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| **VIETNAM NATIONAL UNIVERSITY, HANOI  UNIVERSITY OF LANGUAGES AND INTERNATIONAL STUDIES**  **\*\*\*\*\***  **NGUYỄN THỊ HỒNG TUYẾN** TRANSPORT CONSTRUCTION ENGINEERING TERMINOLOGY IN ENGLISH AND VIETNAMESE FROM LANGUAGE PLANNING PERSPECTIVE (Thuật ngữ tiếng Anh và tiếng Việt trong ngành Xây dựng công trình giao thông nhìn từ góc độ hoạch định ngôn ngữ)  Major: English Linguistics  Code: 9220201.01  Supervisor: - Assoc. Prof. LÊ HÙNG TIẾN - Dr. HUỲNH ANH TUẤN **SUMMARY OF DOCTORAL THESIS**  HANOI – JANUARY 2022 |

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**CHAPTER I: INTRODUCTION**

**1.1. Rationale for the study**

*EMI training is essential* in Vietnam to provide the bilingual workforce for the Transport Sector. *Term support is very necessary* because *specialized concepts* play a prominent role in understanding disciplinary knowledge. TCE EMI students need term resources that provides both *linguistic and epistemological knowledge*. Most current TCE term resources are products of the *traditional top-down terminology planning approach* by *specialist experts* based on their own *intuition and subjective judgment*: Terminology stands apart from Linguistic Theories; Terms are treated as *discrete units* and arranged in the alphabetical order *without conceptual and lexical* relations. The new terminology planning approach brings about terminological products that are not only alphabetically but also onnomasiologically organized to provide both *content and linguistic information* to support EMI students. The study locates itself in *Cognitive-based Terminology* or Socio-cognitive Terminology with a view that a term resource should reflect the *ontology* of the domain with *multi-dimensional term relations.* It involves *re-planning TCE terminology* following the *bottom-up* approach of *term relation analysis* as well as TCE *expert consultancy* and *student opinion survey*. In this approach Terminology and Linguistics Theories are brought close together. *Lexical Semantics* *(Lexical Relations)* is employed for terminology planning. By selectively applying *Lexical Functions (LFs)* in Meaning Text Theories (MTT) as the Analytical Framework for term relations, which include both *Paradigmatic* and *Syntagmatic Lexical Relations*, terms are analyzed not only from *conceptual (content) perspective* but also from *linguistic perspective*. LFs in MTT are advantageous because *Paradigmatic LFs cover conceptual relations, semantic roles, and semantic frames*. They can effectively deal with comprehensive and systematic *multi-dimensional term relations* and *term systems.* Both the *universal and institutionalized term aspects* manifested in *hierarchical* and *non-hierarchical* term relations are considered, so it is suitable for bilingual and multilingual terminological research. *Syntagmatic LFs* related are taken full advantage of to identify the combination potentials terms in TCE terminology.

**1.2. Research aims**

The overarching aim of the study is *to explore the knowledge-based TCE terminology planning approach based on* ***Lexical Relations*** *with a view to optimize the term resources’ usefulness to EMI in students in TCE for studying a specific specialized subject in respect of language and content*.

**1.3. Research questions**

**Overarching research question: *How can English-Vietnamese TCE terms be planned based on English Lexical Relations to optimally mediate both the content (disciplinary knowledge) and linguistic dimensions and maximize its usefulness to the EMI students?***

The overarching research question is rewritten in 3 sub-questions as follows:

### Sub- research questions:

1. *What are the Paradigmatic and Syntagmatic Lexical Relations in Highway Bridge Design terminology and their multidimensional relationships in the term system?*
2. *What are the perceptions of EMI students’ in TCE of the language-planning oriented terminology management (knowledge-based) approach?*
3. *How can knowledge - based TCE term resources be presented based on Paradigmatic and Syntagmatic Lexical Relations and students’ perceptions to facilitate content and linguistic acquisition of individual subjects?*

*- Multidimensional relationships* refer to the hierarchical and nonhierarchical relations of a certain terms to other terms in the whole specialized event or sub-events.

*- Perceptions* mean the students’ needs for term resources, their opinions and expectations for content subject and English language acquisition.

**1.4. Scope of the study**

- The study investigates TCE terminology following an alternative approach, which is language planning-oriented based on lexical relations. It applies the bottom-up approach by studying lexical relations in the domain of HBD and EMI students’ perceptions. The handshake between specialist experts and ESP teachers as terminologists is highlighted as well.

- The study focuses on the identification, extraction and categorization of lexical relations in HBD, an important event in TCE. The lexical relations are extracted from a reliable text-book, *Highway Bridge Design* (Richard & Jay, 2007). The extractions were triangulated with TCE experts as presented in the Methodology Chapter.

- The research involves surveying the perceptions of EMI students in TCE about the available term resources as compared with the knowledge-based term resources to see the extent that these term resources can satisfy the students’ needs from the perspectives of disciplinary and linguistic knowledge acquisition of a certain specialized subject. The results were then combined to recommend the presentation of term products as regards contents and forms.

- The study also involves triangulation and consultation of TCE experts right from the beginning for term extraction, lexical relation identification, Vietnamese translation, and validations of the findings. Only the English lexical relations were investigated. The Vietnamese term equivalents were given for illustration and later presented in the term resource for reference. The translation of English terms were done based on the context, knowledge and experience of the investigator, the Vietnamese TCE materials and expert consultations.

**1.5. Contributions of the study**

**Theoretical contribution**

First, while most terminological works see terms a discrete units without relations, this study takes into account *multi-dimensional* term relations. Term relations are looked into from *multiple dimensions* rather than uni-dimensionally or hierarchically like in the General Terminology Theory. This study features a strong handshake between linguistic and terminology research applying *lexico-semantic* theories in terminology planning. The findings reflects the close connection between specialized and linguistic elements manifested in terminology, thus the role of linguistic majors as terminologists and EMI trainers are reinforced: they can not only teach languages but also disciplinary knowledge. The study consolidates language-in-education planning framework and provides insights into EMI language support, i.e. how term resources can be planned so that they can be used as an efficient pedagogical tool. Overall, the study explores and recommends an alternative framework for planning TCE terminology, which is different from the traditional approach with its own merits, which results in in the *ontologically* organized knowledge-based terminological product that is rich in both disciplinary and linguistic knowledge.

### Methodological contributions

The research methods in the current study are significantly different from those applied before: TCE terms are studied in real contexts whereas previous research studies terms in specialized dictionaries. HBD terms are investigated and planned in relations with each other rather than being treated as discrete units. With this systematic bottom-up term planning approach, all terms are taken into account and potential mismatches of terms in both languages can be identified and addressed because terms are treated as parallel systems and equivalents are easily justified. The bottom-up approach of terminology planning is also reflected in the investigation of students’ needs based on lexical relations, which has never been done before. And finally, the cooperation between the researcher as a linguistic terminologist and TCE specialists for the identification, translation and categorization of lexical relations in HBD is a unique methodological contribution of the current study. Terminology research cannot be done successfully either by specialist experts or linguists. The Analytical Framework for the study is a revolutionary one: Although it is largely based on Lexical Functions in Meaning Text Theory due to its superiority for terminology analysis, description and representation, the Framework is modified with supplementation of lexical relations by other respectable authors and the critical selection and addition of the current researcher depending on the characteristics of the specific event of HBD.

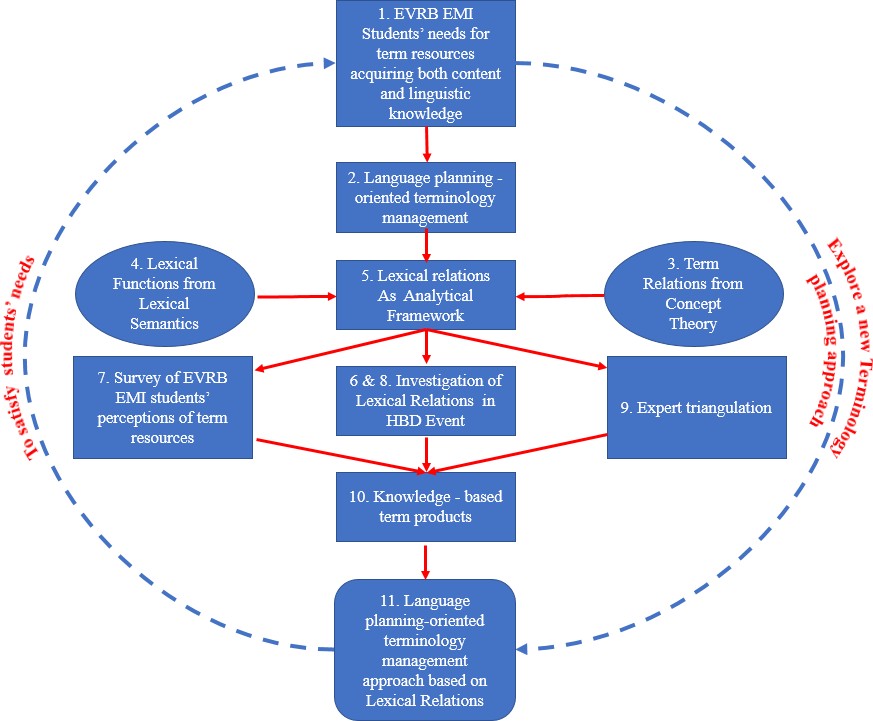
### Practical contribution

First and foremost, TCE EMI student’s needs as regards terminology resources as a tool to disciplinary access are found out so that students can be better supported. Not only Vietnamese students but also non-native English speaking students from other countries who are trying their best to acquire both English language and disciplinary literacy can benefit from the results of the study. The study results can be used as a source of references for higher education institutions to modify their language planning policies to provide pedagogical support for academic access and implement language-in-education planning research projects for the same purposes. Secondly, as for term resource development, the drawbacks of current TCE terms resources are identified and an effective alternative term presentation pattern based on typical lexical relations is recommended with terms presented in relations with each other so they can simultaneously provide disciplinary and linguistic knowledge to students. It can also be used as a reference resource for other stakeholders including TCE students, technical writers, translators and TCE engineers who need a quick access to English terms with their Vietnamese equivalents and basic disciplinary knowledge. In addition, with the aid of computer science, in which tags as well as different forms of diagrams and mind maps link one term to others systematically, the multidimensionality of terms relations will be presented in computer environment to enrich information for the convenience of term users. The term database with its affordances will be undeniably beneficial to the TCE academic population including both chalk-face practitioners and students in the English-Vietnamese bilingual academic environment. This also sets the initial steps for research and application of artificial intelligence in TCE terminology management. And finally, the extracted terms themselves with Vietnamese equivalents and typical lexical relations discovered in the study can be used to develop TCE knowledge-based term resources.

**1.6. Structure of the study**

The main structure of the thesis consists of 8 chapters:

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| --- | --- |
| **Chapter I:** Introduction  **Chapter II:** Literature Review  **Chapter III:** Methodology  **Chapter IV:** Paradigmatic lexical relations in Highway bridge design event  **Chapter IV:** Paradigmatic lexical relations in Highway bridge design event | **Chapter V:** Syntagmatic lexical relations in Highway bridge design Event  **Chapter VI:** The perceptions of EMI students of knowledge-based term resources  **Chapter VII:** Presentation of TCE term resources based on lexical relations and EMI students’ perceptions  **Chapter VIII:** Conclusion |

Figure 1.1 presents the structure of the study with its steps. The study begins with the necessity of knowledge-based term resources to support EMI students in TCE. Language planning-oriented terminology management forms the Theoretical Framework. The Analytical Framework was developed with the combination of concept relations, term relations and lexical functions. All these matters are the stuff of the Literature Review. At the next level, three phases of the research are questionnaire survey, lexical relation analysis, and expert triangulations. The methodology is presented in Chapter 3. The data analysis, finding and discussions are presented in the next 4 consecutive Chapter 4, 5, 6, and 7 before the Conclusion Chapter. The overall purpose of the research is to explore a different terminology planning approach to meet EMI students’ needs for both content and English language acquisition.

**CHAPTER II: LITERATURE REVIEW**

In this chapter, previous international and domestic studies concerning terminology analysis, description, and presentation in published works and unpublished doctoral dissertations are briefly reviewed. Also, the pertinent theoretical areas with the main concepts will be discussed, namely *terminology research (Terminology) and language planning-oriented terminology management*. Theories as analytical frameworks for terminology research are discussed prioritizing Lexical Functions in Meaning Text Theory by Žolkovskij & [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk) (1984, 1988, 1996), based on which the Analytical Framework of Lexical Relations for TCE term planning is developed.

**2.1. Terminology studies for pedagogical purposes**

Despite the ongoing research to support EMI practice in bilingual and multilingual environment, there are few studies into terminology support for EMI students and disciplinary and language matters seem to stand apart; there is little handshake between language teachers and specialized teachers. Knowledge of specialized subjects is different from linguistic knowledge but they must be combined in EMI education as well as terminology research. Therefore, terminologists who act as mediators should have adequate linguistic and disciplinary knowledge to conduct research in terminology planning for pedagogical purposes. That is the motivation for the current research aiming at seeking an alternative terminology management framework for TCE terminology planning.

**2.2. Terminology studies in Vietnam**

There have been quite a few terminology studies in Vietnam carried out by linguistic majors but instead of the more suitable approach of bottom-up descriptive terminology management approach, the top-down and prescriptive approach was applied, which is more suitable for expert specialist as terminologists. In addition, the data were taken from dictionaries for very broad fields, which contain many subdomains, so it is hard to investigate term elements from meaning perspective. In previous studies, terms were mainly looked into from structural perspective by counting term elements. The current study investigated TCE terminology, which has never been done in Vietnam by linguistic majors. A different terminology management approach with other theoretical and analytical frameworks were applied and the research methods was also differ remarkably from those employed before.

**2.3. Terminology research in the field of TCE**

According to highway engineering Prof. Nguyễn Thị Kim Đăng (2017), one of the main characteristics of TCE Vietnamese terms is that they are translated from various foreign languages with quite a few borrowed words. In fact, there are almost no specifications originally developed in pure Vietnamese. Also, the traditional and regional aspects of language use as well as personal rules of thumb greatly affect TCE terms. These socio-cultural characteristics lead to the inconsistency of Vietnamese TCE terms. The chaotic situation also results from the long-lasting unplanned terminology management process without a systematic term creating procedures monitored by official functional agencies, and without the coordination of linguists, specialists, and experts from other concerning domains. TCE Prof. At the “Professional Workshop on Terms in Highway and Railway Engineering in Vietnam” organized on April 29th 2017, leading specialists considered the current terminology situation a chaos, which needs urgent actions of functional agencies in Transport Ministry, experts at the University of Transport and Communications, and concerning people. In order to solve the practical problems, TCE terminology research needs to be conducted; however, hardly has it ever been seen from the light of linguistics and terminology theories.

**2.4. Language planning-oriented terminology management**

Terminology planning is defined by Felber (1986: 10) as ‘‘measures to be taken with a view to develop coordinated terminological activities aiming at the preparation of terminologies”. Nedobity (1990:655) regards terminology planning as an integral part of special language planning: “In fact it is a part of language of science planning”. Guideline for terminology planning (2005: 8) describes terminology planning as an endeavor which “consciously and systematically develops special language according to the needs and requirements of domain communication”. The current study adopts this view on terminology planning because it is concerned with the needs of TCE term users (EMI students) and it manages TCE terminology consciously and systematically. The fact that language planning has not paid enough attentions to terminology is a prevalent view in developing countries as Fishman (1983) stated terms are treated as discrete units without relations, orders and patterns, or other facets of languages. Terminology planning in developing countries may be regarded as unsystematic and studying terminology from language planning perspective is almost an untouched area. Maurais (1983) assures in developed countries, terminology planning is a systematic activity in which subject-field experts or terminologists/linguists draw up a list of terms covering in principle a whole semantic field whereas in developing countries, literate amateurs coin words piecemeal, with no systematic attempt at covering a whole semantic field. Alberts (1999:19) argues that: ‘‘People of different nationalities and language groups should also be able to communicate effectively. It is therefore essential to document terminology in a systematic way.” The philosophy underlined any terminological endeavor, whether terms originate in a developed linguistic community or are created as equivalents in other parts of the world, is how to organize terms; therefore, terminology activity must be carried out systematically and terms should cover a conceptual field and related terms should be arranged as conceptual systems (Antia, 2000, Antia & Kamai, 2006). And most recently, Zarnikhi (2016) recommends terminology be embedded in a broader framework of the language of science planning and terminology planning is concerned with needs: “as a *corpus language planning* activity and with regard to practical discourse problems in science and technology, *terminology planning* deals with terms and their related issues mainly centralized to organizing terms, ranging from creating new terms to standardizing the existing ones, and to presenting them in the form of terminological products to the target users proportional to their sociolinguistic needs and aims, from stable linguistic situations to lesser used languages” (Zarnikhi, 2016: 12). Researchers have approached Terminology from two directions, namely *descriptively* and *prescriptively*. Specialist expert terminologists have the tendency to conduct *prescriptive* Terminology with the top-down approach whereas linguistic terminologists are more prone to *descriptive* Terminology with the bottom-up approach.

***2.4.1 Terminology studies based on Concept Theory***

To form analytical frameworks for terminology research, specialist experts following GTT employ Concept Theory with a top-down approach. Conceptual representation has grabbed attention of terminology researchers, among whom there are Antia (2000) and Faber (2012). The principled configuration of concepts is of prime importance, which facilitates the understanding and acquisition of specialized knowledge: “It goes without saying that knowledge of *conceptualization* processes as well as the organization of semantic information in the brain should underlie any theoretical assumptions concerning the retrieval and acquisition of specialized knowledge *concepts* as well as the design of specialized knowledge resources” (Faber 2010). Supporters of Concept Theory application insist that despite its acknowledged importance, conceptual organization does not seem to have an important role in the elaboration of terminological resources. There are not many conceptually organized specialized knowledge resources and the ones based on meaning solely contain *Type- of* relation. Most terminological resources available on the internet contain little or no information regarding the location of specialized knowledge concepts in larger knowledge configurations (Faber et al, 2006).

***2.4.2. Terminology studies based on Linguistic Theories***

Sociocognitive Terminology have combined Terminology and Linguistics making Terminology an interdiscipline. Researchers have employed various *Linguistic Theories* for terminological analysis, description, and presentation. Those theories include MTT, Semantic Roles, Functional Leximatic Modal, Frame Semantics and Generative Lexicon in Generative Grammar. Each theory has its own affordances and weaknesses, but they are closely related to, inherit from, and compensate for each other. The current study follows Sociocognitive Terminology and Lexical Semantic Teminology because it:

* *Investigates relationship between syntax and semantics.*
* *Changes the focus into ontology for conceptual representation and links ontology with multilingual terminological information.*
* *presents concepts multiple dimensionally because concepts are linked to one another by meaningful relationships*
* *Provides term bases that contain richer and more structured conceptual and linguistic components*

**2.5. Lexical Functions (LFs) in Meaning Text Theory (MTT) for developing the Analytical Framework for the current study**

Lexical Functions (LFs) in Meaning Text Theory (MTT) because they set the basic for establishing the Analytical Framework of the current doctoral thesis. MTT is a theoretical linguistic framework developed by [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk) & Žolkovskij (1970) and [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk) (1996) for the construction of models of natural language. It allows decomposing meanings into more fine-grained representation via *semantic paraphrasing*, which helps to deal with synonymy and translation equivalencies between languages. The theory provides a large and elaborate basis for linguistic description and can be applied to [computer applications](https://en.wikipedia.org/wiki/Natural_language_processing), including [machine translation](https://en.wikipedia.org/wiki/Machine_translation), [phraseology](https://en.wikipedia.org/wiki/Phraseology), and [lexicography](https://en.wikipedia.org/wiki/Lexicography). One important discovery of MTT was the recognition that LUs in a language can be related to one another in an abstract semantic sense and that this same relation also holds across many lexically unrelated pairs or sets of LUs. These relations are represented as **L**[**exical Functions**](https://en.wikipedia.org/wiki/Lexical_functions). The authors propose an inventory of more than 60 LFs that codify different types of *semantic* and *syntactic* relations and uses Saussure (1973)’s dichotomy to divide them into two types: ***paradigmatic*** lexical function relations and ***syntagmatic*** lexical function relations. According to Mel’cuk (1996:39): “A lexical function f is a correspondence that associates a given lexical expression L with a set of lexical items L1 which express specific meaning associated with f. This can be represented in the form of a formula f (L) = L1.”

***2.5.1. Paradigmatic lexical functions***

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*Paradigmatic* LFs deal with *selection*. They are aimed at answering the question: "*What do you call an object (a situation) X, related to Y while speaking of X rather than of Y?”* They associate with a key word a set of lexical items that share a non-trivial semantic component and include all *contrast* and *substitution* relations between lexical items in specific contexts (Faber & Uson, 1999:12). Various classifications for *paradigmatic* LFs or RLs have been proposed. One of the most coherent and comprehensive proposals is that of Raomos et al (1995:353), who have presented paradigmatic LFs in the Figure 2.3. Paradigmatic LFs by Raomos et al (1995)

**- Paradigmatic LFs based on *sense relations*** include four major types: *Hyponymy* (Type-of = Gener), *Meronymy* (Part-of, which is not included in Raomos et al (1995:353)’s typology), *Synonymy* (Equivalent = Syn), *Apposition* (Anti, Conver, Contr).

**- Paradigmatic LFs based on *argument roles* (*semantic derivations or semantic roles*)**

**Actants of a predicate:** For the predicate *to teach* we have three kinds of LRs: **Si** is the standard name of the deep syntactic **actant** of L: **S1** (to teach) = agent role: teacher; **S2** (to teach) = patient role: subject matter; **S3** (to teach) = patient role: pupils.

**Adjectival roles: Ai** is the Adjectival role: Active adjectival **A1,** Passive adjectival **A2,** for example**: A1** (look for) = in search; **A2** (build) = under construction.

**Circumstantial roles:** The group of ***circumstantial roles*** that may enter a lexical function relation with a lexical unit that denotes a predicate consists of the following roles and lexical functions:

|  |  |
| --- | --- |
| **Location: Sloc** *(to lecture) = lecture room*  **Mean: Smed** *(to teach) = teaching materials* | **Mode: Smod** *(to teach) = method of teaching*  **Instrument: Sinstr** *(to plane) = plane*  **Result: Sres** *(learn): skills* |

**- Paradigmatic lexical relations based on *syntactic derivations:*** The third group by Warner (1996) is similar to Raomos et al (1995:353)’s *syntactic derivations* typology. In Cowie (1998), Mel’cuk’s LFs are categorized into 10 main groups, one of which is derivatives sub-divided into *syntactic derivatives* and *semantic derivatives*. Cowie (1998)’s *syntactic derivatives* category coincides with Warner (1996)’s *syntactic derivations*. Thus, three authors have the similar category of ***syntactic derivations*** that consists of the same LFs of Mel’cuk (1981) presented in the following table: Paradigmatic lexical relations based on *syntactic derivations.*

|  |  |  |
| --- | --- | --- |
| **LFs** | **Definition/explanation** | **Examples** |
| LF.**Vo** (verb derivation/ verbalization) | Relations that hold between nouns,  adjective, adverbs and their *verbal derivatives.* | LF.**Vo** (avoidance) = avoid LF.  **Vo** (decisively) = decide |
| LF. **So** (noun derivation/nominalization) | Relations that hold between verbs,  adjectives, adverbs and their nominal derivatives. | LF.**So** (move) = movement, LF.  **So** (brave) = bravery |
| LF. **Ao** (adjective derivation/adjectivization) | Relations that hold between nouns, verbs, adverbs and their adjectival derivatives. | LF. **Ao** (In the middle of) = middle LF. **Ao** (glance) = glancing |
| LF. **Advo** (adverb  derivation/adverbialization) | Relations that hold between nouns, verbs,  adjectives and their adverbial derivatives. | LF. **Advo** (walk) = on foot  LF. **Advo** (good) = well |

### 2.5.2. Syntagmatic Lexical Functions

In the current study, Melcuk (1996)’s typology of *syntagmatic* LFs is used to form the Analytical Framework. *Syntagmatic* LFs are concerned with ***collocations****,* which formalize a semantic relation between two lexemes L1 and L2, which is instantiated in the textual string in a non-predictable way. Such a relation is non- predictable when the co-occurrence of one cannot be derived from the *semantic* selection restrictions of the other, but rather must be learnt as an instantiation of a specific syntagmatic relation. *Syntagmatic* LFs will be combined with *paradigmatic* LFs to form the basis for the Analytical Framework for discovering both *paradigmatic* and *syntagmatic* relations of HBD terms.

### Preposition + Noun

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| **Loc in:** position (*at a height*)  **Loc ab:** moving away (*from a height*) | **Loc ad:** moving towards (*to a height*)  **Instr:** with the meaning of instrumentality (*with a pistol*) |

**Modifiers**

**Magn:** to a (very) high degree, intense(ly)

|  |  |
| --- | --- |
| **Magn** *(naked) = stark*  **Magn** *(laugh) = heartily, one’ head off* | **Magn** *(patience) = infinite*  **Magn** *(skinny) = as a rake* |

**Plus/Minus:** More or less to a greater/ lesser extent than something else.

**Ver:** real, genuine = as it should be, meeting intended requirements.

|  |  |
| --- | --- |
| **Ver** *(surprise) = sincere, genuine;*  **Ver** *(punishment) = well-deserved* | **Ver** *(instrument) = precise*  **Ver** *(walk) = steadily;* **Ver** *(sleep) = restful* |

**Bon:** good

|  |  |  |
| --- | --- | --- |
| **Bon** *(cut) = neatly, cleanly*  **Bon** *(proposal) = tempting* | **Bon** *(service) = first-class*  **Bon** *(assistance) = invaluable* | **Bon** *(contribution) = valuable*  **Bon** *(meal) = exquisite* |

### Verbal functions

**Real 1, 2** takes L (key word NOUN) as its **Dsynt actant II,** for example:

|  |  |
| --- | --- |
| **Real 1** *(a bus) = to drive*, like in *He drives* ***a bus.*** | **Real 2** *(a bus) = to ride on*, like in *She rides on a bus.* |

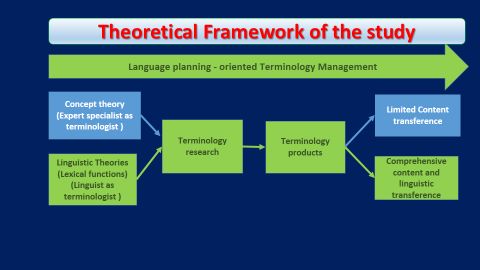
**Fact 0, 1, 2** takes L (key word noun) as its **Dsynt actant I**, For example:

|  |  |
| --- | --- |
| **Fact 0** *(hope) = to come true*, like in *The hope comes true.*  **Fact 1** *(experiment) = to work out*, like in *The experiment works out for someone.* | **Fact 2** *(ship) = to transport*, like in *The ship transports passengers.* |

**2.6. Theoretical Framework**

**Table 2.16:** The Theoretical Framework of the current study as compared with that of General Terminology

|  |  |  |
| --- | --- | --- |
|  | **Traditional studies** | **The current study** |
| **Terminology Schools** | General Terminology | Sociocognitive Terminology based on Lexical Semantics |
| **Approaches** | Top-down based on terminologists’  institution and experiences | Bottom-up based on text- analysis  and students’ needs |
| **Types of terminology**  **management** | Prescriptive | Descriptive |
| **Researchers** | Terminologists as expert specialists | Terminologists as linguists |
| **Analytical Framework** | Concept Theory | Linguistic theories: Lexical  Functions in Meaning Text Theory |
| **Types of relations studied and presented** | Only hierarchical relation of Type-of and Part-of  Only Paradigmatic relations  One-dimensionality | Both hierarchical relation and non- hierarchical relations  Both paradigmatic and syntagmatic relations  Multidimensionality |
| **Term products** | *Onomasiologically* organized lexemes presented in the form of tree-formats, graphics, diagrams. | *Onomasiologically*  organized lexemes presented in the computer environment. |



Chapter II has presented the topics and concepts related to the current research, which are Terminology, Language Planning, Language Planning - Oriented Terminology Management, Concept and Semantic Theories in Terminology. It has also critically reviewed international and domestic terminological works. This is a language planning - oriented terminological research aiming at solving practical discourse problems of term users, who are EMI TCE students. The study lies in the scope of *corpus* planning centralized on analyzing, categorizing, and presenting terms in the form of *onomasiologically* organized lexemes. While previous studies lie in the scope of *prescriptive* Terminology focusing on term standardization, this belongs to *descriptive* Terminology for *pedagogical* purposes. The study follows a totally different approach of knowledge - based and lexicon - based term management: analyzing and presenting TCE terms based on *lexical relations* and *students’ needs*. Most previous studies in Vietnam analyze *structural forms* of terms based on Denoninalisation Theory and Componential Analysis Theory and treat terms as discrete units, which stands apart from term contents and term systems. This study locates itself in Sociocognitive- based Terminology with a view that a term resource should reflect the *ontology* of the domain with term relations. Thus, the products of term research enable term users to get access to both specialized and linguistic knowledge more quickly and easily than in the case of traditional alphabetical dictionary (semasiological dictionaries). This is one of the very few terminological studies that is based on Linguistic Theories making Terminology and Linguistics merge with each other. By principally applying MTT’s LFs as the Analytical Framework, which include both *paradigmatic* and *syntagmatic* term relations, terms are analyzed not only from *conceptual* perspective but also from *linguistic* perspective solving both problems of term substitutions and collocations.

**CHAPTER III: METHODOLOGY**

**3.1. Context of the study**

EMI training has been conducted in the TCE field since 1999 because the growing needs for TCE engineers to be able to communicate in English. Learning content subjects in English poses many problems for EMI students as presented in details in the Introduction Chapter. The students really need richer term resources than the simple lists of terms as discrete units composed by TCE lectures without any linguistic information and content knowledge. Literature in Terminology has also proved that the language planning - oriented terminology management approach brings about a large number of affordances for term users in both disciplinary and linguistic knowledge. Therefore, the PhD candidate was strongly motivated to carry out the research whose results are expected to be generalized to other domains in TCE as well as other disciplines. In this study, we appled the bottom- up terminology planning approach investigating not only *Lexical Relations* from the usage contexts but also term users’ needs, problems and expectations form content and language perspective to recommend an alternative framework of TCE term management.

**3.2. Research design**

Table 3.1: Ontological and epistemological assumptions of the current study

|  |  |  |
| --- | --- | --- |
|  | **What the researcher of the**  **current study IS NOT inclined to** | **What the researcher of the**  **current study IS inclined to** |
| **Ontology** | Objectivism | Constructivism |
| **Epistemology** | Positivism | Interpretivism |
| **Reality** | External, stable, ordered, patterned, pre-existing | Internal, fluid, socially constructed,multiple, emerging |
| **Knowledge** | Objective, measurable, value-free,  universal, decontextualized | Subjective, indeterminate, value-rich,  particular, contextualized |
| **Aim** | Explanation, prediction, control | Description, understanding, empathy |
| **Researcher** | Disinterested scientist | Participant-interpreter, text data interpreter |

Table 3.2: The relationship between philosophical assumptions and methodology of the study

|  |  |  |
| --- | --- | --- |
| **Philosophical assumptions** | | |
| **Ontology** | **Epistemology** | **Axiology** |
| There are multiple realities | There is a close interaction between the | The context of |
| which is socially constructed. | knower and the known and between the | EMI teaching and |
| This is true to the phase of | researcher and the data source. As a | learning, values, |
| attitudinal survey of EMI | teacher in the field of TCE ESP, to some | beliefs, and |
| students. The participants | extent, the researcher will influence how | backgrounds of |
| with different assumptions  and backgrounds will contribute to the multiple realities, each of which is subjective. In addition, in the phase of text analysis, the researcher plays a prominent role in collecting, analyzing, and interpreting lexical relations of terms in the  bridge design event. | participants answer the survey questionnaire about the issue of TCE terminology planning. The interpretation of typical TCE lexical relations are also guided by the researcher’s backgrounds, experiences, beliefs, and values, so she is an instrument for collecting information. The PHD candidate also interacts with TCE expert specialists in the phase of triangulation. | both the PHD candidate and participants will influence actions taken and  research results. |

**3.3. Research methods**

Table 3.4: Essential elements of the methodology

|  |  |  |  |
| --- | --- | --- | --- |
| **Research Questions** | **Data needed** | **Data collection** | **Data analysis** |
| *1. What are the Paradigmatic and Syntagmatic Lexical Relations in Highway Bridge Design terminology and their multidimensional relationships in*  *the term system?* | Term relations in the textbook of Highway Bridge Design | Extracting terms, identifying LRs and coding | Classical Content  analysis, counting numbers |
| *2. What are the perceptions of EMI students’ in TCE of the language- planning oriented terminology management (knowledge-based) approach?* | Responses from EMI EVRB  students as regards term resources and term support: evaluations, requirements and expectations | Likert-type item Questionnaire | Descriptive statistics Content analysis |
| *3. How can knowledge - based TCE term resources be presented based on Paradigmatic and Syntagmatic Lexical Relations and students’ perceptions to facilitate content and linguistic acquisition of individual subjects?* | Term relations in the textbook of Highway Bridge Design  Responses from EMI EVRB  students as regards term resources and term support: evaluations, requirements and  expectations | Extracting terms, identifying LRs and coding  Likert-type item Questionnaire | Classical Content  analysis, counting numbers  Descriptive statistics Content analysis |

This case-study research involves an in-depth study of a rare phenomenon of TCE terminology planning by investigating Lexical Relations in the textbook of Highway Bridge Design Event. It also investigates the opinions of EMI students in TCE about terminology support for studying specialized subjects in English and Vietnamese. The study is an interdisciplinary study concerning EMI terminology practice in TCE, applying ***Lexical Relations*** in analyzing and describing terms. It involves both text analysis and attitudinal survey of EMI student participants. The researcher applies a variety of methodologies and relies on a variety of sources to investigate the research problem of TCE terminology planning.

**3.3.1. HBD Lexical Relation investigation**

The dominant part of the study is centered on text analysis for term identification and categorization based on *Lexical Relations*. It involves the identification and extraction of Highway Bridge Design terms including single-unit and multi-unit terms with their *paradigmatic* and *syntagmatic* lexical relations in a textbook concerning one Event of Highway Bridge Design. With the current method of studying, term relations in the usage context in the specialized event of Highway Bridge Design are identified and categorized based on *paradigmatic* and *syntagmatic* ***lexical relations***, so the multidimensionality of term system is captured. The resulting term products are ontologically organized terms reflecting term relations for disciplinary and linguistic knowledge acquisition (knowledge-based term products). This approach sets the foundation for knowledge- based terminology in TCE. The challenging requirements is that the researcher must be able to identify and categorize the *Lexical Relations* based on the context combined with her specialized and linguistic knowledge. The participation and triangulation of specialist experts are required to validate translation, lexical relations and findings.

**3.3.2. Survey questionnaire to EVRB EMI students**

Apart from the Lexical Relation analysis, the study applied survey method, in which the EMI students in TCE answered questions about TCE term support for studying specialized subjects. This was administered via a questionnaire. The survey used probability sampling and standardized questionnaire design to measure the opinions, attitudes and needs of the EMI student population to seek the answers to the 2nd and 3rd research questions. The questionnaire was sent to 265 participants via the Internet after the pilot survey. To ensure the reliability and validity of the study, the questions were divided into *groups of information* and based on the *typical lexical relations* in HBD event identified in the pilot study. The linguistic terms are difficult for technical students to comprehend, so they were exemplified by lexical relations in HBD event. The combination of questionnaire survey and lexical relation analysis endows the current study with mixed-method nature, which is a flexible approach where the research design is determined by what we want to find out from the data rather than by any predetermined hypothesis or assumption.

**3.3.3. Triangulation with TCE experts**

A group of 6 TCE specialized subject teachers and engineers (a Professor and a Doctor in Bridge Design, a Professor in Structural Mechanics, a Professor in Highway Design, an engineer in Bridge Construction, and an engineer in Bridge Design) were invited as consultants on Lexical Relation extraction, translation and categorization in Highway Bridge Design terminology. These experts consulted on the meanings of concepts if the PHD candidate could not be sure based on the usage context and her specialized knowledge. The lexical relations were checked by the group of consultants. More importantly, these specialist experts gave comments on term translation and categorization. And finally recommendations for the organization and presentation of TCE term resources were advised upon by the same subject specialist group. In fact, the triangulation went through the research.

**3.4. Research participants and text data source**

**TCE EMI student participants:** The participants of the study include 265 undergraduate and graduate English- Vietnamese Road and Bridge students at the International Education Department (INED) of the UTC. The research participants still had a clear memory of experiences in learning specialized subjects at English. This is a cross sectional design, so the time factor was not taken into account. Having experiences in learning specialized subjects in English at the UTC, they were aware of their difficulties, needs and expectations. The students came from different regions of Vietnam, all of whom did not take English as the university entrance exam subject. Although English proficiency of these students were not equal, they must have achieved B2 level by the end of the second year as required by the Curriculum at the UTC. From the first term of the third year, they had to achieve B2 level to study specialized subjects in English. The 265 participants, who met the requirements of the research, were asked to answer a survey questionnaire about the available term resources, their difficulties, needs and expectations as regards specialized knowledge and English-Vietnamese terminology based on typical *Lexical Relations*.

**TCE expert participants:** In another development, a group of six specialist experts in TCE participated in the study for consultation on term extraction, translation and categorization of terms based on lexical relations. They also provided information as regards the available term resources, students’ difficulties, needs and expectations. And finally they gave ideas on the presentation patterns of the knowledge-based term products based on *Lexical Relations*. The triangulation of the specialists experts throughout the course of the research strengthened the trustworthiness of the doctoral thesis.

### TCT text as data source: The textbook *Design of Highway Bridges*, Second Edition (Richard & Jay, 2006) is the up-to-date instruction to the applications of theories and specifications to Highway Bridge Design. It consists of detailed coverage of engineering principles for the design of short-span and medium-span bridges. The book is written based on the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications. The textbook is a reliable Bridge Engineering document.

**3.5. Procedures for data collection, coding and analysis**

***3.5.1. Text analysis: Lexical relations in HBD Event***

**Step 1:** **Coarse term extraction**. In this preliminary phase of term extraction, coding have not been done, so once terms were spotted, they were highlighted in colors for extraction. All the single- unit terms, multi-unit terms (phrases), clauses, sentences and larger text sections that include terms and term relations were extracted.

**Step 2:** **Fine term extraction**. In this step, single-unit and multi-unit terms in each Chapter of the textbook that were identified in the first step are listed in a *Word* table. Moreover, the terms in the clauses, sentences, and paragraphs were refined leaving out the general words that did not contain Lexical Relations. These terms were extracted to put in the *Word* table, as well. Although LRs were not exhaustively and clearly identified in this step, the candidate roughly thought about them for the next more challenging step of coding. She must bear in mind that terms do not always exist apparently in the text-book. In fact, many more terms and LRs were established based on the context, specialized and linguistic knowledge.

**Step 3:** **Coding terms based on lexical relations and translation**. After the BE terms had been extracted and arranged in the alphabetical order, they were *coded* based on the LRs in Table 3.11: Analytical Framework for HBD Lexical Relation investigation. This is the most challenging phase because whether the relations are identified sufficiently and precisely depends on many factors. The terms are linked with one another in *Lexical Relations*. In many cases the LRs do not appear apparently in the passage; however, based on the candidate’s disciplinary and linguistic knowledge combined with the information of the context, LRs become transparent. First, LRs emerged from the context tightened to the knowledge of the topic under discussion, thus the *Chapter Title* and *titles of text sections* are of prime importance. The LRs were identified by referring back to the context of the paragraph, section, and Chapter. The interrelated pieces of knowledge are expressed by language means including terms, general vocabulary, grammar, linking elements, etc. One term is related to various terms in different ways. A *cause* can lead to many effects, and vice versa. A lot of useful pieces of specialized knowledge are extracted from the textbook. It is valuable stuff for composing knowledge-based term resources. Lexical Relation coding not only depends on the context but also on the knowledge of the researcher. Any ambiguity must be clarified by consulting TCE experts.

### Step 4: Categorising and analyzing lexical relations of each Chapter. In step 4, the terms were transferred to *Excel* tables for the purpose of grouping. First, the same coding number was put together. On the other hand, in column 4, the terms were simultaneously arranged based on the initial alphabetical letter of terms: *bridge, bridge deck, bridge construction, bridge design*. Thus, we could interpret what affects *bridge, bridge deck, bridge construction*, *bridge design*, etc. Initially, terms in one Chapter were put together and analyzed because the relations are related to the content knowledge of the Chapter and the topic under discussion. Later on, the grouping and analysis of LRs were carried out in the whole textbook.

### Step 5: Categorizing and analyzing Lexical Relations of 6 chapters. The broadest picture of LRs in HBD was sketched when the largest possible number of example relations had been obtained. Although the LRs in each chapter were already grouped and analyzed in step 4, in step 5, the relations of each type in the six chapters were gathered for further categorization and analysis. The terms with the same coding numbers were copied into one Excel file, and the corresponding term 2 were arranged in the alphabetical order again, which formed sub-groups for detailed analysis. Altogether, there are 32 Excel files that are classified as Paradigmatic relations and Syntagmatic relations as follows.

### Step 6: Triangulation with experts in respects of LR extraction, categorization and translation. The term extraction, translations and Lexical Relations together with the findings and discussion were sent to TCE experts in early June, 2021. Six experts in the field participated in the triangulation step. The experts in the specialized fields read through the term relation categorization, translation, research findings and discussion and gave comments. The corrections were reconsidered and synthesized before adjustments are made to the final version.

***3.5.2. Questionnaire survey: EVRB EMI students’ opinions***

The statements (items) are in the questionnaire are grouped into 4 categories:

1. Personal information as regards content background knowledge, English competence, and expectation when the students started learning disciplinary subjects in English at university (5 items).
2. The students’ needs for *knowledge-based* term resources for individual disciplinary subjects in respects of disciplinary and linguistic knowledge transference (11 items).
3. The extent that the available term resources satisfy students’ needs for *disciplinary* and *linguistic knowledge* acquisition of *individual* content subjects (14 items).
4. The Lexical Relations that should be presented in the term resources including *Paradigmatic* Lexical Relations (13 items) and *Syntagmatic* Lexical Relations (6 items). The LRs are compatible to the Taxonomy of LRs in **Figure 3.4**.

Technical students might find it difficult to understand terms in linguistic field due to their limited knowledge of English Linguistics, so the survey questionnaire was written in Vietnamese and the language was simplified. Thus, the students could understand each item and the purpose of the overall organization of information. The questionnaire was delivered to 10 randomly selected students in a pilot study to see if the language is easy to understand and whether the questions were arranged in a logical pattern. Then, it was modified and administered to 265 EMI students majoring on Road and Bridge Engineering. They acquired B2 English level by the end of the second year and learnt specialized subjects in English. Many of them were still studying at the UTC and the others are graduates who could clearly remember their experiences concerning terminology practice during learning. This is cross-sectional research without taking into the time element.

### How to administer the questionnaires

A *Consent form* was sent to each of the respondents. The purpose of investigation was clearly explained at the beginning of the questionnaire, which was administered to 265 EMI students with the *sampling technique* described in section 3.5.3. The questionnaire was sent to undergraduate and graduate RBVE EMI students on August 22nd 2020 two links:

[https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajB](https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajBLZtrQAAAAAAAAAAAAN__irvd2RUNlhSOFpYVTdUTDRQR1dCWlU4STJTMUxFUC4u) [LZtrQAAAAAAAAAAAAN irvd2RUNlhSOFpYVTdUTDRQR1dCWlU4S](https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajBLZtrQAAAAAAAAAAAAN__irvd2RUNlhSOFpYVTdUTDRQR1dCWlU4STJTMUxFUC4u) [TJTMUxFUC4u](https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajBLZtrQAAAAAAAAAAAAN__irvd2RUNlhSOFpYVTdUTDRQR1dCWlU4STJTMUxFUC4u) (200 forms)

[https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajB](https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajBLZtrQAAAAAAAAAAAAN__irvd2RUMUM4MEVINk9DSkVKNlNXMUcxTkZCT0JGTi4u) [LZtrQAAAAAAAAAAAAN irvd2RUMUM4MEVINk9DSkVKNlNXMUcx](https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajBLZtrQAAAAAAAAAAAAN__irvd2RUMUM4MEVINk9DSkVKNlNXMUcxTkZCT0JGTi4u) [TkZCT0JGTi4u](https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWdsW0yxEjajBLZtrQAAAAAAAAAAAAN__irvd2RUMUM4MEVINk9DSkVKNlNXMUcxTkZCT0JGTi4u) (65 forms)

The results were collected on 29 August 2020 when 265 participants had responded. The questionnaire is presented in **APPENDIX III**.

### Tools for analysis: descriptive statistics

The descriptive statistics used for the questionnaire survey data analysis include a *mode or median* for *central tendency* and *frequencies* for *variability*. The best way to display the distribution of responses (the percentage that agree, and the percentage that disagree, etc.) is to use a bar chart. The tools for data analysis were Excel 2016 and SPSS Software 26.0. No additional analysis procedures such as the chi-square or t-test were conducted due to the limited scope and resources for the current study. The data was analyzed to find out the students’ opinions about the term resources, their attitudes, and needs for term supports during EMI training. The data was analyzed in references to the *typical Paradigmatic and Syntagmatic Lexical Relations*, which had been discovered from the text analysis phase. Paradigmatic relations are for both disciplinary and linguistic transference while Syntagmatic relations, which are institutionalized, play an important role in English language acquisition.

**3.6. Analytical Framework for Lexical Relation analysis and questionnaire survey**

The Analytical Framework is presented in details with definitions and examples in **Table 3.13** The LRs are grouped into two major categories of *paradigmatic* and *syntagmatic* relations, each of which is further divided into sub-categories following Raomos et al (1995) and Mel’cuk (1996) LFs. New relations are added with simplification and modification to be suitable for TCE term analysis applying Lexical Semantics (knowledge-based approach with conceptual relations combined with Lexical Semantics approach with other kinds of relations). In the table below, the explanation and examples, most of which are in Transport Construction Engineering terminology, are provided so that the lexical relations are more easily accessed by TCE EMI students whose major is not linguistics.

In this Chapter, efforts have been devoted the methodological justification and presentation of essential components of a clear design of the study. To realize the overall purpose of the research by answering 5 research questions, methods for investigation including term relation analysis, questionnaire survey and expert triangulation were applied. The three methods of investigation are systematically interrelated based on the predominant assumption that TCE terminology planning can be approached following a different framework resulting in term products that can facilitate disciplinary and linguistic transference and acquisition. The methodological choices are clearly justified in connection with the philosophical assumptions of the research paradigm. The methodology is complicated due to the interdisciplinary nature of the research. The Analytical Framework with both Paradigmatic and Syntagmatic Lexical Relations enabled the researcher to go deep into the content of the TCE term system. The results of the questionnaire survey and triangulation with specialist experts provided at-breadth and in-depth understanding of TCE EMI students’ opinions, attitudes, and needs. The research population and participants and data collection procedure and analysis have been described in details. In addition, expert specialists’ consultation, opinions, and triangulation support the disciplinary aspect, and therefore contribute to the trustworthiness of the research’s findings and recommendations. The measures taken to minimize the limitations of the study have been mentioned**.** Finally, the trustworthiness for quality insurance of the research is confirmed with clear explanation of the four components of credibility, transferability, dependability, and confirmability.

**CHAPTER IV**

# PARADIGMATIC LEXICAL RELATIONS IN HIGHWAY BRIDGE DESIGN EVENT

The thesis is aimed at seeking answers to the overarching research question: *How can bilingual English-Vietnamese TCE terms be planned based on Lexical Relations to optimally mediate both the content (disciplinary knowledge) and linguistic dimensions and maximize its usefulness to the EMI students?* To form the basis for answering the over arching question, it is essential to identify the *LRs* in HBD event, which is prominent in TCE and their degree of popularity. In addition, the internal relationships in each relation type and the multi-relational relationships of the terms must be analyzed from meaning perspective. This Chapter addresses sub-research question one: *What are the Paradigmatic and Syntagmatic Lexical Relations in Highway Bridge Design terminology and how can they be further categorized to see the multidimensional relationships in the term system?* The results of research question one is combined with the students’ opinions in research question two to address the third research question concerning the presentation pattern of TCE term products to support EMI students: *How can knowledge - based bilingual TCE term resources be presented based on Paradigmatic and Syntagmatic Lexical Relations and students’ perceptions to facilitate content and linguistic acquisition of individual subjects*?

### 4.1. The HBD Lexical Relations

**Table 4.3** presents the LRs in HBD terminology. Horizontally, the numbers illustrate its status corresponding to the two major categories of P*aradigmatic* and S*yntagmatic Relations* with their sub-categories while vertically, the numbers correspond to the Chapter of the textbook they belong to. For the most part, the larger number indicates the higher status of popularity. However, if a specific relation continually appeared throughout the text-book, it is considered popular even though the number of example relations is small because similar ones have been deleted from the list. The author presents the number of relations of each type in individual Chapter before mixing them up to be representative of the whole event. This is necessary because the types of LRs are related to the specialized knowledge in the chapter. What types of LRs are dominant in each chapter are also presented in the table. This is very useful for further analysis because each Chapter is considered a subevent of the whole specialized event of Highway Bridge Design. In addition, it is essential to discuss the meanings of relations in relationship with the topics of specialized knowledge. To make the data objective and representative, it must be thick enough to cover the whole Event, so LRs in 6 chapters are studied. Also, to avoid significant change of the initial Analytical Framework, the data for the pilot study must also be representative. The results of the pilot study are combined with references to other previous studies for the formation of the Analytical Framework. Summing up the numbers of LRs in the terminology of six Chapters, we got 8,408 relations. Once the similar terms were deleted, the total number of terms with their relations are 8,246.Each Chapter of the textbook *Design of Highway Bridge* is concerned with a sub-event or topic of the Bridge Design Event. Although a pilot survey was conducted to develop the Analytical Framework, LRs continued to disappear and emerge throughout the term extraction and coding process, so their status of popularity was finally justified at the end of the analysis. Another point worth highlighting is that due to the qualitative nature of the text analysis phase, small numbers sometimes bear significant meanings because they are repeatedly employed. For example, the syntagmatic LR Loc Instr has only 8 relations, but it repeatedly appears in the text and has a close relationship with its Paradigmatic partner Means - of and Instrument - of, which are very important, so LR Loc Instr possesses the status of popularity. Some LRs are added to its corresponding categories, namely Loc Over, Action-of whereas LRs, Goal-of, Causative, Involve, Fact 0, Benefactory are dismissed with no further discussions because they almost disappeared in the last Chapters of the textbook. The coding number is consistent from the beginning to the end, so it has become part of the fixed name of each LR. Table 4.3 illustrates the broad picture of from popularity perspective. The LRs are listed in order of popularity, which, to a very large extent, reflects the status of typicality of each LRs in HBD terminology. Traditional terminologists invest great efforts in the hierarchical relations of 1. Type-of and 2. Part-of because they are absolutely popular and HBD terminology is not an exception with 1228 and 833 relations ranking the first and second positions. Much less effort is devoted to many other kinds of relations like the current research. Detailed discussion of each type will be presented later in this Chapter. 25. Loc Instr has a smallest number of combinational patterns but they are repeatedly used in the textbook, so it is considered to be typical.**Table 4.3:** Number of LRs in the subcategories of *Paradigmatic* and *Syntagmatic* LRs in each chapter.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **N0** | **Lexical relations** | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **N0 of relations** |
| 1 | 1. Type-of | 144 | 327 | 155 | 193 | 51 | 358 | 1228 |
| 2 | 2. Part - of | 179 | 219 | 64 | 109 | 17 | 245 | 833 |
| 3 | 13. Associative  relations | 51 | 143 | 120 | 108 | 83 | 207 | 712 |
| 4 | 11. Attribute-of | 74 | 141 | 116 | 25 | 34 | 305 | 695 |
| 5 | 15. Affect | 56 | 49 | 46 | 133 | 41 | 161 | 486 |
| 6 | 33. Means-of | 22 | 13 | 94 | 39 | 56 | 184 | 408 |
| 7 | 7. Result-of | 51 | 30 | 44 | 26 | 38 | 187 | 376 |
| 8 | 29.Approach/Method-of | 23 | 22 | 66 | 25 | 40 | 184 | 360 |
| 9 | 10. Nominalization | 85 | 78 | 44 | 21 | 33 | 69 | 330 |
| 10 | 6. Patient-of | 29 | 36 | 14 | 31 | 50 | 158 | 318 |
| 11 | 42. Action -of | 12 | 28 | 18 | 28 | 28 | 176 | 290 |
| 12 | 22. Loc in | 44 | 39 | 22 | 36 | 28 | 116 | 285 |
| 13 | 17. Qualifier | 42 | 54 | 45 | 40 | 16 | 84 | 281 |
| 14 | 8. Location-of | 51 | 38 | 8 | 13 | 28 | 128 | 266 |
| 15 | 4. Synonyms | 20 | 30 | 24 | 15 | 17 | 111 | 217 |
| 16 | 5. Agent-of | 29 | 36 | 22 | 11 | 12 | 84 | 194 |
| 17 | 14. Cause-of | 21 | 6 | 5 | 6 | 13 | 101 | 152 |
| 18 | 16. Quantifier | 49 | 19 | 16 | 11 | 6 | 31 | 132 |
| 19 | 31. Real 1 | 4 | 14 | 13 | 12 | 8 | 68 | 119 |
| 20 | 3. Made - of | 50 | 33 | 12 | 3 | 0 | 20 | 118 |
| 21 | 19. Fact 2 | 51 | 39 | 1 | 2 | 2 | 17 | 112 |
| 22 | 32. Opposite-of | 2 | 5 | 3 | 4 | 12 | 39 | 65 |
| 23 | 27. Loc through | 4 | 5 | 0 | 2 | 10 | 39 | 60 |
| 24 | 23. Loc ad | 12 | 5 | 0 | 14 | 0 | 17 | 48 |
| 25 | 35. Real 2 | 8 | 4 | 0 | 6 | 0 | 14 | 32 |
| 26 | 36. Loc over/across | 13 | 8 | 3 | 1 | 1 | 3 | 29 |
| 27 | 9. Instrument-of | 6 | 21 | 0 | 0 | 0 | 0 | 27 |
| 28 | 12. Organization-of | 16 | 4 | 0 | 3 | 1 | 0 | 24 |
| 29 | 26. Propt | 2 | 0 | 3 | 2 | 0 | 12 | 19 |
| 30 | 30. Phase-of | 5 | 2 | 5 | 0 | 1 | 1 | 14 |
| 31 | 24. Loc ab | 4 | 0 | 0 | 1 | 0 | 3 | **8** |
| 32 | 25. Instr | 5 | 0 | 0 | 0 | 0 | 3 | **8** |
|  | **Total** | 1164 | 1448 | 963 | 920 | 626 | 3125 | **8,246** |

The total number of *Paradigmatic* LRs far outweighs its *Syntagmatic* counterparts: 6737 as compared with 1509. This is easy to understand as collocational patterns occurs less frequently than content relation patterns; however, this is a big challenge for TCE EMI students whose English level is modest and they desperately need language supports. As for the *Paradigmatic* type, the first four groups (1.1. Meronymy (Partitive), 1.2. Substitutive Lexical Relations 1.3. Typical category for Actants 1.4. Typical Nouns for Adverbials) consist of several sub-types and had the bigger number of Lexical Relations. The second 4 groups (1.5. Syntactic derivations, 1.6. Attribute-of, 1.7. Associative relations, 1.8. Action -of), each of which has only one type of LR of course contain fewer number of LRs. The *syntagmatic* relations has three sub-groups, each of which has two or more specific relations. Although Syntagmatic relations occupy about one-fourth of its Paradigmatic counterpart, they play a very important roles in language transference and need investigation for term supports. In-depth discussion of each type of LR and their sub-categories will be presented in the next section.

**4.2. Categorization of Paradigmatic LRs from meaning perspective**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **N0** | **Paradigmatic LRs** | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **N0 of LRs** |
| 1 | 1. Type-of | 144 | 327 | 155 | 193 | 51 | 358 | 1228 |
| 2 | 2. Part - of | 179 | 219 | 64 | 109 | 17 | 245 | 833 |
| 3 | 13.Associative | 51 | 143 | 120 | 108 | 83 | 207 | 712 |
| 4 | 11. Attribute-of | 74 | 141 | 116 | 25 | 34 | 305 | 695 |
| 5 | 15. Affect | 56 | 49 | 46 | 133 | 41 | 161 | 486 |
| 6 | 33. Means-of | 22 | 13 | 94 | 39 | 56 | 184 | 408 |
| 7 | 29. Approach/Method-of | 23 | 22 | 66 | 25 | 40 | 184 | 360 |
| 8 | 10. Nominalization | 85 | 78 | 44 | 21 | 33 | 69 | 330 |
| 9 | 6. Patient-of | 29 | 36 | 14 | 31 | 50 | 158 | 318 |
| 10 | 42. Action -of | 12 | 28 | 18 | 28 | 28 | 176 | 290 |
| 11 | 8. Location-of | 51 | 38 | 8 | 13 | 28 | 128 | 266 |
| 12 | 4. Synonyms | 20 | 30 | 24 | 15 | 17 | 111 | 217 |
| 13 | 5. Agent-of | 29 | 36 | 22 | 11 | 12 | 84 | 194 |
| 14 | 14. Cause-of | 21 | 6 | 5 | 6 | 13 | 101 | 152 |
| 15 | 3. Made - of | 50 | 33 | 12 | 3 | 0 | 20 | 118 |
| 16 | 32. Opposite-of | 2 | 5 | 3 | 4 | 12 | 39 | 65 |
| 17 | 9. Instrument-of | 6 | 21 | 0 | 0 | 0 | 0 | 27 |
| 18 | 12. Organization-of | 16 | 4 | 0 | 3 | 1 | 0 | 24 |
| 19 | 30. Phase-of | 5 | 2 | 5 | 0 | 1 | 1 | 14 |
|  | **Total** | 875 | 1231 | 816 | 767 | 517 | 2531 | **6,737** |

There are 6,737 paradigmatic LRs, which make up fourth fifth of the total 8,246 relations. Traditionally terminologists focused on the two major Paradigmatic LRs of **1. Type-of** and **2. Part-of**. Very little effort have been invested in the remaining types of Paradigmatic relation in terminology. **7. Result-of** (**LF Sres**) relation is categorized as Paradigmatic by other authors (Mel’cook and Faber). However, the results of investigation in TCE terminology reveals that “**7. Result-of**” is closely related to collocation and should be moved to the Syntagmatic type.

**Table 4.5:** Paradigmatic Lexical Relations

### Meronymy (Partitive) lexical relations: In this group of lexical relations, 1. Part-of has the largest number while 3. Made-of ranks the second. 30. Phase-of has 14 examples but they are not used repeatedly, so it is not considered a typical type and no further discussion is made.

**Table 4.6:** Meronymy (Partitive) Lexical Relations

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **STT** | **Groups of LRs** | **Coding N0** | **Term relations** | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **Total N0 of**  **LRs** |
| 1 | **1.1.**  **Meronymy (Partitive)** | 2 | Part - of | 179 | 219 | 64 | 109 | 17 | 245 | 833 |
| 2 | 3 | Made - of | 50 | 33 | 12 | 3 | 0 | 20 | **118** |
| 3 | 30 | Phase-of | 5 | 2 | 5 | 0 | 1 | 1 | **14** |
| **Total** |  |  |  |  |  |  |  |  |  | **965** |

### 4.2.2. Substitutive Lexical Relations: The second group of Paradigmatic LRs is Substitutive Lexical Relations, which consists of 3 LRs with their numbers of examples in each Chapter presented below:

**Table 4.17:** Substitute Lexical Relations

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **STT** | **Groups of LRs** | **Coding N0** | **LRs** | **Ch. 1** | **Ch.2** | **Ch.3** | **Ch.4** | **Ch.5** | **Ch. 6** | **Totals** |
| 1 | **1.2.Substitutive** | 32 | Opposite-of | 2 | 5 | 3 | 4 | 12 | 39 | **65** |
| 2 | 4 | Synonyms | 20 | 30 | 24 | 15 | 17 | 111 | **217** |
| 3 | 1 | Type-of | 144 | 327 | 155 | 193 | 51 | 358 | **1,228** |

### 4.2.3. Typical category for Actants: In the literature review, the third group of Paradigmatic Lexical Relations is based on *argument roles* (semantic derivations or semantic roles). In this group, we firstly investigate *Typical category for Actants*. From the data analysis, we have found out 1174 relations with the nouns functioning as 5. Agent-of, 6. Patient-of, 14. Cause-of, 15. Affect, and 12. Organization-of the Bridge Design Event. Also, the actions (not only the verbs) that go with these Agents and Patients are identified. Discussion of each type is presented below.

**Table 4.24:** Numbers of Typical category for Actants

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **STT** | **Groups of LRs** | **Coding N0** | **Term relations** | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **Totals** |
| 1 | **1.3. Typical category for Actants** | 5 | Agent-of | 29 | 36 | 22 | 11 | 12 | 84 | **194** |
| 2 | 6 | Patient-of | 29 | 36 | 14 | 31 | 50 | 158 | **318** |
| 3 | 14 | Cause-of | 21 | 6 | 5 | 6 | 13 | 101 | **152** |
| 4 | 15 | Affect | 56 | 49 | 46 | 133 | 41 | 161 | **486** |
| 5 | 12 | Organization-of | 16 | 4 | 0 | 3 | 1 | 0 | **24** |
|  |  |  |  |  |  |  |  |  |  | **1,174** |

### 4.2.4. Typical nouns for Adverbials

The fourth group of Paradigmatic LRs are *Typical nouns for Adverbials*. In **Table 4.46,** there are 6 LRs of this type, but **Goal-of** doesn’t show itself as typical and **Result-of** has close connection with *Verbal collocation*, so it was finally transferred to the Syntagmatic category. Therefore, there remain 4 typical LRs as *Typical nouns for Adverbials* with the numbers of examples shown in the table below:

**Table 4.46:** Typical nouns for Adverbials

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ST T** | **Groups of LRs** | **Codi**  **ng N0** | **Term relations** | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **Tot als** |
| 1 | **1.4.**  **Typical Nouns for Aderbials** | 33 | Means - of | 22 | 13 | 94 | 39 | 56 | 184 | **408** |
| 2 | 29 | Approach/Method - of | 23 | 22 | 66 | 25 | 40 | 184 | **360** |
| 3 | 7 | Result-of | 51 | 30 | 44 | 26 | 38 | 187 | **376** |
| 4 | 8 | Location-of | 51 | 38 | 8 | 13 | 28 | 128 | **266** |
| 5 | 9 | Instrument-of | 6 | 21 | 0 | 0 | 0 | 0 | **27** |
| 6 | 34 | Goal - of |  |  |  |  |  |  |  |
|  | **Totals** |  |  | **153** | **124** | **212** | **103** | **162** | **683** | **1437** |

Typical Nouns for Adverbials form a very strong group of term relations in TCE terminology. The numbers of relations of each type and in each Chapter are illustrated in Table 70. **Instrument-of**, which denotes the relation between the action/activity and the instrument or machinery used for carrying out it, has the least examples of 27 and they appear in Introduction and Aesthetics Chapters. The other chapters dealing with Loads and System analysis has almost no relations relating to machinery or instrument. The relations of **Means-of**, **Approach/method-of**, and **Location-of** appear in all Chapters. The maximum numbers of these types are much higher in Chapter 6, which is concerned with system analysis. This Chapter also contains the largest number of pages investigated (129 pages). **Result-of** has been relocated into the group of *verbal collocations* because it reiterates the combinations of verbs and nouns. The relation **Goal-of** hardly shows up, so it is not considered typical of Highway Bridge Design Event.

### 4.2.5. Syntactic derivatives: Nominalisation: A large number of *nominalization of verbs and verb phrases* were identified with 254 relations after the similar ones had been deleted. This relation is familiar to EVRB EMI students but it needs to be included in the term products for both terms and English language acquisition.

### 4.2.6. Attribute - of relation means the quality or characteristic of a concept. De Stadler (1991) categorizes *Feature* as *Paradigmatic lexical relations* that are characterized in terms of *semantic roles*. In this study, we employ *Attribute* because it is part of the concept, which is the starting point of Terminology. In the *Law* and *Environmental engineering* by Antia (2000) and Faber (2012), this relation is not discussed. However, the current research has identified 695 relations entitled Attribute- of. This is ranked the *fourth* in the scale of typicality after Type-of, Part-of and Associative relations.

### 4.2.7. Associative relations: Aassoc. (associated with/association) is a Law term relation used by Antia (2000). This is a broad category without a clear pattern of relationship with the key *concept*. The current study identified a large number of terms that have Associative relations with the total number of 712 ranking the *third* position of all types after Type- of (1228) and Part-of (833). With such a large number of terms, further categorizations were carried out resulting in the key terms with the corresponding numbers of Associative relations.

### 4.2.8. Action-of: During the course of analysis several relations appears and disappears and its status can only be certified at the end of the coding phase. Initially, there was no Action-of relation in the Framework because the pilot survey of Chapter I: Introduction didn’t discover many relations of this kind. However, when the term extraction progressed to the second Chapter: Aesthetics, Action-of relation appeared, so it is added to the list of Paradigmatic relations and the relation continued to appear until the end of Chapter 6. We then came back to Chapter one and try to find the relation and coded it again. That is why it bears the high number of “42”. Actions of *beams, bridges, elements, girders, materials* are identified as typical in this text type and the total number of example relations is 290.

In Chapter IV, the *Paradigmatic* LRs were identified and categorized. The numbers of example relations indicate the degree of popularity of each relation type. Also, all the examples relations are categorized and analyzed from meaning perspective to identity the multi-relationships of the term systems, based on which the contents and presentation patterns of TCE term bases can be recommended in the Chapter VII. The *Paradigmatic Lexical Relations* are consistent among languages because they are related to the reality and science, not the languages themselves, which differ widely in the world. Paradigmatic relations are useful for EMI students in any country once the terms are translated from English into their mother tongue. In the *Paradigmatic* group, there are 6737 *Lexical Relations*, which make up 3/4 of the total 8246 relations. Though Syntagmatic LRs have smaller numbers of examples, they are English language – specific (institutionalized) and are extremely useful for EMI students. The category of *Paradigmatic Lexical Relations* has 4 main groups, each of which consists of several sub-types. They are 1.1. Meronymy (Partitive), 1.2. Substitutive, 1.3. Typical category for Actants. 1.4. Typical Nouns for Adverbials. These relation types have 965, 1510, 1174, 1061 relations, respectively. Each of the last 4 relations: 1.5. Syntactic derivations, 1.6. Attributes of, 1.7. Associative, and 1.8. Action-of has one relation type with 330, 695, 712, 290 example relations, respectively. Action- of is a newly discovered relation, but it has a high degree of typicality with 290 relations denoting the *actions* of *bridge* and *bridge members*. Considering the individual LR type, the most typical LRs are Type-of, Part-of, Associative relations, Attribute-of with 1228, 833, 712, 695 relations, respectively. Ranked the second in terms of numbers of relations are Affect, Means-of, Approach/Method- of, Nominalization, Patient-of with 486, 408, 360, 330, 318 relations, respectively. The third typical group includes Action-of, Location-of, Synonyms, Agent-of, Cause- of, and Made – of with 290, 266, 217, 194, 152, 118 relations, respectively. The groups with the least number of LRs include Opposite-of, Instrument-of, Organization-of, Phase-of with 65, 27, 24, 14 relations. Each Type of relation has been further categorized and analyzed in details from meaning perspective to see the internal and external relations (multidimensional relations) of the terms for the purpose of term presentation.

**CHAPTER V: SYNTAGMATIC LEXICAL RELATIONS**

**IN HIGHWAY BRIDGE DESIGN EVENT**

**5.1. The HBD Syntagmatic Lexical Relations with their degree of popularity.**

In the previous Chapter, *Paradigmatic LRs* of HBD terms have been analyzed and presented, which supports EMI TCE students not only in the acquisition of English and Vietnamese terms but also *linguistic* and *epistemological* knowledge because terms are described and presented in relations with other terms. In Chapter V, *Syntagmatic LRs* of BE terms, which have hardly been investigated by terminology research, will be discussed.

**5.1.1. The number of Lexical Relations**

The total number of syntagmatic relations is 1509 as compared with 6737 *Paradigmatic lexical relations*, which make up about ***one fifth*** of the total 8246 relations. While *Paradigmatic* relations are challenging to researchers as linguists because they are centered on relations of concepts and semantic roles in the disciplinary knowledge area, *syntagmatic* relations, however, are more related to English language: *collocations*, which is the strong advantage of researchers as a linguists making them more confident because this does not require in-depth understanding of the discipline. The number of *Syntagmatic relations* is limited and is much smaller than that of the paradigmatic counterparts. The combinations are repeatedly used in the text-book and a great deal of coincident combinations are omitted, which results in the final number of 1509. Indeed, investigation and presentation of BE terms based on Syntagmatic LRs are of great help for EMI students in terms of English language acquisition and production because collocations and word order are challenging to Vietnamese EMI students. In the Syntagmatic category, there are there sub-categories*: Nominal collocations, Verbal collocations, and Prepositional collocations.*

**Table 5.1:** Syntagmatic lexical relations: Phraseology and collocations

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2. Syntagmatic lexical relations: Phraseology and**  **collocations** | | | | **Ch.1** | **Ch.2** | **Ch.3** | **Ch.4** | **Ch. 5** | **Ch.6** | **Totals** |
| 1 | **2.1. Nominal collocations** | 16 | Quantifier | 49 | 19 | 16 | 11 | 6 | 31 | **132** |
| 2 | 17 | Qualifier | 42 | 54 | 45 | 40 | 16 | 84 | **281** |
| 3 | **2.2. Verbal collocations** | 31 | LF Real 1 (V + N) | 4 | 14 | 13 | 12 | 8 | 68 | **119** |
| 4 | 35 | LF Real 2 (V + N) | 8 | 4 | 0 | 6 | 0 | 14 | **32** |
| 5 | 19 | LF Fact 2 (N + V) | 51 | 39 | 1 | 2 | 2 | 17 | **112** |
| 6 | 7 | Result -of (V + N) | 51 | 30 | 44 | 26 | 38 | 187 | **376** |
| 7 | **2.3.**  **Prepositional collocations** | 22 | LF Loc in | 44 | 39 | 22 | 36 | 28 | 116 | **285** |
| 8 | 23 | LF Loc ad | 12 | 5 | 0 | 14 | 0 | 17 | **48** |
| 9 | 24 | LF Loc ab | 4 | 0 | 0 | 1 | 0 | 3 | **8** |
| 10 | 25 | LF Instr | 5 | 0 | 0 | 0 | 0 | 3 | **8** |
| 11 | 26 | LF Propt | 2 | 0 | 3 | 2 | 0 | 12 | **19** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12 |  | 27 | LF Loc through | 4 | 5 | 0 | 2 | 10 | 39 | **60** |
| 13 | 36 | LF Loc over/  across | 13 | 8 | 3 | 1 | 1 | 3 | **29** |
| **Totals** |  |  |  | 289 | 217 | 147 | 153 | 109 | 594 | **1,509** |

The content of the table above is different from the one of syntagmatic relations on the initial Analytical Framework. The relations of Causative, Involve, Fact 0 have been omitted from *Verbal collocations* because their existence hasn’t been confirmed as typical while Result-of has been moved from *Typical nouns for Adverbials* in *Paradigmatic relations* to the *Syntagmatic category* of Verbal collocations because it expresses the results of verbs. The study has discovered two more popular relations of Loc through and Loc over/ across, so they have been added to *Prepositional combinations*. The nature of *nominal collocations* of Quantifier (Modifier) and Qualifier have been changed from the original one of [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk). Antia (2000) and Faber (2012) do not mention this type of collocations. L’Homme (2019) refers to collocations and other linguistic aspects of terms but Lexical Functions of [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk) have never been employed exhaustively to investigate syntagmatic lexical relations in terminology like in the current study.

### 5.1.2. The degree of popularity: In Table 5.2, the relations are listed in the order of popularity: Result-of and Loc-in and Qualifier are the three relations with largest numbers of 376, 285, and 281, respectively. Ranked the second are Quantifier, Real 1 and Fact 2 with 132, 119 and 112 relations. The rest LRs are *Prepositional combinations*, which repeatedly occur in this text type. All these 13 syntagmatic LRs in HBD terminology are discussed in details in the sections below.

**Table 5.2:** Degrees of popularity of *Syntagmatic lexical relations*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **N0** | **Lexical relations** | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **N0 of relations** |
| 7 | 7. Result-of | 51 | 30 | 44 | 26 | 38 | 187 | 376 |
| 12 | 22. LF Loc in | 44 | 39 | 22 | 36 | 28 | 116 | 285 |
| 13 | 17. Qualifier | 42 | 54 | 45 | 40 | 16 | 84 | 281 |
| 18 | 16. Quantifier | 49 | 19 | 16 | 11 | 6 | 31 | 132 |
| 19 | 31. Real 1 | 4 | 14 | 13 | 12 | 8 | 68 | 119 |
| 21 | 19. Fact 2 | 51 | 39 | 1 | 2 | 2 | 17 | 112 |
| 23 | 27. Loc  through | 4 | 5 | 0 | 2 | 10 | 39 | 60 |
| 24 | 23. Loc ad | 12 | 5 | 0 | 14 | 0 | 17 | 48 |
| 25 | 35. Real 2 | 8 | 4 | 0 | 6 | 0 | 14 | 32 |
| 26 | 36. Loc over/  across | 13 | 8 | 3 | 1 | 1 | 3 | 29 |
| 29 | 26. Propt | 2 | 0 | 3 | 2 | 0 | 12 | 19 |
| 31 | 24. Loc ab | 4 | 0 | 0 | 1 | 0 | 3 | **8** |
| 32 | 25. Instr | 5 | 0 | 0 | 0 | 0 | 3 | **8** |
|  | **Total** | 289 | 217 | 147 | 153 | 109 | 594 | **1,509** |

**5.2. Categorization of Syntagmatic LRs from meaning perspective**

**5.2.1. Nominal collocations:** Nominal combinations has two typical relations: **Quantifier and Qualifier** both of which have an abundance of examples. *Quantifier*, however, finally has only 132 relations because many of the same type are deleted.

**Table 5.3:** Numbers of Nominal collocations

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2. Syntagmatic lexical relations:**  **Phraseology and collocations** | | | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **Totals** |
| 1 | **2.1. Nominal collocations** | 16 | Quantifier | 49 | 19 | 16 | 11 | 6 | 31 | **132** |
| 2 | 17 | Qualifier | 42 | 54 | 45 | 40 | 16 | 84 | **281** |

### Quantifiers

**Quantifier as Pre-modifier:** Typical Pre-modifiers are 10-span or 10-year. Sometimes an adjective is added making *48-m long* as *Premodifier.* The three words of *single, double, multiple* are frequently used with an other noun as *Premodifier* such as *Double-leaf*, *single-span bridge*, or *three-ribbed*. This type of quantifiers are the same as in general English language.

**Quantifier as Post-modifier:** The type of Quantifier as Post modifiers are different. For example, *of 1.8 m wide* or *of 20.56 ft kip/ft* are very common. *From … to, longer/shorter than* or *up to* are also used frequently as **Post modifiers**: *from 30 to 200 ft*, *well over 300 ft* , or *longer than 115 ft.*

**Qualifiers**

Typical combinations of the three Qualifiers *critical, global* and *longitudinal* are presented. The word ***critical*** can be used with *shear, reaction, value or damping while* ***global*** *is used with displacement, bending, effect, and response.* ***Longitudinal*** can be used with *bridge parts (girders/spans), force* and *direction, etc. T*here are various typical combinations of adjective and nouns. There are pairs of *opposite adjectives* like *interior/exterior, maximum/minimum, linear/nonlinear,* etc. These adjectives are used repeatedly in all six Chapters under investigation. They are used in combination with nouns to form multi-word terms in HBD Event. For example, *flexural/ ultimate / residual* can all be combined with *stress/ strength/ rigidity* resulting in *flexural rigidity* or *residual stress*. *Moment* can be used with different adjectives such as *positive, negative, elastic, statical flexural, and transverse*. Various combinations are presented in the table below to form HBD terms.

**5.2.2. Verbal collocations**

Žolkovskij and [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk) (1981, 1988, 1996) proposed three groups of Verbal collocations which are *Causative*, *Auxiliaries* (support or light verbs), *Realizations (fulfillment verbs)*. During the investigation of the text data, it was impossible for the researcher of the current study to identify the *first* and the *second* groups as typical of HBD Event, so they are not discussed here. In the *third* category, not all the combinations proposed by Žolkovskij and [Mel’čuk](https://en.wikipedia.org/wiki/Igor_Mel%27%C4%8Duk) (1981, 1988, 1996) are identified as *typical*. *Realizations (fulfillment verbs):* Real 0/i, Fact 0/i and Labreal i/j or *fulfillment verbs*, mean to fulfill the requirements of L (to do with L what you are supposed to do with L or L fulfills its requirement). Different Ls have different "requirements": the "requirement" of a hypothesis is its confirmation, and the "requirement" of a disease is the malfunctioning/death of the person affected, while the "requirement" of an artefact is that it be used according to its intended function. These verbs are more or less synonymous *full verbs*. Unlike *Auxiliary verbs*, which accept basically abstract nouns as their keywords, the *fulfillment verbs* can have both *abstract* and *concrete* keywords. Syntactically, Reali, Fact0/i and Labrealij are fully analogous to the LFs Operi, Func0/i and Laborij, respectively in *Auxiliaries*. Of the combination types proposed above, only **3** typical combination patterns of *fulfillment verbs* were discovered, which are **31. Real 1** (V + N), **35. Real 2** (V + N), **19. Fact 2** (N + V). Also, **7. Result - of** (V + N) is a newly discovered *Syntagmatic Lexical Relation* of verb phrases denoting the *Result* of the *Verb* itself rather than the **Result-of** relation in *Typical Nouns for Adverbials* in the Paradigmatic category. **7. Result-of** is an outstanding combinations with 376 relations as compared with 639 verbal relations. Each type of verbal combination is presented in details in the following parts.

**Table 5.10:** Numbers of Verbal collocations

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2.Syntagmatic LRs: Phraseology and collocations** | | | **Ch.1** | **Ch.2** | **Ch.3** | **Ch.4** | **Ch. 5** | **Ch.6** | **Totals** |
| **Verbal collocations** | 31 | LF Real 1 (V + N) | 4 | 14 | 13 | 12 | 8 | 68 | **119** |
| 35 | LF Real 2 (V + N) | 8 | 4 | 0 | 6 | 0 | 14 | **32** |
| 19 | LF Fact 2 (N + V) | 51 | 39 | 1 | 2 | 2 | 17 | **112** |
| 7 | Result - of (V + N) | 51 | 30 | 44 | 26 | 38 | 187 | **376** |

### - Real 1 (V + N): Real 1 is defined as *Fulfillment* verbs that mean to fulfill the requirements of L (key word noun). This means to do with L what you are supposed to do with L, or L fulfills its requirement. Real 1 takes L (key word noun) as its Dsynt actant II (Object). The subject (Actant I) is the Agent. For example, in the sentence: *Traffic crosses a bridge.* L is the key noun*: “a bridge”,* which is the Actant II (Object)*.* The Subject is *Traffic,* which is the Actant I (Agent). The verb is *cross.* The function of *the bridge* is for *traffic* to travel across*.* We have V + N combination: *to cross a bridge.* Of the 4 types of LRs, Real 1 is secondly typical after Result-of. It has 119 relations as examples. This type of Verb + Noun collocations are very popular in HBD Event. They are repeatedly used through out the Chapters investigated.

The typical combinations are presented in the table with a wide range of Verbs and Nouns involved. EMI students often make mistakes when they translate from Vietnamese into English because they lack linguistic knowledge of *collocations.* These combinations are employed over and over again in the textbook. For example, *to apply loads* is used in various senses as presented in **Table 5.12**. It is different from *to bear loads* because the Subject of *to apply loads* is the **Actant** whereas the Subject of *to bear loads* is the **Patient**. This sophisticated distinction may be not clear-cut and important for EMI students, however, these *collocations* of Verb + Noun are necessarily included in the term resources. The word *to apply* has no terminological value when standing out of the context, but when it is combined with loads, stress, moment, actions, the *verb phrases* become *terminological units*. Another typical LR is *distribute + Noun*, similarly to *apply*, *distribute* is combined with *loads, wheel loads, internal actions, moments, effects*. These nouns are not used alone but in combination with other words such as *wind loads, gravity loads, internal actions, external actions, bending moments,* etc. The pattern of combination is of great value to EMI students. The two **Tables 5.14** and **5.15** below present the combinations of *reach* and *satisfy* with nouns. *Reach* is used with *state, limit state, plastic state, collapse mechanism, plastic capacities* and *satisfy* is typically used with *codes, rules, specifications, requirements, strength limit states, design criteria*, etc.

**- LF Real 2 (V + N)**: **Real 2** is defined as *Fulfillment* verbs that mean to fulfill the requirements of L (key word noun). This means to do with L what you are supposed to do with L, or L fulfills its requirement. **Real 2** takes L (key word noun) as its Dsynt actant **II** (Object). It is different from **Real 1** in that the subject is the Patient. For example: *The girder resists gravity loads.* L - the key noun is “loads*”,* which is the Actant II (Object)*.* The subject is *The girder,* which is the Actant I (Patient). The verb is *resist.* The function of *loads* is for *the girder to bear.* We have V + N combination: *to bear loads.* Structurally, **Real 1** is the same as **Real 2**, but the deep meaning is different because in **Real 1,** the Subject is the Agent but in **Real 2** the Subject is the Patient. The number of **Real 2** collocations is far fewer (32 relations), which reflects its degree of typicality in HBD Event is less popular than that of **Real 1**. We have discovered the typical Verb + Noun combinations used in this sense: *to carry, to bear, to resist, to transfer, to support, to sustain, to transfer, to transmit.* Most of these verbs also go with *loads, force, weight, truck, compression, tension*

**- Fact 2 (N + V ):** LF Fact 2 is defined as *Fulfillment* verbs that also mean to fulfill the requirements of L (key word noun) = to do with L what you are supposed to do with L, or L fulfills its requirements. Fact 2 takes L (key word noun) as its Dsynt actant I. In this case, the key Noun is the subject of the sentence. This makes the combination with to Noun + Verb rather than Verb + Noun like in the Fact 1 and Fact 2 (the key noun is the Object). This is the key difference from Fact 1 and Fact 2. The action is directed to the object, so this combination is closely connected to 3 elements: Subject + Verb + Object as the superficial structure. Fact 2 is very popular in HBD Event. Below are some examples for illustration. This denotes the function of the key word noun as the subject. E.g. *The bridge carries traffic loads; The arch resists the thrust; The truss strengthens (the bridge); The foundations support (the deck).*The total number of LR Fact 2 is 122 relations. They appear the most abundantly in Chapter one, which is concerned with functions of various *bridge parts/ components/ members/ elements*. We have the typical types of combinations as presented in Table 5.18. The key Nouns are shown in column 1. Their functions are presented in columns 2 (the Verb) and 3 (the Object as the Patient or Beneficiary). We illustrated various key nouns as the Subject whose functions are denoted by the Verb *carry* directing to various Objects. The function of the *bridge* is *to carry loads*, so *its parts* must be designed systematically and holistically to *bear* the applied *loads*, which are extremely complicated in nature. Another function of the *bridge* is to *connect* two *locations/entities*, a set of synonyms *(to connect/ to link/ to joint)* are employed to denote this function of the *bridge* and its *parts.* Like *to link, to joint, to connect*, two typical verbs of *to span* and *to cross* are also used to denote the *function* of the *bridge* but their meanings are a bit different: *to connect* two entities but *to span* one entity. The *bridge system* is sophisticated consisting of substructures, which consist of parts. The Substructures and parts support each other. That is why Support is used in many examples below to express the functions of various parts is to support other parts. The main functions of the *bridge* is to *bear loads* and to *connect locations* and *entities*. In order to carry out these two functions successfully, its *parts* must work integrally by cooperating and supporting each other to *resist loads* and *transmit loads* to the *foundations* and finally to the *underlying soil*.

### - Result - of (V + N): Result-of relation is defined as the standard name of the result of the situation denoted by L, which is the key word (not only verb). It originally lies in the group of Paradigmatic Lexical Relations: Typical Nouns of Adverbials: Sres (learn) = knowledge, skills; Sres (explosion) = shockwave; Sres (copy) = copy/reproduction. The key word L is of different parts of speech. The researcher, however, only investigates Verb-Noun relation by clarifying the examples in TCE terminology, for example, Spray – Surface layer, Invent – Construction techniques, Develop – Compression field theory. After studying the example relations in the textbook, the relation expresses a collocation of the Verb and its Result (the Noun as the Object), so 7. Result-of has been transplanted to Syntagmatic Lexical Relations and put in the sub-group of Verbal collocations. There are quite a few Verbs denoting to Result-of relation in the table below:

**Table 5.25:** Verbs in **Result- of** relation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Determine | Achieve | Accomplish | Install | Estimate | Construct | Constitute |
| Develop | Approximate | Assemble | Plot | Obtain | Formulate | Equate |
| Establish | Calibrate | Assess | Precast | Define | Make | Erect |
| Calculate | Complete | Bound | Predict | Generate | Outline | Evaluate |
| Model | Compute | Codify | Rebuild | Build | Verify | Fabricate |
| Create | Cast | Compile | Tabulate | Design | Yield | Underestimate |
|  |  |  |  |  | Form | Found |

There are tables that provide conbinations of the top five Verbs of c*alculate, create, design, develop and model* combining with noun phrases expressing **7. Result - of** relation. Firstly, the results of calculate include *mean, standard deviation, factors, actions, displacements, moments, loads, values, load effects, coefficients, rigidities, thickness, etc*. The verb *Create* has a different collocation patterns. It usually goes with *bridge, bridge part, function, temperature gradient, rigidity*. In this sense, create means *build*. However, more often it means *cause* and goes *with stress, crack, shear, reaction, degree of freedom, bending, compression, deformation, force, stress, strain.* The verb *Design* is extremely popular, which goes with nouns such as *bridge, structure, part (truss, girder, joints, bearing), load*. It also goes with intangible nouns such as *moment, shear, load, technology, approach, moment diagram. Develop* often goes with *technique, load curve, specification, formula, theorem, method, procedure*. Sometimes it is used to denote “*cause*” like “*create*”. *Model* is another typical verb, which goes with *effect, load characteristic, velocity profile, bridge, beam, actions, response, deformation, box system, condition*.

### 5.2.3. Prepositional collocations: In the Paradigmatic LRs, there is the relation 8. Location-of belonging to *Typical Nouns for Adverbials*. The *location* in English sentences is not expressed with just a Noun. Rather, the Noun is frequently accompanied with a Preposition resulting in *prepositional phrases*. Of the seven types of *Prepositional collocations*, the first five relations are developed by Mel cook, the last *two* which are typical of HBD Event are added by the researcher of the current study. English prepositions form a

complicated grammar category: “One who is good at English prepositions is good at English”, so they challenging to EMI TCE students.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 5.32:** Number of *Prepositional collocations* | | | | | | | | | | |
| **2. Syntagmatic lexical relations:**  **Phraseology and collocations)** | | | | **Ch. 1** | **Ch. 2** | **Ch. 3** | **Ch. 4** | **Ch. 5** | **Ch. 6** | **Totals** |
| 1 | **2.3.**  **Prepositional collocations** | 22 | Loc in | 44 | 39 | 22 | 36 | 28 | 116 | **285** |
| 2 | 23 | Loc ad | 12 | 5 | 0 | 14 | 0 | 17 | **48** |
| 3 | 24 | Loc ab | 4 | 0 | 0 | 1 | 0 | 3 | **8** |
| 4 | 25 | Instr | 5 | 0 | 0 | 0 | 0 | 3 | **8** |
| 5 | 26 | Propt | 2 | 0 | 3 | 2 | 0 | 12 | **19** |
| 6 | 27 | Loc through | 4 | 5 | 0 | 2 | 10 | 39 | **60** |
| 7 | 36 | Loc over/ across | 13 | 8 | 3 | 1 | 1 | 3 | **29** |
| **Totals** |  |  |  |  |  |  |  |  |  | **457** |

### - Loc in: Location-of is an extremely popular *Paradigmatic Lexical Relations*, which is realized most frequently by its Syntagmatic LR Loc in counterpart. It consists of a Preposition and a Noun denoting the position of specific objects in the Highway Bridge Design Event. Loc in is the most popular *Prepositional Lexical Relation* with more than a half LR of all (285 out of 457 relations). The main prepositions used in Loc in are *At, In, On* with 83, 73, 42 relations, respectively. Other prepositions include *Below, Beneath, Between, Under, Within, Above,* all of which have only 59 relations. The most typical combinations is At + Noun. The nouns refer to specific locations: midspan, point, level, depth, location, height, etc. *At* also goes with bridge parts such as *bearing, support*; *at the site* is also typical of this text type. Ranked the second is *In* (73 relations), which go with the *bridge* and its *parts* such as *girder*, *concrete structure*, *system, beam, etc*. It also often goes with *state, area, plane, direction, zone, etc*. The phrase *in situ* is a typical Loc in relation. The next typical preposition of Loc in relation is *On*. It is used with the *bridge* and *bridge parts,* which has a surface for something to be placed on or an *action* to occur on. *On* is typically used with *route, highway, railway, railroad, bridge, etc*. Others prepositions used in Loc in LRs include *Below, Beneath, Between, Under, Within, Above* but they are not as popular as *At, In and On.*

### - Loc ad: Although this LR does not have many examples, they are used repeatedly in the textbook, so the collocation is categorized as *typical*. Loc ad means moving towards the position of L. It has 48 relations.

**- Loc ab** is mostly made of *Off, Away*, sometimes with *From, Outward*.

**- Propt** denotes *because of*, but in this text type it is used with *Due to.*

### - Loc through: Loc through was not mentioned by previous researchers. It emerged during the term relation extraction of the current study and was added to the group of *Prepositional collocations*. Loc through indicates movements and locations of actions inside the bridge. Usually this LRs indicates directions. The three typical prepositions used in Loc through are *Along, In the direction, and Through*. The *bridge* is a long structure consisting of *girders, beams, bars, and rods, etc,* which are also long. Actions move through and along these *parts* in a certain *directions*. Besides the three most typical prepositions, *Align with, Parallel to, Throughout* are also used in Loc through, but they are not very popular.

### - Loc over: Like Loc through, Loc Over is a newly discovered LRs in HBD. This is due to the fact that the *bridge* is constructed *across* or *over* a *river, stream, gorge, valley, highway*, or *between* two locations. This LR is used frequently in HBD Event, which makes Loc Over a typical LR in this specific text type.

In this chapter, the second category of *Syntagmatic Lexical Relations* has been analysed. It consists of 1509 example relations out of the total number of 8246 relations. The relations are divided into 3 groups: Nominal collocations, Verbal collocations, and Prepositional collocations with 413, 639, and 457 relations, respectively. Each group consists of several relation types. As regards the degree of popularity of each LR type, Result-of, a new relation transferred to this category, has the largest number with very complicated combination of Verbs and their Nouns as the results of the verbs themselves. Loc in is ranked the second with 285 relations. Then comes Qualifier and Quantifier, which are popular with 281 and 132 relations. The nominal combinational patterns are employed to create terms as Noun phrases in HBD field. In the *Verbal Combinations,* Real 1 (V + N) and Fact 2 (N + V) are most typical of this text type with 119 and 112 relation. These typical patterns of combinations were identified for making Verb Phrases denoting the functions of terms in HBD events. Real 2 had only 32 example relations. And lastly, the group of *Prepositional Collocations* had two-digital number relations, except for the most outstanding one Loc in with 285 relations. Loc through and Loc over/ across are newly discovered relations with 60 and 29 example relations. Although each type of relation does not contain a large number, they are of significance in English language acquisition of specialized language. The three least popular *Prepositional Combinations* Loc ab, Instr, and Propt have 8, 8, 19 examples.

**CHAPTER VI**

**TCE STUDENTS’ PERCEPTIONS OF KNOWLEDGE-BASED TERM RESOURCES**

While specialized experts apply a top-down approach in Terminology based on their own subjective judgment, this language planning-oriented terminology research employs the bottom-up terminology planning, which begins with terms extracted from a textbook of a specific subject with their multidimensional relations. Then term users’(EMI students’) opinions about the term resources for each individual subject were surveyed. This study requires the terminologist to be the bridge to connect disciplinary knowledge and English linguistic knowledge in the research effort that results in TCE term products to support TCE EMI students. It requires the participation of professional terminologists, who possess knowledge of both specialist subjects, linguistics, and terminology. This chapter is concerned with EVRB students’ perceptions about the term support for learning individual specialized subjects. The linguistic approach of *Lexical Semantics* (L’Homme, 2019) is adopted for bottom-up terminology planning, which is lexically centered, and usage based*.* Based on these typical TCE *Paradigmatic and Syntagmatic* LRs, the *survey questionnaire* was composed to investigate TCE EMI students’ opinions and needs for terminology resources of a certain disciplinary subject. The data were then quantitatively analyzed using *descriptive statistics* to identify EMI students’ opinions and needs, based on which recommendations are put forward for the content and form of term products that help TCE EMI students acquire both disciplinary and linguistic knowledge. The overall purpose is to recommend an alternative TCE terminology planning framework that results in knowledge-based TCE term databases with richer content and linguistic (semantic and syntactic) information to support TCE EMI students. This chapter aims at answering the second research questions: *2. What are TCE EMI students’ perceptions of the language-planning oriented terminology management (knowledge-based) approach?* It first investigates TCE EMI students’ needs for the term resources from content and linguistic perspectives. Secondly, it tries to find out the extent that current TCE term resources satisfy Vietnamese TCE EMI students’ needs from content and linguistic perspectives. It also discovers the lexical relations that should be included in the TCE term resources to satisfy the students’ needs for learning *individual* subjects. In this case study, one subject of Highway Bridge Design was explored in depth.

**6.1. EMI students’ needs for term resources for studying a specific subject from the content and linguistic perspectives**

The literature review section indicates that terminology research from language planning perspective is a scarcely touched field, which results in very few term products that are ontologically organized and thus more beneficial to term users. This section addresses ***Research question 2****: What are TCE EMI students’ needs for the term resources from the content and linguistic perspectives?* The students are familiar with traditional term products, which are alphabetically composed and when the students know about knowledge-based term resources that facilitate both content and language acquisition, they highly appreciate their affordances. Their needs are reflected in the results of the *second* group of information in the survey questionnaire with the mean value higher than that of the first group of information (from 4.05 to 4.53 in **Table 6.2** and the standard deviations are very close to each other from 0.567 to 0.763, which reflects the degree of dispersion from the mean is very low. The Cronbach's Alpha is 0.861 and the total of 265 answers are valid for all 11 items. The students are badly in need of knowledge-based term resources. In Vietnam we have term resources for Transport field, which cover so many subject areas. It is unthinkable to investigate the lexical relations of such a big reservoir of terms. That is why the LRs of one disciplinary subject of HBD have been investigated systematically both in breadth and in depth. The term product therefore can support one subject from both content and linguistic perspectives. This has never been done in any specialized field in Vietnam. As presented in **Table 6.2** and **Figure 6.2,** items 2.1 and 2.2. are needs for term resources (TRs) for individual subjects and knowledge-based TRs. Almost all the students choose Agree and Strongly Agree: 95.5 % and 97 %, respectively. The students (97 %) not only need term resources for understanding concepts but also for learning terms as lexical units and lexical collocations of terms. This belongs to English language acquisition. They agree that concepts are of prime importance in specialized subject teaching and leaning (96.2% of agreement). The research participants are in support of conceptual mind maps, concept relations, definitions for content knowledge acquisition: the percentage of Agreement and Strong agreement are 43%, 49.4 %, 48.7 % and 42.6 %, 40.8 %, 35.5 %, respectively. The lowest percentage of 35 % strongly agree that definitions should be included in the term resources. They may think definitions are provided in textbooks or technical specifications already. The students are asked about their needs for three types of collocations, which include collocations of Noun Phrases, Verb - Noun and Noun - Verb, and Preposition - Noun: 78%, 80.8%, and 81.9 % of agreement, respectively. Most of the students need to learn about collocations from term resources. This comes from the fact that they are not English native speakers and cannot easily produce chains of words and have difficulties in combining words correctly. Literal translation and meanings from the mother tongue may negatively affect their English language use. That is why they need term resources that include not only the *content* aspect but also *language* aspect of terms. Lexical relations indicating collocations and word orders should be presented in term resources with the agreement of a very large number of students: 78.5%. The mean values of this category in **Table 6.2** are very high as compared with the maximum value of 5. The standard deviation values are smaller than those in the first category of general information reflecting the concentration of answer choices about the mean. Concepts are more important to the students than collocations: most statements concerning concepts are Strongly Agreed while statements related to collocations are Agreed.

**6.2. The level of satisfaction about the available term resources for content and linguistic knowledge transference of a specific subject.**

In the previous section we have discussed the *needs* of the students for term resources for individual subjects from content and language perspectives. Now we will see *to what extent the students’ needs are satisfied*. The statements are written with negative meanings which are expressed either explicitly with “not” or implicitly. The Cronbach's Alpha indicating Reliability Statistics is 0,881. The mean values of all the items in this category range from 3.55 to 4.24 (**Table 6.3** ), which means the students **agree** with the statements (*3.41 – 4.20: Agree)*. They agree with the **negative aspects** of the available term resources for content and linguistic knowledge transference. The degree of dispersion of answer choices from the mean is wider than that of the previous category because standard deviations are bigger (from 0.654 to 0.878). This indicates the lower level of consistency in the set of answers. Statements 3.1, 3.2, 3.4. with the means of 3.95, 3.81, and 4.04, respectively are related to the level of satisfaction with term resources for individual subjects. They all agree that the available term resources are neither adequate nor effective, which causes them a lot of difficulties in learning content subjects in English. At present, there are almost no dictionaries for individual content subjects; therefore, the students are provided with word lists composed by their lecturers, in which terms are arranged in alphabetical order without conceptual relations. This prevents the students from understanding the concepts in relation with other concepts (statement 3.7; mean: 3.96). Statements 3.3, 3.5, 3.6, and 3.14 (mean values: 3.55, 3.96, 4.24, and 4.08, respectively) are concerned with the students’ level of satisfaction with other available terminological support resources: monolingual English-English dictionaries, English- Vietnamese TCE dictionaries, Google translation, and Vietnamese equivalents to English terms. Monolingual English-English dictionaries are difficult to use because they are more suitable for highly English competent students. English - Vietnamese TCE dictionaries cover too many terms and words from various fields and cannot satisfy the students’ needs for individual subjects. They strongly agree on the inadequate role of Google translation, which cannot interpret meanings of specialized concepts and translates texts literally while the students find it hard to correct the errors by themselves. Most of the student (83%) agree that there are controversial issues concerning Vietnamese equivalents to English terms: the percentage of Agreement and Strongly Agreement are 57.7 % and 25.3 %. Statements 3.8, 3.9, 3.10, and 3.11 are related to the students’ attitudes towards concept-based term resources. At presents there are hardly any term resources with conceptual relations to facilitate content knowledge acquisition (statement 3.9; mean: 4.03). The fact that the term resources delivered by lectures are not knowledge – based planned is agreed upon by 60% of the students in statement 3.11. 72% of the student agree that they are provided with alphabetically arranged term resources without multidimensional term relations (statement 3.8), so the term resources do not facilitate content and language acquisition. Likewise, 78.1 % agree they have difficulties in understanding concepts and content knowledge when the terms are presented as discrete units. And finally, the linguistic dimensions of terms, in general and lexical relations denoting collocations, in particular are not presented in the term lists (statements 3.12 and 3.13 with means of 3.66 and 3.77, respectively). All in all, with the mean values of a little below and above 4, all the students surveyed agree that the available term resources for individual subjects cannot satisfy their needs from content and language perspectives. The frequencies (the percentage) of the answer choices are presented in **Figure 6.3.**

**6.3. The Lexical Relations (LRs) that should be included in the *knowledge-based* term resources**

Having investigated the the students’ needs and the degree of satisfaction with the available term support, the typical paradigmatic and syntagmatic TCE TRs are given to them to be Agreed upon for inclusion in the term resources. There are abundant linguistic terms in the statements, which the students may find hard to understand, so examples of term LRS in Highway Bridge Design Event are given for

illustration. This section of the questionnaire aims at finding out the *lexical relations* that should be included in the TCE term resources to in order to satisfy the students needs to study a certain subject of Highway Bridge Design.

***6.3.1. Paradigmatic term relations***

**Table 6.4** reflects a very high level of agreement of the 13 types of *Paradigmatic* LRs 4.1, 4.2, 4.3, 4.4, 4.12, 4.13 all receive Strong Agreement (all mean values are above 4.2) while LRs relation from 4.5 to 4.11 are a little below the scale of strong agreement (all mean values are above 4 and below 4.21). The students have realized the usefulness of the new term products planned based on LRs that they have hardly got access to. The tables of mean and standard deviations as well as frequencies of answer choices indicates the warm welcome to the new term management approach. **Table 6.4:** Mean and Std. Deviation of the needs for Paradigmatic lexical relations

|  |  |  |
| --- | --- | --- |
| **Paradigmatic LRs** | **Means** | **Std. Deviation** |
| 4.1. Meronymy | 4.23 | .673 |
| 4.2. Opposite - of | 4.28 | .672 |
| 4.3. Synonyms | 4.28 | .688 |
| 4.4. Type - of | 4.24 | .687 |
| 4.5. Agent - of | 4.17 | .721 |
| 4.6. Patient - of | 4.12 | .737 |
| 4.7. Agent - Patient | 4.14 | .762 |
| 4.8. Cause - of | 4.17 | .772 |
| 4.9. Means/ Approach/ Method/Instrument - of | 4.17 | .790 |
| 4.10. Result - of | 4.08 | .752 |
| 4.11. Location - of | 4.05 | .752 |
| 4.12. Nominalization | 4.21 | .702 |
| 4.13. Frame-based presentation of terms | 4.22 | .730 |

***6.3.2. Syntagmatic term relations***

Syntagmatic LFs (Mel’čuk, 1996) consist of three categories: Preposition + Noun, Modifiers, and Verbal functions. Each category contains various LFs denoting both semantic and syntactic aspects of the head word. There are 6 typical TCE syntagmatic LRs. The Cronbach's Alpha denoting Reliability Statistics of 6 items is 0,911.

### Prepositional collocations

(Mel’čuk, 1996) presents five LFs concerning *prepositional phrases.* In addition, other prepositional combinations were identified, which is **Loc through** and **Loc over:** *through the truss, over the highway*. Prepositions form an important domain in English grammar, which is challenging to Vietnamese students because many English prepositions cannot be literally translated into Vietnamese when they are parts of phrasal verbs or go with verbs. However, word-by-word translation is a habitual practice of technical students, which results in many errors concerning prepositions in productive skills: the students may leave out a necessary preposition or use a wrong one. In HBD texts, 7 types of prepositional combinations presented in **Table 6.7** are very popular. However, there is only *one statement* (5.6) in the questionnaire referring to this type of collocation, so further interviews, written or oral productive skill investigation should be conducted. The tendency of agreement for including prepositional collocations in the in term bases is very high (mean: 4.14 and standard deviation: 0.74).

### Nominal collocations

(Mel’čuk, 1996) allocates the category *Modifiers* in Noun Phrases in general language. However, TCE text analysis has discovered that two kinds of quantifiers and qualifiers are typical in TCE texts. In the survey questionnaire, statements 5.1 and 5.2 are written for these two kinds of combinations. The quantifier is clear and extremely popular while the modifier is a cluster of semantic nuances and needs further investigation. The degree of welcome is similar to the prepositional collocations with the means of 4.19 and 4.06 and standard deviations of 0.714 and 0.713, respectively. These fall in the scale of Agreement (3.41-4.20). Looking at **Table 6.9,** the students express a passionate support for these kinds of Verb + Noun and Noun + Verb collocations. The mean values and standard deviations of statements 5.3, 5.4, and 5.5 are 4.20, 4.11, 4.12 and 0.677, 0.694, 0.705, respectively.

**Table 6.9:** Mean and Std. Deviation of the needs for Syntagmatic LRs

|  |  |  |  |
| --- | --- | --- | --- |
| **Collocational types** | **Syntagmatic LRs** | **Mean** | **Std. Deviation** |
| Nominal collocations | 5.1. Quantifier | 4.19 | .714 |
| 5.2. Qualifier | 4.06 | .713 |
| Verbal collocations | 5.3. LF Real 1 & Real 2 | 4.20 | .677 |
| 5.4. LF Fact 0 | 4.11 | .694 |
| 5.5. LF Fact 2 | 4.12 | .705 |
| Prepositional collocations | 5.6. Preposition - Noun | 4.14 | .740 |

### Summary of Chapter VI

Terminology support contributes considerably to the successes of EMI training, but the question is how terminology can be planned to support EMI students for content and linguistic acquisition. The quantitative questionnaire survey based on the typical LRs investigates EVRB EMI students’ perceptions of the current term support and the expected term products as the results of the new terminology planning approach for learning individual subjects as regards their needs, level of satisfaction and expectations from content and linguistic perspectives. It is discovered that, for each disciplinary subject, the EVRB EMI students are usually provided with traditionally planned terminology term lists without much information from content and linguistic perspectives. Monolingual English-English terminological dictionaries are so difficult for the students to use while English - Vietnamese TCE dictionaries cover too many terms from various subjects but lacking terms for individual subjects. There are hardly any term resources with conceptual relations to facilitate content acquisition. Neither are there term resources with LRs to facilitate language acquisition such as collocations. The results from the investigation of EVRB EMI students’ opinions have proved that the students always expect to acquire both content and linguistic knowledge, but the semasiologically organized terms provided to them are treated as discrete units without term relations and they cannot satisfy their needs from content and linguistic perspectives. The students passionately welcome the new onnomasiologically term products of an individual specialized event that present both *paradigmatic* and *syntagmatic* LRs. These term resources not only provide them with specialized concepts and an overall picture of the event with its own processes, actions, and participants but also with linguistic information, especially collocations. This new terminology planning framework can be applied for other specialized events in TCE and other disciplines.

**CHAPTER VII**

**PRESENTATION OF TCE TERM RESOURCES**

**BASED ON LEXICAL RELATIONS AND EMI STUDENTS’ PERCEPTIONS**

Based on the results of the 1st research question that reveals the typical *Paradigmatic* and *Syntagmatic Lexical Relations* in Highway Bridge Design as well as the internal and external relationship of the *Lexical Relations*, which are presented in details in chapter IV and V as well as the results of the second reserch question about of EVRB EMI students’ perceptions about term supports in chapter VI, and opinions from expert specialists, the recommendations for the term products to support EVRB EMI students have been established. This part answers **Research question 3:** *How can knowledge - based bilingual TCE term resources be presented based on Paradigmatic and Syntagmatic Lexical Relations and students’ perceptions to facilitate content and linguistic acquisition of individual subjects?*

**7.1. The elements to be included in the term resources**

***7.1.1. Knowledge-based term resources:*** The *lexical relations* and their *categorizations* identified in research question 1 provides stuff for composing knowledge -based term resources that facilitate both content and language acquisition. EVRB students strongly welcome this kind of term support because they wish to acquire both content and English knowledge. This has hardly been researched in any specialized field in Vietnam. Dictionaries in a specialized area usually contain terms arranged in alphabetical orders, whose affordances cannot be denied, but *knowledge-based* term resources are onomasiologically-organized lexemes with semantic relations as a function of memory, where words of related meanings are stored near each other in the mental lexicon and there are common properties that bind the items in the domain together and there are properties that differentiate them from each other. These models represent human semantic memory as a network, in which concepts are linked together by a variety of semantic and *lexical relations*. These models help to look at lexical universals, principles of lexicalization, and translation. They also contribute positively to the construction of a machine-readable lexicon. A lexicon with onomasiological structure permits the meaningful combination of linguistic information in the description of lexical entries. The vocabulary is presented as a structured whole, despite the specific language. Such databases facilitate the selection of appropriate terms during translation because they enable the user to “understand conceptual coherence”. These term products therefore can support learning a subject from both content and linguistic perspectives. 60% of the surveyed EVRB students agree that the available term resources delivered by lecturers are not knowledge - based and 72% of the students agree that they are provided with alphabetically arranged term resources without *multidimensional* term relations, so the term resources do not facilitate content and language acquisition. The *paradigmatic* and *syntagmatic lexical relations* discovered in this study provides information for composing *knowledge -based* term resources.

***7.1.2. Frame-based term resources:*** Frame-based systems are knowledge representation systems that use *frames,* a notion originally introduced by Marvin Minsky, as their primary means to represent domain knowledge. A frame is a structure for representing a concept or situation. Such a frame includes several kinds of information such as definitional and descriptive information. In Highway Bridge Design, super frames and sub-frames of the Event can be developed based on the typical *lexical relations, participants, actions, entities, attributes* that have been discovered. In this specialized discipline, the structures and components of frames are much more complicated than in general language. *Moments* are taken as an example: *hierarchies* are types of moments whereas *non-hierarchies* are *causes* of moment, what are *affected* by moments, the *actions, positions*, and *attributes* of moments. These organizational principles turned out to be very useful, and, indeed, the now popular object-oriented languages have adopted these organizational principles. The EVRB students are passionate for the terminological presentation pattern with the *actants, actions, processes, etc.* of the specialized event with their *multidimensional* relations to facilitate content and linguistic knowledge acquisition. They strongly support the frame-based presentation format: the mean value is 4.22.

***7.1.3. Conceptual dimensions of terms: specialized concepts:*** *Concepts* are the most important dimension of terms. In the survey, 96.2% of the TCE EMI students agree that concepts are of prime importance in specialized subject teaching and leaning. Likewise, 78.1 % accept they have difficulties in understanding concepts and content knowledge when the terms are presented as discrete units. At present, there are almost no dictionaries for individual content subjects; therefore, the students are provided with word lists composed by their lecturers, in which terms are arranged in alphabetical order without conceptual relations. This prevents the students from understanding the concepts in relation with other concepts. The *paradigmatic lexical relations* and their taxonomies in HBD Event are predominantly tightened to *concept relations*. For example a *cable-stayed bridge* is a type of *bridge.* In students’ mind, they need to be able to visualize a *bridge* and *a cable stay-bridge* with complicated specialized knowledge. A *girder* is a part of a *bridge* and it is made of *reinforced concrete*, and it is affected by *loads* which can be *live loads* or *dead loads*. All these are concepts that are *multidimensional* related to each other. The relationships between concepts are more often multilateral rather than unilateral. Term bases with concepts and concept relations certainly facilitate knowledge acquisition that students and translators or practitioners need to quickly grasp.

***7.1.4. Linguistic dimensions of terms:*** 97 % of the research participants need term resources not only for understanding concepts but also for learning terms as *lexical units* and *collocations* of terms, which facilitates English language acquisition. The students are not native English speakers, so they cannot easily produce chains of words and have difficulties in combining words correctly. The *linguistic dimensions* of terms are institutionalized, i.e., language specific such as *collocational patterns, pronunciations, part of speech, and grammatical rules*. These aspects of English foreign language are manifested in *lexical relations*. *Nominal collocations, Verbal collocations* and *Prepositional collocations* are very typical in HBD terminology, which are discussed in the typology of *Syntagmatic lexical relations* that should be included in the term bases. Lexical entries with shared meaning components are in the same lexical sub-domain. Each lexeme is provided with its meaning definition as well as *grammatical* information necessary for its use in different contexts. Thus, *lexical relations* become a dynamic component where the choice of one lexeme instead of another is goal-directed. Like in dictionaries, Pronunciation and Part of speech should be presented in the term resources for the students to learn English language.

***7.1.5. Lexical relations:*** As discussed repeatedly above, TCE term resources should present *lexical relations* that consist of not only *hierarchical* and *non-hierarchical* concept relations but also other *syntagmatic relations* denoting combinational potentials of terms and term elements as revealed in Highway Bridge Design Event. *Paradigmatic lexical relations* include both *logical* relations (**Type-of**) and *ontological* relations which are concerned with contiguity in space and time (Partitive: **Part-of**). Logical and partitive relations together comprise *hierarchical* relations. *Associative* relations form an other kind of paradigmatic relations that are loosely defined. *Paradigmatic* LRs are useful for both hierarchical and non-hierarchical term relations. *Syntagmatic* LFs, on the other hand, can be used to describe collocations and phrases in terminology. Both *paradigmatic* and *syntagmatic* relations are incorporated in definitions of lexemes. *Lexical relations* are very relevant and useful for term description as Wanner (1996) mentions that *lexical relations* are not only a distinct characteristic of not only Verbs but also all predicates including adjectives and Nouns, which make up the majority of terms, so they are very useful for term representation to show structural relationships between terms, including *hierarchical* and *non-hierarchical* as well as *equivalent* and *associative* relationships. In recommending systematic ordering of specialized dictionaries, Picht & Draskau (1985: 132) maintain such databases facilitate the selection of appropriate terms during translation because they enable the user to understand conceptual coherence. Via meaning definitions with a high degree of information and a maximum economy, such a lexicon allows for the codification of semantic relations between lexical units and permits the development of a framework which classifies predicates (verbal, nominal or adjectival) into semantic classes. It also clarifies the interrelations between syntax and semantics since the syntax behavior of predicates is motivated by the lexical sub-domain to which these predicates belong.

***7.1.6. Definitions containing lexical relations***

In specialized textbooks, there are usually *Glossaries* that provide the definitions of terms. *Lexical Relations* are means of defining and explaining terms, so they are indispensable parts of definitions. In fact, ***Lexical Relations*** are the components of definitions. For example, in the definition of *girder: “A* ***girder*** *is a support* [*beam*](https://en.wikipedia.org/wiki/Beam_(structure)) *used in* [*construction*](https://en.wikipedia.org/wiki/Construction)*. It is the main horizontal support of a structure which supports smaller beams”,* the lexical relations are extracted as below:

**Type-of:** A girder is a type of support beam.

**Synonym:** A girder is the main horizontal support of a structure.

**Part-of:** A girder is a part of a structure.

**Qualifier:** Horizontal support

**Agent-of:** A girder supports smaller beams.

**Patient-of** (Beneficiary): Smaller beams are supported by a girder.

Once students are not sure about the *concepts*, they resort to definitions, so it is necessary to present *definitions* in the TCE term resources. The survey of EVRB EMI students results in 48.7 % strongly agreeing and 35.5 % agreeing on being provided with definitions in term resources for content knowledge acquisition.

***7.1.7. Vietnamese equivalents of English terms:*** In the current research, the term translations of the researcher were triangulated with the group of specialist experts. The results of the triangulations gave various versions of translations in many cases. There are controversial opinions as regards term equivalents (Grillage method: Phương pháp lưới dầm, phương pháp mạng; box- girder web: thành hộp dầm thép/bản bụng dầm thép). In HBD domain, there exist some Vietnamese equivalents for the same English terms, which is reflected in the corrections of the specialists. In some cases, different versions of translations are acceptable among Bridge Design Community (stiffened truss: giàn tăng cường/ giàn cứng, substructure: kết cấu phần dưới/hạ bộ). In other cases, there is no appropriate Vietnamese equivalent for the English term, so it remained untranslated (composite material: vật liệu com-po-sit). Most of the EMI students (83%) agree that there exist controversial issues concerning Vietnamese equivalents to English terms: the percentage of Agreement and Strongly Agreement are 57.7 % and 25.3 %, so they really need the provision of Vietnamese translation in the term resources.

**7.2. How are the term resources presented**

***7.2.1. In alphabetical order:*** The dictionary provided to EVRB EMI students by the Bridge Professor Nguyễn Viết Trung is composed in the alphabetical order. EVRB EMI students majoring in Bridge Engineering are familiar to this term resource. The dictionary has been developed in three languages of Vietnamese, English, and French. This term base is published as a dictionary, but the term entries are simply presented in Vietnamese alphabetical order with English equivalents as follows. In the term list with *lexical relations,* the first terms can also be presented in *alphabetical order* with Vietnamese equivalents, but the second term is also given. In the following table, apart from the terms indicating *construction materials*, term users know what kind of bridge is *made of* a certain material:

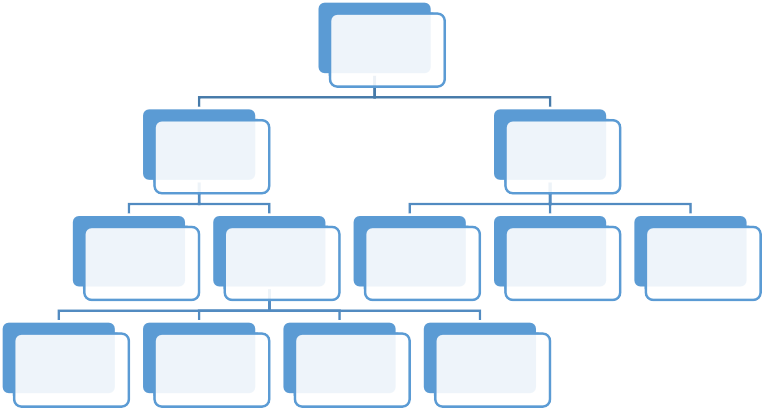
**Table 7.3:** Presenting Term one in *alphabetical order* and Term two in *bridge kind*

|  |  |  |
| --- | --- | --- |
| **Material-of (Made-of) relation** | | |
| **Term one** | **Translation** | **Term two** |
| Steel plate girder | Dầm bản thép | Bridge (Plate girder) |
| Stone | Đá | Bridge |
| Stone arch (bridge) | Vòm đá | Bridge (arch) |
| Stone masonry | Đá xây | Bridge |
| Structural steel | Thép kết cấu |
| Wood | Gỗ |
| Wooden structures | Kết cấu gỗ |
| Wrought iron | Sắt rèn |

*Alphabetical order* is useful for presenting terms in tables or as word lists. The lexical relation: **Nominalization**, which is abundant in HBD Event, can also be effectively presented in *alphabetical order*.

***7.2.2. Hierarchical presentations for Type-of relations:*** For **Type-of** and **Part-of** *lexical relations*, the traditional *hierarchical* format can be used to facilitate content knowledge transference and acquisition and tree formats are easy to be presented in paper medium. Below is an example of **2. Part-of** hierarchy.

**Figure 7.1 : Part-of** hierarchy.



Bridge

Superstructure

Substructure

Truss

Deck

Footing

Abutment

Piers

Cantilever arm

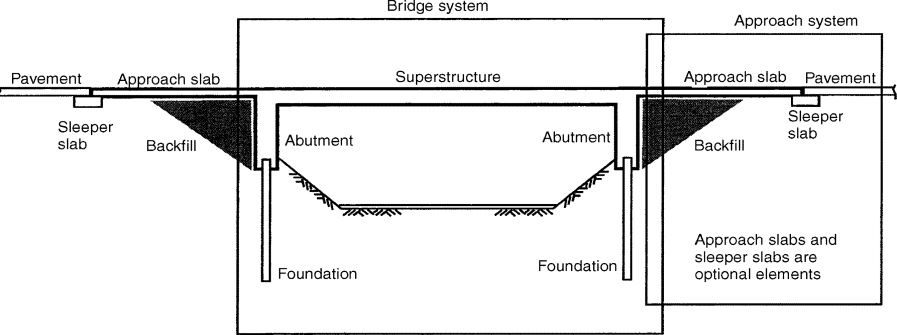
Girder

Median

Joint

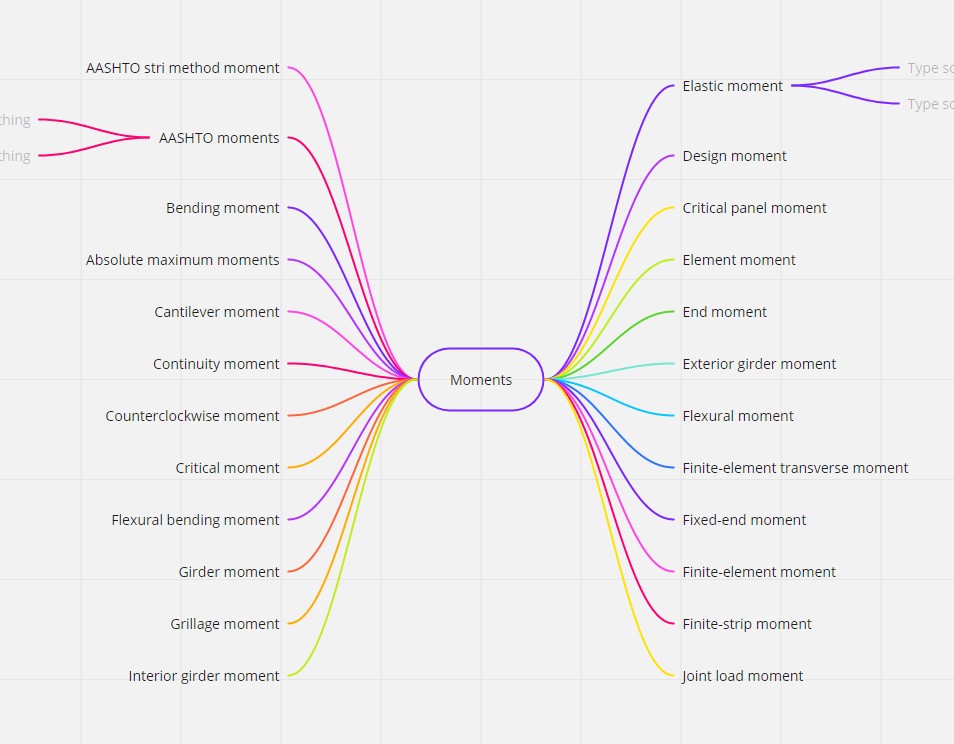
**Type-of** has 1228 examples of *HBD Lexical Relations*. There are types of 35 terms**,** each of which consists of sub-types with their hyponyms. All the Type-of relations can be presented in the form of *hierarchies* so that the term resources are enriched with not only terms but also content knowledge. Further refinement of **Type- of** relations should be carried out by both HBD specialists and linguists for high- quality term products.

*7.2.3. Pictures for Part – of relations*

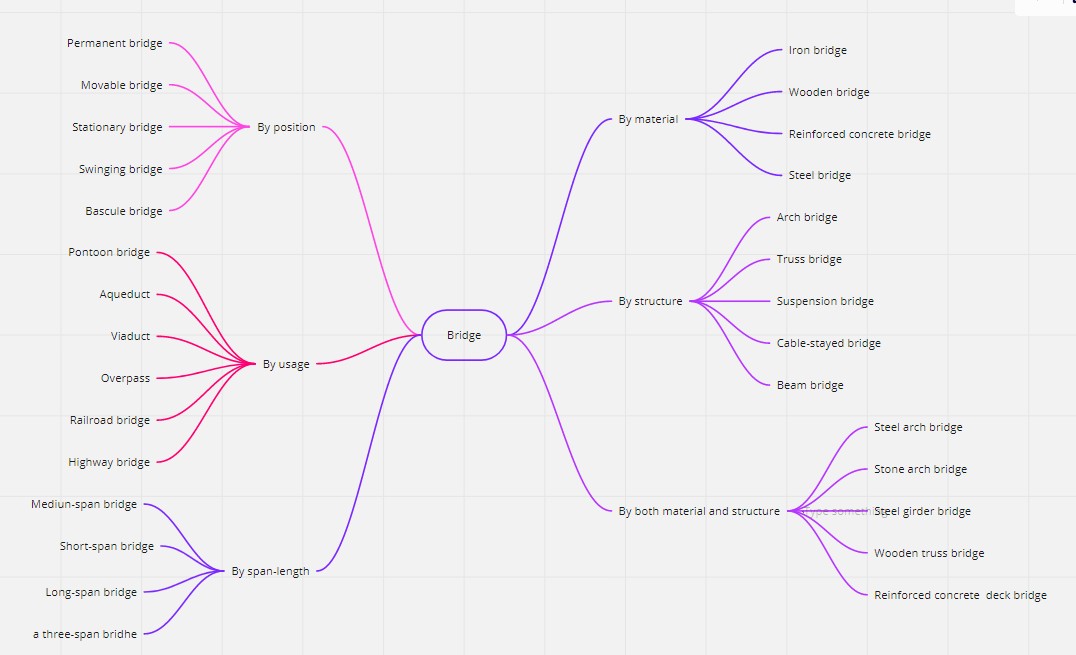
***7.2.4. Tables for Material – of and Patient - Agent relations:*** In this research, most of the results are presented in the form of tables. Presenting term relations in tables can save words and are easy to understand. This form of presentation is suitable for categorizations and relations. The table below presents the materials that slab-girder bridges are *made of*. The first column presents the *material* of the *girder* and *slab* while the translation in the second column helps students understand the concepts more easily and the *kind of bridge* is presented in column 3. In a bigger table, the third column contains different kinds of bridges:

**Table 7.4:** Presenting Materials of slabs and girders of slab-girder bridges in tables

|  |  |  |
| --- | --- | --- |
| **Material – of (girder-slab)** | **Translation** | **Bridge** |
| Steel - Precast concrete | Thép - Bê tông đúc sẵn (Cầu dầm thép - Bản mặt bê tông cốt thép) | Slab-girder bridge |
| Steel - Steel | Thép - Thép (Cầu dầm thép - Bản mặt thép) |
| Steel - Wood | Thép - Gỗ (Cầu dầm thép – Bản mặt gỗ) |
| CIP concrete - CIP concrete | Bê tông đổ tại chổ - Bê tông đổ tại chổ (Cầu dầm bê tông đổ tại chỗ - Bản mặt bê tông đổ tại chỗ) |
| Precast concrete - CIP concrete | Bê tông đúc sẵn - Bê tông đổ tại chổ (Cầu dầm bê tông đúc sẵn- Bản mặt bê tông đổ tại chỗ) |
| Precast concrete - Precast concrete | Bê tông đúc sẵn - Bê tông đúc sẵn (Cầu dầm bê tông đúc sẵn – Bản mặt bê tông cốt thép đúc sẵn) |
| Wood - Wood | Gỗ - Gỗ (Cầu dầm gỗ - Bản mặt gỗ) |

****In fact, Agent-of and Patient-of relations are related with the same verbs, so it is best to present them together with the verbs. In the horizontal line, the first column consists of Animate Agents and Inanimate Agents. In the second column, each row consists of a group of Verbs, which go with certain Patients in the third columns. The tables presents not only terms but also Verbal Collocations of terms for language acquisitions. ***2.5. Diagrams* Figure 7.3**: Presenting terms as **Type of** *moments*

***7.2.6. Mind maps for classifications: Type-of relations:*** The *bridge* is the central concept in Highway Bridge Design Event. There are various ways of classifying *bridges*, namely by *material*, *structure*, *both material and structure*, *usage*, *span length*, and *position*. The *lexical relations* can be presented in the form of *mind maps* with the bridge as the central entity. The criteria for classification circle the bridge and subtypes of bridge radiate from each criterion for classification. The *mind map* has branches and sub-branches of bridge-type system.

**Figure 7.4:** The Mindmap of bridge classification

***7.2.7. Multidimensional lexical relations:***In the lexical semantic approach of term research, the multidimensionality of terms are highlighted. Term presentation patterns, therefore, should contain the multidimensional nature of terms. A simple example is taken in the table below: the *deck overhang* is related to *Bridge* and *Deck* in **Part-of** relation. It is also related to *Facia girder* in **Location-of** relation, etc. The *multidimensionality* of lexical relations related to “Deck overhang” can be presented diagrams or mindmaps.

|  |  |  |  |
| --- | --- | --- | --- |
| **Lexical relations** | **Term 1** | **Term 2** | **Translation** |
| 2. Part-of | Deck overhang (Bản hẫng) | Bridge | Cầu |
| 8. Location-of | Located outside the facia girder | Nằm ở ngoài dầm biên |
| 3. Made-of | Reinforced concrete | Bê tông cốt thép |
| 2. Part-of | Deck | Bản mặt cầu |
| 6. Patient-of | Loads | Tải trọng |
| 1. Type-of | Structutal part | Bộ phận kết cấu |
| 13. Asociative | Bridge design | Thiết kế cầu |
| 5. Agent-of | Trafic loads | Tải trọng phương tiện |

***7.2.8. Relations presented in contexts:*** Even HBD experts need the *context* for precise understanding and translation of terms. Very often, the term does not possess uni-dimensional relation but multidimensional relations. Also, the relation is not *one - to - one* but *many - to - one* or vice versa. Maybe a group of terms has the same relation with another term, for example, “*concrete curbs, parapets, barriers, and dividers”* in the table below. Therefore, the context is important for identifying the relationship:

|  |  |  |  |
| --- | --- | --- | --- |
| **17. Qualifier** | concrete curbs, parapets, barriers, and dividers | Vỉa hè bê tông, lan can, dải phân cách và rào chắn | Structurally continuous with the deck |
| **2. Part-of** | concrete curbs, parapets, barriers,  and dividers | Roadway (Đường xe  chạy) |

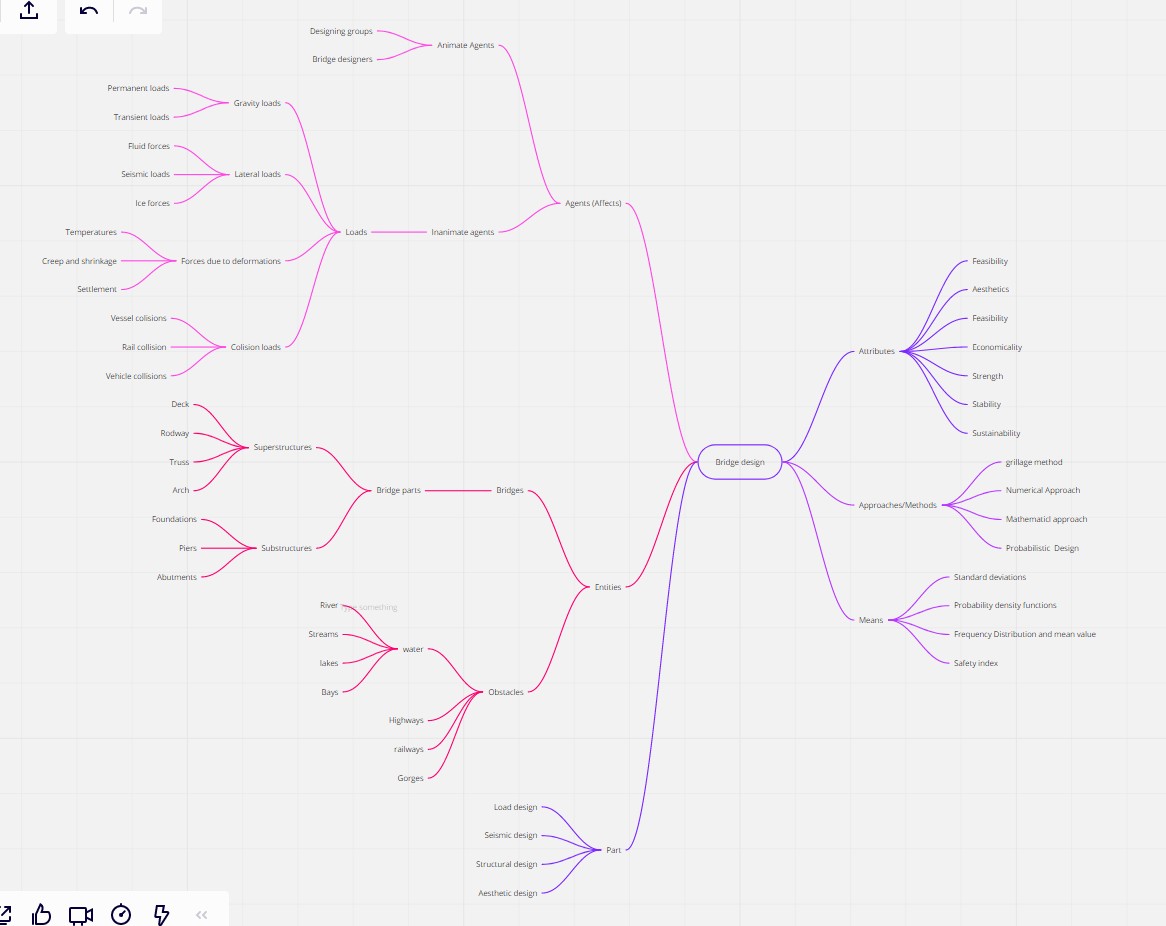
Standing out of the context, especially in domains other than Highway Bridge Design, the terms *Stiffness, Mass,* and *Damping* have different meanings, however, in the context of HBD, these terms are **Type-of** *Transient structural dynamic problems*:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1. Type - of** | Stiffness | Độ cứng | Transient structural dynamic problems | Bài toán động lực học kết cấu tức thời |
| Mass | Khối lượng |
| Damping | Sự giảm chấn |

Learning a specialized subject needs precise understanding of concepts, so term resources based on lexical relations brings plentiful advantaged to EMI learners in acquiring definitions of concepts.

***7.2.9. Frames of events and sub-events:*** *Frame semantics (*Fillmore (1992, 1998) relates [*linguistic*](https://en.wikipedia.org/wiki/Natural_language) [*semantics*](https://en.wikipedia.org/wiki/Semantics) to *encyclopedic knowledge*. The underlying idea is the meaning of a single word is related to the essential knowledge of a certain Event. The *conceptual structures* (semantic frames) provide the background of belief and experiences required to interpret the lexical meaning of the specific term and they provide the basic for creating an overall picture of a specialized Event with its participants and processes. Relations systems *(Paradigmatic* and *Syntagmatic)* are linked to each other in logical orders and can be filled in the frame. A *semantic frame* is a collection of facts that specify *characteristic features*, *attributes*, and *functions* of a denotatum, and its *characteristic interactions* with things necessarily or typically associated with it. It is a *coherent structure* of related concepts representing an *Event*, *Relation*, or *Object* and its *Participants*. Without knowledge of the background situation with related concepts, we cannot fully understand any specific concept in the system. *Frame elements* give additional information to the semantic structure of a sentence. Each frame has several core and non-core frame elements which can be thought of as *semantic roles*. *Core* frame elements are essential to the meaning of the frame while *non-core* frame elements are generally descriptive (such as time, place, manner, etc.). Meanings of terms are described in terms of a structured background of experience, belief or practices which are necessary for term understandings.

**Figure 7.6:** Frames and Subframes of Highway Bridge Design Event



***7.2.10. Location-of relations presented in passive sentence patterns:***Location-of lexical relations are extremely useful for epistemological knowledge acquisition. The ontology of HBD can be illustrated via Location-off relations, so that the term users can visualize the locations of physical parts and intangible actions of bridges like in **Table 4.58 to Table 4.66**. In the term bases, **Locations** of *physical parts* and *intangible bridge actions* are best presented with other Actants and Verbs to facilitate language acquisition. In table 88, the locations are presented in the Imperative Mood. The relations can also be commonly expressed in the Passive Voice like in **Table 4.64:** Location of actions/ processes in passive sentences. These sentence patterns are extremely useful for TCE EMI students to acquire both the subject content and English language.

***7. 2.11. Tags for collocations:*** Tags are useful for presenting linguistic features of terms, especially collocations. Tags are easily presented in the computer environments. Terms can be tagged with prepositions, synonyms, antonyms, quantifiers, and qualifiers. The category of lexical relations of verbal collocations can be effectively presented with tags. For example, the pre-modifiers as qualifiers can be tagged to their head-nouns to indicate common collocations in the terminology. In many cases, Verbs are considered terms and are presented in specialized dictionaries. Standing alone, verbs do not express its terminological value as strongly as in combinations with other Nouns. This kind of relation if extremely popular in HBD terminology. The popular combinations are identified in the phase of term relation analysis. *Verbal Collocations* can be presented via Tags in the computer environment. The most frequently used verbs *Carry* and *Model* are taken as examples in table.

In this Chapter, the content and presentation formats of the term bases were recommended. These term resources not only provide TCE EMI students with specialized concepts and an overall picture of the Event with its own *processes, actions,* and *participants* but also with *linguistic information*, especially *collocations*. The findings of the two research phases are holistically presented together with detailed discussion and recommendations for presentation of term bases. The research results of the current study recommend *an alternative Framework for TCE terminology planning*. However, limitations are unavoidable for any scientific study, so further research is essential. This new terminology planning framework can be applied for other specialized events in TCE and other disciplines.

**CHAPTER VIII: CONCLUSION**

**8.1. Recapitulation of the study**

**8.1.1. The thesis is language planning - oriented terminology research**

Although Terminology research has had a long history of development with different schools applying various theories and research methods, the term products in the field of TCE have revealed that little attention has been paid to *descriptive* terminology and there should be an alternative efficient framework for TCE terminology planning. General Terminology employs Concept Theory for term *analysis, description,* and *presentation* focusing on the *hierarchical* concept relations *Type- of* and *Part- of*. The products of term planning efforts following this traditional terminology planning framework are dictionaries and specialized databases that cannot present the *combinational potential*s of terms. Being familiar with the poor term lists provided to EMI students, which are composed by specialist subject teachers without linguistic information and systematic knowledge structure, the researcher was impressed by *language planning-oriented terminology management*, which treats terms in relations and systems. This alternative framework for Terminology Planning was developed by Antia (2000), a pioneer author in *language planning-oriented terminology management*. However, Antia’s research is in a different field from TCE and if *Paradigmatic term relations* and *ontological* term presentation receive much attention in Antia’s Law term bases, *Syntagmatic lexical relations* are not seriously taken into considerations. Although Antia (2000)’s term systems overcome the drawbacks of the traditional approach of General Terminology, they do not seriously take into account the *collocation patterns* of English terms and no *specific linguistic model* was employed.

**8.1.2. Linguistics and Terminology are brought close together by using LRs for HBD term analysis:**

One of the major drawbacks of previous terminological products as results of terminology research is that no *syntagmatic* data is provided in any of the term representation formats, and hardly any *linguistic models* have been applied systematically and exhaustively for term investigations. The current researcher made an effort to investigate the relationships between *syntax* and *semantics* because linguistic forms cannot be analyzed separately from meanings. The potential *semantic* and *syntactic* behavior of specialized language units were exploited and a description of *conceptual relations* and term *combinational potentials was provided*. The current research borrows the principles and methodologies from *Lexico- Semantic Frameworks* because they complement perspectives of General Terminology that entirely focused Part-of and Type-of relations. The research also bears many features of Sociocognitive Terminology looking into TCE terms in usage context and students needs. It links *ontology* with *multilingual* terminological information and opens a new horizon for presenting TCE concepts *multiple dimensionally*. As for *Paradigmatic Lexical Relations*, besides the Generic- Specific and Part-Whole relationships, many other types of relationships such as Cause-Effect, Agent-Patient, Action-Location, etc. that enrich the knowledge structures were studied. Furthermore, the *Syntagmatic Lexical Relations* denoting *Verbal, Nominal* and *Prepositional Collocations* were thoroughly explored and analyzed.

**8.2. Implications of the thesis**

**8.2.1. Methodological implications**

**The top-dowwn approach:** Terminologists as linguists don’t apply *top-down* terminology research because they cannot visualize the *skeleton frames* and *sub-frames* of the term system like specialist experts. This is time consuming and the resulting organization of terms is not much beneficial for *translation* as well as *knowledge* and *language* acquisition. The sources of data were collected in a different way. Rather than using terms taken from dictionaries or term bases composed by expert specialists, the *Lexical Relations* were extracted from a reliable text-book which is compacted with knowledge in HBD with multidimensional relations. The *bottom-up* method involved studying terms in the real usage context in a specific textbook. Not only the typical *Lexical Relations* with their degree of typicality were identified but also the multidimensional relations of terms were investigated. Both the *Paradigmatic* and *Syntagmatic Lexical Relations* were investigated in depth. Moreover, students’ needs at the lowest level of terminology planning were surveyed, so the research was aimed at a certain product for specific users. The survey questionnaire was composed based on the typical TCE *Paradigmatic* and *Syntagmatic Lexical Relations* in HBD Event. Students are positioned at the lowest level of *language planning model* and term relations extracted from textbook are at grass-root level, too. This, therefore, features the *bottom-up* term planning method that is in contrast with the *top-down* approach, in which the state government issues policies in *language planning* and term lists are prepared subjectively by specialist experts. The linguist has made use of her strong points in applying *linguistic models* in terminology research. The HBD terms are investigated not as discrete units but *in relations* with other terms in the usage contexts. In other studies, terms are treated as discrete units without relations, orders, patterns, or other facets of languages.

### Multi-disciplinary descriptive terminology research: The current terminology planning research is *descriptive* by nature, which is concerned with term *analysis*, *description*, and *presentation* rather than *prescriptive*, which is concerned with terminology *standardization*. The terminological descriptions are not superficial based on *structural forms* but get deep into the technical meanings of the HBD term system, which linguists have hardly attempted to do before. The research is *interdisciplinary* concerning *English Linguistics*, *EMI Training*, *Terminology Research*, and *Disciplinary Knowledge*. The overall approach of terminology planning is not only advanced in Transport Construction Engineering but also in Terminology in general.

### A comprehensive Analytical Framework was developed and applied: The biggest methodological contribution of the thesis is the formation of the Analytical Framework for the study. Being well-aware of the needs for *language planning-oriented terminology planning* to satisfy EMI students’ needs and the affordances of *Lexical Semantics* in Terminology, the author tried to seek a *linguistic modal* to develop the an Analytical Framework for TCE terminology planning and settled on Lexical Functions in Meaning Text Theory developed by Mel’čuk (1981, 1996). The Lexical Functions were adapted and supplemented to form the Framework for analyzing and categorizing *Lexical Relations* in Highway Bridge Design Event. This enabled a description of both *conceptual relations* and *term combinational potentials*.

### 8.2.2. Theoretical implications

The Doctoral Thesis has contributed to Theories in Terminology Planning and Management (including Term Resource Development), Lexical Semantics, and EMI Training Theory.

**Implications to the Theory of Terminology Planning:** The greatest theoretical significance of the thesis is to *Terminology Planning Theory*. It is the first *language planning - oriented* terminology work conducted by a linguist in the field of TCE. This revolution in research and practice concerning TCE terminology planningbrings Terminology and Linguistics close together. The principals and methods applied and discovered in the study are in marked difference from the ones in the traditional approach and form a different approach in TCE terminology planning. The research results imply that terminology management can only be fully effective with the coordinations of linguists and specialists as terminologists. This research postulates an interdisciplinary approach and theoretical premises to make the modeling of conceptual structure less subjective, i.e. not merely based on intuition of specialist experts. The thesis also reinstates the position that terms are living elements with their characteristics and relations in the communicative context. Also, any terminology research is aimed at terminology products for a specific kind of users, so their needs must be taken into considerations. Sociocognitive terminology can bring about the fullest affordances for term users.

**Implications to Lexical Semantic Terminology:** The study highlights that *specialized language semantics* is concerned with the mental representation of terminological units and their relations with other units in the same domain. Lexical Semantics can be successfully applied to terminology planning, which results in not only the conceptual structure and constellations of concepts in semantic networks but also the combinational potentials of terms of the specialised domain. The theoretical values of the thesis lie in the identification of 32 HBD typical*Lexical Relations* with 19 *Paradigmatic* relations and 13 *Syntagmatic* ones. Many of the original LFs were simplified and renamed to facilitate easy understanding of non-linguistic EMI students and experts.These *LRs* were further analyzed and categorized from meaning perspective to see how they are multidimensionally linked to each other. New paradigmatic and syntagmatic LRs emerged and quite a few term systems which are hierarchically, associatively and collocationally related were established.

### Implications to EMI training theory: The thesis confirms the very important role of terminology planning as a *pedagogical tool* to facilitate knowledge acquisition in the EMI training environment. EMI students need both *conceptual lexical relations* and *collocational patterns* in the knowledge-based term products for learning specialized subjects in English. However, term support has been hardly researched in EMI training, especially in Vietnam where the level of English proficiency is lower than in countries where English is an official or second language. Teaching methods for EMI students need to be established based on specific training conditions. In additions, the role of English language teachers in teaching English for specific purposes has been questioned in the recent years, especially by specialist subject teachers even though the name of the subject is English. The ability of language teachers to teach disciplinary content embedded in ESP is suspected. The current research confirms English language teachers not only can teach ESP but also can play a prominent role in helping EMI students to acquire disciplinary content. This kind of research is impossible to be conducted by terminologists as specialist experts. Language researchers and teachers not only can teach ESP but also can transfer epistemological knowledge to EMI students via knowledge-based terminology. The coordination of the researchers on both sides results in the beneficial term products for EMI students.

**8.2.3. Practical implications**

Whether Terminology is *descriptive* or *prescriptive*, it is always connected to a form of terminology products for specific term users. The result of the study will help TCE EMI students not only acquire epistemological knowledge but also learn English for Specific Purposes (ESP). The current terminological research has several remarkable practical implications. First, TCE EMI student’s needs as regards terminology resources as a tool to disciplinary access are found out so that TCE EMI students can be better supported with suitable terminology resources. Not only Vietnamese students but also non-native English speaking students from other countries who are trying their best to acquire both English language and disciplinary literacy can benefit from the results of the study. The study results can be used as a source of references for higher education institutions to modify their language planning policies to provide pedagogical support for academic access and implement language-in-education planning research projects for the same purposes. Secondly, the *language planning oriented* term resources as products have quite a few advantages over the traditional ones because terms are presented in relations with each other so they can simultaneously provide disciplinary and linguistic knowledge to students. It can also be used as a reference resource for other stakeholders including TCE students, technical writers, translators and TCE engineers who need a quick access to English terms with their Vietnamese equivalents and basic disciplinary knowledge. Representation of specialized concepts in networks with both *vertical* and *horizontal* relations is very important in terminological work. *Non- hierarchical* relations defining the *cause, effect, action, attribute, associative,* and *result* of HBD event are as important as *hierarchical* ones such as *Type-of or Part-of*, etc. Typical semantic roles of *Agent, Patient, Result, Instrument,* and *Location, Means, Method/ Approach, etc.* in HBD Event are identified, too. Term users can obtain knowledge of English collocational patterns, namely *Nominal Collocations, Verbal Collocations and Prepositional Collocations.* All the typical combinational patterns such as *Adjective + Noun, Quantifier + Noun, Verb + Noun, Noun + Verbs, and Prepositional combinations* with various paradigmatic lexical relations bring quite a lot benefit to term users. Furthermore, with the aid of computer science, in which tags as well as different forms of diagrams and mind maps link one term to others systematically, the multidimensionality of terms relations will be presented in computer environment to enrich information for the convenience of term users. This also sets the initial steps for research and application of artificial intelligence in TCE terminology management. And finally, the extracted terms, LRs, Vietnamese term equivalents discovered in the study can be used to develop specialized TCE dictionaries. The research results are useful for not only Vietnamese EMI students but students of different mother tongues who study TCE subjects in English.

**8. 3. Limitations and recommendations for further research**

- The investigation of the HBD term systems were principally dependent on *Lexical Relations* rather than specialized knowledge expertise. It was impossible for the researcher to develop the skeleton term systems right from the beginning like specialist experts. In some cases, it was quite hard for the researcher to interpret the *LRs* because HBD requires knowledge of *physics, material mechanics, structural engineering,* and most importantly *mathematics*. Thus, she had to consult specialist experts during the whole process of term relation extraction and categorizations. Therefore, projects with co-researchers as linguistic experts and specialist experts right from the beginning would be more efficient.

*- LFs* in MTT are complicated and not always easy to understand even for linguists, not mentioned non-linguistic majors. This results in some unaddressed issues. For example, the meanings and potentials of Lexical Functions for terminology analysis have not been completely exploited. There are Lexical Functions that have not fully revealed their usefulness for HBD term relation analysis, but the reasons for this have not been clearly articulated. Only the identified Lexical Relations were triangulated with specialist experts, but there remains unidentified Lexical Relations and the identified one have not been categorized exhaustively from different dimensions, therefore, they should be further refined and analyzed.

- The Verbal Collocations based on LRs are major findings of the thesis, however, much further investigation should be conducted as regards the meaning of auxiliaries and realization verbs. There remain some uninvestigated Lexical Relations in the category of Verbal Collocations. It may not be true that these kinds of relations do not exist in HBD text-book but because the researcher has not been able to identify and categorize them.

- Numerous numbers of discovered Lexical Relations from the textbook provided useful stuff for term presentations; however, the limited ability in using computer aided programs such as CAD prevented the researcher from presenting and recommending more sophisticated and knowledge-compacted term systems. The term relation analysis have been done and must be done manually to achieve the most reliable results. It would have been more effective with the aid of terminology management software. Manual term extraction and computer term management software should have been combined for term extractions. This needs much more time and effort to design the integrated process of manual and computer terminology management.

- Controversial issues still exist in the equivalent Vietnamese terms in TCE. Even experts in HBD do not agree on the translations of terms into Vietnamese, so there exist different equivalents for one terms. Thus, research in *prescriptive* terminology management for term standardization should be conducted by terminologists as specialist experts to *standardize* TCE terms.

- HBD is a textbook developed by American authors for constructing highway bridges in the USA. The country has its own geological, climate and weather conditions, which differ considerably from those in Vietnam and this greatly affects Bridge Design and Construction. To a certain extent, the standards applied in the USA have to be modified so that they can be successfully applied in Vietnam, so some little bits of knowledge in the text-book may not be relevant to the situation in Vietnam.

- The students are non-linguistic majors and it was hard for them to understand precisely the ideas in the questionnaire, so their answers might have not reflected what they think because they may have interpreted the meaning of the questions wrongly. There should be interviews with EMI students and EMI university lecturers for in-depth understanding of what they thought to supplement the information collected from the survey questionnaire.

- HBD is a part of TCE and the potentials of LRs should be taken advantage of in further research in other sub-branches of TCE such as Highway design, Highway, Railway, and Tunnel Design and Construction, Material and Soil Mechanics, etc. and also in other disciplinary domains.

The overall research approaches and methods of term planning in the Doctoral Thesis can constitute a new Terminology Planning Framework that can be applied in specialized disciplines other than Transport Construction Engineering: The work starts from term extraction from text-books, categorization, and triangulation with experts and then surveying users’ opinions for developing the final term products to satisfy term users’ needs. Therefore, further research should be conducted in this directions to develop useful term resources to satisfy the needs for term users in the integration and globalization process.

-----The end----

**REFERENCES**

[1]. Alberts, M. (1999). “Terminology in South Africa”. *Lexikos*. Series 9: 18-35.

[2]. Antia, B. E. & Kamai, R. (2006). “African issues in terminology: an educational perspective’’. In Heribert Picht (ed.) *Modern Approaches to Terminological Theories and Applications*, 135-152. Bern [etc.]: Peter Lang.

[3]. Antia, B. E. (2000). *Terminology and Language Planning: an Alternative Framework of Practice and Discourse*. Amsterdam: John Benjamins.

[4]. Antia, B. E. & Dyers, C. (2016). Epistemological access through lecture materials in multiple modes and language varieties: the role of ideologies and multilingual literacy practices in student evaluations of such materials at a South African University. *Language Policy*, *15*, 525–545. <https://doi.org/10.1007/s10993-015-9389-4>

[5]. Faber, P. & Sanchez M. T. (2001). Codifying Conceptual Information in Descriptive Terminology Management. Meta: *Translators’ Journal* 46 (1): 192-204.

[6]. Faber, P. & Usón, R.M. (1999). *Constructing a Lexicon of English Verbs*. New York: Mouton de Gruyter

[7]. Faber, P. (2010). The dynamics of specialized knowledge representation: simulational reconstruction or the perception action interface. Paper presented at the Third Terminology Seminar in Brussels: The Dynamics of Terms in Specialized Communication (23 April 2010).

[8]. Faber, P. (2012). *A cognitive Linguistics view of Terminology and Specialized Language*. A research project funded by the Spanish Ministry of Science and Technology. Berlin: De Gruyter

[9]. Fishman, J.A. (1983). Modeling rationales in corpus planning: Modernity and Tradition in Images of the Good Corpus. In *Progress in Language Planning*, J. Cobarrubias, J. & Fishman, J.A. (eds), 107–118. Berlin: Mouton.

[10]. Hương, N. T., Walkinshaw, I., & Hoa, H. P. (2017). EMI-progra. In B. S. et al Fenton (Ed.), *English medium Instruction in Higher Education in Asia Pacific, Multilingual Education 21* (pp. 37–52). Springer International Publishing AG. <https://doi.org/10.1007/978-3-319-51976-0_3>

[11]. Jernudd, B.H. (1983). Evaluation of Language Planning - What Has the Last Decade Accomplished? In *Progress in Language Planning*, Cobarrubias, J. & Fishman, J.A. (eds), 345–378. Berlin: Mouton.

[12]. L’Homme, & Pimentel, J. (2012). “Capturing syntactico-semantic regularities among terms: An application of the FrameNet methodology to terminology”. In *Language Resources and Evaluation, LREC*. Istanbul, 2012.

[13]. L’Homme, M. C. (2019). *Lexical semantics for terminology - An introduction*. Amsterdam: John Benjamins.

[14]. Maurais, J. (1993). Terminology and language planning. In Helmi, B. S. & Kurt, L. L. (eds.) *Terminology: Applications in Interdisciplinary Communication*, 111-125. Amsterdam: John Benjamins.

[15]. Mek’cuk, I. A. (1998). Collocations and Lexical Functions, in Cowie, A.P. (ed.), *Phraseology. Theory, Analysis, and Applications.*  Oxford: Clarendon Press, 23-53.

[16]. Mek’cuk, I. A. & Žholkovskij, A. K. (1970). Towards a functioning Meaning-Text Model of language. *Linguistics* 57: 10-47.

[17]. Mek’cuk, I. A. (1981). Meaning-Text Models: A recent trend in Soviet Linguistics. *Annual review of Anthropology* 10, 27-62.

[18]. Mek’cuk, I. A. (1988). Semantic description or lexical units in an explanatory combinatorial dictionary: basic principles and heuristic criteria. *International journal of lexicography* 1 (3): 165-188.

[19]. Mek’cuk, I. A. (1989). Semantic primitives from the viewpoint of the meaning Text linguistics theory. *Quaderni di Semantica* 19 (1): 65-102.

[20]. Mel’čuk, I. A. (1996). Lexical Functions: A Tool for the Description of Lexical Relations in a Lexicon. In (Wanner, 1996): 37-102.

[21]. Mel’čuk, I. A. & A. K. Zholkovsky. (1984). Explanatory Combinatorial Dictionary of Modern Russian. Wiener Slawistischer Almanach, Vienna.

[22]. Mel’čuk, I. A. and L. Wanner. (2001). Toward a lexicographic Approach to Lexical Transfer in Machine Translation (Illustrated by the German-Russian language Pair). *To appear in Machine Translation.*

[23]. Mel'čuk, I. A., & A. Zholkovsky (1988). The explanatory combinatory dictionary. In Evens, M.W. (ed.), *Relational Models of the Lexicon: Representing Knowledge in Semantic Networks,* pages 41 – 74. Cambridge University Press.

[24]. Richard, M. B. & Jay, A. P. (2006). *Design of Highway bridges: An LRFD Approach, Second Edition.* New jersey: John Wiley & Sons, Inc.

[25]. Raomos. A., R. Tutin, A., & Lapalme, G. (1995). Lexical functions in the explanatory combinatorial dictionary for lexicalization in text generation. In: P. Saint-Dizier-E.Viegas (eds.), 351-366.

[26]. Temmerman, R. (2000). *Towards New Ways of Terminology Description. The sociocognitive approach.* Amsterdam/Philadelphia: John Benjamins.

[27]. Nguyễn Thị Hồng Tuyến (2019). “Codifying bridge Engineering Terminology Based on Lexical functions in meaning text Theory”, in *Graduate Research Symposium Proceedings in Linguistics, Foreign language Education and Interdisciplinary Fields*. Hanoi: ULIS

[28]. Wanner, L. (ed.). (1996). *Lexical Functions in Lexicography and Natural Language Processing*. Benjamins, Amsterdam/Philadelphia.

[29]. Wüster, E. (1979b). *La théorie générale de la terminologie* (I). (Lurquin, G. Trans.). *Le Langage et l'Homme*, 14(2), 59-71. (Original work published 1974).