has only one caption for both. E.g. KDC 520 – Agriculture, DDC 630 – Agriculture (division level), & Agriculture and related technologies (section level). In this analysis, if the KDC’s and the DDC’s captions at the division level are the same, the captions were considered “match.”*

As modern classification mostly addresses the concepts commonly shared in the modern world, examining different representations of semantic contents and structural arrangements would account for socio-cultural influences. Section 4.2.4. illustrates what the variables and categories of the second coding scheme and observability of the adaptation are in the context of comparison of the two classification schemes and their resultant patterns.

**3.5.2.3. Limitation**

Qualitative content analysis involves identifying patterns in text. Ideally it is carried out in a thorough and transparent matter. Analysis accompanies an interpretive reading to discover the meaning inherent in the text. Unlike quantitative content analysis, qualitative content analysis leaves room for interpretation of texts because qualitative content analysis is based on the belief

in multiple understandings of reported reality. As in qualitative content analysis, the researcher's judgment is more critical. It is considered more subjective than quantitative content analysis. A conscientious effort was made to ensure rigor in the qualitative content analysis by discussing deviant cases and describing the coding process itself through consulting external sources such as dissertation committee members and methodology text books, as well as mentoring via presentations of work in progress research or colloquia for dissertators in our field. With continued discussion of the coding scheme during the coding process, it nonetheless was possible to code and interpret data in many ways. To prevent this natural limitation, a second coder familiar with both Korean and English who conducted a second coding of the sample increased reliability (Appendix 1).

### 3.6. Conclusion

As described above, this study is a comparative study and content analysis was applied in a mixed methods design. Application of descriptive and analytic visualization captured a snapshot of similarities and differences between the two classifications in Phase 1. An interpretive approach in the second phase provided more contextualized explanations for the changes made to *KDC* in adapting *DDC* for South Korean society. Mixing two methods, one quantitative and the other qualitative in this study provided a mechanism by which it was possible to mine patterns of the adaptation, either explicit or implicit, expected or unexpected. In the interpretation of the data, it was contextualized with external sources, such as introductions to *KDC/DDC* as well as with internal sources, specifically the data itself.

## Chapter 4 Findings: Quantifying differences between *KDC* and *DDC*

This chapter describes noticeable patterns of differences emerging from a comparison of *KDC* and *DDC*. As previously discussed, the analysis consists of two phases – a quantitative, descriptive phase and a qualitative, analytic phase. For the first phase, multiple visualization techniques and descriptive statistics are applied and meaningful patterns will be described. These meaningful patterns include the resultant findings leading to the second phase of analysis and discussion points.

Phase 1 was a quantitative comparison of *DDC* and *KDC* in terms of concepts and structures in the two systems. The results included the total quantities of class numbers in the recent three editions of *DDC* and *KDC* respectively; tracked changes in quantity of class numbers of the recent three *DDCs* and three recent *KDCs* by main class; and percentage changes of the ten main classes over the recent three editions of *DDC* and *KDC*. Class numbers included in this phase were all those already enumerated in the schedules. Based on analysis of those class numbers, two main classes were identified –social sciences and technology – as exhibiting the highest degrees of difference between *KDC* and *DDC* for analysis in Phase 2.

### 4.1. Changes in class numbers of *DDCs* and *KDCs*.

In total, 148,901 class numbers were collected - 72,317 from the three editions of *DDC* and 76,584 from the three editions of *KDC*. The total number of class numbers of the six editions ranged from 21,176 (*DDC23*) to 27,156 (*DDC22*), the highest and lowest number both from *DDCs*. In comparison of *DDC* and *KDC*, the average number for the three editions of *KDC* (25,528) is slightly bigger than the three editions of *DDC* (24,105.6). Thus, *DDC* exhibits larger

variations in the quantity of class numbers among the recent three editions than does *KDC* (Figure 4-1).

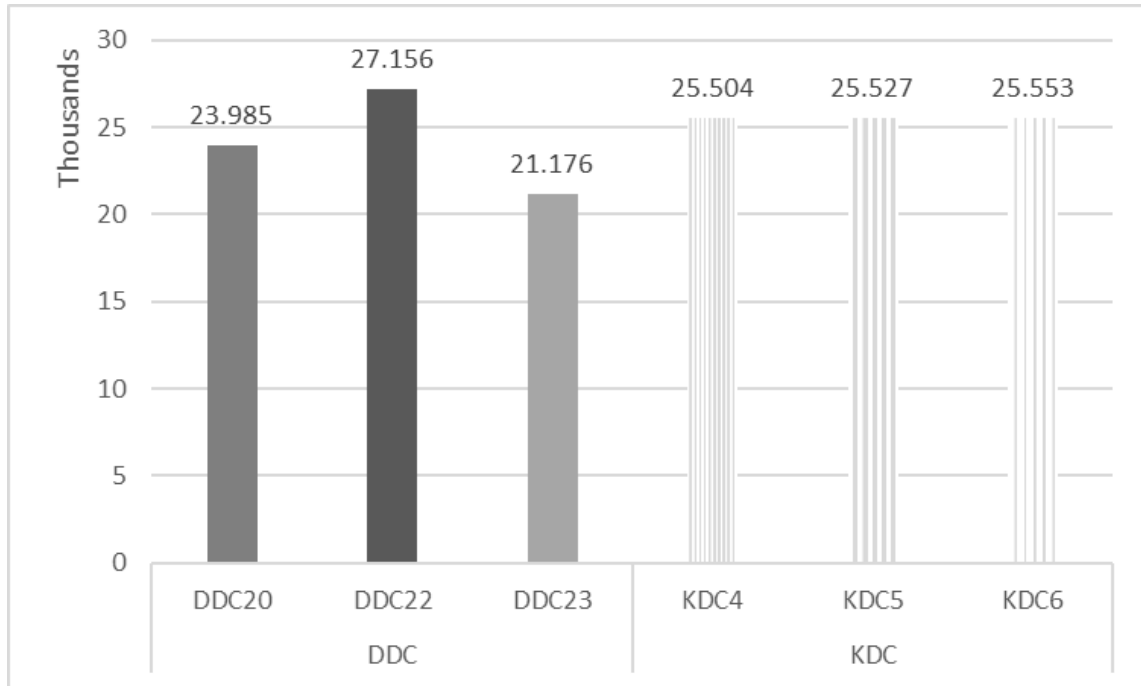


Figure 4-1 Quantities of the collected editions of *KDC* (4,5, &6) and *DDC* (20, 22, & 23)

The recent three editions of *KDC* maintained stable quantities of class numbers.

However, changes in the quantity of class numbers becomes evident in chronological tracking of all six editions from 1964 to 2014. Figure 4-2 shows that the largest change in quantities of class

numbers in *KDC* occurred between editions 3 and 4, implying that edition 4 carried major changes and subsequent editions remained stable in terms of quantities.

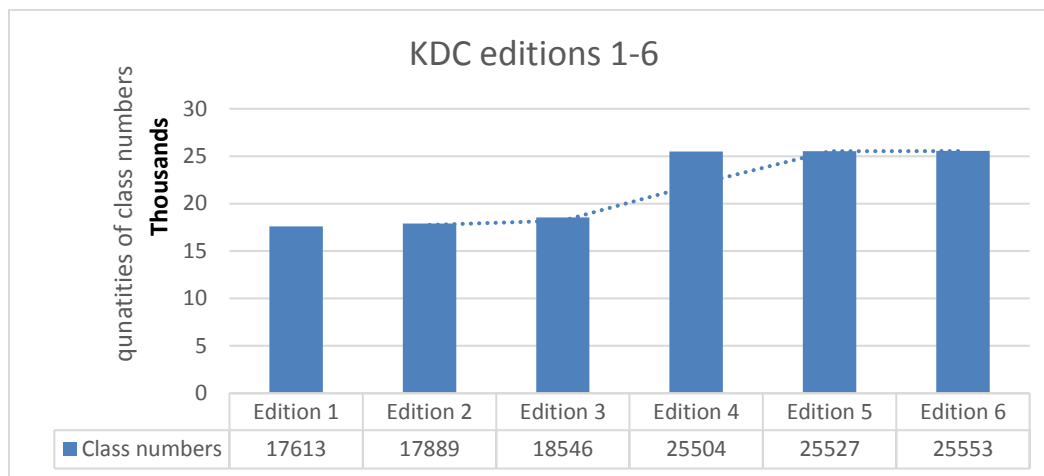


Figure 4-2 Quantities of the six editions of the *KDC* from 1964 to 2014

Because *KDC* and *DDC* share the structure of ten main classes, a quantitative comparison of class numbers by class was feasible. A larger quantity of class numbers in a main class is an indication of a higher level of specificity in topical coverage of a certain subject. *DDC* 23, the most recent edition, however, has decreased numbers of class numbers in total as well as in seven of the main classes in comparison with its immediate predecessor, which is possibly a function of the increased facet features in the former, making it easier to have more built numbers than the ones enumerated in the schedules. Interpretation of recent changes in quantities of class numbers for *DDC* and *KDC* editions, including the changes in each main class, will be elaborated on in Chapter 5.

#### 4.2. Distribution of ten main classes in the *DDCs* and the *KDCs*

Distribution of class numbers of all ten main classes for the collected editions of *DDC* and *KDC* are visualized in Figure 4-3. The top three main classes with the highest numbers of class numbers are ‘technology’, ‘social sciences’, and ‘history & geography’ for *DDC* editions;

‘technology’, ‘science’, and ‘social sciences’ for *KDC* editions. The three main classes with the lowest numbers of class numbers are ‘language’, ‘literature’, and ‘philosophy & psychology’ for *DDC* editions; ‘language’, ‘literature’, and ‘computer science, information & general works’ for *KDC* editions.

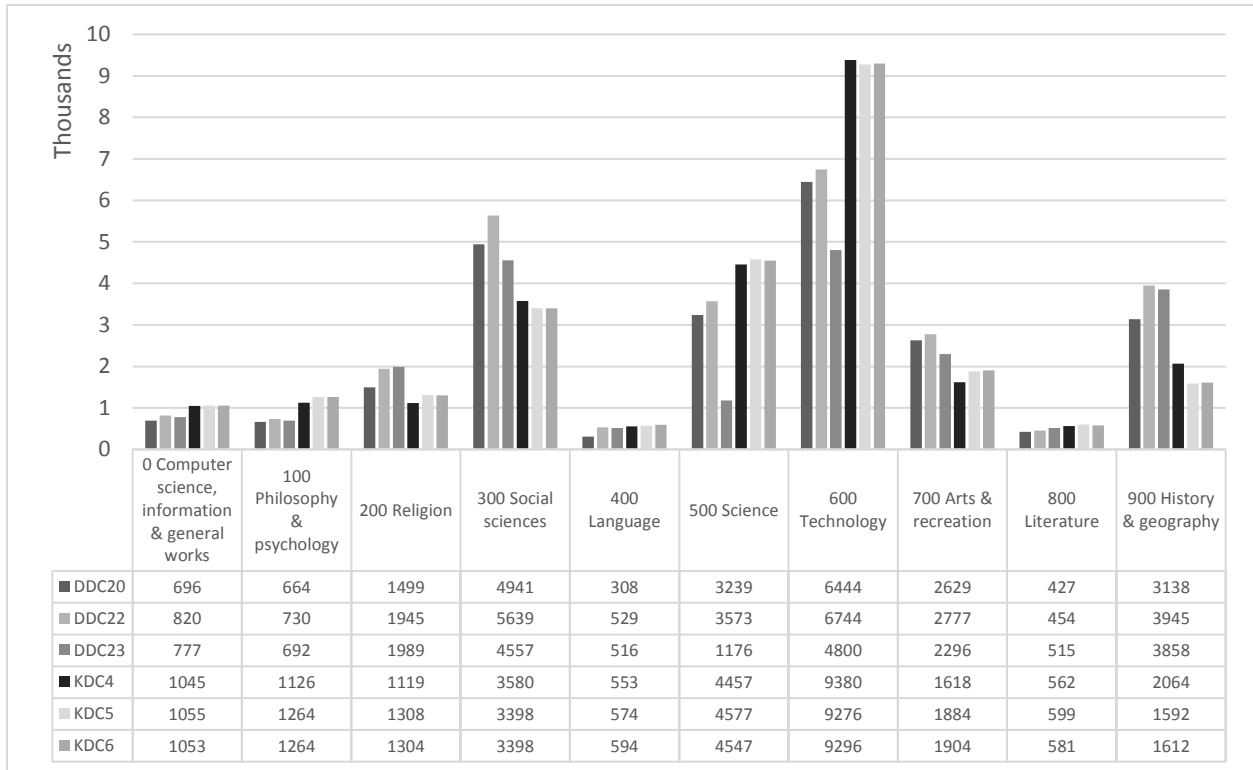


Figure 4-3 Frequency distributions of class numbers in the recent six editions of *DDC* and *KDC*

In tracking the changes among recent editions, corresponding main classes of *DDC* and *KDC* were compared. As is the case with the overall quantities of *DDC* editions presenting more evident changes than *KDC*, quantitative changes in class numbers by main class across the recent editions are also more varied in *DDC* (Figure 4-4). From *DDC* 20 to 22, the language class increased radically in size (71%), while the science class decreased most significantly (-67.1%) from *DDC* 22 to 23. By comparison *KDC* editions’ class distributions by main class had not

changed as much. History & geography had the largest decrease (-22.9%) from *KDC* 4 to 5; the largest increase in class numbers by main class is in religion from *KDC* 4 to 5 (16.9%).

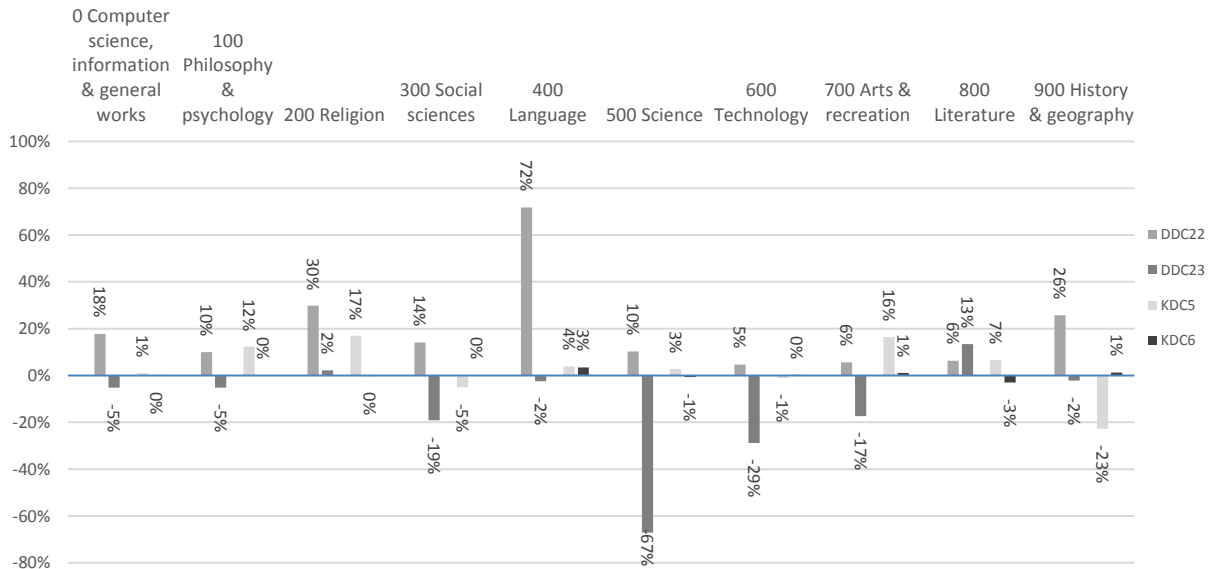


Figure 4-4 Percentage changes in class numbers by main class across *DDC* and *KDC* editions

In previous graphs, it is evident that *DDC* in general displays broader ranges of changes from edition to edition as compared to *KDC*. However, differences in the distributions of class numbers across the main classes between *DDC* and *KDC* tend to be consistent across recent editions. Figures 4-5 & 4-6 show the percentage of each main class in every edition in terms of class numbers for *DDC* and *KDC* respectively. Comparing compositional percentages of *DDC* 20, 22, and 23 with its counterparts *KDC* 4, 5, and 6 reveals the main classes with the most noticeable differences, which lead to selection of the main classes for the second phase of analysis. The two main classes presenting the greatest differences in composition of knowledge structures are technology and social sciences.

Figures 4 and 5 display percentages of all ten main class compositions for *DDC* 20, 22, and 23 and *KDC* 4, 5, and 6. Comparing each main class of *DDC* and *KDC*, the gaps between compositional percentages of technology and social sciences are consistently high throughout

editions. The main class of technology takes 27% of *DDC* 20, 25% of *DDC* 22, and 23% of *DDC* 23 respectively, while its counterparts in *KDC* take 37% of *KDC* 4, 36% of *KDC* 5, and 37% of *KDC* 6. Differences in percentages of the technology class between *DDC* and *KDC* range from 10% to 14%. The main class of social sciences takes 21% of *DDC* 20, 21% of *DDC* 22, and 22% of *DDC* 23, while its counterparts in the *KDC* take 14% of *KDC* 4, 13% of *KDC* 5, and 13% of *KDC* 6 respectively. Differences in the percentages of the social sciences class between *DDC* and *KDC* range from 7% to 9%.

In the early stages of this study, I presumed that *KDC* and *DDC* would differ most in philosophy, the social sciences, or religion. Although the social sciences class does exhibit a high degree of difference between the two schemes, the class that turned out to have the highest degree of difference is the technology class. Interestingly, *DDC* editions have more class numbers in social sciences, while *KDC* editions have significantly more class numbers in technology. It is worth noting that measuring quantities of class numbers alone does not explain differences in concepts or hierarchical structures of the schemes. The intention in such counting is only to assist in identifying the two classes with the greatest variations between the two schemes for qualitative analysis in the second phase of the study.

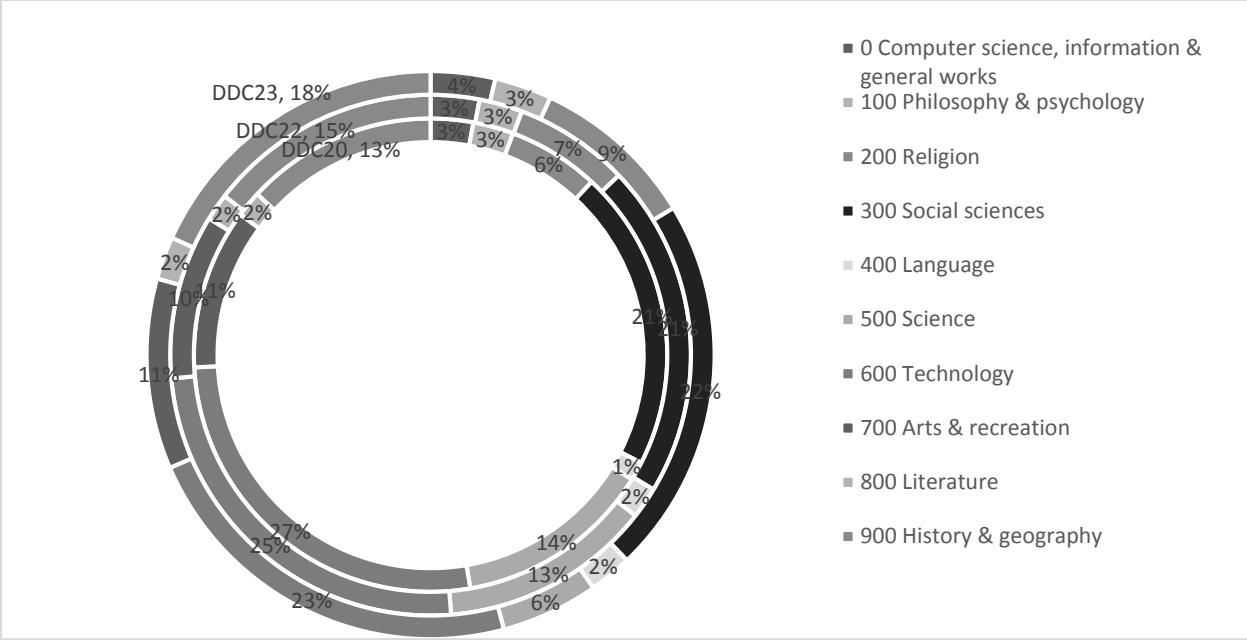


Figure 4-5 Percentages of main classes: *DDC* 20-22-23

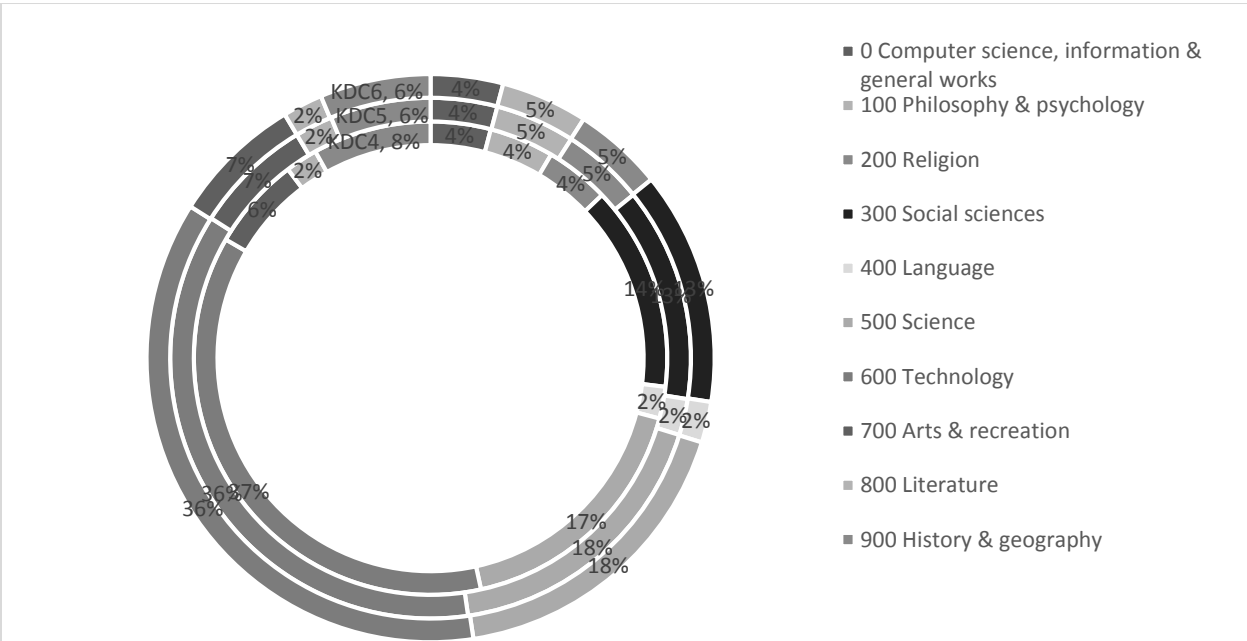


Figure 4-6 Percentages of main classes: *KDC* 4-5-6

### 4.3. Distribution of ten divisions in two selected main classes

Figure 4-7 and 4-8 show distributions of class numbers in divisions of two selected main classes. The class numbers included in these figures are only those at the levels of division and

section<sup>3</sup> under the selected main classes. Only the most recent editions of *DDC 23* and *KDC 6* were compared for visualizing the size and distribution of divisions and sections under two main classes.

The first column of Figure 4-7 represents all three-integer class numbers including divisions and sections of the social sciences class: 300-399. Each of the remaining columns is for a sub-discipline (i.e., a division) in the main class. The overall scope of the two chosen main classes from *DDC* and *KDC* have shared topical coverage. However, the divisions do not match exactly. Thus, the ten divisions of the social sciences class were integrated into nine columns in Figure 4-7 by moving economics and commerce in *DDC 23* and public administration and military science of *KDC* into one column. *DDC 23* and *KDC 6* locate division class numbers differently, but topical coverages are also different (e.g., *DDC 23* has military science (355) under public administration (350) but *KDC 6* has military science as a separate division (390) from public administration (350)). The last row in Figure 4-7 shows *KDC 471*, which covers the topic of anthropology under the main class of natural science unlike *DDC*, which has social sciences, sociology, and anthropology all together in the first division of the social sciences.

In a similar pattern, Figure 4-8 includes 99 class numbers of the technology main class in *DDC 23* and *KDC 6*. Figure 4-8 uses 0-99 as *DDC 23* has 600-699 and *KDC 6* has 500-599 for the technology class, while Figure 4-7 uses class numbers 300-399 in both *DDC 23* and *KDC 6* to designate the main class of social sciences. The ten divisions of the technology class also

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<sup>3</sup> Decimal classification has three named ranks in its hierarchical structure: main class, division, and section. The highest rank (e.g., represented by class numbers 100, 200, and 300) is named as main class, representing 10 broad disciplines; as the second rank (e.g., 110, 120, and 130) is named as division, representing sub-disciplines under each main class; and the third rank (e.g., 111, 112, and 113) is named as section, representing subordinate concepts to sub-disciplines.

integrated into nine columns by merging two manufacturing-related divisions of *DDC* and three engineering-related divisions of *KDC*.

In Figures 4-7 and 4-8, bars indicate the counts of all class numbers combined with auxiliary numbers under each section (e.g., for the section number 301, all the numbers from 301.01 to 301.98 are totaled as 98). Thus, the length of a bar indicates how many detailed (subordinate) concepts there are under each division or section class number.

The counts and numerical display of all division and section numbers of the two selected main classes show how class numbers in the divisions are distributed across the main class. In *KDC* social sciences, six divisions (3. political science, 4. economics, commerce, communication, 5. law, 6. public administration & military science, 7. social problems & social services, and 9. customs, etiquette, folklore) are in different locations while the other three sub-disciplines (i.e., 1. social sciences, sociology, & anthropology, 2. statistics, 8. education) are in the same locations when compared to *DDC*. In the technology class, only two sub-disciplines (i.e., 1. technology, 2. medicine & health) are in the same order and the other seven are located differently. This difference in locations and sizes of sub-disciplines is expected to generate insight into the comparative reading of class numbers in Phase 2.

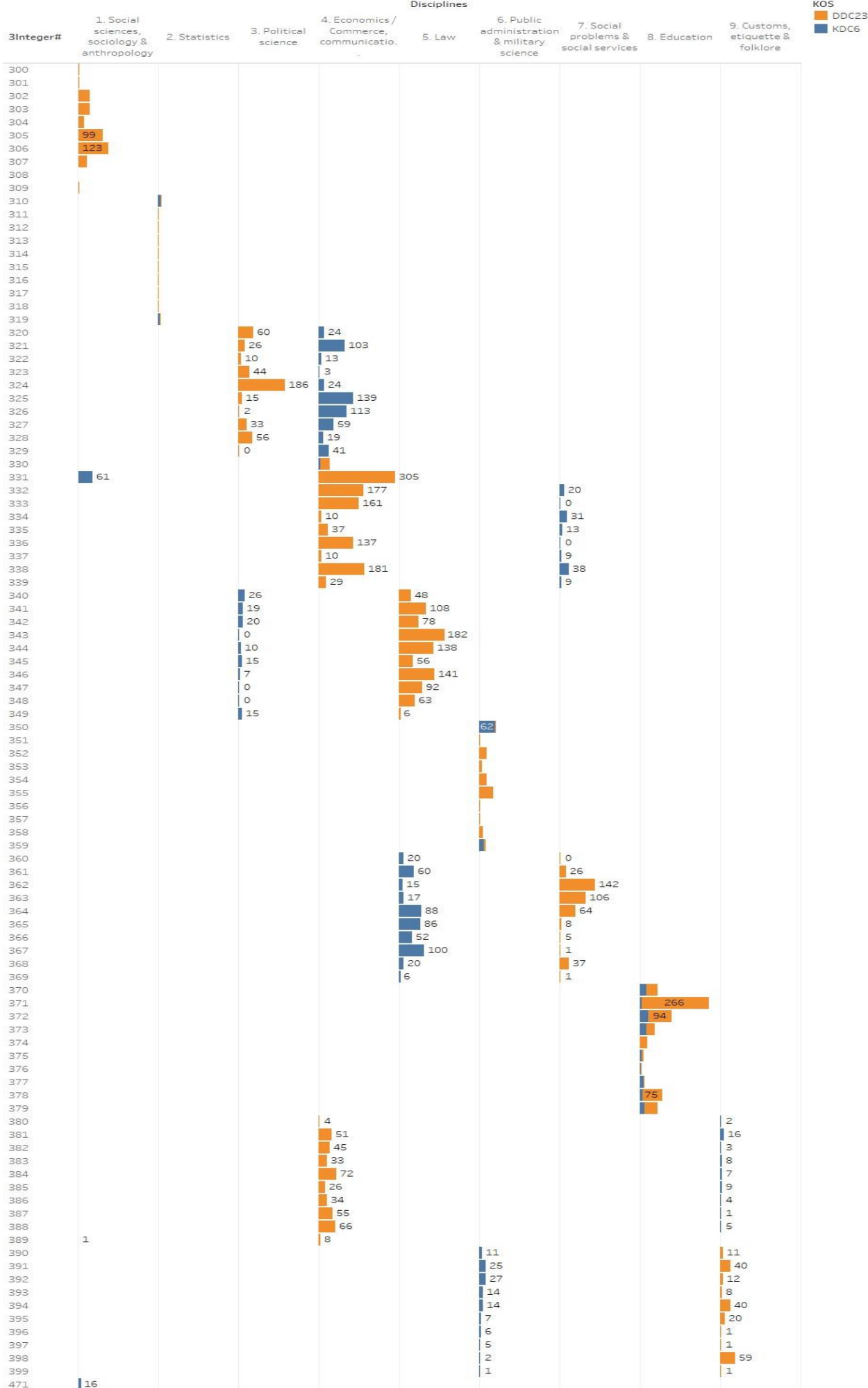


Figure 4-7 Divisions of Social science from DDC 23 and KDC 6

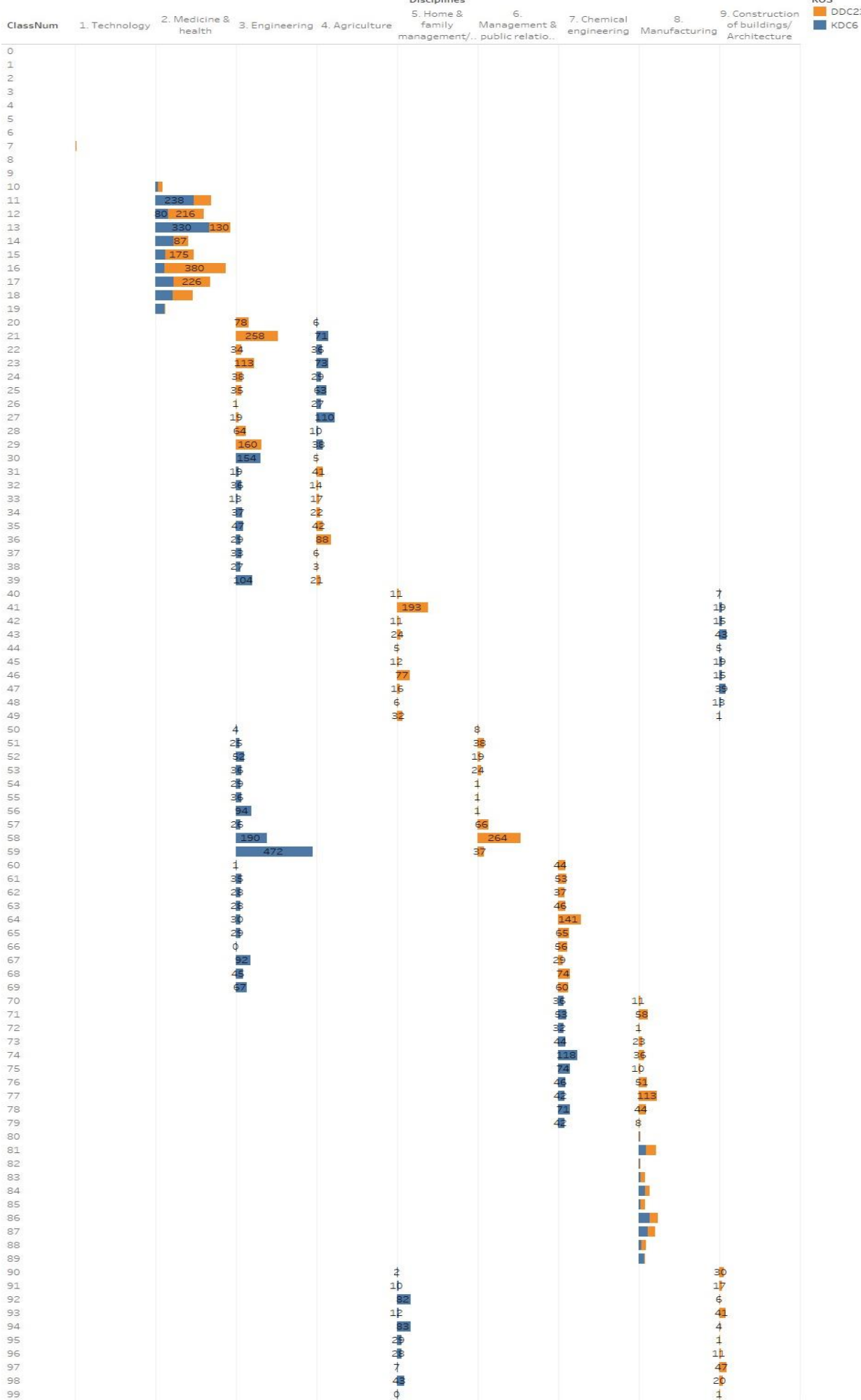


Figure 4-8 Divisions of Technology from DDC 23 and KDC 6

## 4.4. Conclusion

For Phase 1, quantities of class numbers were analyzed by edition and discipline. The visualizations of two classification systems revealed three main differences: 1) in range of changes across editions, 2) in distribution of class numbers at the main class level, and 3) in distribution of class numbers at the division and section levels. In terms of the quantity of class numbers of three editions of *DDC* and three editions of *KDC*, *DDC* has had more changes across editions. *KDC* is bigger range of changes between editions was verified not only by the total but also by the number of class numbers in ten main classes. These changes in quantities do not solely represent modifications or revisions of classification systems, because there could be types of changes other than the number of class numbers, such as change of captions or relocation of the class numbers. Nonetheless, the curves of increasing or decreasing tendencies across editions and disciplines demonstrate differences in chronological evolution of *DDC* and *KDC*.

Despite varied curves for the changes in quantities, analyzing the quantities of class numbers in the ten main classes exhibits a consistent tendency in distributions of class numbers in the main classes. The main class with the highest percentage of differences in *DDC* was the social sciences, while the main class with consistently high numbers of class numbers in *KDC* was technology. The two main classes showing the most difference in quantities are expected to have more differences in conceptual coverage or higher levels of specificity. Lastly, exploration of the counts and locations of the class numbers at division and section levels uncovered the types of differences to be examined in Chapter 5.

## Chapter 5 Findings: Examining in-depth differences to understand sociocultural influences

For Phase 2, the developed adaptation taxonomy described in Chapter 3 was applied to the two selected main classes, social sciences and technology, of *KDC* 6 in comparison with *DDC* 23. With the second coding scheme—the observability of adaptation described in Chapter 3, noticeable classificatory characteristics were examined to capture manifested sociocultural influences in the differences of classificatory characteristics from the comparison of *KDC* and *DDC*. The entire coding process and coding schemes will be introduced in this section along with major findings from the coding process. The class numbers used in the examples below are from the *KDC* 6.

### 5.1. Coding process

There were two coding schemes involved in the two parts of the coding process (5-1). One is the adaptation taxonomy developed based on Berry's model that captures sociocultural differences in four progressive adaptive strategies; the other is the observability of adaptation that captures classificatory differences in comparison of the two classifications. I examined two coding schemes in relating one to another in order to see how the identified classificatory differences in the observability of adaptation bear sociocultural influences examined from application of the taxonomy of adaptation.

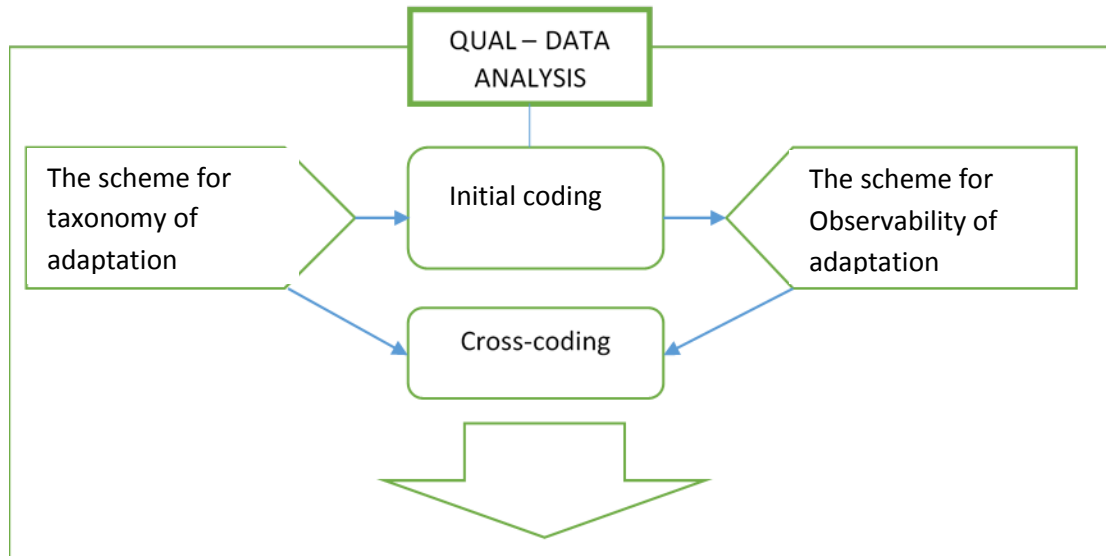


Figure 5-1 Coding process

In the first coding of the social sciences and technology classes from *DDC 23* and *KDC 6*, the taxonomy of the adaptation was applied as the initial coding scheme. The four adaptive strategies were indifference, nativization, absorption, and integration. The indifference strategy is not to take either *DDC*-like concepts or Korean specific, nativization is to implement Korean specific concepts into the system, absorption is to adopt *DDC*-like concepts as they are, and lastly integration is to incorporate Korean specific and *DDC*-like concepts in harmony. The coding, however, resulted in many class numbers being coded into two strategies simultaneously. Short definitions and examples are listed on the next pages.

Several patterns emerged from the comparison of *KDC* and *DDC* class numbers for each adaptive strategy. After sorting the coded cases, observable characteristics were identified. A second coding scheme was developed for observability of adaptation based on the previously identified components. The existing taxonomy of adaptation was analyzed with the application of the second coding.

## 5.2. Initial coding with the taxonomy of adaptation

As discussed in Chapter 3, the adaptation taxonomy has four discrete categories representing different strategies in the adaptation of an original classification to an adapter system. The four categories will be described below with specific examples. Also, during the coding process, the four categories were deemed too simplistic to account for the complexity of adaptation, because *KDC*'s development and adaptation of *DDC* is often sourced in two or more cultural warrants. Given the two systems' somewhat different purposes and usages, the adaptive choices between global and local are more varied than the four simple categories. In this analysis, three more adaptive strategies in between two nearby categories emerged, as they exhibited distinctive characters. Two other classifications, *Nippon Decimal Classification* (NDC) and Library of Congress *Classification* (LCC), were also examined to identify the possibility of their influence in cases where the category of *Indifference* was applicable.

### **Indifference**

Cases coded as this category show neither noticeable influence from *DDC* nor satisfy Korean local cultural needs. It seems that there was some influence from *NDC* but no noticeable influence from *LCC*. Those of *NDC*-influenced class numbers have captions almost identical to the counterparts of *NDC* 10 (the most recent edition published in 2014).

### *Examples*

#### Social Sciences

- 386 - Festival, regular annual events
- 389 - Cultural anthropology
  - *DDC* has no such subclass. It appears to be from the *NDC*. No other subdivisions were listed under this.

## Technology

- 517 Promotion of health, public health & preventive medicine
  - This section could have been influenced by the LCC, class RA421-790.95 Public health. Hygiene. Preventive medicine. Many of the subordinate topics overlap with *DDC* 613 (personal health and safety), but the way they are organized is totally different; *KDC* 6's approaches are public not personal, although some parts of this section cover personal health as well.
- 532 Civil engineering mechanics and materials
  - This section bears a concept borrowed from *NDC* 511 (mechanics and materials). Although *DDC* also covers mechanics and materials, it doesn't specify it as a separate section.
- 533 Surveying
  - This section seems to be a concept borrowed from *NDC* 512 (surveying). *DDC* doesn't specify it as a separate section.
- 536 Bridge engineering
  - This section appears to be a concept borrowed from *NDC* 515 (bridge engineering). *DDC* 624 (civil engineering) covers this.

## Indifference & Nativization

In this strategy, although the influences of *NDC* seem evident, the numbers and captions influenced by *NDC* are somewhat modified for localization. Even with the influence of *NDC*, the coded concepts below are likely Korean-specific in comparison with both *DDC* and *NDC*.

### *Examples*

#### Social Sciences

- 379 Special education
  - The concept of special education is covered in *DDC* 371 (schools and their activities; special education). Subordinate class numbers under *KDC* 379 (special education) are close to *NDC* 378 (education for disabled children (special support education)), but the captions are not matched as well as to the order.
- 381 Customs of clothing, eating and dwelling places
  - This conceptual understanding is also closer to *NDC*'s counterparts than *DDC* 23. But, the captions are different as well as the partial coverage from *NDC* 383 (customs of clothing and shelter). *DDC* has covered it in *DDC* 391 (costume and personal appearance) and in *DDC* 394 (general customs).

#### Technology

- 539 Sanitary, municipal and environmental engineering
  - *NDC* has two sections - 518 (sanitary and municipal engineering) and 519 (pollution, environmental engineering). *KDC* 539 covers concepts represented by both *NDC* section numbers.
- 593 Grooming
  - *NDC* 595 (beauty culture). There is no such *DDC* section.

#### **Absorption**

Concepts in this strategy originate from *DDC*, preserving both the conceptual scope and structural fidelity of their counterparts in *DDC*. This absorption strategy mostly has an identical caption at the same rank (division/section/subordinate (auxiliary) number) with overlapping subordinate topics. (The components of conceptual coverage will be discussed later.)

#### *Examples*

## Social Sciences

- 349 - International relations
  - The captions and conceptual scope of the class under *KDC* 349 (international relations) are identical to those under *DDC* 327 (international relations).

## Technology

- 501 Technical theory
  - The section number is matched with *DDC* 601 (philosophy and theory), as the Korean caption of *KDC* 510 is identical.

## **Absorption & Integration**

This strategy adopts *DDC*-like concepts but includes partial differences, specifically the inclusion of adjacent subjects or more subordinate numbers rather than the topic itself. This absorption and integration strategy mostly has similar or identical captions at different levels of class unit (division/section/subordinate (auxiliary) number) or at the same level with no overlapping subordinate topics.

### *Examples*

## Social Sciences

- 326 Commerce (Trade), transportation, communications
  - *KDC* 326 has identical captions to *DDC* 380 (commerce, communications & transportation). *DDC* has a whole division for this topic –*DDC* 380-389. Thus, the topical scopes and treatment of the topic are not matched.
- 327 Financial economics

- This caption is identical with *DDC* 332 (financial economics), but the topical scope is not. For example, the topic of *KDC* 328 (insurance) as a separate section is a subordinate concept under *DDC* 332 (financial economics).

## Technology

- 541 Building construction materials
  - This section, starting with materials, seems almost the same with *DDC* 691 (building materials), given the order of subordinate numbers. But, the division is not identical: *KDC* covers the subjects of construction and architecture together in *DDC* they are separate.
- 548 Detail finishing and architectural decoration
  - Subordinate concepts of *KDC* 548.1-548.8 are same as *DDC* 698 (detail finishing)'s counterparts. But, the last number, 548.9, is only in *KDC* and only partially matched with *DDC* 747 (interior decoration) under *DDC* 740 (graphic arts & decorative arts).

## Nativization

This strategy is used to insert native Korean-specific systems or concepts. But this strategy also often occurs with integration or indifference simultaneously for the cases displaying Korean specificity in adaptation. The examples below are culturally specific subjects.

### *Examples*

#### Social Sciences

- 345 Legislation
  - Due to differences between Korea and North America's systems of law, this section is about Korean-specific political systems.

## Technology

- 519 Oriental medicine, Korean medicine

## **Nativization & Integration**

Approaches to or understanding of similar concepts represent Korean local needs. The topical concept in *KDC* does not match any concept in *DDC*, but subordinate or adjacent subjects are found, as with the counterparts of *DDC*. This nativization and integration strategy usually has different captions and unique (or Korean-specific) interpretations of the concepts in *KDC*.

## *Examples*

### Social Sciences

- 332 Social organizations and institutions
  - The caption is not matched at all, but *DDC* 305 (groups of people) under the division of social sciences, sociology and anthropology (300-307) has partially overlapped subordinate concepts with this *KDC* 332.
  - This section's subordinate numbers start with family groups and extend to social classes. There is no gender, age, or ethnicity addressed. *DDC* 305 (groups of people) also addresses social and economic levels for groups of people. *KDC* 331.2 also covered those demographic groups, but not about social classes that concern social and economic levels.
- 335 Problem of living
  - *DDC* 363 (other social problems and services) has partial overlaps with this section.

## Technology

- 540 Construction and architecture

- At the division level, *KDC* 6 changed the caption to locate all architecture-related subjects here. *NDC* also locates both together in 520, but this is a more recent change and not a direct influence of *NDC*. In addition, the order of subordinate sections differs from *NDC*. Interestingly, the order of materials, practice-related, structures, and detailed jobs are matched with *DDC*. But, at the section level, *KDC* 540 includes all theories and histories of not only construction but also architecture, while *DDC* has a separate division for architecture in the arts and recreation division (700-799).

## **Integration**

The integration strategy reflects both Korean culturally specific and *DDC*-like concepts together in harmony. Integration appeared in cases where there are no perfectly identical counterparts of *DDC* in *KDC* in terminology and structure or vice versa. Unlike absorption, which shared the concepts in terms of semantic contents and structures, integration shared either only one or parts of each. Different captions and the level of class ranks, different broader categories or unmatched subordinate concepts are common patterns of integration. Topics coded as integration solely tend to be reflections of general disciplines compared to the other two coding categories that were culturally influenced – ‘Absorption & Integration’ and ‘Nativization & Integration’.

### *Examples*

#### Social Sciences

- 319 Demography (Population statistics)
  - *DDC* has population under section number 304 (factors affecting social behavior), while *KDC* 6 has population under a division of social statistics (310-319).

- 321 Economic theories or thoughts
  - This section covers a variety of topics that *DDC* 331-333 (economics of labor, finance, land, and energy) covers.

Analysis of cases coded in these categories provides a snapshot of the adaptation regarding two cultural warrants, most originated from nationality in this study. In both main classes, the social sciences and technology, the percentage of cases coded as integration is the highest, 46% in the social sciences and 37% in technology (Tables 4-1&4-2). The percentage of cases coded as nativization is higher than absorption (31% vs. 16%) in the social sciences, while the percentage of the cases coded as absorption is slightly higher than that of nativization (25% vs. 21%) in technology. The percentage of cases coded as indifference for the social sciences is a lot less than that for technology (5% vs. 15%).

The social sciences			
1 Indifference	2 Absorption	3 Nativization	4 Integration
6	20	37	55

Table 5-1 Number of cases in each category in the social sciences

Technology			
1 Indifference	2 Absorption	3 Nativization	4 Integration
28	45	38	67

Table 5-2 Number of cases in each category in technology

As described earlier, the four categories are inadequate in capturing various adaptive strategies. Thus, a coding rule allowing two or more categories to be coded at the same time was created. In most cases, two adjacent categories were coded together; three categories rarely occurred simultaneously. Tables 4-3 and 4-4 show the number of cases for co-occurring

categories. The most commonly co-occurring categories were integration and nativization and the second were integration and absorption in both the social sciences and technology. However, in the technology class, indifference and nativization was the third most commonly co-occurring pair, and the indifference category more frequently occurred in the coding for technology (Table 4-3 & 4-4).

The social sciences				
	1 Indifference	2 Absorption	3 Nativization	4 Integration
1 Indifference	6	0	4	1
2 Absorption	<b>0</b>	20	1	13
3 Nativization	<b>4</b>	<b>1</b>	37	20
4 Integration	<b>1</b>	<b>13</b>	<b>20</b>	55

Table 5-3 the number of coding for co-occurred categories (the social sciences)

Technology				
	1 Indifference	2 Absorption	3 Nativization	4 Integration
1 Indifference	28	1	21	19
2 Absorption	<b>1</b>	45	2	27
3 Nativization	<b>21</b>	<b>2</b>	38	31
4 Integration	<b>19</b>	<b>27</b>	<b>31</b>	67

Table 5-4 the number of coding for co-occurred categories (technology)

The counts for the four categories were also examined in relation to a distribution of divisions in the social sciences and technology.

### Social Sciences

The class numbers coded as indifference were mostly found in *KDC*'s division of customs, etiquette, & folklore (380-389). The indifference category is, however, always coded concurrently with other categories. The sequence of the most commonly concurrent categories is: integration, nativization, and absorption.

Absorption appeared mostly in the first division of the social sciences, which includes general subjects such as types of materials or regional/local names. Standard tendency in decimal systems, such as taking the subjects from standard subdivisions into the first subclass, are applicable to both the social sciences and technology main classes. The division of education exhibited absorption most frequently. Nativization appears mostly in the division of law, which reflects the different law systems of the two countries. All 10 divisions include class numbers coded as integration, but military science presents the most cases of integration with no other concurrently coded categories. Exploring the way these four strategies appear by division in the social sciences, integration was found to be most common, followed by nativization. In most cases, integration accompanies nativization. Concerning the two categories, absorption and indifference either occur together or each one occurs individually. One exceptional case is the first division of the social sciences, which had absorption and integration categories coded for most of its numbers.

300-309 Social Sciences - This division in *KDC* differs from *DDC*'s corresponding division. *KDC* 301 to 309 employs the straightforward application of standard subdivisions, while *DDC* 300-309 focuses specifically on sociology and anthropology. Section 301 covers general topics in sociology and anthropology, then 302-307 lists specific topics such as social interaction, social processes, factors affecting social behavior, groups of people, culture and institutions, and communities.

310-319 Statistics - Statistics as an academic discipline has been moved to the natural sciences class. The current edition of *KDC* classifies statistical resources in 310-319. Thus, subordinate subjects are somewhat different from *DDC*. Specifically, 311-313 of *DDC* were not adopted as they are [Unassigned] class numbers. *KDC* has assigned the three-digit numbers from

311 to 317 for general statistics of specific places. Similarly, *DDC* has assigned 314-319 for general statistics of specific continents, countries, and localities in the modern world.

320-329 Economics – This division corresponds to *DDC* 330-339. *KDC*'s division of economics includes similar topics to those in its *DDC* counterpart division, but most of them are located/organized differently. Thus, more nativization emerges along with integration. It is interesting to note that *KDC* covers commerce, transportation, and communications in a section numbered 326 while *DDC* has an entire division devoted to this topic – 380-389. Although the terms and scopes of this class are about same as those in *DDC*, levels of the topics are not.

327 Financial Economics - *DDC* 332 (financial economics) has the same subject name and covers shared topics but with a different scope. *DDC* 332 is broader in terms of topical scope. *KDC* has multiple subdivisions for the same scope of *DDC* 332 (financial economics) - e.g. the *KDC* 328 (insurance) belongs to *DDC* 332 in terms of topical scope. *DDC* 332 (financial economics) also partially covers *KDC* 328 (insurance) in terms of credit and loan functions of insurance companies, and *DDC* 344 (labor, social service, education, cultural law) and 346 (private law) under the division of law (340-349) also cover different kinds of insurance. However, as a comprehensive subject for insurance, *DDC* covers it in section number 368 (insurance), which is in the division of social problems and social services (360-369). On the other hand, *KDC* does not include insurance in its divisional counterpart - sociology and social problems. Rather, *KDC* has it in the economic division only. One possible explanation for this is the differencing strategies in the development of social welfare systems between the two countries and the notion of insurance as either social welfare or financial asset.

330-339 Sociology and Social problems - *KDC* covers sociology and social problems together in a division, while *DDC* locates sociology with social science and anthropology (300-309) and social problems in social services (360-369). *KDC*'s first section number 331 (sociology) partially overlaps with the subjects under *DDC* 305 (groups of people). *KDC* 332 (social organization, institutions) begins with family groups extended to social classes. Unlike *DDC* 305 (groups of people), however, there is no mention of gender, age, or ethnicity, as well as social and economic levels for groups of people in *KDC*. In this division, interesting cases of *KDC*'s distinctive topical differences from *DDC* were found. They are listed below:

334 (social problems) lists homosexuality as a sexual issue, along with crimes, etc.

335 (problems of living), although labeled differently, overlaps with *DDC* 363 (other social problems and services).

337 (problems of women) - Both *KDC* and *DDC* locate feminism under sociology. This notion of women as a gender is comparatively widely spread out across all main classes in *DDC*, as *DDC* has listed subdivisions for groups of people in any subjects. On the other hand, *KDC* has only a few classes addressing women – religion, sociology and social problems, laws, customs, medical, and clothes. The caption for *KDC* 337 (problems of women) is limited as well.

Although this subdivision covers topics related to feminism, it mostly includes roles and occupations of women, topics which do not match with the caption—problems of women—.

340-349 Political Science - *KDC* 340 (political sciences), corresponds to *DDC* 320 (political science (Politics and government)) as a subdivision. But *DDC* 320 has more detailed subordinate concepts listed. For example, *KDC* 344 (elections and suffrage) overlaps with part of 324.6 (election systems and procedures; suffrage) under *DDC* 324 (the political process). Also,

*KDC* 346 (political parties), is a part of *DDC* 324 (the political process), corresponding to *DDC* 324.2 (political parties).

350-359 Public Administration - Public administration is a whole division in *KDC*, while *DDC* has it combined with military science. Secondly, detailed scopes are somewhat similar in a sense that both *KDC* and *DDC* cover public administrative agencies and divisions/managements and other issues at a general level. For example, *KDC* 351-357 (administration in specific countries) has equivalences in *DDC*. Interestingly, however, the level of classes is different: *DDC* has specific locational administrations under *DDC* 351 (public administration), such as *DDC* 351.1 (administration in areas, regions, places in general), and *DDC* 351.3-351.9 (administration in specific continents, countries, localities).

360-369 Law - In general, the subclasses of law are difficult to compare as the law systems of the two nations are different. In the *KDC* law class, civil law and commercial law are possibly from *NDC*. However, the order of the law class, especially the first to the third sections of *KDC*, is more similar with the *DDC*. The *KDC* 369 (foreign law) addresses different law systems such as continental law and Anglo-Saxon law.

370-379 Education - The most similar subdivision (even the number is the same) is education. But, *KDC*'s entire education class is small in quantities of refined subordinate numbers. For example, *KDC* 371 (policy and administration of education) overlaps with the *DDC* 379 (public policy issues in education). The scope overlaps in many parts. But, *DDC* 379 (public policy issues in education) addresses more debates on major policy issues and controversial issues.

380 -389 Customs, Etiquette, Folklore - This subdivision displays the most conceptual coverage differences from *DDC*. Many of the concepts were borrowed from *NDC*, such as “customs of clothing, eating and dwelling places”, “customs of ages, sexes and social class”, “festival, regular annual events”. However, *KDC* 385 (etiquette) adopted *DDC* 395 (etiquette (manners)), as *NDC* has no separate subclass for etiquette. In comparison with subordinate concepts for *DDC* 395 (etiquette (manners)), only a small amount of different numbering is observed, but the order of etiquette-related topics matches with *KDC*.

390 - 399 Military Science - *DDC* places military science under the division of public administration and military science (350-359), but *NDC* has a division of military science for 390-399. Although the detailed sections of *NDC*'s military science are not exactly matched with *KDC*, more influences from the *NDC* were observed on this subject.

### Technology

*KDC* has had three engineering-related divisions since the first edition, while *DDC* has had one division. Thus, the indifference category was mostly found in all engineering-related subclasses with the exception of chemical engineering. Interestingly, the listed sections in chemical engineering are close to *DDC*'s. Thus, most of the class numbers in chemical engineering were coded as absorption. As in the social sciences class, the first subclass for technology also follows many parts of the standard subdivisions rather than deploying related subjects hierarchically. Although the divisions of technology, such as mechanical engineering and electrical engineering, were influenced by *NDC*, they had some *KDC*-only concepts and structures contributing to the integration code. Other than engineering-related subclasses,

construction and architecture was the exemplary case for integration concurrently coded with absorption or nativization.

Compared to the social sciences, the technology main class presents more cases of indifference and absorption. While the social sciences have maintained almost the same divisions, different subordinate concepts are listed, including sections. The technology class has divisions structured differently, but it maintains similar subordinate concepts including sections. Medical science, however, exhibits the highest number of integration strategy examples due to fewer structural differences but more detailed subordinate concepts. In both cases, structures of divisions and subordinate concepts mainly displayed characteristics of integration.

500-509 Technology - The first division of the technology class mostly matches with *DDC* 600-609, because the first division covers subjects from standard subdivisions. *DDC* 23 adjusts the standard subdivisions to be more suitable with this technology division, while *KDC* 6 always follows almost the same standard subdivisions regardless of division topics. For example, the *KDC* 504 caption was 'Essays and lectures' while the *DDC* 604 caption was 'Technical drawing, hazardous materials technology'. And *KDC* 508 was simply 'Collection' from the standard subdivisions, but *DDC* 608 covers 'Patents'.

510-519 Medical Science - The division headings from *DDC* 23 and *KDC* 6 are different: *DDC* 610 (medicine & health) and *KDC* 510 (medical science). Sections such as surgery; gynecology, obstetrics, pediatrics; and pharmacy matched with *DDC* in topics, but not in order. Some of the *KDC* class numbers with auxiliary numbers cover details of the topics in medicine. For example, *KDC* 511 (basic medical science) listed 236 subordinate numbers, covering the concepts from two *DDC* section numbers, 611 (Human anatomy, cytology, histology) and 612

(Human physiology). In *KDC*, there is also oriental medicine, Korean medicine (519), which has no concept counterparts in *DDC*.

520-529 Agriculture - Division captions do not match with *DDC*'s division of agriculture; most of the listed concepts in this division only partially overlap with their *DDC* counterparts of *DDC*. In the case of *KDC* 522 (agricultural economics), the corresponding concept is placed in the economics division of *DDC*, 333.73-.78 (economics – natural resources).

530-539 Engineering, technology, civil and environmental engineering - This division consists mainly of civil and environmental engineering as subjects. The *DDC* division of engineering (620-629) covers civil and environmental engineering as well. But, *DDC* 621 (applied physics) includes electrical and mechanical engineering knowledge as well, while the *KDC* has mechanical engineering and electronic engineering as separate divisions. At the section level, *KDC* 530 (engineering, technology, civil and environmental engineering) is more likely to list components of engineering such as materials, measurements, etc., but *DDC* 620 (engineering) addresses operations allied with engineering such as nanotechnology, vibrations, and human factors and safety engineering. This division has influences of *NDC* in its listed concepts. For example, *KDC* 532 (civil engineering mechanics and materials), *KDC* 533 (surveying), *KDC* 534 (roads and highway engineering), and *KDC* 535 (railway engineering) are likely borrowed from *NDC*.

540-549 Construction and architecture – At the division level, the current edition of *KDC* changed the name of captions to locate all architecture-related subjects with construction. *NDC* also has both together in *NDC* 520 (architecture, building), but this is a recent change. Thus, it is not a direct influence of *NDC*. In addition, the order of sections is different from *NDC*.

Interestingly, the deployment of materials, practices-related, structures, and detailed jobs are quite similar to *DDC*'s counterparts. One of the noticeable cases for nativization is *KDC* 544 (green building and construction for specific purpose). *DDC* 693 (construction in specific types of materials and for specific purposes) covers both *KDC* 543 (structural mechanics and general building constructions) and 544 (green building and construction for specific purpose). But, it is interesting that *KDC* 6 has a separate section for green building while *DDC* has it combined with specific kinds of construction or materials.

550-559 Mechanical engineering – This division has no counterpart at the division level in the *DDC*, but conceptually overlaps with *DDC* 620.103-620.107 (engineering mechanics (applied mechanics)) and *DDC* 629 (other branches of engineering).

560-569 Electrical, communication and electronic engineering - Although the caption of this division seems influenced by *NDC* 540 (electrical engineering), concepts covered in *KDC* sections 560-569 are matched with the subordinate numbers for *DDC* 621.3 (electrical, magnetic, optical, communications, computer engineering; electronics, lighting).

570-579 Chemical engineering - This division is matched with the division of chemical engineering and related technologies (660-669). Captions of most section numbers are either exactly matched or partially matched for their specificities.

580-589 Manufactures – At the division level, subordinate concepts ordered by materials are very similar with their *DDC* counterparts (671-677). The last two section numbers of *KDC*, 588 (apparel manufacture(clothing)) and 589 (manufacture of small articles), however, are not adopted from *DDC*. Interestingly, although *KDC* 580-587 covers the same concepts as 670-677 of *DDC*, caption names are slightly different: e.g. *DDC* - Manufacturing/*KDC* – Manufactures.

590-599 Human ecology - The division name differs from both *DDC*'s human and family management and *NDC*'s domestic arts and sciences, although concepts in this division are similar compared with either *DDC* or *NDC* in part. One interesting section number is *KDC* 593 (grooming), which corresponds to *NDC* 595 (beauty culture). It may or may not indicate an *NDC* influence. There is no such section in the *DDC* division.

### 5.3. Cross analysis with the adaptive taxonomy and the observability of adaptation.

This subsection reports on the cross analysis with both the adaptive taxonomy and observability of adaptation. The listed classificatory variables in the observability of adaptation were analyzed to see patterns relating the observability of adaptation to the adaptation taxonomy. The social sciences and technology classes has shown few different patterns regarding which variables were more evident in which adaptive strategy. In general, the choices of adaptive strategies showed more variations in the social sciences and technology main classes.

#### 1) Semantic contents

In similarities and differences of corresponding concepts between *KDC* and *DDC*, three elements account for the semantic contents which draw boundaries for shared semantic contents – caption, rank, and quantity of subordinate numbers. Similarities of captions examined semantic contents of a certain concept by identifying boundaries of the concept. The types of similarities/differences are derived from the five degrees of interlanguage equivalence in ISO 5964 as discussed in Chapter 3. The quantity of subordinate numbers intuitively indicates how specifically the concept has been enumerated.

In the cross analysis, the observability of adaptation presents a certain pattern in relation to the adaptive taxonomy. The patterns of semantic contents and structural arrangements were analyzed for the social sciences and technology main classes respectively.

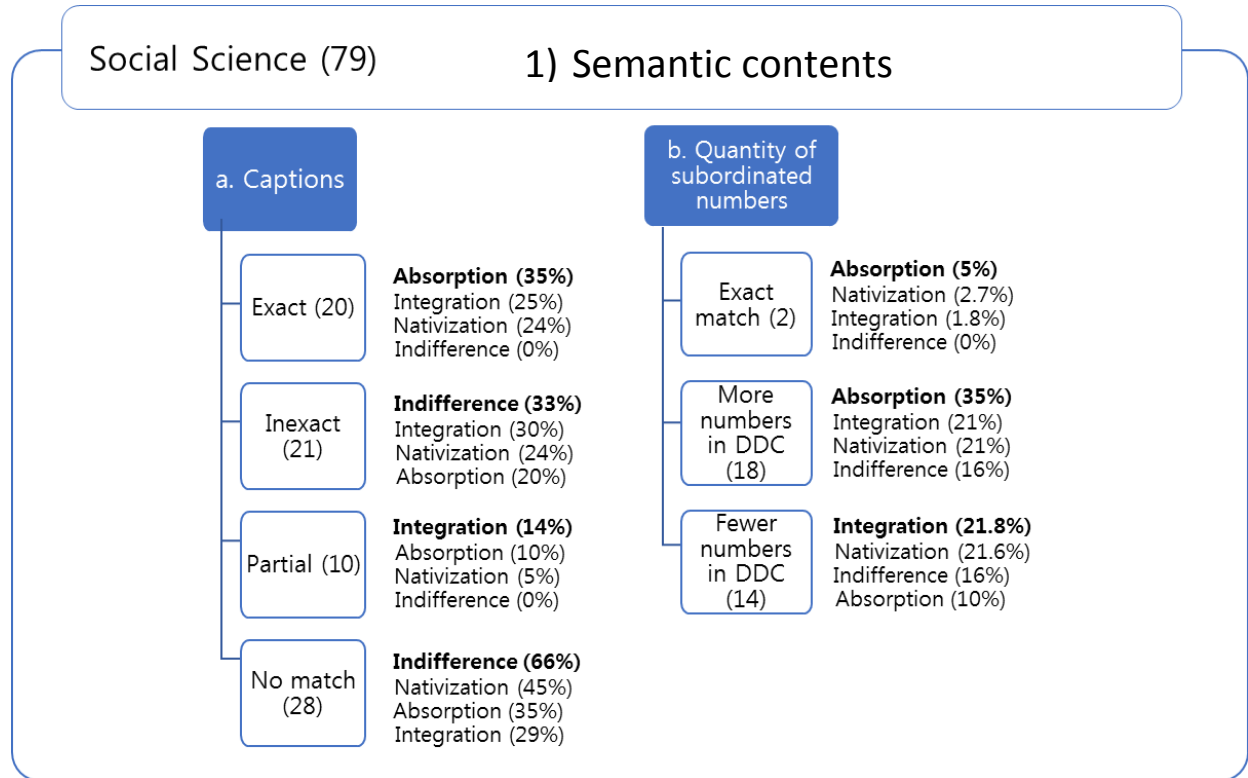


Figure 5-2 Cross analysis with the adaptation taxonomy and the observability of adaptation (the social sciences)

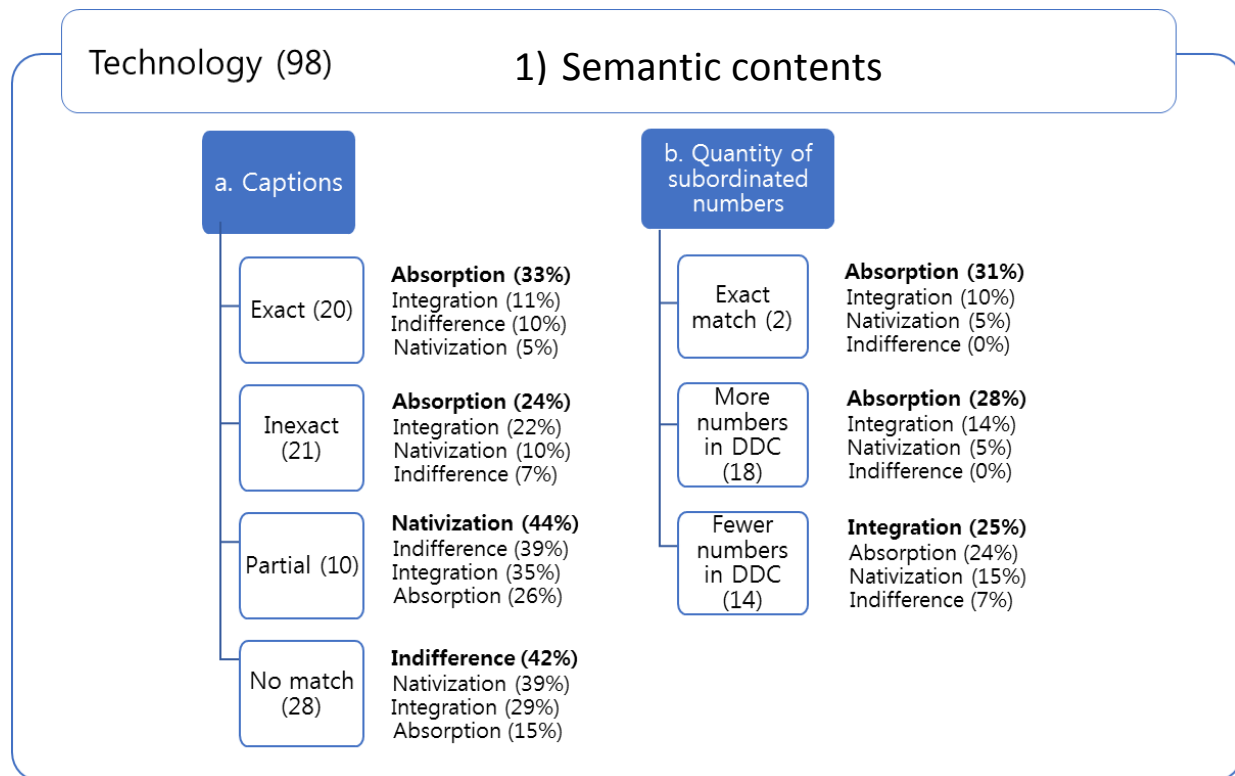


Figure 5-3 Cross analysis with the adaptation taxonomy and the observability of adaptation (technology)

Figures 4-10 and 4-11 show the coding results for the cross analysis of semantic contents. Percentages noted in the figures are based on the number of cases for each coding number of the classificatory variables/ total number of cases coded as each adaptive strategy. For the corresponding captions of *KDC* and *DDC* in the social sciences, cases coded as *No match* were the most common (28), followed by *Inexact (viewpoint)* (21), *Exact* (20), and *Partial* (10). *No match* cases commonly appear in indifference and nativization. *Exact* match captions were found mostly in absorption and integration. Interestingly, two in-between codes, *Inexact (viewpoint)* and *Partial* matches show slightly different patterns. *Inexact (viewpoint)* takes one third of indifference and integration, followed by nativization. *Partial (specificities)* were found mostly in integration and absorption. Patterns of different levels of specificity were more evident in *DDC*-like adopted concepts, while different viewpoints were identified/seen/noted (pick one) in

cases of adapting the adopted concepts to local needs. So, when the adaptation localizes concepts of *DDC*, *KDC* captions tend to reflect more different viewpoints than different levels of specificity. Interestingly, the corresponding captions in the main class of technology show different patterns in captions. The most commonly occurring code was *No match*, but the code of *Partial* matches came next, followed by *Inexact (viewpoint)* and *Exact*. As with the coding from the social sciences, *No match* cases were mostly found in indifference and nativization while *Exact* matches were seen in absorption and integration. However, in technology, *Partial* matched cases occurred more frequently in nativization and integration, whereas *Inexact (viewpoint)* matches were found in absorption and integration. This could mean the emergence of different viewpoints was more common in the adopted concepts from *DDC*, unlike the observations of the social sciences.

The quantity of subordinate numbers was also compared when corresponding concepts were in one to one relationship. The code more subordinate numbers are listed under *DDC* number was the most common in the social sciences, followed by the code that less subordinate numbers are listed under the *DDC* number than the corresponding *KDC* number. Exactly matched subordinate numbers was a rare occurrence – only two were found. When more subordinate numbers were listed under the *DDC* number, the adaptive strategy of absorption, was the most common. When more subordinate numbers were listed under the *KDC* number, the adaptive strategies of nativization and integration were more commonly found. In the case of technology, there were no noticeable differences among three types of coding for the second variable of semantic contents—quantity of subordinate class numbers—for quantity of subordinate numbers. All three have absorption and integration as the most common cases. It is worth noting that both the social sciences and technology classes have shown more absorption

and less nativization for the third code, that fewer numbers of the *DDC*'s subordinate numbers are listed.

## 2) Structural arrangement

Classificatory differences identified from the comparison inevitably involved structural arrangement of the shared concepts. Four main categories accounting for similarities and differences of structural arrangement are *rank*, *the broader category*, *subordinate concepts*, and *order of subordinate concepts*. Determining rank for a concept presents the contexts of the concept within the classification's structure. Some adopted concepts are placed at different ranks in that one classification's treatment of the concept is broader than the other. The broader category is to indicate the upper part of the hierarchy of the concept. The subordinate concepts and order of the subordinate concepts are to indicate the lower part of the hierarchy of the concept.

Social Science (79)

## 2) Structural arrangement

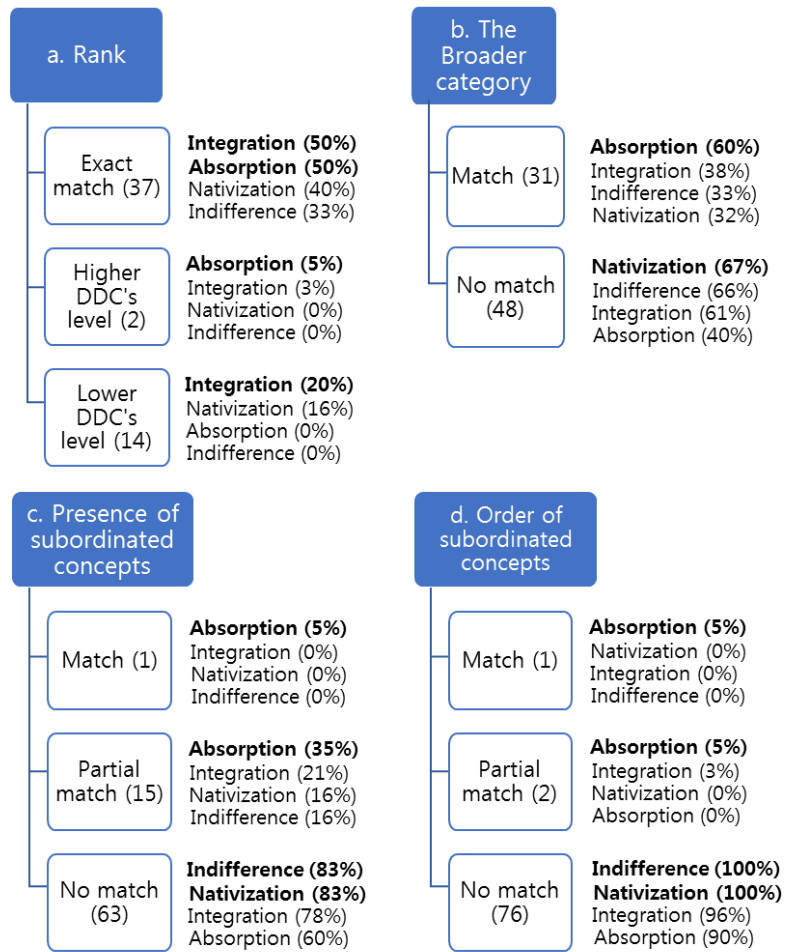


Figure 5-4 Structural arrangement analyzed with the adaptation taxonomy (the social sciences)

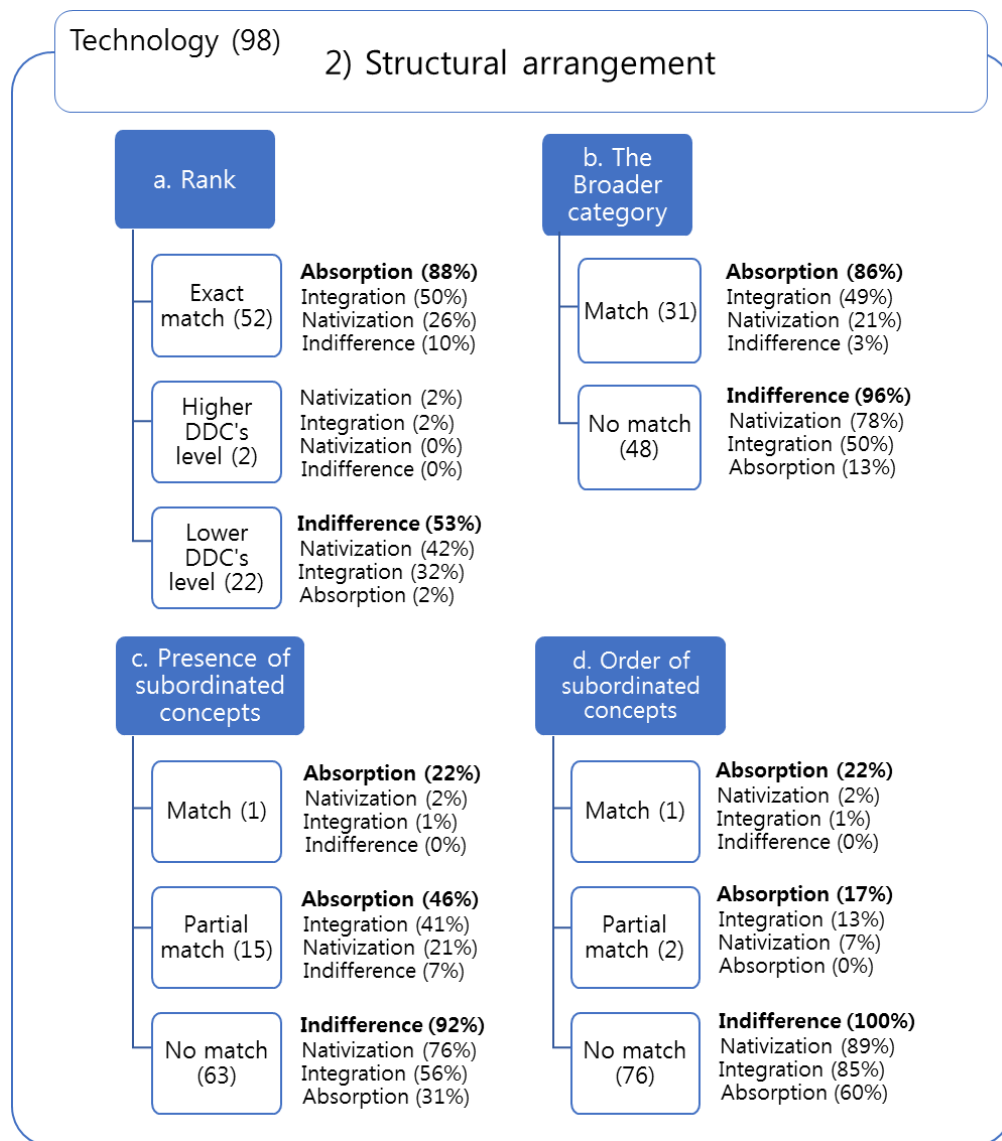


Figure 5-5 Structural arrangement analyzed with the adaptation taxonomy (technology)

Figures 4-12 and 4-13 show coding results for the cross analysis of structural arrangements. The percentages noted in the figures are based on the number of cases for each coding number of the classificatory variables/the total number of cases coded as each adaptive strategy. Rank for a concept was only judged when both *KDC* and *DDC* share one concept represented by a single class number. In the case of a corresponding concept not in one-to-one relationship (e.g., *KDC* 334 – Social Problems matches *DDC* 361, 362, and 363), the comparison cannot be made. Among the three matching codes for rank, *Exact match* was most commonly

assigned in the social sciences, followed by *lower rank in DDC*. The same pattern was evident in the technology class as well.

Only a couple of cases belong to *higher rank in DDC*. Half of cases coded as integration and absorption are also coded for *Exact match*. In a case that the *DDC* number is at the lower level than the corresponding *KDC* number, integration and nativization are commonly coded simultaneously in the social sciences and indifference and nativization are coded more in technology. When *KDC* and *DDC* share similar concepts, 68% of the cases are at the same level, and 25-28% of the cases (25% for the social sciences and 28% for technology) have *DDC* numbers at a higher level than *KDC*. However, there are no noticeable relations found between rank and the adaptive taxonomy.

The matching of the broader category exhibits relatively simple patterns of the adaptive taxonomy. When the broader categories match, absorption and integration strategies claim most cases. Indifference and nativization occurred for most cases coded as *Not match* for broader categories. Both the social sciences and technology show the same patterns in terms of matching broader concepts.

The third and the fourth categories of structural arrangement (i.e., subordinate concepts and order of subordinate concepts) display a similar pattern across the two classes. There are three codes of matching – *match*, *partial match*, and *not match* for both presence and order of subordinate concepts. When subordinate concepts of a corresponding concept match for either presence or order, absorption is the only major strategy. In case of partial matches, absorption occurs the most often, followed by integration. When the subordinate numbers do not match, there are strong tendencies of indifference and nativization. These results are observed both in the social sciences and technology classes.

## 5.4. Conclusion

The comparison of two bibliographic classifications yields noticeable results. Phase 1 quantitative comparison of class numbers in the two systems led to the selection of two main classes exhibiting the most differences for Phase 2 analysis. In Phase 2 of the study, two coding schemes were employed to examine differences in the two chosen classes between the most recent edition of *KDC* and that of *DDC*. On one hand, the taxonomy of adaptation, originating from Berry's acculturation model for examining immigrants' adoption of a new culture, provided four strategies applied in cross-cultural adaptation of classification. It facilitated the examination of *KDC*'s strategies in adaptation of *DDC* to meet the sociocultural needs of South Korea. On the other hand, a cross analysis was conducted by adding the observability of adaptation as a second coding scheme to the results of the initial qualitative analysis. The cross analysis helped form a better understanding of the differences between the two classifications as manifested in the semantic contents and structural arrangements of individual concepts. In the next chapter, a more in-depth discussion of the findings will provide further interpretation of *KDC*'s strategies in adapting *DDC*.

## Chapter 6 Discussions

In Chapter 4 and 5, based on the major results from the quantitative comparison of *DDC* and *KDC*, patterns of sociocultural influences in classificatory variables including semantics and structures were analyzed. This chapter provides further interpretation of the major results and patterns from the comparison in answering the research question. Furthermore, the newly developed notion of intercultural warrant as a ramification of the study of cross-cultural classification is addressed.

### 6.1. Answering the research question

The sole research question of the present study is “How does the *KDC* adapt the *DDC* in terms of the underlying sociocultural perspectives in a classificatory form?”

#### 6.1.1. Phase 1.

Phase 1 was designed to compare the enumerated concepts and knowledge structures of two classification schemes. The interpretation of the differences in quantities of class numbers for the chosen *DDC* and *KDC* editions illustrate two aspects of the comparison: structure and size.

##### **Interpretation 1. Structure**

The introduction to *DDC* implies that a bibliographical classification is meant to be practical rather than philosophical. *KDC*, as a national library classification, also aims to be practical. Originally, *DDC*, aiming to cover all kinds of knowledge from a body of literature, followed the reverse order of Bacon’s basic forms of human intellectual production: reason, imagination, and memory. This explains the current structure of the order of *DDC*’s ten main classes. The introduction of *DDC 23* claimed literary warrant as the basis for the development of

a class or the explicit inclusion of a topic in the schedules, tables, or relative index. *KDC*'s adoption of *DDC* replicated these characteristics, but the comparative analysis of the main class structures of the two systems demonstrates ways in which *KDC* developed as a result of localizing *DDC*.

Because it is not a straightforward Korean translation of *DDC*, *KDC* does not share the identical set of class numbers and captions. *KDC* was built and modified extensively in view of Korean needs derived from cultural warrant. During the Korean National Library Association's early development of *KDC* in the 1960s (Cho 1995), relocations affected many fields (e.g., the relocation of the language class to support the convenience of users looking for language-related materials in closer proximity to literature-related materials). Relocating architecture *KDC* into the division of engineering and construction in the most recent edition of *KDC* also supports user convenience; rather than locating architecture-related materials in two separate locations—engineering and arts—it enables users to find all such materials in one place.

### **Interpretation 2. Size**

Level of specificity is a significant factor affecting the size of main class. This, in general, may account for differences in academic discipline development between South Korea and the United States. In many cases, *KDC*'s class numbers represent almost the same coverage of concepts as the *DDC*'s. However, *KDC* has far more class numbers in technology. *DDC* has more class numbers in the social sciences, especially the divisions of social problems, education, law, and political science, whereas *KDC* exhibits a high density of class numbers in engineering-related divisions in technology. This is mainly because *KDC* has three divisions for engineering, compared with *DDC*'s single engineering division. Tables 5-1 and 5-2 are the exemplary cases showing the difference in specificity and size for corresponding divisions of *KDC* and *DDC*. As

Table 5-1 shows, *DDC*'s political science division includes more specific concepts than *KDC*'s, which partially accounts for the differences in the total size of class numbers for the political science divisions.

<i>DDC</i> 23 class number and caption	size	<i>KDC</i> 6 class number and caption	size
320 Political science (Politics and government)	60	340 Political sciences	26
321 Systems of governments and states	26	341 Form of state and government	19
322 Relation of the state to organized groups and their members	10	342 Relation of the state to their members and groups	20
323 Civil and political rights	44	[343] [Unassigned]	
324 The political process	186	344 Elections and suffrage	10
325 International migration and colonization	15	345 Legislation	15
326 Slavery and emancipation	2	346 Political parties	7
327 International relations	33	[347] [Unassigned]	
328 The legislative process	56	[348] [Unassigned]	
[329] [Unassigned]		349 International relation	15
Total	432	Total	112

Table 6-1 Divisions of Political science from *DDC* 23 and *KDC* 6

However, the divisions of engineering, mechanical engineering, and electrical engineering in *KDC* include more specific concepts (Table 5-2). Although *DDC*'s division of engineering covers all three engineering divisions (engineering, mechanical engineering, and electrical engineering), the number of sections for the division is a lot smaller than that of *KDC*. For example, while *KDC* has two sections related to the subject of civil engineering—531 (civil engineering) and 532 (civil engineering mechanics and materials), *DDC* has one—624 (civil engineering). Moreover, *KDC* has sections addressing roads and railways respectively in the division of engineering—534 (roads and highway engineering) and 535 (railway engineering)—but *DDC* has one section covering both railroads and roads—625 (engineering of railroads and roads).

<i>DDC</i> 23 class number and caption	size	<i>KDC</i> 6 class number and caption	Size
620 Engineering/ Engineering and allied operations	78	530 Engineering, technology, civil and environmental engineering	154
621 Applied physics	258	531 Civil engineering	19
622 Mining and related operations	34	532 Civil engineering mechanics and materials	36
623 Military and nautical engineering	113	533 Surveying	13
624 Civil engineering	38	534 Roads and highway engineering	37
625 Engineering of railroads and roads	35	535 Railway engineering	47
[626] [Unassigned]	1	536 Bridge engineering	29
627 Hydraulic engineering	19	537 Hydraulic engineering	33
628 Sanitary engineering	64	538 Harbor engineering	27
629 Other branches of engineering	160	539 Sanitary, municipal and environmental engineering	104
		550 Mechanical engineering	4
		551 Mechanics, parts and design machine	25
		552 Tools and fabrication equipment	52
		553 Heat engineering and prime movers	36
		554 Fluid mechanics, pneumatic and vacuum technologies	29
		555 Precision instruments and other devices	36
		556 Motor vehicle engineering	94
		557 Railroads rolling stock and locomotives	26
		558 Aerospace engineering, astronautics	190
		559 Other engineering	472
		560 Electrical, communication and electronic engineering	1
		561 Circuits, measurement, materials	35
		562 Electric machinery and apparatus	28
		563 Generation of electric power	28
		564 Electric transmission and distribution	30
		565 Electric lighting, illumination engineering	29
		567 Communication engineering	92
		568 Radio communication(wireless)	45
		569 Electronic engineering	67
Total	765	Total	1818

Table 6-2 Divisions of Engineering from *DDC* 23 and *KDC* 6

As discussed, main classes with differences in size from the comparison of *DDC* and *KDC* are expected to differ in specificity and topical coverage. For further examination of those differences, the two main classes showing the most differences in quantities were selected for Phase 2: the social science main class displays a high number of class numbers in *DDC*, whereas the technology main class exhibits a high number of class numbers in *KDC*.

### 6.1.2. Phase 2.

Phase 2 was designed to compare the concepts and their relationships of the social sciences and technology in examining the changes made in *KDC*'s adaptation of *DDC*. Interpretations of patterns revealed in the qualitative coding address three discussion points: application of standard subdivisions, adaptation taxonomy, and adaptation observability.

#### **Interpretation 1. Application of standard subdivisions**

As we have seen, *KDC* has applied captions and concepts from standard subdivisions to section numbers in the first division of each main class, whereas *DDC* has included more subject specific concepts in the first division of main classes. In Table 5-3, *KDC*'s captions in the first division of the social sciences main class are almost identical to those in the first division of *KDC*'s technology main class, while *DDC*'s captions are most subject-specific to social sciences and technology. This tendency of *KDC* to list almost identical sections for the first divisions prevails across main classes, whereas *DDC*'s listing of various subject-related sections for the first divisions is more common. This application of the standard subdivisions as they are for the first division of each main class is a part of *KDC*'s adoption of the standard subdivisions inherited from *DDC*. On the other hand, it could be considered *KDC*'s *adaptation* of standard subdivisions, unified across all the main classes, unlike *DDC*, whose first division is more specific to subject areas. Section 5.1.3, which discusses sociocultural influences, will discuss cases of *KDC*'s adaptation of *DDC*'s divisions and sections other than adoption and adaptation of standard subdivisions.

<i>DDC</i> 23	<i>KDC</i> 6
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300 Social sciences, sociology & anthropology 300 Social sciences 301 Sociology and anthropology 302 Social interaction 303 Social processes 304 Factors affecting social behavior 305 Groups of people 306 Culture and institutions 307 Communities	300 Social sciences 301 Social thoughts 302 Miscellany 303 Dictionaries, encyclopedias 304 Essays and lectures 305 Serial publications 306 Organizations and societies 307 Study and teaching 308 Collections 309 Social and cultural situations
600 Technology (Applied sciences) 601 Philosophy and theory 602 Miscellany 603 Dictionaries, encyclopedias, concordances 604 Technical drawing, hazardous materials technology; groups of people 605 Serial publications 606 Organizations 607 Education, research, related topics 608 Patents 609 History, geographic treatment, biography	500 Technology 501 Technical theory 502 Miscellany 503 Dictionaries and encyclopedias 504 Essays and lectures 505 Serial publications 506 Organizations and societies 507 Study and teaching 508 Collections 509 History of technology

Table 6-3 The first divisions of the social sciences and technology main classes for *DDC 23* and *KDC6*

### **Interpretation 2. The taxonomy of adaptation**

The application of the fourfold taxonomy of adaptation in the analysis led to a discovery of complexity in strategic choices for cross-cultural adaptation of the bibliographic classification. One strategy alone cannot explain all cases. Rather, most cases of comparisons fall between two strategies because of the granularity in the interplay between Korean-specific concepts and those from *DDC*. For example, absorption strategy matches both semantic contents and structural arrangement. However, the in-between category of absorption and integration matches only either semantic contents or structural arrangement (e.g., commerce, communications, and transportation). Both *KDC* and *DDC* have the same captions and almost identical narrower categories to cover the subject, but *KDC* has covered it as one of the section numbers for the Economics division, whereas *DDC* has a whole division for it. Thus, despite the same topical coverages for commerce, communications, and transportation, the ranks of the two classification systems, one of elements for structural arrangement, are not matched. At the other end of

granularity for matchiness, integration strategy has unmatched parts for both semantic contents and structural arrangement. Table 5-4 describes the four adaptive strategies from the preliminary framework and three in-between strategies identified as a result of the preliminary coding. As in the adaptation taxonomy discussed, indifference, absorption, nativization, and integration are positioned by the two forces that are more standardized and indigenized. The three added strategies are located between indifference and nativization, nativization and integration, and absorption and integration. No strategy exists between indifference and absorption that includes characteristics of both indifference and absorption.

<b>Nativization</b>	Nativization & Integration	<b>Integration</b>
<p>This strategy is used to insert native Korean specific systems or concepts. But this strategy also often occurs with integration or indifference simultaneously for cases displaying Korean specificity in the adaptation. The examples below are culturally specific subjects.</p>	<p>The approaches to or understanding of the similar concepts are the result of Korean local needs. The topical concept in <i>KDC</i> does not match any concept in <i>DDC</i> but subordinate or adjacent subjects found like the counterparts of <i>DDC</i>. This strategy usually has different captions and unique (or Korean specific) interpretations of the concepts in <i>KDC</i>.</p>	<p>The strategy reflects both Korean culturally specific and <i>DDC</i>-like concepts together in harmony. The integration appeared as the cases for which there are no perfectly identical counterparts of <i>DDC</i> in <i>KDC</i> in term and structure or vice versa. Unlike absorption, which shared the concepts in terms of semantic contents and structures, integration only shared either one or parts of each. Different captions and level of class ranks, different broader categories or unmatched subordinate concepts are common patterns of integration.</p>
Indifference & Nativization		Absorption & Integration
<p>In this strategy, the influences of <i>NDC</i> seem evident. But, those numbers and captions influenced by <i>NDC</i> are somewhat modified for localization. Even with the influence of <i>NDC</i>, these are likely Korean specific in comparison with both <i>DDC</i> and <i>NDC</i>.</p>		<p>This strategy adopts <i>DDC</i>-like concepts but with partial differences included. Partial differences are inclusion of adjacent subjects or more subordinate numbers rather than the topic itself. This Absorption &amp; Integration strategy mostly has similar or identical captions at the different level of class unit (division/section/subordinate (auxiliary) number) or at the same level with no overlapped subordinate topics.</p>
<b>Indifference</b>		<b>Absorption</b>
<p>The cases neither show noticeable influence from <i>DDC</i> nor satisfy Korean local cultural needs. It seems that there was some influence from <i>NDC</i> but no noticeable influence from <i>LCC</i>. Those of <i>NDC</i>-influenced class numbers have captions almost identical to their counterparts of <i>NDC</i> 10 (the most recent edition).</p>		<p>Concepts in this strategy originate from <i>DDC</i>, preserving both the conceptual scope and structural fidelity of their counterparts in <i>DDC</i>. This absorption strategy mostly has an identical caption at the same rank (division/section/subordinate (auxiliary) number) with overlapped subordinate topics. (The components of semantic contents will be discussed later)</p>

Table 6-4 The four adaptive strategies of the preliminary framework and three in-between strategies

### **Interpretation 3. Observability of adaptation**

Two classificatory features—semantic contents and structure— also matched with the categories discovered by the comparison of classification systems in the bottom-up approach. Moreover, the variables for semantic contents and structural arrangement in the observability of adaptation support the validity of the comparative criteria from Kwasnik and Chun’s (2004) study of *KDC* and *DDC* and ISO 5964 (ISO 1985)’s degrees of interlanguage equivalence. Table 5-5 compares the observability of adaptation and the matched comparative criteria from Kwasnik and Chun or ISO 5664. Captions, the first element of semantic contents, consider the matchiness of semantic contents, and the two codes of matchiness for the element—inexact and partial matches—originate in the differences in viewpoint and scope respectively. I have borrowed the labels “inexact” and “partial” from ISO 5964’s degrees of interlanguage equivalence. In Kwasnik and Chun’s study, the difference in scope of a concept was used as a criterion, labeled “differences in specificities”; they also determined the scopes’ differences through the comparison of the narrower categories. I also examined the quantity of subordinate numbers (narrower categories) as well as the subjects’ specificities in this study. Two elements from structural arrangement—rank and broader category—correspond to “differences in class placement” . “Empty lexical or conceptual categories” from Kwasnik and Chun’s study exhibited the cases in which a certain concept existed in one system but not the other. This category is partially matched with the last category, nationality, which, in the scheme of observability of adaptation, includes only prominent cultural differences, such as Korean-only concepts, and excludes subtle national or sociocultural influences emerging through different class numbers or structures. The observability of adaptation uncovers the classificatory features representing different types of differences induced by sociocultural influences and responds to previous studies grounding the comparison of cross-cultural classifications. Because it contains more

categories of classificatory features that can bear sociocultural influences, the scheme presented in this study is applied to make a systematic comparison of classifications across cultures. The scheme also could be useful in comparing classification systems of a certain field across distinct cultures.

Semantic contents a) Captions – 1. Exact match/ 2. Inexact/ 3. Partial/ 4. No match	ISO 5964 (ISO 1985)’s degrees of interlanguage equivalence & Kwasnik & Chun (2004): 2. differences in term specificity
Semantic contents c) quantity of subordinate numbers	Kwasnik & Chun (2004): 2. differences in term specificity
Structural arrangement a) rank (division/section/+auxiliary number)	Kwasnik & Chun (2004): 3. Differences in class placement
Structural arrangement b) Broader category	Kwasnik & Chun (2004): 3. Differences in class placement
Nationality	Kwasnik & Chun (2004): 1. Empty lexical or conceptual categories.

Table 6-5 Comparative classificatory features matched with previous studies.

Comparison of *KDC* and *DDC* reveal ways in which structures of the classification systems address conceptual categories in terms of various devices of classification. Olson (2009), Tennis (2011), and Kwasnik & Chun (2004) discussed classificatory structures in addressing different viewpoints. Both *DDC* and *KDC* are structured by discipline, or field of study, and most concepts are common to both. But there are apparently different approaches in representation of concepts. These appeared in semantic contents and structural arrangement. The second coding scheme with two categories of semantic contents and structural arrangement is an exemplary case that describes diverse viewpoints in classificatory structures. The scheme could be identified because *KDC* shared the same classificatory principles and main classes but has been developed to be a national library classification reflecting the development of Korean academic disciplines.

### 6.1.3 Sociocultural influences in adaptation

Adaptation of bibliographic classification across cultures reveals sociocultural influences on knowledge representations through semantics and structures. In this study, two main classes of *KDC* and *DDC*, the social sciences and technology, were compared by applying the taxonomy of adaptation to reveal sociocultural influences. Interestingly, adaptation strategies varied depending on the discipline. In other words, the examination of the two selected main classes revealed differences in sociocultural influences by discipline. The social sciences class had more numbers coded for nativization than for absorption, while technology had more numbers coded for absorption than for nativization. Also, co-occurrence of nativization and integration was found frequently in both classes, but the gap between nativization and integration and absorption and integration was larger in the social sciences than in technology.

In terms of sociocultural influences, comparing *KDC* and *DDC*, shows no big differences in the social sciences at division level, not the case at the section level. On the other hand, differences in the technology classes of *KDC* and *DDC* are more evident at division level but less so at section level. Although the technology classes of *DDC* and *KDC* comprise different divisional structures, at the section levels, the social sciences main class reflects sociocultural differences. The social sciences' divisions in *KDC* correspond to all the divisions of the social sciences in *DDC*, except for *DDC* 350 (Public administration and military science) and 380 (Commerce, communications and transportation). *KDC* has two separate divisions for public administration and military science corresponding to *DDC* 350, and *KDC*'s section number 326 under the division for Economics (320–329) covers commerce, communication and transportation, corresponding to *DDC* division 380. Although those subjects—public administration military and commerce, communications and transportations—are located at

different levels, their semantic contents were mainly matched. On the other hand, *DDC* and *KDC* technology divisions exhibit different compositions. In *KDC*, three divisions correspond to *DDC* division 620 (engineering): *KDC* 530–539 (engineering, technology, civil and environmental engineering), 550–559 (mechanical engineering), and 560–569 (electrical, communication and electronic engineering). Where *KDC* has a single division (580–589) addressing manufacture, two divisions of *DDC* (670–679 and 680–689) cover the same topic. Additionally, *DDC*'s division of 650-659 covers the topic of management and public relations, which *KDC*'s technology class does not cover. *KDC* adapted *DDC* by changing the constitution of divisions in the technology class. However, at the section level, technology has many matched narrower categories (subordinate numbers) and their matched order. By contrast, the social sciences class displays more variations in both the presence and order of sections/narrower categories. For example, the technology class has almost identical sections for the division of chemical engineering, as Table 5-6 shows.

<i>DDC</i> 23	<i>KDC</i> 6
660 Chemical engineering and related technologies	570 Chemical engineering
661 Technology of industrial chemicals	571 Industrial chemicals
662 Technology of explosives, fuels, related products	572 Explosion and fuels engineering
663 Beverage technology	573 Beverages technology
664 Food technology	574 Food technology
665 Technology of industrial oils, fats, waxes, gases	575 Technology of industrial oils, fats, waxes, gases
666 Ceramic and allied technologies	576 Ceramic and allied industries
667 Cleaning, color, coating, related technologies	577 Cleaning, dyeing and related industries
668 Technology of other organic products	578 High polymer chemical industries
669 Metallurgy	579 Other organic chemical products

Table 6-6 Divisions for chemical engineering in *DDC*23 and *KDC*6

On the other hand, in the social sciences, the division of education displays different deployments of sections, implying a partially different understanding of education systems.

Table 5-7 shows ten sections of the education division from *DDC* and *KDC*.

<i>DDC 23</i>	<i>KDC 6</i>
370 Education	370 Education
371 Schools and their activities; special education (372-374 Specific levels of education)	371 Policy and administration of education
372 Primary education (Elementary education)	372 School administration and management
373 Secondary education	373 Methods of teaching
374 Adult education	374 Curriculum
375 Curricula	375 Elementary education
[376-377] [Unassigned]	376 Secondary education
378 Higher education (Tertiary education)	377 Higher education
379 Public policy issues in education	378 Life-long education
	379 Special education

Table 6-7 Divisions for education in *DDC23* and *KDC6*

From the differences in deployment of sections in the education division in *DDC* and *KDC*, we may infer that the two cultures have a different understanding of higher education. *DDC* lists specific levels of education: 372 (primary education), 373 (secondary education), and 374 (adult education). Higher education is not considered a continuous level after those three levels of education in the life cycle. However, *KDC* lists the levels of education: 375 (elementary education), 376 (secondary education), 377 (higher education), and 378 (lifelong education). Higher education immediately follows secondary education. The listed levels of education based on the life cycle from elementary to lifelong education imply that higher education is continued, rather than voluntarily pursued.

These examples suggest that the social sciences, as a discipline, contains more sociocultural influences. Interestingly, the quantitative analysis in Phase 1 has shown more quantitative differences in the technology class between *KDC* and *DDC*. As the second analysis reveals, the quantitative description of class numbers is limited for reading sociocultural differences. Thus, such a study needs multidimensional observations on captions, broader and narrower concepts, and hierarchical locations in classification along with comparison of the quantities of class numbers. Therefore, the frameworks applied in this study—the taxonomy of

adaptation and the observability of adaptation—would provide methodological ground for future studies of sociocultural influences in adaptation of classification.

#### **6.1.4. Sociocultural influences and adaptation of classification**

By examining a case of adaptation, I identified three added strategies (i.e., indifference & nativization, nativization & integration, and integration & absorption) for modifications to accommodate South Korea's sociocultural needs in *KDC*'s adaptation of *DDC*. Generally, I could observe two types of sociocultural influences in adaptation: prominent influences and subtle influences.

Concepts or social systems only used in one culture indicate prominent sociocultural influences. Prominent influences are represented by establishing new concepts for existing class numbers or classification system features, such as hierarchical locations or captions that manipulate the representation of the concept that *DDC* and *KDC* share. For example, sections for Korean medicine are represented in *KDC*'s adaptation of *DDC* through the addition of a newly added concept. Technically, the *DDC* may represent Korean medicine using tables for geography. *KDC*, however, has a separate section for Korean medicine in the medical science division. This case shows the differences in concepts represented by class numbers that result from sociocultural influences.

Although the law division in both systems seems to be classified similarly as one of the divisions for the social sciences, patterns of sections and narrower categories appear differently in order to organize the different legal systems of South Korea and United States. Basically, concepts addressed in the law divisions from the two systems overlap in scope, but in most cases the shared concepts are located differently, implying distinctive sociocultural influences within

each classification system. As examples, commercial law is represented as section 366 in *KDC*, while in *DDC* commercial law is a narrower category of a section of private law (346). Moreover, concepts covered in a section for foreign law (369) in *KDC* are in section 341, the narrower category of laws of nations, in *DDC*. Likewise, administrative law, a section of *KDC* 363, is represented in *DDC* as part of section 342, constitutional and administrative law. Those subjects—Korean medicine, and law—demonstrate how the degree to which sociocultural influences affect classification. They mostly appear in the nativization strategy in the taxonomy of adaptation.

Other cases generally exhibit subtle sociocultural influences in two ways, either in viewpoint or in scope of the concept shared or used commonly in both cultures. In the case of concepts that demonstrate different viewpoints—broader categories, such as general management, insurance, agricultural economics, and construction and architecture—are not matched even though most of their narrower categories are matched.

*DDC* represents general management as a division in the class of technology, while *KDC* includes it as a section under the division of economics. Although in both *KDC* and *DDC* general management concepts share many similarities, *DDC* emphasizes the technological dimension of general management, whereas *KDC* categorizes it as a narrower category of economics, demonstrating two different perspectives on the subject. The concept of management in terms of managing resources appears across disciplines in *DDC*, but general management as a field of study is classified under technology rather than economics. In the case of insurance, *KDC* includes the concept in financial assets, making it one of *KDC*'s narrower economics categories. However, *DDC* includes insurance partly in the law division and partly under social welfare systems in the division of social problems and social services, whereas *KDC* has no class

numbers representing insurance in the division of social problems and social services. Although Korean medical insurance is included in social services, insurance is classified under financial assets in the classification. The representations of agricultural economics in *KDC* and *DDC* also demonstrate locational and hierarchical differences. *DDC* locates agricultural economics under natural resources in the division of economics, while *KDC* locates it in the division of agriculture under the technology class. This may be because agricultural economics is interdisciplinary and the two systems classify the concept using different approaches. Because *KDC* prioritizes user convenience, the concept of agricultural economics is in the division of agriculture, making it easier for users to browse, just as in construction and architecture.

Along with locational differences resulting from different viewpoints, the scopes of the two systems differ particularly regarding the narrower categories for the matched concepts in both systems. Consider education policy and administration and a section on child rearing. The educational policy addressed by *KDC* 371 (policy and administration of education) shares some narrower categories with *DDC* 379 (public policy issues in education), but the specific subjects classified under the two concepts are different. *DDC*, as the caption indicates, addresses more controversial policy issues such as “specific elements of support and control of public education,” “specific policy issues in public education,” and “public policy issues in private education” in comparison with *KDC*, which lists subjects of policy according to the education system such as “permit to establish education institutions, scholarship, voucher, and budget.” Moreover, some concepts in *KDC* sections 371 (policy and administration of education), 372 (school administration and management), and 373 (methods of teaching) are covered in *DDC* 371 (school and their activities; special education). Thus, although the education divisions of *KDC* and *DDC* share similar concepts, the scopes of the sections for those concepts differ.

Technology divisions *DDC* 640 (home and family management) and *KDC* 590 (human ecology) share concepts relating to technology for daily life. Both divisions have a section for child rearing; however, the former, but not the latter, includes home care of people with disabilities and illness in section 649, the caption of which indicates that the section addresses those two subjects equally: child rearing, and home care of people with disabilities and illnesses. Such differences in the scopes of *DDC* and *KDC* sections do not mean that the concept appearing in a section in the *DDC* but missing in a corresponding section in the *KDC* cannot be represented at all in the *KDC*. Both the *DDC* and the *KDC* allow for expansion of class numbers thanks to decimal classifications features such as tables and auxiliary numbers. However, I only address differences in scope regarding classification units (class, division, and section) based on the class numbers already enumerated in the schedules of both systems. In general, the class numbers listed in the schedules are maintained because of the needs and demands of literary warrant, despite regular modifications such as removal or addition of or changes to class numbers. The differences in location or scope carry indirect sociocultural influences, and those cases mainly are coded as nativization and integration according to the taxonomy of adaptation.

## 6.2. Development of intercultural warrant

This study is an exemplary case, focusing on the *KDC*, for examining sociocultural influences in a cross-cultural environment where plural cultures or perspectives interact within the KOS. For such a KOS to be ethical, proper treatments of multiple cultures require an understanding of the interplay of those sociocultural influences within the KOS. Thus, developing the notion of intercultural warrant would contribute to an operationalization of cultural warrant for more effective system design.

### **6.2.1. Cultures and ethics for KOS**

Star et al. (1998) suggested ethical concerns as consequences of sorting that are more likely to be fundamental challenges for KOS. In practice, those ethical concerns can result from any exercises of classificatory activities using symbols and systems, according to Adler and Tennis (2013). With respect to cultures, ethical concerns are significant.

Beghtol (2002) was the first to propose ethical treatments of KOSs in consideration of cultural warrant, the recognition of which within the KOS leads to realization and acknowledgement of multiple cultural views. Beyond recognizing pluralistic perspectives in organizing knowledge, an ethically-minded approach emerges for taking actions to prevent one view from suppressing another. A KOS usually comes from one cultural perspective. However, in an environment involving multiple cultural perspectives, focusing on the dominant culture and disregarding the others in representing knowledge will lead to a harmful KOS, which raises ethical concerns.

### **6.2.2. Practical approaches to culture and ethics of KOS**

Beghtol's cultural hospitality is a useful concept in the design of KOSs that recommends appropriate treatment of multiple cultures. Although her presumption that an ideal KOS could be constructed that is suitable for all users is more likely to exist in theory than in practice, her suggestion for sharing universal concepts and making space for cultural variety/diversity is meaningful for practical construction of KOSs.

Likewise, in discussing information ethics across cultures, Hongladarom (2016) mentioned universalism and relativism, an old framework that is still useful for looking at cultural differences. He takes a rather pragmatic approach in defining information ethics (i.e.,

value systems). Although he does not aim for an ideal system for all users, his practical guidance aligns with Beghtol's cultural hospitality in that it is universal for commonalities and relativistic for differences.

### **6.2.3. Cross-cultural classifications: translation and adaptation**

Based on this understanding of KO ethics and its relationship with multiple cultures, I will discuss two approaches to ensuring that a KOS is ethical and accommodates diverse cultures: translation of the *DDC* and adaptation of the *DDC*.

How does the system incorporate multiple cultures in the cross-cultural uses of KOS? What are the requirements for each case? Cultures, especially those recognized within one unit such as a nation, can be incorporated for cross-cultural use of KOS. The first approach is to have a globally useful predominant system that accommodates multiple cultures, and the second is a system (within the influences of Western scientific disciplines) that has adapted the dominant system to become locally useful. Both call for intercultural survey of national cultures and the classification systems that embed them.

In the case of the translated *DDC*, the new scheme includes identical *DDC* class numbers with identical scopes and structures so that the numbers can communicate across linguistic boundaries. The *DDC* and the translated *DDC* are expandable to accommodate diverse social and cultural characteristics by respecting vernacular contents based on literary warrant (Beall 2003). Translation enables supplementation of the *DDC* for the need of diverse cultures. However, the accommodation of diverse social and cultural characteristics is still heavily based on the *DDC*'s existing structures. Adaptation of the *DDC*, however, does not change either the *DDC* or the

adapter system. Because the *DDC* does not share the same numeric representations, the system is built and modified radically based on the adapter's local needs.

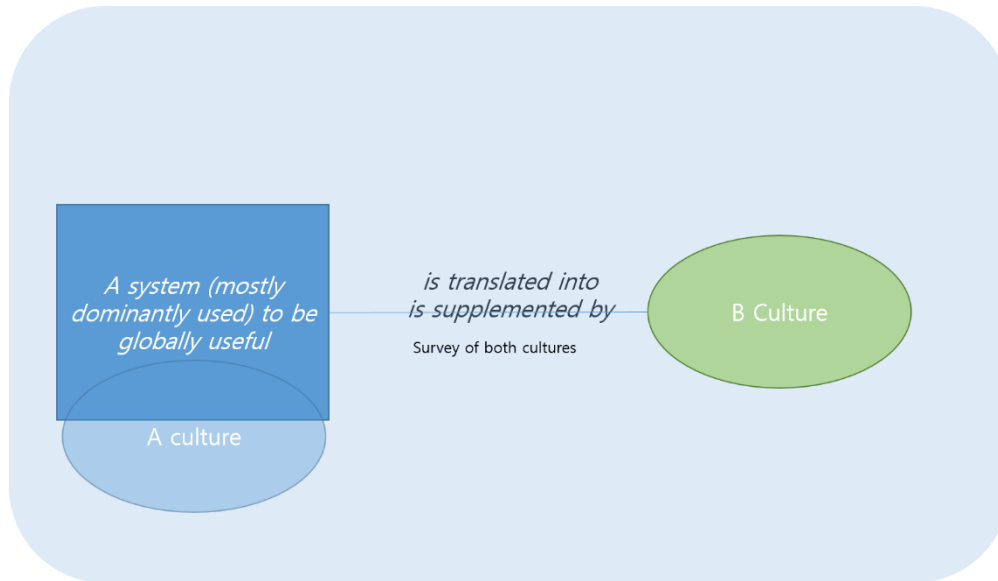


Figure 6-1 A system (mostly dominantly used) to be globally useful – accommodating multiple cultural warrants

In Figures 5-1 and 5-2, the square represents a system and a circle represents a culture. In the *DDC*'s case, the system is warranted by the American culture. To have the translated *DDC* and to expand the *DDC* in accommodating vernacular contents found from the translations, a

survey of both cultures, the original culture that warrants the *DDC* and the culture of the adopter is necessary.

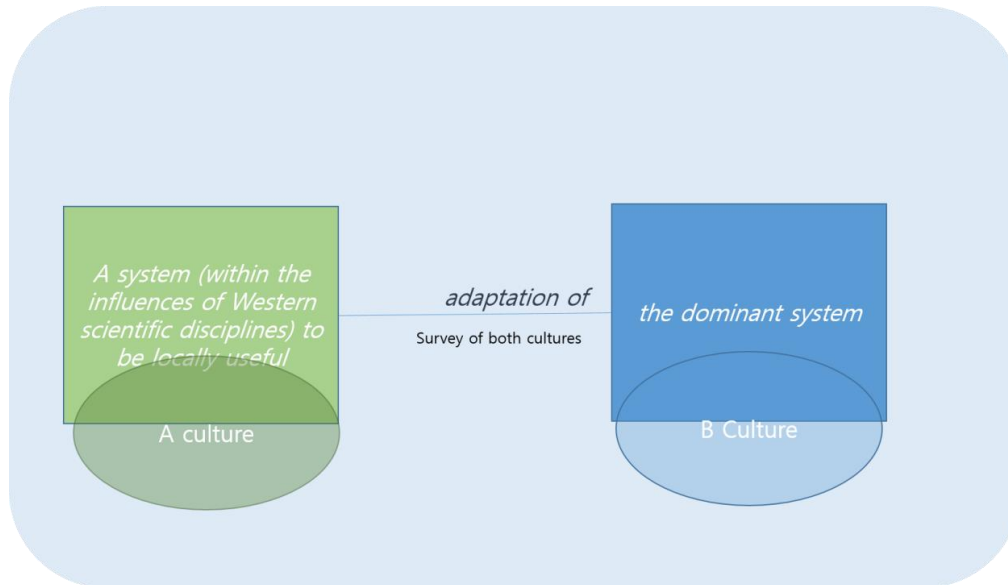


Figure 6-2 A system (within the influences of Western scientific disciplines) to be locally useful – adaptation of the dominant system

Likewise, the system adopting and/or adapting the original system requires a survey of both cultures to meet local needs as well as to borrow concepts and structures long validated in the scientific domains from the original system. In any case, the new system always incorporates two distinct cultures. Thus, the newly introduced concept of “intercultural warrant” is suggested as an operational framework to the survey of dynamics of distinct cultures and is necessary for ethical classification in the current system.

#### **6.2.4. Values of intercultural warrant**

Warrant is the grounds on which the KOS is built. For example, literary warrant refers to the literature on which the KOS is based, and users’ behaviors or perceptions are grounds for the KOS in user warrant. The broader scopes of warrant can be cultural and ethical: the KOS is based on sociocultural contexts and guidelines or activities regarding ethical concerns. Thus,

intercultural warrant describes the principle that requires the KOS to be based on the dynamics of cross-cultural considerations.

A study of cross-cultural dynamics such as the case involving the *KDC* would validate this notion of intercultural warrant. To understand multiple cultures and their dynamics in a KOS, it is useful to discuss documentation of intercultural warrant. The documentation includes tracking which changes were derived from either conflicts or harmonization and what classificatory features were strategically used for the changes made. The tracking of changes and updates derived from the cross-cultural dynamics not only verifies the values of the KOS in a certain sociocultural context but also qualifies the KOS as meaningful data for study of diverse sociocultural perspectives. In addition, the notion of intercultural warrant and the documentation would contribute to defining a relationship between KOSs. Networked Knowledge Organization Systems (NKOS) is a group of researchers and developers who are working toward KOSs such as classification systems, thesauri, gazetteers, and ontologies as networked interactive information services to support the description and retrieval of diverse information resources. The NKOS has developed vocabularies for describing KOSs and the relationships between KOSs. However, there is no relationship such as “adaptation of” indicating the case of one KOS’s adaptation of the KOS. The relationship “adaptation of” can be found in Family of Works as one of the derivative relations between works (Figure 5-3). This derivative relationship, “adaptation of,” can be applied to the family of KOSs as well. The current vocabulary describing the relationships among KOSs includes a similar relationship to the derivative: “is based on” (Table 5-8). The newly proposed relationship “is adaptation of,” as one of the types for “is based on” relationships, describes a type of interaction between KOSs which has not previously been articulated. Along with other types of “is based on” relationships such as “is translation of,” “is

extension of,” or “is version of,” the addition of this specific type of relationship “is adaptation of” will expand understanding of interactive KOSs, especially those in cross-cultural environments and in which multiple cultures warrant interplay (Table 5-8).

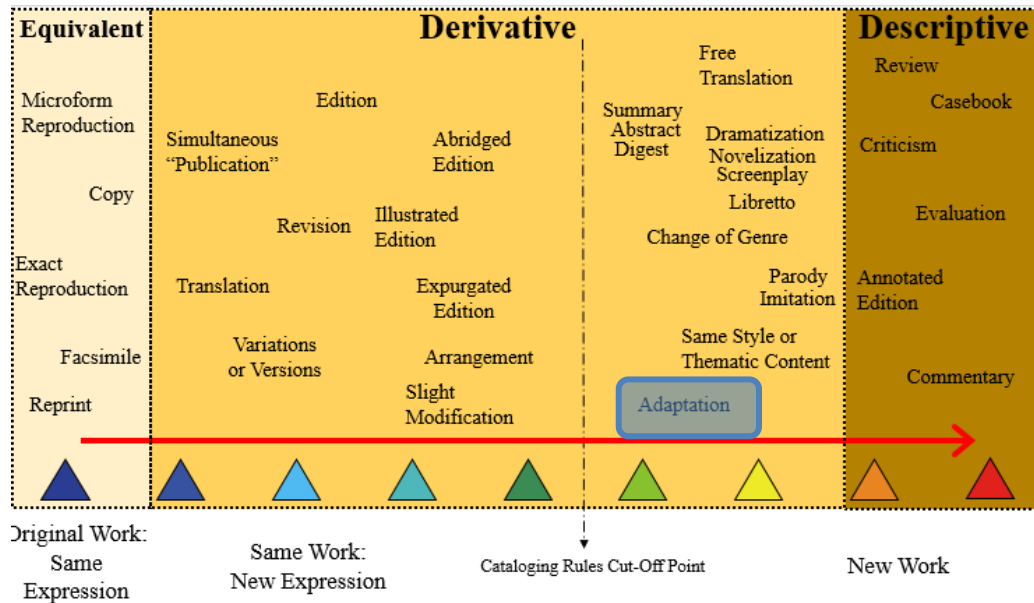


Figure 6-3 Family of Works (Tillett & Kuhagen 2011). Library of Congress RDA Workshop for Georgia Cataloging Summit

<i>based-on:</i>	<b>A</b>	<b>B</b>
<b>is based on</b>	<b>A is based on B.</b>	<b>nkos:isBasedOn</b>
		<i>Canadian Subject Headings (CSH)</i>
		<i>Library of Congress Classification(LCSH)</i>
<b>is basis for</b>	<b>B is basis for A.</b>	<b>nkos:isBasisFor</b>
.translation of	A is translation of B.	nkos:isTranslationOf
	B has translation A.	adms:translation
.abridgment of	A is abridgment of B.	nkos:isAbridgmentOf
	B has abridgment A.	nkos:hasAbridgment
.extension of	A is extension of B.	nkos:isExtensionOf
	B has extension A.	nkos:hasExtention
.version of	A is version of B.	dct:isVersionOf
	B has version A.	dct:hasVersion

Table 6-8 NKOS Vocabularies

([https://github.com/dcmi/repository/blob/master/mediawiki\\_wiki/NKOS\\_Vocabularies.md#KOS\\_Types\\_Vocabulary](https://github.com/dcmi/repository/blob/master/mediawiki_wiki/NKOS_Vocabularies.md#KOS_Types_Vocabulary))

### 6.3. Conclusion

The interpretations of the comparison discussed in this chapter disclose some noticeable differences in structures and distributions of class numbers in the main classes of *KDC* and *DDC*. The two classifications have been developed in different historical and sociocultural contexts, so that the major principles of organizing knowledge through the systems inevitably also show somewhat different viewpoints on how the systems should be constructed and what their major purposes are. In a broader sense, the different approaches and viewpoints on organizing knowledge are also considered as related to cultural warrant. The study's investigation of multiple sociocultural influences or perspectives in the adaptation of the *DDC* into the *KDC* proposes the development of a notion of intercultural warrant. It has theoretical and practical implications as a KO study in filling a gap between cultural warrant and ethical warrant.

## Chapter 7 Conclusion

### 7.1. Summary of the study

Knowledge organization systems (KOSs), including library classification, represent knowledge in ways that reflect how people understand knowledge as it is shaped by social and cultural factors. Based on this understanding of KOSs, I investigated a cross-cultural adaptation of library classification. Since American library science was a leader in the early development of library classifications, many libraries in other countries subsequently based their own national library classifications upon American library classification schemes. South Korea was one such case. Under American influence following the Korean War, South Korea adapted *Dewey Decimal Classification* (DDC), directly adopting its basic rules, principles, and parts of the original *DDC* schedules. But, unlike the German or French translation of *Dewey Decimal Classification* schemes, which share *DDC*'s schedules with translated captions, *Korean Decimal Classification* (KDC) developed its own schedules of class numbers for many of its subjects in order to meet the needs of South Korean society. As a result of this adaptation, *KDC* both has similarities to and also differs from *DDC*. For this reason, it was an ideal choice for a study on the ways in which social and cultural contexts influence the adaptation of KOSs cross-culturally, and it is the focus of this study.

This study was conducted to investigate the adaptation of bibliographic classifications in examining the influences of sociocultural differences through the case of *KDC*'s adaptation of *DDC*. Chapter 2 reviewed related literature regarding sociocultural contexts in KO. Through the review, it also discussed the need for studies recognizing multiplicity in epistemologies and addressing this diversity. Consideration of comparative approaches also led to the study's methodological approach, which seeks to explore the differences in knowledge representation in

various cultures and applications of established KO frames in different sociocultural contexts. The final section of Chapter 2 described the background and developmental history of *KDC*'s adaptation of *DDC*.

Chapter 3 detailed the process by which a methodological plan was developed for conducting comparative research on the cross-cultural adaptation of classification. The study was specifically designed to apply sequential explorative mixed methods. Phase 1 was a quantitative analysis itemizing and visualizing the differences between *KDC* 4, 5, and 6 and *DDC* 20, 22, and 23, specifically in terms of class numbers and classificatory structures. For the qualitative analysis of Phase 2, Berry's (1997) acculturation model of intercultural communication was adopted as the basis for developing a taxonomy of cross-cultural classification adaptation as a coding scheme. The taxonomy of adaptation explains similarities and differences between the two classifications progressively within a fourfold frame: indifference, nativization, absorption, and integration. Application of the taxonomy of adaptation as an initial coding scheme led to the second coding scheme to capture the major comparable classificatory variables in semantic contents and structural arrangement—observability of the adaptation.

Chapter 4 reported the major findings from the first phase of the comparison. Phase 1 included a focus on three main differences between the classifications in (a) range of changes across editions, (b) distribution of class numbers at the main class level, and (c) distribution of class numbers at the division and section levels. *DDC* exhibits greater variations in the quantities of class numbers among the recent three editions than *KDC*'s three recent editions. Secondly, the differences in the distributions of class numbers at the main class level tend to be consistent across recent editions of both. Comparing the compositional percentages of *DDC* 20, 22, and 23 with their counterparts of *KDC* 4, 5, and 6 at main class level reveals the main classes with the

most noticeable differences. The two main classes presenting the most differences between *DDC* and *KDC* are the social sciences and technology. Then, two main classes of *DDC* and *KDC* were compared to see how the divisions are distributed across the main classes. Chapter 6 discussed the interpretation of the differences in the structure and size of main classes.

In Chapter 5, the first coding with the taxonomy of adaptation in Phase 2 clarified the scope of each category in interpretation of the coded examples. The adaptation taxonomy has four categories representing different strategies in the adaptation of an original classification to an adapter system. The second coding scheme, developed from the observed patterns of major comparable classificatory variables in semantic contents and structural arrangement, was applied to analyze cross-cultural adaptation of bibliographic classification. This analysis revealed patterns of variables of semantic contents and structural arrangement in relation to adaptive strategies in the taxonomy of adaptation.

- a) Semantic contents: For the classification captions of *KDC* and *DDC* in both the social sciences and technology, the codes of unmatched captions were the most common, and those cases mostly appeared in indifference and nativization adaptation strategies. In addition, in technology, different viewpoints in captions emerged more commonly in the adopted concepts from *DDC*. The codes that more subordinate numbers are listed under *DDC* number are the most common in the social sciences and co-occurred with the absorption strategy. In the case of technology, there were no noticeable differences for quantity of subordinate numbers in comparison of *DDC* and *KDC*.
- b) Structural arrangement: Among three types of matching for rank, exact match were the most commonly coded cases in the social sciences. This pattern was found in

technology as well. However, there are no noticeable relations found between rank and adaptive taxonomy. When the broader categories were matched, absorption and integration strategies took most parts of the cases while indifference and nativization occurred for most parts of unmatched broader categories. Both the social sciences and technology show these patterns.

Chapter 6 further addressed the study's main research question, "How does *KDC* adapt *DDC* in terms of underlying sociocultural perspectives in a classificatory form?" Interpretations of the results from Phase 1 and Phase 2 answered the research question. In Phase 1, I analyzed differences in quantities of class numbers in two aspects: structure and size. The structure of main classes and divisions was different, especially regarding South Korea's efforts to localize the structure to meet users' needs. Also, the main classes with differences in size also differ in specificity and topical coverage. *DDC* has more class numbers in the social sciences in the divisions of social problems, education, law, and political science, which show more specificities in topics, whereas *KDC* exhibits higher specificities in engineering-related divisions in technology.

Interpretations of the patterns revealed in Phase 2 address application of standard subdivisions, the taxonomy of adaptation, and the observability of adaptation. First, the *KDC*'s adoption of the standard subdivisions inherited from *DDC* also can be viewed as *KDC*'s adaptation of the standard subdivisions, unified across all the main classes, unlike *DDC*, whose first division is more specific to the subject areas. Second, the application of the fourfold taxonomy of adaptation in Phase 2 also led to a discovery of the complexity in strategic choices for the cross-cultural adaptation of the bibliographic classification. Most cases of comparison fall between two strategies because of the granularity in the interplay between the Korean-specific

concepts and those from *DDC*. Lastly, in Phase 2, two major categories for classificatory characteristics were discovered by the comparison of classification systems in a bottom-up approach: semantic contents and structural arrangement. Moreover, the variables for semantic contents and structural arrangement in the observability of adaptation complement the existing comparative criteria from Kwasnik and Chun's (2004) study of *KDC* and *DDC* and ISO 5964 (ISO 1985)'s degrees of interlanguage equivalence.

In this study, the taxonomy of adaptation was applied to reveal adaptive strategies regarding sociocultural influences in the comparison of *KDC* and *DDC* with two selected main classes, the social sciences and technology. The examination of the two selected main classes discloses differences in sociocultural influences by discipline. The social sciences class has more numbers coded for nativization than for absorption, while technology has more numbers coded for absorption than for nativization. These examples suggest that the social sciences, as a discipline, is more influenced by sociocultural differences.

Regarding sociocultural influences in cross-cultural adaptation of classification, all observed cases seemed to be of two types: prominent influences and subtle influences. The prominent involve concepts that are unique to one of the two cultures, such as the Korean medical and legal systems. Those examples—Korean medicine and law—demonstrated how prominent sociocultural differences affect cross-cultural adaptation of the classification. Furthermore, given that they mostly appear in the nativization strategy, the prominent sociocultural influences led to adaptation affected by indigenization forces. There are also more subtle influences such as *DDC*'s placement of general management in its main technology class but *KDC*'s placement of general management in economics within the main social sciences class.

The differences in location or scope carry subtle sociocultural influences, and those cases mainly are coded as the in-between strategy of nativization and integration.

The ethics of KOS in cross-cultural environments would require proper treatments of multiple cultures. To understand multiple cultures and their dynamics in a KOS will maintain an ethical KOS. The patterns discussed above, of sociocultural influences in cross-cultural adaptation of a classification scheme, offer a path to the development of a notion of intercultural warrant: the principles of KOS in cross-cultural environments requires an understanding of interplaying social influences in classificatory features.

## 7.2. Limitations and Future studies

As an exploratory qualitative study, an in-depth analysis of a purposefully selected case of cross-cultural adaptation of classification was conducted. The scope of its data was limited to the class numbers and captions of the two comparable classification systems. There are extensive organizing devices in the decimal classifications, meaning that multiple interpretations and analyses are possible, given resources and classificatory devices other than the schedules of class numbers.

A variety of data types leads to methodological variety. However, the current study is unidimensional because the comparison was to carry out a phenomenological examination to the differences appearing in a cross-cultural adaptation of the classification scheme. For a multidimensional study of *KDC*'s adaptation of *DDC*, it would be necessary to collect external resources related to both systems and use multiple methods to analyze them, such as a document analysis or interviews with system editors. This section discusses limitations of the study and some external resources that might be useful for future studies.

I focused on *KDC*'s adaptation of *DDC*, and discovered enormous sociocultural influences in the adaptation. However, it seems unavoidable that *KDC* and *DDC* will be compared with *Nippon Decimal Classification* (*NDC*), particularly because influences of *NDC* were discovered in culturally relevant concepts. Because *NDC* also adopted major principles of *DDC*, the taxonomy of the adaptation developed in this study revealed the interrelations between these three systems: *KDC* and *NDC*, *NDC* and *DDC*, and *DDC* and *KDC*. The study of the interplay of two or more cultural warrants in a KOS would thus be valuable as an extended case of intercultural warrant in future research.

I compared the meanings and relationships of concepts that were listed in the schedules of *DDC* and *KDC* at the section level and above. Such a study has at least two limitations. First, classifiers may interpret concepts, including those identified as the same in the comparison, differently according to their cultural perceptions and practices. Second, concepts represented by class numbers at levels lower than section and concepts requiring number building are not considered in the current study. Thus, some of the refined concepts can be differences between two systems, which might be covered by the practices of subject cataloging. To obtain subject cataloging practices in the use of *DDC* and *KDC*, a future study could be designed to examine actual library collections from South Korea and America, addressing how books on the same subject have been classified. Such instances would show cases of either a shared understanding or a partially shared understanding of subject and terms. Also, interviews with the classifiers putting these systems into practice could also uncover how they understand and use class numbers in assigning them to bibliographic products, which could complement collections relevant to the two systems.

Additionally, data types other than class numbers and captions will enable additional interpretation and comparisons, as discussed earlier. Potential data types of the bibliographic classifications are described below.

Relative Index – A relative index would provide information about multiple instances of a shared concept and related concepts beyond the selected main classes. In this way, the inclusion of a relative index as a secondary data source might find cases of the same topic in different locations.

The editorial boards – A document analysis of data, as mentioned above, could examine the results of the adaptation, but one limitation is that it could not identify the participants' intention in the creation, design, or revision of the systems. Melvil Dewey's thoughts on the studies of *DDC*, as well as those on the agendas of the editorial boards for subsequent editions, have been documented; it appears comparatively straightforward to track historical changes over the editions in their chronological order. Nevertheless, documentation of the editorial activities in studies of *KDC* have often not been to the same extent. Access to documents containing editorial agendas is another factor, because they are not available to the public. Regarding *KDC*'s relatively short history of only six editions, a researcher might be able to interview the previous editors or editorial board members, especially of the more recent editions. Combined with documents written by previous editors or editorial boards, interviews with these key figures would enable an examination of the sociocultural complexities of the adaptations as well as the editors' interpretations of their consequences. Thus, interviews could either validate or modify the adaptation process and identify sociocultural influences such as those examined in this study.

Chapter 6 introduced the notion of intercultural warrant as an actionable approach when the researcher also bridged cultural warrant with ethical warrant. To examine whether the

documented intercultural warrant of the current study aids the KOS in its actual ethical practices, ethnographic observations of and direct interviews with the editorial board of *KDC* would be useful. In turn, such contacts with editorial board members could enhance awareness of ethical choices of classification activities, which could be determined by examining the intentional/unintentional or conscious/unconscious ethical choices made when two different cultural warrants conflict.

I proposed the taxonomy and observability of adaptation to examine the cross-cultural adaptation of bibliographic classifications. Although they contribute to studies on interplays of cross-cultural views in the classifications across cultures as well as their documentation, the validity of the taxonomy and observability of adaptation need to be affirmed by applying them to multiple cases of cross-cultural adaptation of KOS. In this study, there were some relations found between adaptation strategies by the taxonomy of adaptation and classificatory features by the observability of adaptation but we couldn't answer how and why those patterns of relations appeared clearly. Future studies of multiple cases of the cross-cultural adaptation and utilization of the discussed external data are expected to address the complex relationships between two frames revealed in this study, the taxonomy of adaptation and the observability of adaptation.

### 7.3. Concluding remarks

Knowledge organization systems, such as library classifications or thesauri, are often shared and adapted across cultures. When systems are adapted, some parts of the original scheme may stay intact and others may be modified in light of cultural differences. Comparing two classification systems provided a more systemic illustration of how sociocultural influences emerge in classificatory structures.

Two frameworks developed in this study—taxonomy of adaptation and observability of adaptation—suggest the development of intercultural warrant as a theoretical view to understand the KOSs shared and used worldwide. Along with the theoretical implication of this study, the developed frameworks would serve as both designing principles and an evaluation tools for cross-cultural classification systems in practice. In designing or planning the cross-cultural adaptation, the frameworks would answer questions such as:

- What are major sociocultural differences requiring changes when adapting the classification scheme?
- What adaptive strategies would be the most appropriate for examined sociocultural differences?
- What classificatory variables—the observability of adaptation would be needed to implement a certain adaptive strategy?

On the other hand, when evaluating an existing classification system shared or used cross-culturally, the frameworks would also answer questions such as:

- Are existing classificatory variables suitable to accommodate sociocultural differences?
- Does a certain sociocultural difference appear prominent or subtle? What classificatory variables would need to be altered to reflect either prominent or subtle sociocultural influences?
- Is the adaptive strategy a right choice? Would it be justified regarding cultural warrant of the classification scheme?

The aim of conducting this cross-cultural comparative study is to understand the dynamics of the diverse cultures of classification systems. That is beyond the scope of a study of classification based on (or warranted by) a society or a culture because the KOS becomes more international and cross-cultural. Understanding the dynamics and finding a model to explain them could uncover sociocultural influences on classification, thereby improving the ethics of classification by treating plural perspectives properly.

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## Appendix. Intercorder reliability

Two divisions from the social sciences and technology respectively were coded by the second coder. The selection of the divisions considered a variety of four strategies in order to examine the agreement over the categories.

The second coding scheme, observability of adaptation, has not been coded by the second coder, because those features do not require researchers' judgements. Rather than that, the classificatory features from the second coding are based on the facts.

Total 19 cases (out of 181) were coded by the second coder, and the intercoder reliability for the entire coding is calculated below.

n variables	1
n coders per var	2

Percent Agreement	Scott's Pi	Cohen's Kappa	Krippendorff's Alpha
<b>88.15789</b>	0.756019	0.75641	0.757624

N Agreements	N Disagreements	N Cases	N Decisions
67	9	76	152

The agreements over the four coding categories (variables) were calculated below.

n variables	4
n coders per var	2

	Percent Agreement	Scott's Pi	Cohen's Kappa	Krippendorff's Alpha
Indifference	<b>84.21053</b>	0.309091	0.313253	0.327273
Absorption	<b>94.73684</b>	0.893557	0.893855	0.896359
Nativization	<b>84.21053</b>	0.649231	0.658683	0.658462
Integration	<b>89.47368</b>	0.77381	0.776471	0.779762

	N Agreements	N Disagreements	N Cases	N Decisions
Indifference	16	3	19	38
Absorption	18	1	19	38
Nativization	16	3	19	38
Integration	17	2	19	38

## CURRICULUM VITAE

Inkyung Choi

Place of birth: Seoul, South Korea

### EDUCATION

B.A., Sungkyunkwan University, January 2010  
Major: Library and Information Science

M.L.I.S., Syracuse University, May 2012

Dissertation Title: Toward a model of intercultural warrant: A case of Korean Decimal Classification's Cross-cultural Adaptation of Dewey Decimal Classification

### JOURNAL PUBLICATION *Refereed*

1. Kipp, M. E. I., Beak, J. and **Choi, I.** (2017), Motivations and intentions of flickr users in enriching flick records for library of congress photos. *Journal of the Association for Information Science and Technology*. doi:10.1002/asi.23869
2. Joo, S., **Choi, I.**, & Choi, N. Topic Analysis of the Research Domain in Knowledge Organization: A Latent Dirichlet Approach. (Forthcoming), *Knowledge Organization*

### JOURNAL PUBLICATIONS *Non-refereed*

1. Beak, J., **Choi, I.**, Lee, S., Park, H., Ridenour, L., & Smiraglia, R.P. (2014). Knowledge Organization and the 2013 UDC Seminar: An Editorial. *Knowledge Organization*. 42(3), 191-194.
2. Olson, H. A., Beak, J., and **Choi, I.** (2013). The Natural is Artificial: Legacy of The Scientia Scientiarum. *Hermès la revue*.

### CONFERENCE PROCEEDINGS

1. **Choi, I.** (2017). Visualizations of cross-cultural bibliographic classification: comparative studies of the Korean Decimal Classification and the Dewey Decimal Classification.

*Proceedings of the 2017 North American Symposium on Knowledge Organization*. June 15-16, Champaign, Illinois. 17p.

2. **Choi, I.** & Lee, H. (2016). A Keyword Analysis of User Studies in Knowledge Organization: The Emerging Framework. *Proceedings of the Fourteenth International ISKO Conference*. Sep. 27-29, Rio de Janeiro, Brazil. 116-124p.

3. **Choi, I.** (2015). Is User Studies User-oriented? Domain analytic approach to User Studies in Information Organization. *iConference 2015 Proceedings*. Mar. 24-27, New Port Beach, CA. 4p.

4. Kipp, M. E., **Choi, I.**, Beak, J., Buchel, O., & Rasmussen, D. (2014). User Motivations for Contributing Tags and Local Knowledge to the Library of Congress Flickr Collection. In *Proceedings of the Annual Conference of CAIS/Actes du congrès annuel de l'ACSI*. May. 28-30, Ontario, Canada. 5p.

5. Kipp, M., Joo, S. & **Choi, I.** (2013). Classification of Online Resources using User Generated Terms. In *Proceedings of IFLA 2013 Classification and Indexing Section*, Aug. 17-23, Singapore. 8p.

#### CONFERENCE PRESENTATIONS

1. **Choi, I.** (2017). “Comparative analysis of universal library classification: The Dewey Decimal Classification and the Korean Decimal Classification (Poster)” will be Presented at Internatioinal UDC 2017, London, UK.

2. **Choi, I.** (2017). “Visualizations of cross-cultural bibliographic classification: comparative studies of the Korean Decimal Classification and the Dewey Decimal Classification.” Presented at NASKO 2017, Champaign, IL.

3. **Choi, I.** (2017). “Toward cross-cultural bibliographic classifications: the adaptation of the DDC into the KDC.” Presented at ALISE 2017, Atlanta, GA.

4. Lee, T., Park, H., Lee, S., & **Choi, I.** (2017). “Public Libraries’ Multilingual supports: A preliminary framework in 19 public libraries in United States.” Presented at ALISE 2017, Atlanta, GA.

5. **Choi, I.** & Lee, H. (2016). “A Keyword Analysis of User Studies in Knowledge Organization: The Emerging Framework.” Presented at the 14th International ISKO Conference. Sep. 27-29, Rio de Janeiro, Brazil. (PAPER)

6. **Choi, I.** & Ridenour, L.E. (2016). “Cross-lingual analysis of English-tagged literature written in English and Korean.” Presented at WAAL Annual Conferences, Green Lake, WI.

7. Beak, J., **Choi, I.**, & Lee, T. (2015). "Research Methods in KO Domain: Pilot Study." Presented at 3<sup>rd</sup> Milwaukee Conference on Ethics on Knowledge Organization, May 2015, Milwaukee, WI.
8. **Choi, I.** (2015). "Is User Studies User-oriented? Domain analytic approach to User Studies in Information Organization." Presented at iConference, New Port Beach, CA.
9. **Choi, I.**, Joo, S. and Kipp, M. E. (2013). "Web Resource Clustering Based on Social Tag Information: A Pilot Study". Presented at 5th International Conference on Qualitative and Quantitative Methods in Libraries, Rome, Italy.
10. Joo, S. and **Choi, I.** (2013). "Estimation of User Satisfaction in Academic Libraries: A Multi-dimensional Evaluation Model". Presented at 5th International Conference on Qualitative and Quantitative Methods in Libraries, Rome, Italy.
11. **Choi, I.**, Joo, S. and Kipp, M. E. (2013). "Web Resource Organization based on Consumer Vocabulary in the Domain of Consumer Health Information". Presented at American Symposium on Knowledge Organization (NASKO), Milwaukee, Wisconsin.
12. Kipp, M. E., Joo, S., & **Choi, I.** (2013). "Classification of Web Resources using User Generated Terms". Presented at 79th IFLA Conference Classification and Indexing Section, Singapore. (PAPER)
13. **Choi, I.**, and Hur-li Lee (2013). "Toward social-contextualization of big data and linked data". Presented at 2013 ASIS&T 76<sup>th</sup> Annual Meeting SIG/CR workshop, Montreal, Canada. (PAPER)
14. Kipp, M. E., Buchel, O., Beak, J., **Choi, I.**, & Neal, D. R. (2013). "User Motivations for Contributing Tags and Local Knowledge to the Library of Congress Flickr Collection". Presented at 41th Annual Conference of Canadian Association for Information Sciences (CAIS), Victoria, British Columbia. (PAPER)
15. Kipp, M. E., Buchel, O., Neal, D. R., Beak, J. and **Choi, I.** (2012). "Exploring Digital Information Using Tags and Local Knowledge". Presented at ASIS&T 75th Annual Meeting, Baltimore, Maryland.

#### INVITED TALKS AND PRESENTATIONS

1. **Choi, I.** (Invited, 2017). "Map of cross-cultural bibliographic classifications: the adaptation of the DDC into the KDC" Invited to present at Observatory for Knowledge Organisation Systems by KNOWeSCAPE, Feb. 1-3, University of Malta, Malta.

2. **Choi, I.** (2017). “Cross-cultural adaptation of classification: The case of the Korean Decimal Classification” Presented at Brown bag research presentation, School of Information Studies, University of Wisconsin, Milwaukee, Wisconsin.
3. **Choi, I.** (2017). “Map of cross-cultural bibliographic classifications: the adaptation of the DDC into the Korean Decimal Classification (Poster)” Presented at SOIS student Research day, School of Information Studies, University of Wisconsin, Milwaukee, Wisconsin.
4. **Choi, I.** (2014). “Is User Studies User-oriented? Domain analytic approach to User Studies in Knowledge Organization” Presented at Doctoral Research in Knowledge Organization, Nov. 13rd, School of Information Studies, University of Wisconsin, Milwaukee, Wisconsin.

#### TEACHING EXPERIENCES

Instructor      School of Information Studies at UWM

INFOST230      Organization of Knowledge (Spring 2017 – Onsite, undergraduate)

- This course introduces information and knowledge organization, including principles of conceptual systems in various disciplines and their relevance and application to knowledge organization

INFOST511      Organization of Information (Fall 2017 – Online, & Spring 2017 – Onsite, graduate)

- This course introduces basic concepts in the theoretical, practical, and technological aspects of information organization from daily organizing activities to bibliographical systems.

INFOST110      Introduction to Information Science and Technology (Fall 2017 – Online, Spring 2016 - Online, Summer 2016 - Online, & Fall 2016 – Online & Onsite, undergraduate)

- This course is introductory course at undergraduate level, which cover basic backgrounds of information science as a discipline and roles of information systems & technology.

Teaching Assistant      School of Information Studies at UWM

INFOST110      Introduction to Information Science and Technology (Fall 2015 – Online & Spring 2015 – Onsite)

- Assisted grading and in charge of class materials.

INFOST511 Organization of Information (Fall 2014 – Onsite)

- Assisted grading and taking questions in class activities.

INFOST714 Metadata (Fall 2014 – Onsite)

- This course introduces principles and application of metadata for networked information resource organization, representation, retrieval, and interoperability using a variety of schemes.
- Assisted grading and taking questions in class activities.

iSchool at Syracuse University

IST649 Human computer interaction

- This course introduces theoretical and practical implication of human computer interactions including designing exercises.
- Gave an instruction for usability testing software – Morae and evaluate assignments of students

#### ACADEMIC AND WORK EXPERIENCES

2012 – 2014 Research Assistant, School of Information Studies

University of Wisconsin-Milwaukee, Milwaukee, WI

Assigned as a RA for

- Prof. Olson – worked on a research project of theoretical discussions of artificial and natural classifications, published in *Hermès la revue*, 2013.
- Prof. Kipp – worked on a research project of studying users' motivation of LC Flickr collections, published at several conferences, accepted to JASIST at 2017.
- Prof. Lee – co-authored research projects of 1) theoretical discussions of social epistemology, presented at ASIST 2013, and 2) domain analysis of user studies in KO, presented at ISKO 2016

2011 – 2012 Faculty Assistant Fellowship, iSchool

Syracuse University, Syracuse, NY

- Assisted professor Kevin Crowston as a research assistant
- Qualitative coding using Nvivo for online documents of FLOSS communities

2010 - 2012 Digital archive project assistant, Korean Peninsula Affairs Center

Syracuse University, Syracuse, NY

- Data collection through interviews and digitization of artifacts from

- Korean war veterans
- Modified the subject classifications for memories and artifacts of Korean war
- Data entering through implementing Dublin Core and collaboratively design a digital archive (<http://kwvdm.org>)

2010 Library research fellows, Anti-Asian Hate Crime Research

Syracuse University Library & multicultural affairs departments, Syracuse, NY

- Conduct research for the Anti-Asian and Asian American Hate Crime Exhibition

2009 – 2010 Internship, Daumsoft

DATA mining company, Seoul, Korea

- Analyzed Automobile industry by aggregating online opinions through the ‘online buzz analysis system’ and managed the automatic ‘NLP system’
- Reported trends and marketing solutions for companies and government organizations using ‘online buzz analysis system’
- Taught new employees how to use the ‘online buzz analysis system’

2007 - 2009 Research Assistant, Information Public Library Research Center

Sungkyunkwan University, Seoul, Korea

- Collected academic English articles and data for Korea Research Foundation’s online database
- Entered data into a metadata model based on FRBR (Functional Requirements for Bibliographic Records)

## UNIVERSITY & PROFESSIONAL SERVICES

School of Information Studies at UWM

2015 Executive officers of Doctoral Student Organization

2015 Editor in SOIS (School of Information Studies) PhD Newsletter

- 2014-2015      Student Representative for Academic Planning Committee (APC) at SOIS  
 Knowledge Organization Research Group (KOrg)
- 2015            Administrative assistant for The 3<sup>rd</sup> Milwaukee Conference on Ethics in  
 Knowledge Organization 2015
- 2014- current   Volunteer for organizing Knowledge Organization Literature in ISKO  
 (International Society for Knowledge Organization) – formatting and updating  
 Korean KO literature

#### AWARDS AND HONORS

- Honorable Mention at ALISE/Jean Tague-Sutcliffe Doctoral Student Research Poster Competition 2018
- Sponsored attendance to the International UDC Seminar by The Information Architecture Institute, Doctoral Program Committee of School of Information Studies (SOIS) and the Dean's Discretionary fund at the University of Wisconsin-Milwaukee
- Chancellor Award for SOIS Doctoral students: UW Milwaukee (2015 fall 2016 spring)
- Chancellor Award for SOIS Doctoral students: UW Milwaukee (2014 fall to 2015 spring)
- Graduate school Travel Awards: UW Milwaukee (2016 fall, 2013 spring & fall)
- Korean Honor Scholarship: Korean Education Center, Korean Consulate General (2011)
- Anti-Asian Hate crime Research Fellowship (2010)
- Merit-based Academic Scholarship, Sungkyunkwan University (2009)

#### PROFESSIONAL ASSOCIATION MEMBERSHIP

- Association for Library and Information Science Education (ALISE)
- American Library Association (ALA)
- International Society for Knowledge Organization (ISKO)
- Association for Information Science and Technology (ASIS&T)