

# Terminology Planning Evaluation:

The Case of Persian Language

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To my pillars *Narges* and *Bahar*



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## **Abstract**

The strategic importance of terminology planning, its complexities, and implementation of the policies have been tackled in the literature from distinct points of views. The diversity of discussions and methodologies used to advocate the dynamicity of terminological activities and their context-based characteristics has brought about challenges in the evaluation of terminology works. These challenges are associated with the definitions of terminology planning from different perspectives (i.e. national, international, local) on the one hand, and on the other hand, are caused by the lack of an analytical framework that can address complex relations among terminology planning elements and criteria.

The aim of this study was to investigate the possibility of designing a methodological framework that can be useful for conducting evaluations on terminology planning and standardization in the national or local scenarios. For this purpose, I have adapted the evaluation methodology used in development plans to the context of terminology planning based on which I have evaluated the terminology work and standardization at the Academy of Persian Language and Literature. It is assumed that this methodology can be useful for the improvement and development of any type of terminology activity defined in the framework of language planning.

## Resumen

La importancia estratégica de la planificación terminológica, su complejidad y la implementación de las políticas terminológicas se han abordado en la literatura desde distintos puntos de vista. La diversidad de debates y metodologías utilizadas para defender la dinámica de las actividades terminológicas y sus características basadas en los contextos particulares, han resultado obstáculos en la evaluación de los trabajos terminológicos. Estos obstáculos están asociados con las definiciones de la planificación terminológica según a diferentes perspectivas (nacional, internacional, local) por un lado, y por otro lado, son resultados de la falta de un marco analítico que pueda dirigir las relaciones complejas entre elementos y criterios de la planificación terminológica.

El objetivo de este estudio fue investigar la posibilidad de diseñar un marco analítico que pueda ser útil para llevar a cabo evaluaciones sobre planificación terminológica y estandarización en un escenario nacional o local. Para ello, he adaptado la metodología de evaluación utilizada en los planes de desarrollo al contexto de la planificación terminológica a partir de la cual he evaluado el trabajo terminológico y la estandarización en la Academia de Lengua y Literatura Persa. Se supone que esta metodología puede ser útil para mejorar y desarrollar de cualquier tipo de actividad terminológica definida en el marco de la planificación lingüística.



## ABBREVIATIONS

Absolute Frequency.....	(AF)
Academy of Persian Language and Literature.....	(APLL)
Conference of Translation Services of European States.(COTSOES)	
Development Assistance Committee.....	(DAC)
English Terminological Unit.....	(ETU)
European Commission.....	(EC)
EuroTermBank.....	(ETB)
General Theory of Terminology.....	(GTT)
Guidelines for Terminology Policies.....	(GTP)
Institute of Standards and Industrial Research of Iran.....	(ISIRI)
Internal Oversight Service Evaluation Section.....	(IOS/EVS)
International Labour Organization.....	(ILO)
Iran University Press.....	(IUP)
Language Planning.....	(LP)
Organisation for Economic Co-operation and Development.(OECD)	
Representative Article.....	(RA)
Representative Frequency.....	(RF)
Result-Based Management.....	(RBM)
Standardized Persian Term.....	(SPT)
Supreme Council of the Cultural Revolution.....	(SCCR)
Terminological Unit.....	(TU)
Terminology Planning.....	(TP)
United Nations Development Group.....	(UNDG)
United Nations Development Program.....	(UNDP)
United Nations Educational, Scientific and Cultural Organization .....	(UNESCO)
United Nations Evaluation Group.....	(UNEG)
United Nations Office on Drugs and Crime..(UNODC)	



“What is nonmeasurable and nonpredictable will remain  
nonmeasurable and nonpredictable.”

Nassim Nicolas Taleb (*Antifragile*, 2012, p. 138)



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## CHAPTER I. INTRODUCTION

To create objects, to name concepts and to define new scientific phenomena are inseparable practices from knowledge and science development. However, theorization in terminology and planning for terminology activities has always been posterior to practices. Systems of terms, systems of harmonization of terms and concepts, systems of terminology management, terminology planning, terminology approaches and theories have been trying to explain and facilitate the understanding of the existing phenomena and terms.

In the 20<sup>th</sup> century, the rapid growth of technology and science accelerated the systematic development of terminology; and, the academic borders of terminology, i.e. principles and methods, started forming (Cabré, 1992, p. 21). Auger (1988) has classified the process of terminology development as a subject of study into four distinct periods as follows (as cited in Cabré, 1992, p. 28):

- a) Origins (1930-1960)
- b) Structuring (1960-1975)
- c) Boom (1975- 1985)
- d) Expansion (1985- current)

In general, this chronological order gives, to some extent, a schema summarizing how terminology has progressed. By comparing these periods with other related changes (i.e. technological, scientific, social, cultural and political), we can also figure out how they have affected terminology works in general and terminological debates or its academic status in particular.

The first period of terminology evolution, as the subject of study refers to the forming of terminological works' methodology which is characterized by the appearance of the earliest theoretical attempts of Wüster and Lotte.

The second period coincided with the creation of the data banks and the establishment of the International Standardization Organization (Cabré, 1992, p. 28). After the formation of sociolinguistics in the 1960s, debates on terminology planning and the role of terminology in language planning started. According to Cooper (1989), sociolinguistic debates were the result of "breakdown of the colonial system that had occurred around 1960" which prompted

“the birth of language planning as an academic discipline” (as cited in Nekvapil, 2011, p. 872). Since 1960 (during the *structuring* period) terminology planning became the subject of debates in sociolinguistics.

As the most significant elements of terminology planning, terminology standardization has been discussed along with the social and political implications of language planning. Cabré has also stated that it was in this period that the foundations of the new approaches to terminology, in the framework of language normalization and language planning, have formed (Cabré, 1992, p. 28).

The third period (1975- 1985) coincided with the “proliferation of language planning projects which included the terminology.” It is worth mentioning that the Auger’s schema does not give clear-cut starting-ending points. As Cabré notes it, “some countries such as URSS and Israel had already started their language policies” before the *boom* period (1992, p. 28).

On the path of the advances in terminology- both in linguistic and social aspects- socioterminology was born in the period of *expansion*. Hence, the underlying interactional systems, interdisciplinary approaches and anticipating the behavior of terms through understanding their pragmatic and sociolinguistic forces became the subject of socioterminological debates. As the leading advocate for diversity in terminology, socioterminology has emerged in Quebec and then developed in France and Catalonia, to emphasize the complexity and plurality, and to promote the use of terms in certain social contexts.

Socioterminology is defined by its relationship to terminology and sociolinguistics. Socioterminologists assert that the classical terminology (Wüsterian approach) is not sufficient and efficient in looking at both social structures and terminological functions. Besides, socioterminology tends to address terminology as a phenomenon “effectively at the service of the social needs<sup>1</sup>” (Rey 1988, as cited in Aito 2000, p.47). Yves Gambier summarizes the shortcomings of the classical terminology (1994) titled as “*the*

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<sup>1</sup> “servante efficace des besoins sociaux”

*quadruple crisis of classical terminology*<sup>2</sup>” (as cited in Aito 2000, p.47) and by Teresa Cabré as a twofold crisis, i.e. *reductionism* and *excessive standardization* (Cabré 1999a, p.69).

While the classical approach has built up a considerable base of knowledge and led to a major engagement of different disciplines in building terminology pillars and standardization, many of the problems now can be only solved if we employ a holistic approach toward terminology. In other terms, terminological resolutions should be collective and multidimensional actions addressing linguistic, social and cognitive needs.

This idea is also aligned with the contemporary sociolinguistic argumentation discussed by Albert Bastardas-Boada, inspired by physicists’ epistemological postulates, ecological thinking and complexity perspectives which resulted in “*complex-figurational view*” towards sociolinguistics. He stresses the need to holistic view in sociolinguistics and states:

By visualizing, for instance, the different levels of linguistic structure not as separate entities but rather as united and integrated within the same theoretical frame, by seeing their functional interdependencies, by situating them in a greater multidimensionality that includes what for a long time was considered ‘external’ – the individual and her or his mind-brain, the sociocultural system, the physical world, etc. – and expanding in this way our classical view, we should be able to make important, if not essential, theoretical and practical advances (2014, p. 66).

According to Cabré (2017, p.12), terminology debates in the 21<sup>st</sup> century are in favor of diversity “with the call to adapt our work on terminology to situations characterized by different social needs.” She adds:

This is because terminology, and all the schemes and all the choices regarding terminology, are made for society, and are dependent on it. We, therefore, have to make them suitable for the task and to guide them in responding to such needs.

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<sup>2</sup> “quadruple aspect de la crise de la terminologie dominante”

Terminological findings must also be employed in their right place. The impact of terminological interventions by the institutions and authoritative bodies in language development, communities and the local image of the culture and identity should be carefully considered. Hence, the results of terminological activities, outputs and outcomes need to be measured and evaluated by employing multidimensional methodologies; and, these methodologies should be able to provide us with a deep understanding of the essential elements and their interactions. This need is expressed by Bastardas-Boada in sociolinguistics as follows:

The conceptual resources and tools currently at our disposal are, in all likelihood, not up to the task yet to be done. This is why we need to push towards new theoretical and methodological instruments able to help us better imagine and understand how the various aspects of sociocultural and linguistic events are dynamically interwoven (2014, p. 69).

This sheds light on the multidisciplinary approaches to terminology planning and suggests that terminologists continue to advocate and support cooperation and integration between terminology and social sciences. A multidisciplinary approach also demands that terminology planning be contiguous with cognitive needs and cultural values, local systems and management forward progress. In this process, “evaluation” functions as a navigator or a compass to ensure that terminology planning correctly proceeds its voyage, and to assist in arriving at the desired destination.

The fact that any system needs a systematized evaluation procedure- and not just a systematized practice, suggests that evaluation has a strategic position in terminology planning, as it is effectively considered in almost all models of terminology planning.

The present study shows my interest in multidimensional view to the evaluation of terminology planning systems. This thesis is an attempt to address “evaluation” in the context of terminology planning to realize how complexity and multidimensionality affect terminology activities in a given social and political context. It emphasizes the significant role of evaluation and systematized procedures in development and improvement of terminological activities.

## 1. Problem statement

Recently, some valuable research works have been done by terminologists in relation with terminological works and challenges. The most relevant work to my research line is Zarnikhi's thesis (2014) which approached terminology planning as a multidimensional system. However, the focus of my thesis is on evaluation models while his approach toward terminology is oriented to terminology planning models, based on *principles* and *parameters* (inspired by Chomsky's syntactic approach). Although he has also evaluated Iranian terminology to some extent, neither did he present any methodology for evaluation, nor was it the objective of his thesis.

Another relevant work in the context of terminology planning is Bhreathnach's thesis (2011) wherein the author presents some indicators of a "best-practice model" in terminology planning. She addresses the effectiveness and success by providing three case reports and comparative studies mainly on TERMCAT, Irish case (i.e. Foras na Gaeilge) and Swedish case (i.e. TNC). Nevertheless, in her thesis, the suggestion of success factors for terminology planning is limited to the existence of some fundamental elements mainly discussed in socioterminology approach. It is perceived that a best-practice model would achieve by implementing all these elements. However, the question that "how these elements in terminology planning can guarantee the success" is still unanswered.

The existing evaluation efforts in terminology rarely have taken into account the plurality and phenomenological aspects of the activities. For instance, comparing Catalan case with Swedish case or Persian case or any other cases neither can address the underpinning factors nor can provide useful information and feasible solutions for further improvements in each case. Maybe it is due to this fact that modeling proposals remain in theory and could not be developed into the practical aspects to amend the real practices.

This issue is also tackled by Albert Bastardas-Boada in the article "*Language policy and planning as an interdisciplinary field: towards a complexity approach*" (2013) wherein the author

discusses that “we can find comparative studies of language policy and legislation that ignore the *contexts* in which these measures are produced and applied.” Therefore, it is important to take into account the context, phenomenological aspects and *the proper vision of each practice*.

The concept of “diversity” in Cabré’s terms also suggests that even if a “successful” model is applicable in another context, this can only happen to a certain extent. Given the examples of Catalan case and its origin, the Quebec case, she stressed the role of “constant revision” and “update” that give autonomy to scientific works. She also believes that there are also some models that are not sufficient enough even in their respective communities (Cabré, 1996a, p. 33). In this regard, it is important to have critical thinking and autonomous visions based on the local needs.

Given these discussions, I look for the criteria and frameworks in which we can interpret the data due to their contextual values to apply in local terminology systems. In simple words, I look for the real meaning of “success” in terminology planning. In my opinion, it seems that the term is used to grant an additional value to some terminological works without a consensus on its definition and position in terminology field.

By reviewing the literature and developing the evaluation model accordingly, I emphasize the need for a holistic approach in terminology works and evaluations. This model is defined and developed for terminological activities at national and regional level. Thus, the international standardization or multilingual approaches are excluded.

The evaluation model presented in this thesis can be useful for the improvement and development of any type of terminology activity in a national setting, independent of their models. In other terms, this evaluation is not based on a rough comparison among various practices, but a methodology to assess a certain terminology work in its proper context. The current thesis covers debates from classical terminology to the modern argumentations and movements. Therefore, linguistic, sociolinguistic and socioterminological approaches are addressed to map the main

elements and their relevant criteria in the proposed evaluation model.

After designing the model, I examine it by conducting empirical research on Persian terminology planning, trying to provide practical resolutions for some of the problematic situations in the current terminology planning in Iran. During my professional experiences in Persian terminology, as a former researcher at Terminology Department (2006-2011) and a current member of Terminology Committee (2015-present), I have been experiencing the importance of evaluation in the standardization process and implantation of terms. This background motivated me to conduct empirical research on Persian terminology as an evaluation case study. In expectancy that these results can be useful for terminology planners, I have collected extensive information by approaching terminology planning in Iran from various dimensions.

In the next sections, first, I present the objectives, hypotheses, research questions and the rationales of choosing the Persian case; then I continue with the organization of the thesis.

## 2. Objectives, hypotheses and research questions

The strategic importance of terminology planning and implementation of the policies suggest an *integrated methodology* to effectively analyze various aspects of terminology activities in a given context. This methodology should be able to:

1. Characterize the existing patterns of a terminology planning system
2. Identify the characteristics of a sociolinguistic system
3. Identify the manifest and latent interactions among various sectors and systems; i.e. deliberate interventions and the real impact of interventions.
4. Observe and assess the appropriateness of a practiced scenario to the current needs.

The diversity of terminology settings, requirements, approaches to coordination among sub-systems and levels, and the importance of consistency in planning and activities confirm the significance of

systematized evaluation that allows detecting variables involved in terminology planning.

## 2.1. Objectives

Based on these implications mentioned above, the main objective of this thesis is to propose an “evaluation methodology” by which all aspects of terminology planning can be analyzed. This methodology will be used to conduct various analyses in the context of Persian terminology, in Iran.

## 2.2. Hypotheses

1. To improve a terminology planning system, we need to conduct a holistic evaluation;

2. Identification of users’ needs is directly associated with outcome and impact of terminology planning systems:

2.1. Current terminology activities in Iran and Terminology Guideline published by the Academy of Persian Language and Literature cannot fulfill the terminological needs of field specialists;

2.2. Unsystematic terminology processing in Iran may increase the potential terminological issues in scientific fields, particularly in interdisciplinary domains;

2.3. Observing and profiling specific needs of domains and subject fields users can improve the implantation function.

## 2.3. Research questions

a) *Questions for designing the analytical model proposal:*

- What are the elements associated with a holistic evaluation in TP?
- What are the role and the objective of evaluation in TP models?
- What are success indicators of a TP system?



- How is implantation evaluation associated with other elements of the TP?
- How and to what extent implantation evaluation can be helpful to update resources and improve terminological activities?

b) *Questions for the empirical study:*

- What can be done to improve the TP system in the Persian language?
- How can we improve the implantation of Persian standardized terms in their real context?
- Can identification of users' need influence the outcome and the impact of TP system in Iran?

### 3. The choice of the language and country

The choice of Iran and the Persian language for conducting the case study is made for the following reasons:

- The existence of an institutional terminology planning, with a long history in terminology activities, with significant advances which are assumed appropriate characteristics for carrying out the research;
- The experience of the author as a researcher and terminologist at the Academy of Persian Language and Literature, which provides the author with adequate familiarization with terminological works in Iran;
- The emergent need for improvement in terminology work in Iran due to the unsuccessful results of standardization activities reported in recent research;
- A tendency towards the use of English terms in general and specialized contexts which calls for a systematic planning;
- The proficiency of the author in the Persian language, as her native language.

## 4. Organization of thesis

This thesis is organized as follows:

Chapter II is devoted to addressing the meaning of planning in terminology planning and the implications that form its complex and dynamic nature. It presents some insights into the general meaning of planning and connects them to the current debates regarding diversity and strategic planning in terminology.

Chapter III describes various perspectives and dimensions of terminology planning by addressing the concept of terminology and the terminology planning models. It continues with identifying the evaluation's elements addressed by various scholars.

Chapter IV is dedicated to the proposal of the evaluation model by accommodating the elements, standards, and debates presented in the previous chapter and by adapting the criteria and evaluation stages used in development plans to the terminology planning systems.

Chapter V presents an empirical research carried out based on the proposed model. In this chapter, various dimensions of Persian terminology planning from sociolinguistic aspects to the organizational activities and socioterminological exigencies are studied and supported by relevant data and discussions.

Chapter VI, the final part of the thesis, summarizes the outcomes of this thesis by giving the general and final conclusions on the empirical study and reflections on the proposed model intending to answer the research questions.

## CHAPTER II. ON THE NATURE OF TERMINOLOGY PLANNING

This chapter is designed in three distinct sections. The first part is an introduction to the concept of planning to presents its meaning and implications in systemic and development planning. The specific meaning of planning in terminology context is presented in the second section, and the chapter continues by addressing the challenges in terminology planning (TP) and the importance of TP in developing countries.

### 1. Planning

Planning is a widely used term, but it is still ambiguous and difficult to define. Planning can be considered as the most important part of development. Not all planning experiments end in development, but for any development, we need to plan. United Nations Development Program (UNDP) in its handbook of "*Planning, monitoring and evaluating for development results*" (2009) defines planning as below:

Planning can be defined as the process of setting goals, developing strategies, outlining the implementation arrangements and allocating resources to achieve those goals. (p.7)

Another definition of planning has been given by Coombs (1970, p. 14-15), in the series of UNESCO publications about educational planning:

Planning is a continuous process, concerned not only with where to go but with how to get there and by what best route. Its work does not cease when a plan gets on paper and has won approval. Planning, to be effective, must be concerned with its own implementation- with progress made or not made, with unforeseen obstacles that arise and with how to overcome them.

In business and management context, planning is defined as:

1. A basic management function involving formulation of one or more detailed plans to achieve optimum balance of needs or demands with the available resources. The planning process (1) identifies the goals or objectives to be achieved, (2) formulates strategies to

achieve them, (3) arranges or creates the means required, and (4) implements, directs, and monitors all steps in their proper sequence.

2. The control of development by a local authority, through regulation and licensing for land use changes and building. (<http://www.businessdictionary.com/>)

(Retrieved April 7, 2015)

In Steen Leleur's terms (2008), planning in general means:

Planning in public and private organisations and enterprises is concerned with foresight and the provision of decision support for the formulation and implementation of projects, programmes and policies (p.32).

We can grasp from these definitions, through different contexts, that planning is a process by its very nature. What planning is, in fact, can be described by series of action plans, strategies, and achievements that can be carried out by identifying proper goals and monitoring functions. Thus, the difference between these definitions is not essentially manifested by the nature of planning, but the purposes that each context pursues. For instance, in development programs, the main goal can be formulated as any improvement in social aspects or well-being; while in a business context, the goal can vary from product enhancement to organizational development.

In planning process objectives are either quality-oriented or quantity-oriented; however, there are contexts in which the main focus of planning is merely for quality improvement (e.g. social planning) or problem-solving (e.g. language planning; Fishman, 1974). Therefore, we can conclude that planning as an abstract concept in all domains of study is the same; however, it can be employed and progressed distinctly due to the particular and contextual needs.

Nevertheless, available definitions still give us the instructions and structure of planning, and not delimiting or essential characteristics. In general, at an abstract level, one can perceive planning as procedural attempts to change any position or condition toward what that could be visualized as a better position or condition (so-called vision). Anja Drame (2009, p. 64) also presents an interesting perspective on the concept of planning:

It [planning] is a cognitive activity which includes predetermination and anticipation of future events and reactions upon particular actions, based on past experiences and under special consideration of time and socio-cultural environment.

There are defining elements of planning in general which are common in many planning processes, either in business or sociology or even languages. The most significant ones are:

- Objectives (where do we want to be, why do we need to be there, what do we plan to do)
- Properties (where are we now)
- Operations (how do we get there)
- Outcome evaluation (how do we measure our progress)

There is a seven-stage ideal-typical decision model, proposed by Friedmann (1996, as cited in Leleur 2008, p.33) which offers a detailed version of these elements:

1. Formulation of goals and objectives.
2. Identification and design of major alternatives for reaching the goals identified in the given decision-making situation.
3. Prediction of major sets of consequences that would be expected to follow upon adoption of each alternative.
4. Evaluation of consequences in relation to desired objectives and other important values.
5. Decision based on information provided in the preceding steps.
6. Implementation of this decision through appropriate institutions.
7. Feedback of actual programme results and their assessment in the light of the new decision-situation.

Sometimes planning process serves to provide all possible resources together for a definite purpose, and once that purpose is achieved the process ends, and the plan loses its credibility. It usually happens in short-term planning. Short-term planning often follows templates or linear sequences of actions and is less complex.

However, some other planning processes will support a long-term development and follow interrelated levels of action plans. They might represent either a cycle of functions in which after reaching the last stage the cycle would begin from the first level again or a more complex diagram. These planning efforts build their own model or apply any model from similar experiments in case of being proved as successful experiences. Moreover, long-term planning models would contain one or more short-term planning.

It is worth noting that although the function of the planning process is the matter of practice, the act of planning happens at a theoretical level. Thus, what manifests credibility or success of planning is the extent of similarities between the virtual vision and achieved outcomes and impact. Any failure in each level (theoretical or practical) can be reflected on the final achievements. Evidently, the most successful models of planning are those which contain assessment functions to test if each procedure has reached its optimal results or not. In other terms, not only a model as an integral process needs to be evaluated but also each stage of the process should be systematized to obtain its optimal outcome.

In *Development Plans: Guidelines for Planning Authorities* (2007, 8-9) a “good development plan” is presented by some common criteria:

- a) Create a clear strategic framework for the proper planning and sustainable development [...].
- b) Set out an over-arching vision for the development of the area to which the plan relates.
- c) Give spatial expression to the economic, social and cultural aims.
- d) Be grounded in public and political consensus around the plan’s strategic framework.
- e) Provide a clear framework for public and private sector investment in infrastructure and in development in the area, having regard to both national and regional plans and policies.
- f) Protect and enhance the amenities of the area.
- g) Offer clear guidance to developers in framing development proposals and to the planning authority in assessing such proposals.
- h) Establish a policy framework within which more detailed plans (such as local area plans or plans for architectural conservation

areas) can be drawn up for specific parts of the planning authority's area.

i) Be capable of implementation and monitoring.

Therefore, we can conclude that successful planning models, in general, can be characterized by owning:

1. Clarified and defined objectives
2. Real perspective about resources based on facts
3. Trained operators and organized criteria
4. Dynamic observation system
5. Precise factors for assessments

## 1.1 Types of planning

Due to the main function of any planning process and its pragmatic context of actions, planning types can fall into various categorizations. There are two main approaches in planning according to the level of complexity (Mashayekhi, 1994; Moraitis & Tsoukiàs, 1999):

### *Conventional approach:*

Planning is a cyclical activity, which occurs every year, or once every two years or three years. The goal of each planning cycle is to formulate a plan which should be implemented during the period that ends with the beginning of the next planning cycle.

### *Systemic approach/ dynamic approach:*

Planning consists of designing appropriate policies which govern a stream of decisions on a continuous basis. The behavior of the system and objectives that the system can achieve, or the states that the system goes through, are dictated by the policies that are designed during the planning process.

“Conventional planning” is the most typical type of planning that can be either top-down or bottom-up. However, “systemic/dynamic planning” provides more interactions in decision-making levels by providing appropriate updated data in various stages of the process.

It is worth mentioning that the performance of the planning and its success it is not influenced by the type of approach, but by the function and behavior of each stage within a certain approach. For

instance, an effective conventional plan can show better results comparing to an insufficient dynamic plan. However, in the case of being well-organized and well-coordinated, dynamic plans show superior results (Mashayekhi, 1994, p. 137).

As the title of these approaches show, conventional approach presents a relatively concrete framework for procedures based on the current situation and predicted behaviors. In contrast, dynamic approach presents a dynamic framework based on policies, with a continuous systematic analysis about in-progress evolutions and conditions, to make more effective decisions.

"Dynamic planning means reasoning about planning and executing actions in a dynamic, real world environment, by taking into account changes generated by unpredicted events occurred during the execution of actions". (Moraitis & Tsoukiàs, 1999, p. 182)

A dynamic approach is discussed also as dynamic decision-making widely in business or intelligent systems due to the needs of complex systems (See also Brehmer, 1992; Diehl & Sterman, 1995; Gonzalez, Lerch & Lebiere, 2003). However, a detailed classification regarding complexity and uncertainty in planning systems is proposed by Steen Leleur, whereby he identifies dynamic complexity as a type of complexity in planning studies.

Leleur (2008), following Kenneth Boulding's hierarchical model (1956), categorizes human beings and socio-cultural systems as complex systems that expose at least three types of complexities that should be taken into account in "planning and managerial strategic decision-making":

1. *Detail complexity* which operates in space, (**means**): a certain precision about the number of variables; detail complexity helps us focus on the influences from the system demarcations and the system components as they enter at an early stage in our examinations and/or models (p. 8).

2. *Dynamic complexity* which operates in time (**path**): temporal aspects; the medium in which dynamic complexity operates is "time"; dynamic complexity relates to concerns about "path" (p. 13).



3. *Preference complexity* which operates in mind (**ends**): the medium of preference complexity is “mind”; preference complexity relates to concerns about “ends” (p.16).

Another category of planning is the classification mainly based on the duration of the process and dimensions of objectives. In this context planning process can be classified into three main types:

*Strategic planning/corporate planning:*

Organizational activities that systematically discuss mission and goals, explore the competitive environment, analyze strategic alternatives, and coordinate actions of implementation across the entire organization (Bryson, 1988; Andersen, 2004).

*Tactical planning:*

Is composed of three planning levels: the Sales and Operation Planning (S&OP), the Master Planning Schedule (MPS) and the Material Requirement Planning (MRP). (Vollmann et al., 1997, as cited in Comelli, Gourgand & Lemoine, 2008).

*Operational planning:*

The setting of short-term objectives for specific functional areas such as finance, marketing, and personnel (Sharder, Mulford, & Blackburn, 1989).

These types of planning are originally organizational processes, but they can be applied to communities and small groups as well; i.e. any other system. Strategic planning includes ongoing monitoring, analysis, and reviews so as to ensure that the process is aligned with visions and objectives. With increasing number of challenges that organizations confront, there is no need to prove that strategic planning is a must.

Strategic planning is distinct to other types with being more elaborated and systematized. However, it contains all qualities of tactical planning and operational planning as necessary parts of its progress. Bryson (1988) proposes eight steps for any strategic planning:

- Development of an initial agreement concerning the strategic planning effort (the purpose of efforts, preferences, the roles and function)

- Identification and clarification of mandates (regulations, legislation, articles of incorporation)
- Development and clarification of mission and values
- External environmental assessment (identifying opportunities and threats by exploration of the environment)
- Internal environmental assessment (identifying strengths and weaknesses of organization)
- Strategic issue identification (conflicts)
- Strategy development (consistency across rhetoric, choices, and actions)
- Description of the organization in the future (vision of success)

These eight steps build the formulation process. Bryson adds that these steps should be followed by actions and decisions to implement the strategies and the evaluation of the results (p.77). For the sake of simplicity these steps are written in a linear format, but he explains that the process is in a sequential manner and is iterative (p. 78).

Taylor (1984, p. 51) also discusses five different approaches to corporate planning (strategic planning). He calls them "modes of planning":

- Central control system (a system for acquiring and allocating resources)
- Framework for innovation (the generation of new products and new processes)
- Strategic management (developing the commitment, the skills and the talents required to implement the strategies)
- Political planning (resolving conflicts between inside and outside)
- Futures research (exploring and creating the future)

## 1.2. The choice of planning type

These perspectives and approaches to planning show that they are not too far from each other but complementary parts of an ideal process. However, sometimes there would be an obstacle that prevents an organization or system from applying all steps together in the beginning. This is usually because there is some basic works or simpler planning to be done on primary levels before the ideal planning can be carried out.

The external forces like social and political factors or internal forces like hierarchical systems or knowledge insufficiency can also bring

about challenges in planning processes. The more complex an environment is, the more complex planning approach we need. This is the main notion discussed by Leleur (2008), wherein the complex situations are studied and rationality and certainty are challenged by observing “*open-ended*” situations and “*unknowable*” factors. According to Leleur, uncertainty and unpredictability are two major characteristics of complex systems.

One of the most significant results of planning types’ comparison is that at macro-level the number of different types of planning is limited. While at the micro-level of analysis, systems’ preferences tend to lead to a large variety of planning styles. These planning styles not only affect analyses of the systems’ efficiency and effectiveness but also suggest various evaluation functions in the planning process at each stage. Besides, the evaluation process of systems is a subordinate function of the process as the whole. For instance, if the system is identified in a dynamic situation or if the planning is categorized under the strategic planning or a combination of two or more, the evaluation process should reflect all aspects involved.

## 2. Planning in the context of terminology

TP is a domain of study where interdisciplinarity meets multidimensionality. For Louis-Jean Rousseau (2005) TP<sup>3</sup> starts when language planning (LP) deals with the description, modernization or development of terminologies, their social diffusion in one or more languages, with the intervention of States or authoritative actors to urge their use:

Domaine d’intervention de l’aménagement linguistique visant la description, la modernisation ou le développement des terminologies, leur diffusion sociale, dans une ou plusieurs langues,

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<sup>3</sup> *L’aménagement terminologique* is the French term used for terminology planning concept early by Pierre Auger, and *L’aménagement linguistique* for language planning by Jean-Claude Corbeil in 1970 (Rousseau, 2005, p. 94). Jernudd and Neustupný use the term *language management* to refer a concept more related to language/terminology planning in the Quebec context, and for distinguishing this concept from “linguistics of language problems”. (footnote in Jernudd & Neustupný, “*Language planning: for whom?*”, 1987, p. 71).

dont l'État ou un acteur social faisant autorité préconise l'usage.  
(p.97)

In the literature, for the concept of TP, there is an indeterminate use of terms. Terms like “planificación terminológica” (*terminological planning*) (Cabré, 1993 & 1996b & 1999a), “term planning” (Bhreathnach, 2011), “terminology management” [in the framework of “language management”] (Jernudd & Neustupný, 1987; Spolsky, 2004; Chiu & Jernudd, 2015), “terminology planning” (Maurais, 1993; Myking, 1997; Cabré, 1999b; Beukes, 2010; Zarnikhi, 2014) and “l'aménagement terminologique” [the French approach to terminology planning] (Auger, 1986), or even “language (terminology) planning” (Antia, 2000) are used alternatively.

Although all these terminological variations, more or less, address a unique object, in some aspects they slightly employ distinct perspectives and the focus of the process might vary to some extent. We can consider that these variations are emanated from either distinct approach to terminology or different socioterminological demands. Borbujo (2001, p. 658-659) distinguishes two basic terminology approaches that might reflect basic approaches to TP as well:

1. Terminology of science and materials: the emergence of terminology as a necessity of denomination of new concepts and products with the science and technology development (1900-1930)
2. Terminology of languages/ normalizing terminology: the emergence of linguistic normalization programs as a result of post-war transformations (after 1970), aimed at language status protection (e.g. Catalonia) or defense and promotion of language vitality (e.g. France)

These two approaches are still followed by communities and schools which involve national and international efforts in terminology and TP. The first approach concentrates on terminological products as means of *science development* and technological aspects of terminology development can be more significant. While, the second approach focuses more on social aspects of terminology, and thus, TP for the second approach is a matter of *social development*.

Moreover, Myking (1997, p. 227) proposes two frameworks for TP analyses: *the interface function* and *the cultural function*. The interface function of TP seems more aligned with the terminology of science and material, while the socio-cultural function emerges from normalizing terminology (The topic is described in details in Chapter III, Section 1.1.2).

However, there is no clear-cut distinction between these functions. Any terminological activity can expose one or both of these functions; although in specific cases one aspect can be more predominant than the other.

## 2.1. Complexity and dynamicity of terminology planning

As language and terminological units have a dynamic nature, all activities in planning for the language and terminology intrinsically inherit this dynamicity. The dynamicity of terminology is due to terminology evolutions, either for denomination changes or conceptual developments (Cabr , 1999b). Cabr  (1997, p.52) states that:

Terminology is one of the most visible indicators of a language updating because it is in the scientific and technical fields where changes about world knowledge are faster and more drastic.

Sageder (2010, p. 127) also stressed dynamics of terminology by mentioning the growth of concepts/terms and accordingly terminological formations. Dynamics of terminology at linguistic level implies continuous updating of terminological and terminographical resources.

Dynamicity of terminology can also be observed in terminological activities, methodologies, and processes. This dynamicity is associated with social changes. The fact that society is not a stable system along with social aspects of terminology affects terminology-oriented systems. The fast pace of technological changes, increasing scale of organizations, rapid developments in communication tools, economic and political changes, new generations of communicative systems, and interdisciplinarity and

globalization have changed our society from a simple traditional system to a complex dynamic system.

Terminological processes and methodologies, as social and communicative practices of the science, reflect dynamic characteristics of the society. Thus, the effectiveness of theories and methodologies or any modeling attempt in terminology is influenced by their potency of dynamic approaches. Dynamics of terminology at social level implies continuous evaluations, periodical system assessments, updating guidelines and revising the criteria.

TP is a complex system that on the one hand deals with language and linguistic systems, and on the other hand, deals with social systems. This fact suggests that TP not only should consider communicative terminological needs of specialized communities but also should employ a dynamic mechanism to observe and analyze social situations, social functions of terminological processes and feedbacks.

## 2.2. Terminology planning at strategic level

TP is a strategic process. Its strategic characteristics can be justified through four dimensions:

### 1. *TP in the framework of language planning:*

Language planning is situated at the level of strategies and implementation tools to achieve the objectives of a predefined language policy (Rousseau, 2005, p.99).

Language standardization is a gradual and dynamic process with a sociocultural character in which a language, starting from an unstable situation, achieves a stability which people perceive as natural. (Cabr , 1999a, p.308; 1999b, p.215)

### 2. *TP as planning, entailing objectives and implementation strategies:*

Any proceeding related to planning [including terminology planning] must consider the following conditions: 1. detection

of needs, 2. evaluation of possibilities, 3. elaboration of a work plan, 4. description of the implementation/ application (Cabré, 1997, p.59; see also Corbeil, 2007).

### 3. *TP as a set of operations and plans:*

Operating terminological resources, management of terminological data, standardization process (corpus planning), determining terminology policies (status planning), and etc. are presented as diverse operations incorporated into terminology planning (Auger, 1986).

### 4. *TP as a set of strategic decision-makings:*

Distribution and implantation of terminologies imply strategic decision-makings (Corbeil, 2007, p.4-5).

## 2.3 Challenges in terminology planning

TP is a dynamic process in the form of a complex and nonlinear system which exposes multiple interactions between different functions and operations. The process is predisposed to unexpected outcomes because there are various variables involved from social needs and political situations to specialists' unpredictable behaviors towards terms in use and even linguistic factors.

Sub-systems and their dynamic interactions bring uniqueness feature to TP efforts. In a systemic model (e.g. Zarnikhi, 2014), TP process can be articulated into three distinct levels: theory, practice, and analysis levels. Consequently, any operation in TP might reflect a threefold characteristic which is shaped by its connection to distinct levels. For instance, terminology policy is connected to theoretical level by underpinning authorizations and “planning theory”. At the same time it is connected to a practical level by implementing the policies; and, in parallel with these two levels, it is connected to an analytical level by the need to validation and update.

Although we can define each operation and/or plan for sub-systems, or even anticipate potential relations and hierarchical interplays among them, it is almost impossible to predict their interactions and

impacts in their real performance. Given the uncertainty and probability of unpredictable instants in such complex system, the big challenge is how we can manage these features to establish an integrated and sustainable plan.

For Cabré (1999a), the planning process for languages in general and for terminology, in particular, is a dynamic process in which actions should be result-oriented. For her, analysis of the situations not only is necessary right before starting any action plan but also is a must when the action is approaching the end. In other words, permanent and continuous monitoring before action plans and decision-making is necessary to feed the strategic plan, as a coherent process, to avoid ad-hoc and arbitrary decision-makings.

[...] un proceso dinámico que dé sensación de coherencia, por cuanto las acciones se ponen en marcha de manera encadenada, y que cuente con un seguimiento permanente (de forma que se puedan reorientar las actuaciones según los resultados) tiene más posibilidad de salida que otro en el que se actúe puntual e improvisadamente, en el que no exista ningún análisis de la situación, ni previo a la acción ni cuando ésta ya se haya llevado a cabo. (p. 309)

In other words, terminology planners can reduce unpredictable incidents by increasing analytical interventions. This systematized view to TP sheds some light on the evaluation function. It reveals that although in TP models "evaluation" is assumed as a stage of actions (mainly assumed as implantation evaluation), result-oriented analysis before any action commencement, and after carrying out the operations would guarantee the integrity of TP as a dynamic strategic planning. Cabré complements her idea by elaborating the stages of a strategic and systematic plan:

Consideramos que las medidas interventivas puntuales, aunque importantes en ellas mismas, son totalmente ineficaces; y, por lo tanto, defendemos la integración de estas medidas en un plan estratégico sistemático que incluya:

- a) la explicitación de los objetivos a cubrir;
- b) una planificación rigurosa de las medidas y actuaciones con las que se pretende alcanzar los objetivos;
- c) un marco legal que respalde la intervención; y
- d) los recursos necesarios para llevar a cabo el plan.

(Cabré, 1999a, p.309)



This integration and nonlinear view to TP recalls the idea of Steen Leleur (2008) about systemic planning in which three complexities have been taken into account; i.e. *means*, *path*, and *end*.

### 3. Terminology planning in developing countries

In developing countries, the importance of TP is more significant due to their particular conditions. In these countries, the need for constant cares and concerns in terms of language richness and power should be the main objectives of the language policy to protect the language by developing linguistic resources and offering appropriate vocabulary.

Besides, there should be a balance between the pace of imported terminology and the production of national terminology to avoid disconnection between global scientific development and local academicians' knowledge. However, in fact, this ideal coordination is not feasible even for the developed languages. These needs suggest an integral system that offers management and political supports at the same time. Cabré (1999b, p. 215) states that:

The evolution of a language cannot be separated from the evolution of the society in which it is spoken. Political, economic, social and demographic changes that condition a society also condition the language, or languages, it uses. This evolution, however, is not a free, neutral process in which languages evolve independently but is beset by interferences that push the development of a language in one direction or another. Thus, the greater the economic and political power of a society, the more probable is it that its language will be dominant.

It is also acceptable that the language condition can affect the economic and social changes. Any development in science and technology is not possible unless with long-term and continuous LP. Improvements in the education system, the curricula, the popularization of science, and in general dissemination of knowledge necessitate a systematized developed language of science. In developing countries where the language of international communication is different to the national language, TP even plays a more important role than general language plans. Cabré (1999b) believes that:

The health and survival of a language depends on its being appropriate for all contexts of communication identified by a society. A language reduced to informal usage only begins to lose its prestige and in the end disappears. In this sense special languages are key parts of the real capabilities of survival of a language (p.48).

The importance of TP is acknowledged also by UNESCO in *Guidelines for Terminology Policies* (GTP) and ISO in *Terminology policies- Development and implementation* (ISO 29383, 2010) wherein systematic terminology policy and planning are titled as important factors in language competitions. According to GTP:

At a strategic level, the positive potential of systematic terminology planning – and especially of terminology policies – in support of information, knowledge or innovation policies, as well as of educational strategies, etc. has been recognized. With this greater awareness, countries and language communities are increasingly feeling the need to formulate systematic terminology policies (comprising also terminology planning strategies) in order to improve their competitiveness. (Infoterm, 2005, ii)

One of the interesting topics in the context of developing countries is the awareness of the development process and its consequences as it is stated by Cabré (1999a):

[...] una operación compleja de este tipo [planificación lingüística] requeriría aclarar previamente qué se entiende por desarrollo y qué consecuencias tiene participar en él para una comunidad hablante, ya que la noción de desarrollo nace vinculada a la industrialización. Y con ella los países industrializados encabezan un expansionismo económico que, sin duda, tiene repercusiones culturales y lingüísticas para los países menos desarrollados. (p.304)

## CHAPTER III. LITERATURE REVIEW

TP is broadly understood as a domain to include not only the practical activities directly oriented to standardization and creating or sustaining terminological resources but also the comprehensive knowledge and skills needed in support terminology systems and language of science. TP has caught the interests of a significant number of research over recent years. The crucial role of the precise application of knowledge (in theory and practice) and the development of guidelines and modeling in TP is acknowledged in the literature by increasing number of studies and proposals in this field.

The motivations underlying this rise in academic and practical endeavors are diverse. TP has been developed expressly in communities and countries which have the highest urge to adjust their languages to the terminology needs. We can now admit that TP is not only a symbolic act but also the most important set of actions for the manifestation of and supporting language development plans. It is also verified that TP is an integral part of the language planning system which associates with policies and performance of institutions.

This chapter deals with the arguments and debates briefly mentioned above in the evolutionary path of TP. It presents various engagements of the literature concerning theoretical, practical and analytical efforts in TP to formulate a methodology for TP evaluation based on the underlying premises and assumptions. For this purpose, I have articulated this chapter into three distinct sections:

1. **Conception:** Studies on terminology planning and different perceptions regarding definitions and involving factors;
2. **Models and Stages:** Endeavors on identification of elements, procedures, principal components, and model proposals;
3. **Evaluation:** Studies on terminology evaluation, determinative elements, and the position of evaluation in terminology planning.

# 1. Conception

It is only over the last few decades that terminology has become a subject of theorization and analysis by addressing both systematization and planning. We can look through the literature written or translated into many different languages about the concept of TP and its applications in societies and various languages. In the literature, TP arguments are not grounded in a univocal setting but theorized from various perspectives ranging from linguistic, sociolinguistic, and socioterminological aspects to management and communication plans.

A comparison of the variety of existing perspectives would help us to construct a comprehensive understanding of the rationales and, at the same time, would provide a foundation for integrating various dimensions to move toward a general analytical model. For realizing the grounds of TP that formed its theoretical framework, and for understanding the debates that position TP as a process subordinated to language and development planning, I assume that addressing the concept of terminology, the pertinent political and social expediencies might be relevant.

Another important aspect that would help to obtain a big picture of TP is to know how scholars have tackled the subject by identifying involving factors in the planning process. For this purpose, first, the concept of TP and its connectedness to LP is presented. Then, the section continues by identifying involving factors which may influence the process of planning in one way or another:

1. The concept
  - 1.1 Terminology orientations
  - 1.2 Terminology and language planning
  - 1.3 Language planning goals
  - 1.4 Terminology settings
2. Involving factors
  - 2.1 Intersystemic factors
  - 2.2 Intrasytemic factors

## 1.1. The concept

We cannot define TP without distinguishing different approaches to terminology and their origins. Theoretically, terminology and its associated perceptions have affected TP to some extent, and each approach has positioned TP due to their practical understanding of terminology.

### 1.1.1. Terminology orientations

Terminology orientations are often associated with the standardization perspectives. Standardization is understood here as a general concept including international or multilingual and monolingual standardization that the later in many cases is called normalization as well. We can distinguish two general orientations in terminology: traditional orientation and modern orientation. However, the overall tenors in terminology (i.e. internal and external tendencies) are diverse and complicated (Cabr , 1999a, p. 30). In 1992, following the Auger's classification (1988), Cabr  identified three orientations toward terminology and their relatedness to distinct scopes:

- a) Terminology oriented to language system (focusing on concepts and the standardization of terms and notions)
- b) Terminology oriented to translation (creating large databases)
- c) Terminology oriented to language planning (systematic interventions to change the status of a language recently stabilized).  
(Cabr  1992, p. 33-35)

She has explained that the first orientation is represented by three traditional schools (i.e. Vienna, Prague/ Czech school and Moscow/Soviet/ Russian school). The Vienna school is the only one that has developed a set of principles that formed the theoretical and practical foundations of the modern terminology (Cabr , 1992, p. 33). These principles are based on the elements of General Theory of Terminology (GTT) proposed by E. W ster (also cited in Aguilar-Amat & Santamaria, 1999).

It is worth noting that the GTT was originally founded for standardization purposes (Cabr , 1999a, p. 43) aiming to reach

unambiguous universal communication. The other schools focused more on the structural and functional descriptions of the specialized language (Prague) and conceptual standardization “in the light of the problems connected with the multilingualism in the former Soviet Union (Cabr , 1992, p. 34; Cabr , 1999b, p. 13).

In 1999, Cabr  elaborated these three orientations into various tendencies that emerged from both the theoretical and practical aspects of terminology. She presented a detailed list of tendencies in terminology that two of them have contributed to the perception of standardization (Cabr , 1999a, p. 30-32):

a) [international standardization] The tendency toward standardization in the context of multilingualism or international standardization; basically developed on the standardization principles of GTT.

b) [sociolinguistic standardization] The tendency toward standardization in a monolingual context supporting language development plans, also called normalization.

It is worth noting that standardization in the second tendency is one of the functional aspects of TP (as it is postured in Auger’s model, 1986) and accordingly this tendency implicitly addresses the TP activities. In “*La normalizaci n de la terminolog a en el proceso de normalizaci n de una lengua: algunas precisiones*” Cabr  has also added the *sociocultural standardization* as it is understood in the countries with a developing economic situation (1999c, p. 35). According to Cabr , standardization in these tendencies has principally emerged as an essential practical aspect of terminology (both descriptive and prescriptive), and hence, its associated models and theoretical postulates have been developed afterward.

Furthermore, although these tendencies are similar to the first and the last orientations presented in 1992, one can realize that the concept of LP and its relation to TP is slightly broadened. This brought about the inclusion of all LP activities since the LP-oriented terminology is not limited to the recently stabilized languages. This offers a broader context to include the countries or communities that have planned for their proper languages due to social, economic and cultural reasons. It can be assumed that these orientations reflect the

rise of the theorization on the activities associated with the conservation, maintenance or extension of the use of the languages. Therefore, the standardization in the context of multilingualism or international standardization is rooted in the classical approach to terminology and the standardization in a monolingual context is developed due to the sociolinguistic, sociocultural and economic exigencies.

The primary focus of the Vienna school, as the representative of the classical approach, is on classification, compilation, standardization, and presentation of terms in term banks, ontologies, and dictionaries. In *Terminology work — Vocabulary — Part 1: Theory and application* (ISO 1087-1, 2000), terminology work is defined as follows:

Work concerned with the systematic collection, description, processing and presentation of **concepts** (3.2.1) and their **designations** (3.4.1).

This conception of terminology work in classical view is also reflected in the definition of TP:

**Terminology planning** activities aimed at developing, improving, implementing and disseminating the **terminology** (3.5.1) of a **subject field** (3.1.2).

**NOTE** Terminology planning involves all aspects of **terminology work** (3.6.1) and has among other objectives the objective of achieving vocabulary control through such normative documents as thesauri and terminology standards.

In this sense, TP is conceived as a type of planning which deals with the preparation of terminology collections (terminography) and controlling standardized terms tending to a prescriptive approach. In Felber's terms (1986, p. 10), TP means:

Measures to be taken with a view to develop coordinated terminological activities aiming at the preparation of terminologies.

According to *Infoterm*, TP is “an activity that is carried out by many institutions, organizations or communities for an array of purposes”. In this context, although TP is addressed by its relation to LP, the

focus of the activities falls into terminology and metadata management:

Terminology planning increasingly gains importance in corporate language planning and management at a strategic level. More and more organizations recognize “Terminology management is an essential element of an organization’s metadata management system...”, which means that systematic terminology is the basis for all information, communication and knowledge related activities and tools of the organization.

( *Infoterm*, retrieved July 7, 2016, from *infoterm.info* website)

It is also explicitly mentioned that TP and LP should be treated as two separate disciplines:

Lexical expansion is an important component of language corpus planning. However, its horizontal cross-departmental character, its complexity, and the fact that certain domains are not following the rules of general language often require terminology planning being treated as a separate discipline or activity. It reaches beyond language planning when it involves non-linguistic concept representations (formulas, pictograms, audiovisual signals, etc.).

Terminology planning is often connected with terminology standardization activities. It can take place at different levels – from local to international.

( *Infoterm*, retrieved July 7, 2016, from *infoterm.info* website)

In this sense, first, TP is not defined precisely; and, from the context, it is perceived that TP is a synonym to "lexical expansion" in scientific domains (i.e. terminology expansion). Second, it shows the tendency to detaching TP from LP when it comes to the nonverbal communication. Third, the relation between terminology standardization and TP is quite vague and the definition only addresses the connectedness between these two activities.

Aguilar-Amat & Santamaria (1999, p. 104) have compared two different approaches of Vienna and Catalonia, and stated that TP in Vienna school is more oriented to ensure unambiguous [multilingual] communication, while in Catalonia the development of terminology is more connected to the communicative needs of users in a specific language (Another e.g. is TP in France).



In the context of Vienna school, Drame (2009, p. 95) also confirms that terminology standardization is a prior condition for unambiguous communication in specialized contexts:

Standardized terminology is the prerequisite for exact and unambiguous communication among subject specialists of equal or different levels of abstractness, between subject specialists and laypeople as well as in the transfer of knowledge across linguistic borders, i.e. through translation and interpreting.

On the contrary, modern orientations deal with the collection and analysis of the real use of terms in specialized contexts and consequently studies upon TP tend to observe and examine cultural, communicative, social and cognitive aspects of terms. Modern orientations apply a comprehensive approach to the elaboration of procedures and terminology work; i.e. considering linguistic and metalinguistic factors to describe terminology activities and propose terminological protocols. Cabré (1997, p. 59) defines terminology work as "a process of proceedings enchainment which refers to four different types of activity":

1. Work planning
2. Creation of terminological resources
3. Spreading and implementation of resources
4. Information interchange

Regarding work planning, she proposes four distinct conditions that should be taken into account:

1. Detection of needs
2. Evaluation of possibilities
3. Elaboration of working plan
4. Description of the implementation/ application

These procedures elucidate the underlying assumptions of modern orientation regarding TP process. Given the conditions of work planning, terminology work not only comprises a set of activities but also consists of a set of preparations that provide terminology practitioner with detailed knowledge about the needs, circumstances, aims and implementation strategies.

Temmerman & Kerremans (2003, p. 2) pointed to some changes from traditional terminology to the modern tendencies. They have

mentioned that terminology has shifted from standardization to communication and discourse studies:

The discipline of terminology has seen a shift from what is now referred to as traditional terminology (standardisation-oriented and concept-centred) to a communication-oriented and discourse-centred approach (Cabré 1999 & 2000, Temmerman 2000) [...].

In my opinion, I would interpret this change as a “development” rather than a “shift”; because, the classical terminology is still functional in particular contexts, and it is not entirely changed into the modern terminology. In other words, the theoretical and practical aspects of terminology have developed to the extent that comprise more diverse engagements and contributions. This development suggests that terminologists and planners should get known with the circumstances in which the terminology activity will be applied to choose the most appropriate orientation and methodologies accordingly.

One of the most important aspects of modern orientation is its attitude toward variables and plurality. Modern terminology adapted the conception of terminological units from linguistic structuralism (i.e. units consist of form and content) and applies this notion to analyze sociolinguistic, sociocultural, sociocognitive, and psychological variables in all aspects of terminology works, including standardization, implantation, and implementation.

Temmerman & Kerremans have also noted that in modern terminology “terms (linguistic expressions) in texts became the starting point in terminological analysis” (vs. concepts in classical terminology) (2003, p. 2). This shift from *concept* to *term* prompted the study of contextual and discursive variables and parameters which also reflect different levels of specialization. As a result, univocity principle in classical terminology cannot be systematically applied in modern terminology in which synonymy and polysemy have crucial importance based on the discursive and functional aspects of terminological units.

Another implication of the study of terms as the “starting point” is that mere conceptual structures and intercategory relationships of concepts are given much less prominence than “detection of needs” and “evaluation of possibilities.” As a consequence, terminology

procedures in modern approaches focus on the “profile of the users” that may influence the decision-making in terminology standardization as well.

### 1.1.2. Terminology and language planning

The most prominent area in which terminology and TP have a role to play is in the description and prescription of a language: corpus and status (language) planning. As I have mentioned earlier, the classical orientation and modern orientation have also entailed some divergences regarding the relation between TP and LP. However, this separation does not imply the complete dissociation of TP and LP in the traditional approach.

The term *language planning* was first “introduced by the linguist Einar Haugen in the late 1950s” (Deumert, 2000, p. 384) and it is defined by him as follows:

[Language Planning] refers to all conscious efforts that aim at changing the linguistic behavior of a speech community. It can include anything 'from proposing a new word to a new language' (Haugen 1987: 627).

According to Fishman (1987, p. 409), language planning is:

[...] the authoritative allocation of resources to the attainment of language status and corpus goals, whether in connection with new functions that are aspired to, or in connection with old functions that need to be discharged more adequately. (as cited in Jernud, 1993, p. 133)

Einer Haugen’s fourfold model of language planning (1966) was one of the pioneering models in this field which influenced the other typologies and models afterward.

The model proposed by Haugen, who indeed launched the term *language planning* [...] was developed within the context of Haugen’s work on the language situation in Norway. (Antia, 2000, p. 1)

In revised version of this model (Table 3.1), *terminology modernization* is a part of the elaboration process in language cultivation and corpus planning (Haugen, 1983, p. 273). However,

Marí i Mayans (1992) believes that terminology in corpus planning is not only a part of language elaboration but also it is a complementary part of the codification of general lexicon (p. 21).

	<b>Form (policy planning)</b>	<b>Function (language cultivation)</b>
<b>Society (status planning)</b>	selection (decision procedure) a. identification of problem b. allocation of norm	application [implantation]/ implementation (education spread) a. correction b. evaluation
<b>Language (corpus planning)</b>	codification (standardization procedure) a. graphization b. grammatication c. lexication	elaboration (functional development) a. terminological modernization b. stylistic development

Table 3.1. Einer Haugen's LP model (as cited in Marí i Mayans, 1992, p. 12)

Kloss (1969) in his proposed dichotomy of corpus and status planning also has considered terminology as "the main area of concerns" in corpus language planning (as cited in Humbley, 1997, p. 19). According to Cobarrubias (1983), the highest degree of standardization for a language, as a central aspect of corpus planning, can be reflected in the use of the language "in all areas of communication, including science and technology at a tertiary or research level (as cited in Deumert, 2000, p. 385). Languages with this characteristic are identified as "mature modern standard languages."

By giving the example of Catalan LP and TP, Marí i Mayans (1992, p. 21) has stressed the role of cooperation between terminology and language policy in status planning. According to him, without this cooperation, the use of Catalan language in all institutional public functions was not possible. The same scenario applies to the Quebec experience (Daoust, 1982, p. 57).

In Cooper's terms, "language planning refers to deliberate efforts to influence the behavior of others with respect to the acquisition, structure, or functional allocation of their language codes" (Cooper, 1989, p. 45; also cited in Nekvapil, 2011, p. 877; Wright, Buon & García, 2015). This conceptualization of LP is also reflected in the

perception of Auger and Cabré of TP. In this sense, the objective of TP is not only proposing a new term but also changing the attitude of others toward a language by manifesting the abilities and potentials of a language in scientific domains.

Cabré, referencing Auger, has stressed the role of terminology in status planning for recently stabilized languages wherein TP entails implementation of systematic and strategic interventions (Cabré, 1992, p. 41). In other words, TP for unstable or recently stabilized languages should be entirely at the service of language planning goals. While for the fully preserved languages, another scenario may apply.

The underlying belief of this type of language planning is that the use of an unstable language can change with systematic, strategic intervention carried out by official bodies, with the right legislation and appropriate measures aimed at implementing the change. To attain the desired change, the language in question must have up-to-date, coherent terminology to ensure professional communication in all fields. (Cabré, 1999b, p. 14)

Within the short compass of this paragraph, Cabré provided a resume of the importance of TP in relation with LP to achieve the desired status of a language across the development of the corpus (including the terminology). Planning for specialized language or language of science is considered as an undetachable element of LP which not only assists the development of a language by expanding its vocabulary and its functioning in all areas but also supports the political rights and conditions of languages.

Maurais (1993) has also discussed some aspects of terminology that are more relevant to LP and with analyzing the LP motivations in Quebec pointed the roots of terminology practices in Canada originated from LP efforts. He also highlighted the *symbolic role* of terminology in LP:

Terminology plays an important symbolic part in language planning as it is a public manifestation of underlying (and at times concealed) struggles or competition in a bilingual or multilingual environment (p.114).

Myking (1997, p. 227), confirming the idea of Maurais, has discussed that “there is a unilateral relation between terminology and language planning, i.e., terminology work is conceivable without the context of national language planning, but not vice versa”. He has addressed TP within the framework of two interdependent functions:

–*The cultural function*: Terminology work functions as a manifestation of national language elaboration in Einar Haugen's terms. To the language community, it is symbolically important that the national language is terminologically elaborated to function in advanced scientific and technological settings (Maurais 1993).

– *The interface function*: Terminology functions as the fundamental part of developing efficient and unambiguous communication between specialists, at various levels: the individual, societal, multilingual, institutional and infrastructural.

In this classification, the *cultural function* (proposed by Maurais) is the conception of TP in modern terminology, and the *interface function* is the understanding of TP in the traditional terminology. Hence, the former shows the leaning toward elaboration of language across terminological works. While the latter represents the tendency to either conceptual harmonization at institutional and infrastructural levels or international and multilingual standardization.

The methodological and theoretical foundation of Norwegian terminology work is the tradition initiated by Eugen Wüster, "The General Theory of Terminology". It is my hypothesis that this tradition is of special importance to the interface function of terminology [...]. (Myking, 1997, p. 227)

These approaches to TP (whether as an element of status planning or corpus planning) suggest that TP is not only characterized by lexical expansion in scientific domains but social aspects of language (i.e. sociolinguistic aspects) should be also addressed.

According to Downes (1998, p. 9), sociolinguistics in a broad definition studies “those properties of language and languages which require reference to social, including contextual factors in their explanations”. This definition includes two main types of studies; i.e. large-scale and small-scale studies. Variation studies,

modern urban dialectology or sociolinguistics proper are other denominations for the large-scale studies (p. 15). Coulmas (1998, p. 9) states that “sociolinguistics has been concerned in a very practical sense with the functions language fulfills in social institutions and the organization of society.” He also explains the relation between language planning and sociolinguistic practices:

Language planning operates on the micro- and macro-levels of sociolinguistics dealing with such issues as graphization, standardization, lexical augmentation on the one hand, and status, prestige, and the functional allocation of languages in a society on the other. While in most other fields of language-related inquiry language is taken as an object which has an existence of its own with which the speech community is confronted, language planning highlights a different aspect of the social nature of language, emphasizing as it does that, in some respects at least, speakers and writers are the creators and masters of their language, hence the importance of language planning for the sociolinguistic enterprise as a whole (Coulmas 1998, p.10).

Sociolinguistics is defined by Spolsky (1998) as follows:

Sociolinguistics is the field that studies the relation between language and society, between the uses of language and the social structures in which the users of language live. It is a field of study that assumes that human society is made up of many related patterns and behaviours, some of which are linguistic. (p. 3)

Given the necessity of studying terminology in its social context, socioterminology originally developed in Quebec, functioned as a bridge between terminology and sociolinguistics to explore the elaboration of language and terminology modernization concerning the context of cultural and social forces.

Researchers whose approach is often characterized as “socioterminological” include Guespin, Corbeil, Gaudin, Gambier, Boulanger, Guilbert, and Rey. Socioterminology argues that language and terminology should be studied and understood in their proper contexts; i.e. societies (Aito, 2000, p. 50; see also Bhreathnach, 2011). This understanding differs from the ideal model of Wüsterian approach which intended to prescribe a universal use of language.

In Gaudin's terms (1994, p. 6-7), GTT for some particular characteristics such as biunivocity, mono-referentiality, and the division between general language and specialized language could not respond to problems that have emerged from cultural and social contexts. Consequently, for fulfilling the terminological needs due to variations, language contacts and discursive elements, a set of reflections originating from sociolinguistic approach were gathered under the title of socioterminology.

C'est dans ce contexte qu'une position théorique se dessine, conduisant à la révision des postulats de la terminologie dominante : bi-univocité, découpage en "domaines", mono-référentialité, partage entre langue générale (LGP) et langues de spécialités (LSP) ; et c'est l'ensemble des réflexions issues de cette critique, fondée sur une approche socio-linguistique, que nous rassemblons sous l'étiquette de socioterminologie (cf. Gaudin, 1993a). (p.7)

“According to Boulanger (1995, p. 195), socioterminology has developed along the lines of the concept of “*aménagement linguistique*”, that is, language planning in the sense of Jean-Claude Corbeil” (as cited in Campo, 2012, p. 144). Socioterminology is a framework for building theory that sees terminology as a complex system whose epistemological and methodological aspects work together to promote the terminology use in social contexts.

For this purpose, social forces that influence the terminology use and promotion get a central focus. The interactions among various mechanisms in an individual society (e.g. cultural norms, expectations, and context) and their relation to terminology are frequent topics in socioterminology studies. The early discussions on socioterminology started from the study on linguistic factors of term acceptance and then developed to psychological, cultural and social factors. However, the theoretical framework only developed after the early 1980s and the term *socioterminology* first used by Jean-Claude Boulanger in 1981-1982 (Aito, 2000, p. 47).

Gaudin (1994, p. 6) believes that terminology practices, since the thirties, are emerged by socio-historical and sociolinguistic reasons.

Si une pratique a pu se dégager dans le champ terminologique, depuis les années trente, ce fut avant tout pour des raisons socio-historiques et sociolinguistiques, liées, d'une part, au



développement de la normalisation technique et industrielle, et, d'autre part, à l'équipement des langues.

Jean-Claude Corbeil the Canadian terminologist whose works and research line have given a significant rise in the development of socioterminological debates has identified four distinct approaches to terminology from which the fourth approach is characterized as a *sociolinguistic approach to terminology*.

L'approche sociolinguistique poursuit comme objectif la standardisation des terminologies dans le cadre d'un plan d'aménagement linguistique d'une langue, en general explicité par une législation linguistique. (Corbeil, 1997, P. 37).

He emphasized the critical role of terminology in LP and states that this approach has borrowed its theoretical considerations from sociolinguistics (Corbeil, 1997, p. 35). Corbeil has identified six distinct reasons that position TP as a crucial element in LP activities.

- 1- Comme soutien indispensable à la réalisation d'une politique linguistique
- 2- Comme soutien à la définition d'une norme technique par un organisme de normalisation, national ou international, ou encore comme soutien à la rédaction d'une loi, d'un règlement ou d'un code devant régir une activité à contenu technique.
- 3- Pour régler les problèmes terminologiques que pose l'exercice d'une profession, d'un métier, d'une fonction, l'enseignement d'une matière, l'établissement d'un catalogue de produits, la publicité commerciale, etc.
- 4- Pour compiler des thesaurus documentaires, c'est-à-dire ces ensembles de termes qui permettent d'indexer des documents en fonction de leur contenu, ce qui facilite la recherche de l'information par la suite.
- 5- Pour traduire ou rédiger un texte à contenu technique ou faire la traduction simultanée ou l'interprétation d'une conférence réunissant des spécialistes.
- 6- Pour répondre aux questions des usagers dans le fonctionnement quotidien d'un service de consultation linguistique et

terminologique offert aux citoyens dans le cadre d'une politique linguistique.

Humbley (1997) by addressing the particular terminology approach in Quebec- the influence of Corbeil and activities of *Conseil de la langue française* as well as the *Office de la langue française*- has also stated explicitly that terminology development in Quebec has been a matter of LP concerns (p. 19). He has mentioned some characteristics of terminology work in Quebec as follows:

From a theoretical point of view, the Quebecers were undogmatic: the theory of both terminology and language planning was developed as it was needed, and quite often theory followed practice, providing tools for analyses of on-going programs rather than a preconceived framework.

As terminology was actually implemented at the level of an organization, private or public company or administration, the systematic aspect of its elaboration, as proposed by Wüster, was largely followed. (p. 20)

Louis-Jean Rousseau (2005, p. 97), in the context of Quebec approach, has also discussed that “TP is generally supported by language policy (status planning), which should include all dimensions of terminology activities from initial research to implantation of terms” [my translation]. He also notes that this conception of TP at the practical level has been coincident with the birth of socioterminology.

L'aménagement terminologique s'appuie généralement sur une politique linguistique, formulée ou non, et inclut tous les aspects de l'activité terminologique, de la recherche à l'implantation des termes auprès des milieux professionnels ciblés. L'aménagement terminologique, en tant que pratique, a accompagné la naissance d'un nouveau champ d'expérience que l'on nomme aujourd'hui la socioterminologie.

According to Faber (2009, p. 113), “socioterminology, as proposed by Gaudin (1993) applies sociolinguistic principles to terminology theory, and accounts for terminological variation by identifying term variants against the backdrop of different usage contexts”.

Antia (2000, p. 34) has studied profoundly the state of terminology in various language planning models. In his terms, in many LP models, specialized language and terminology are concerned more or less similar but under the distinct titles:

Terminology is part of elaboration in Haugen's model; an aspect of intellectualisation in Garvin's language development; a part of modernisation in Ferguson's scheme; a component in Neustupný's cultivation approach, etc. Work on terminology is typically the result of challenges associated with (the continuing) implementation or use of the chosen code. But from the point of view of alternative or more flexible models, terminology, like other aspects of corpus planning, can be the reason for choosing a code.

Angela Campo (2012) has also described the relationship between socioterminology and LP as follows:

Socioterminology also takes into account the process of language planning for the reason that it inherited many conceptual and methodological features from sociolinguistics. In this sense, language planning is taken as a management instrument to search for solutions to language problems (e.g., Quebec and Catalonia[...]). (p. 144)

All these arguments are in support of the connection between TP and LP. Although in some cases the focus is on status planning, the implication of political activities in corpus planning is also admitted. These discussions reveal that TP subordinated to LP initially accounts for terminology expansion to support the status of the languages at the political level. In other words, as it is also stressed by Cabré (2002), TP functions as an indicator to manifest the potentials of a language to be used in all areas of knowledge along with general circumstances.

### 1.1.3. Language planning goals

The recognition of the objectives of TP- that principally are designed to fulfill the terminological needs- is partially<sup>4</sup> dependent on the identification of LP goals, motivations, and objectives in

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<sup>4</sup> Terminological needs are also conditioned on the internal needs of subject fields that associate with socioprofessional requirements.

their proper contexts. The question that might come to mind is what these goals are and how they can affect the terminology practices.

According to Kaplan & Baldauf (1997, p. 59), although the Haugen's model was practical to show the process of LP and its related operations and procedures, it could not be accounted for identifying LP goals and purposes. They believe that it was after Cooper's *accounting framework* (1989) that other theoreticians started to address explicitly the notion of "goals" and "purpose" in LP models. However, Rubin (1971) has identified some of the LP goals of the early period of LP [during the years 1950-1970] associated with unification, modernization, efficiency, and democratization:

Goals of language planning were often associated with a desire for unification (of a region, nation, a religious group, a political group, or other kinds of groups), a desire for modernization, a desire for efficiency, or a desire for democratization. (as cited in Ricento, 2000, p. 199)

According to Ricento the second period of LP started from the early 1970s and continued until the late 1980s (2000, p. 200). He believes that this period is characterized by the growing awareness of the social, economic and political implications that affected LP studies and linguistic debates. As a consequence, the topics such as "social behaviors", "motivation", "attitude" and "beliefs" have become the foci of LP and linguistics studies.

Several important themes such as "language promotion", "multilingualism", "ecology of language" and "linguistic diversity" have entered LP debates as a result of postmodernism and evolution of national identities roughly since the mid-1980s (Ricento, 2000). This period, according to Ricento, is the third stage of LP which continues to the present (p. 203). Therefore, the primary goals of LP are associated with the cultural and social rights, ideology and promoting multilingualism. Regarding these shifts in LP, Phillipson & Skutnaab-Kangas (1996) stated:

The ecology-of-language paradigm involves building on linguistic diversity worldwide, promoting multilingualism and foreign language learning, and granting linguistic human rights to speakers of all languages. (p. 429)

In 1994, Hornberger presented a “framework integrating nearly three decades of language planning scholarship (Table 3.2) based on Ferguson (1968), Kloss (1968), Stewart (1968), Neustupny (1974), Haugen (1983), Nahir (1984), and Cooper (1989)” (as cited in Ricento & Hornberger, 1996, p. 402-403). This framework shows two main approaches to LP (i.e. policy planning and cultivation planning) and some 30 goals within the parameters of three types of LP (i.e. status planning, acquisition planning, corpus planning).

According to Hornberger “the direction of change envisioned” is due to the LP goals assigned to LP activities (Ricento & Hornberger, 1996, p. 403). In other terms, the goals determine the means and the path. However, before assigning the goals, what originally orient LP activities are “language problems”. According to Rubin (1971), LP is the pursuit of “solutions to language problems through decisions about alternative goals, means, and outcomes to solve these problems” (as cited in Ricento & Hornberger, 1996, p. 405).

Table 3.2. Language planning goals (N. H. Hornberger, 1994, as cited in Ricento & Hornberger, 1996, p. 403)<sup>5</sup>

<b>Approaches→ ↓Types</b>	<b>Policy planning (on form) Goals</b>	<b>Cultivation planning (on function) Goals</b>
<b>Status planning (about uses of language)</b>	Standardization status Officialization Nationalization Proscription	Revival Maintenance Interlingual communication - International - Intranational Spread
<b>Acquisition planning (about users of language)</b>	Group Education/school Literature Religion Mass media Work	Reacquisition Maintenance Foreign language/second language Shift
<b>Corpus planning (about language)</b>	Standardization - Corpus - Auxiliary code Graphization	Modernization -Lexical -Stylistic Renovation -Purification -Reform -Stylistic simplification Terminology unification

<sup>5</sup> Also in Hornberger (2006, p.40).

Nahir's contribution to LP goals (1984) is also one of the most cited classifications by which Nahir has identified eleven LP goals as follows:

1. Language purification, that is, maintaining linguistic consistency and standards of a language, usually through the development of prescriptive grammars and dictionaries.
2. Language revival, language revitalization and language reversal, encompassing efforts at restoring the language.
3. Language reform, that is, changing the orthography, spelling, lexicon, or grammar of a language in order to facilitate language use.
4. Language standardization for effective communication, accomplished usually through pedagogical grammars and dictionaries.
5. Language spread, an attempt to increase the number of speakers of a language, usually by having speakers shift to another language.
6. Lexical modernization, that is, expanding the capacity of a language to deal with new concepts and technology.
7. Terminological unification, also known as term planning, and having to do with development of equivalent terminology across geographic areas, especially terms having to do with medicine, science, industries, aviation and maritime navigation, and technology.
8. Stylistic simplification, attempts to make text more readable and less complex in lexicon and syntax.
9. Interlingual communication to facilitate communication between members of different speech communities.
10. Language maintenance, having to do with the preservation of a language.
11. Auxiliary code standardization.

(as cited in García, 2015, p. 356)

As it is noted by Ager (2001, p. 10), these goals are mainly a combination of motives (e.g. maintenance of a dominant language –

issue of the ideology), strategies (e.g. language purification), as well as goals (standardization, language reform...). Dennis Ager (2001, p. 12) proposes three main components for LP motivation which are *motive*, *attitude*, and *goal* (including strategies). He classifies seven types of motive for LP or policy in general that are associated with the values and beliefs underlying attitudes:

1. Identity
2. Ideology
3. Image
4. Insecurity
5. Inequality
6. Integration
7. Instrumentality

Regarding instrumentality, which is very close to the LP interventions or deliberate efforts in status and corpus planning, Ager believes that “corpus policy may be important here for communities, while for individuals the result of the instrumental motive is mainly a matter of acquisition policy” (p. 139). These motives, indeed, form a successive procedure that starts from identity and continues to image wherein the majority of decisions and the evaluation of language reside. The sequence follows the stages to reach the final result; i.e. language loss or language shift. Instrumental moves comprise to adjust or to reform linguistic instruments. He supports the idea with presenting three different attitudes towards a particular language or variation, depending on the original motive:

1. Knowledge of language
2. Emotion towards language
3. Desire to take action

And finally, he proposes various goals which are supposed to be planned to achieve by actions:

1. Ideal (vision, intention): Idealistic future state. (e.g. language reform)
2. Objective (mission, purpose): a way of achieving the vision. (e.g. stylistic simplification)
3. Target: precise achievable point which is measurable and quantifiable. (e.g. spelling standardization)
4. Needs: physiological, psychological

## 5. Strategies to achieve these goals

Ager (2001) believes that “a particular planning or policy decision depends on the structure of motives, on attitudinal structure and on the goals pursued” (p. 194). This classification is used to measure language attitudes and to achieve a meaningful summary of language and planning behaviors.

In the context of Communicative Theory of Terminology, communicative purposes, as noted by Cabré, are also considered as LP goals that inevitably affect and orient the terminology activities and standardization (Cabré, 2002). Cabré believes that for a language to have a standard use not only it is necessary to have available lexical resources for general usage, but also it is essential to equip the language with terminological resources in specialized and professional contexts. In other terms, the standard or normal use of a language depends on its use in all communicative areas.

Los escenarios de comunicación especializada forman parte del conjunto de los contextos de comunicación de las sociedades, y por ello una lengua que desee para sí misma un uso normal en intensidad y extensión necesita tener terminología disponible para los usos especializados de sus hablantes en tanto que profesionales y especialistas en temas y sectores concretos. (2002, p. 7)

Cabré has also stressed the role of the “desire to take action” in LP and TP in realizing the goals. She has noted that any language or terminology plan requires the governments’ willingness on the one hand and the active role of specialists and scientists on the other hand (2002, p. 19).

Arguments show that as an indispensable aspect of LP, terminology policies and their implementation are affected by the behaviors toward a language. In this regards, a question might come to mind that “to what extent the legal entities’ motives, at sociopolitical level, would overlap or mirror the individuals’ motives” at sociocultural level. In simple words, who decides for the language and through what means the decision can conform to the community members’ images and needs? This question suggests studying the *relevance* of language policies to the attitudinal behavior of speakers, their images, needs, desires, ideals and, in general, sociolinguistic and sociocultural contexts. If the realization



of plans is dependent on the governments' willingness and active role of speakers, it is required that both parties share a common vision and desire.

To sum up, language planning debates and language behaviors shed some light on the individual attitudes towards newly coined equivalents or new term proposals. In this regard, the roles of institutions as planners and the individuals as recipients/users are given prominence in a socio-dynamic system. Complementing this system with communicative models, I can also identify two major concerns in relation to the content (message) of the terminological plans and the *relevance* of these plans to both ecolinguistic systems (context) and the users (recipient). In this sense, the relevance in TP can be interpreted in two ways:

1. The relevance of terminological activities (i.e. operations and institutional activities) to language policies [which should be previously in accordance with the ideology and cultural images of speakers];
2. The relevance of terminology policies to socioprofessional and terminological needs and desires.

#### 1.1.4. Terminology settings

In practice, the needs and expediencies of the terminology settings predicate different interpretations of TP. This fact brought about a particular classification based on the areas of application. In this regard, three distinct general categories can be identified: international, national, and regional (or local). Drame (2009, p. 95) states that:

Terminology standardization can take place in different environments. Besides on an international level, it is part of regional and national standards.

Since the needs of each terminology setting are unique, the aims and visions of each category are defined distinctly. According to “*EuroTermBank*” (ETB), terminology activities at local, national, and international levels perform different scenarios and are systematically different. A terminology scenario is defined as “schematic framework of terminology work that is based on a

certain set of conditions and goals” (Rirdance & Vasiljevs, 2006, p. 15). Thus, the differences in terminology settings imply that their objectives and goals are not formulated in the same way.

International TP aims at developing the ideology of universality by improving international communication, and hence, it involves more in the harmonization of concepts with a multilingual attitude. On the contrary, national TP falls in the scope of socioterminology and national language policies. Language policy in the form of official supports and constitutional or legislation documents play a crucial role in the progress of TP implementation in national scenarios. In ETB (Rirdance & Vasiljevs, 2006) the primary tasks of national scenario are presented as follows:

- Terminology and language planning
- Development of integrated terminology systems based on international principles
- National standardization and approval of terms
- Maintenance of national terminology
- Coordination of terminological work in state institutions, standardization departments, translation centres and other organizations. (p. 17)

This categorization of terminology settings is also admitted by *Infoterm*:

Terminology planning is often connected with terminology standardization activities. It can take place at different levels – from local to international.

(Retrieved September 11, 2016, from *infoterm.info* website)

The international TP refers to imposing lexical options in other languages (Aguilar-Amat & Santamaria, 1999, p. 107). However, terminology work at local level “is mainly defined by the user’s needs e.g. translation or localization of documents, etc. and their working conditions, e.g. the framework of research projects” (Rirdance & Vasiljevs, 2006, p. 19).

Terminology settings in GTP (Infoterm, 2005) are presented at “national, regional, language community, local community, institutional or organizational level” (p. i). In this regard, activities such as terminology control and terminology management at multinational enterprises are also considered as TP activities. Regarding the terminology policies, the GTP (Infoterm, 2005) differentiates communities’ needs according to the area of application from large scale communities to the smallest language communities:

Each language community may have different needs with respect to institution building and human capacity building as part of the design, formulation and implementation of a terminology policy according to the particular culture, society and other circumstances involved.

Based on these discussions, TP in the framework of the LP is more connected to the terminology works at the national level; however, it can also comprise the coordination of terminology works at the local level (i.e. language communities).

## 1.2. Involving factors

The very initial driving forces in TP is to solve terminological problems, to fulfill terminological gaps or to improve a certain terminological situation to meet the users’ needs; i.e. communicative forces. In this path, as it can apply to any other systems, TP might wrestle with various difficulties or other forces that make TP lean toward a position or another. Identifying these factors not only gives a better understanding of TP concept but also is an important move toward designing analytical models.

As it is discussed earlier, TP consists of two parts that are “terminology” and “planning”. This combination suggests that apart from contextual forces, we can identify factors that are associated with its constituent elements. On the one hand, terminology is not separate from the general language; therefore, any characteristic of a language affects its terminology or specialized language as well. On the other hand, planning also involves special proficiencies and competencies that might influence TP in the formulation phase or the practice and implementation.

Generally speaking, we can identify two types of involving factors:

a) External factors or *intersystemic*

b) Internal factors or *intrasystemic*

The former can consist of linguistic, sociolinguistic, sociocultural, political, and geographical and any external and contextual forces that can orient the formulation and implementation of plans or approaches toward TP. While, the latter comprises factors originated from the intrasystemic working and the functionality of sub-systems; i.e. institutional activities.

In the following sections, I review those intersystemic and intrasystemic factors which have frequently been addressed in the literature that may incline the process of TP toward a particular condition. In other words, the distinct forces in relation to linguistic (proper attributes of terms and the general language), sociolinguistic and sociocultural aspects (implantation of terms and social development plans) and institutional factors are presented.

### 1.2.1. Intersystemic factors

In GTP (Infoterm, 2005, p. i), three distinct categories of factors are identified that should be taken into account for TP at the national level. These factors can influence the formulation of policies and plans which also “have an impact on the success of the measures taken”:

a) Demographic factors;

b) Cultural, ethnolinguistic and geo-linguistic factors;

c) Socio-psychological factors.

It is also mentioned in GTP that formulating terminology policies are strongly influenced by “linguistic situation” in which policies are supposed to be applied (Infoterm, 2005, p. 14).

According to Zarnikhi (2014, p. 359), “any ecolinguistic situation has its own sociolinguistic potentialities and limitations rooted in its social, cultural and linguistic contexts which appear in the form of

forces from top, down and sometimes from a totally unexpected source.” These forces include the linguistic attitudes, LP’s goals, epistemological and strategic factors, political and economic forces and terminology settings as well.

#### 1.2.1.1. Linguistic factors

The intrinsic characteristics of languages can either affect the needs or restrict the terminology activities by imposing distinct obstacles. According to Cabré (2003, p. 183), terminological units are “at one and the same time units of knowledge, units of language and units of communication.” As units of language, any particular linguistic feature can affect certain procedures in TP, ranging from term creation and standardization to knowledge representation and implantation. Linguistic elements like the script and phonological and morphological aspects can be recognized as the most basic involving factors.

Although languages are equal regarding the production ability or expressivity, when it comes to the language competition and terminology in the target language, it might be seen differently. The potential linguistic mechanisms to create or adopt new forms and their analogy to the source language may influence the entire decision making and strategies in the standardization process. Linguistic principles and criteria addressed in almost all terminological manuals and guidelines also shed light on the importance of linguistic factors in TP. One of the good examples regarding the role of linguistic factors in TP is the study of abbreviations and their implications in the Persian language conducted by Akbari (2014).

Corbeil (1999b) also believes that “the source language influences the elaboration of terminology in target languages” (p. 80). He gives some examples and compares countries that are influenced by the English language or French language. As an instance, he compared the word “*canot*” (Quebec French) and “*canoë*” (French in France, directly influenced by English and indirectly by Spanish). This influence is more related to the borrowing forms, diversities and the lexical expansion oriented to the specific forms affected by the source languages.

In *ISO 704- Terminology Work: Principles and Methods* (Second edition, 2000, p. 25-27) some linguistic aspects of terms that are crucial in term formation and terminology works are also identified as *transparency, consistency, appropriateness, linguistic economy, derivability, linguistic correctness* and *preference for native language*. These principles have also been addressed in GTP (Infoterm, 2005, p.10) along with a presentation to general term formation methods. According to GTP, these principles are “basically applicable to ‘all’ languages” and “focus on the systematic nature of terminologies with their underlying conceptual networks, including the cognitive dimension, aspects of knowledge representation”.

Linguistic factors can also influence the process of preparation and representation of terminological resources; i.e. corpus analysis and terminography. According to GTP (Infoterm, 2005, p.10), in corpus analysis, *term extraction* and *term identification* are not easy tasks, and it could be even more challenging for some specific languages. In other words, the technology and term extraction applications can be adjusted for some languages easier than some others.

For instance, those applications that can be employed for term extraction in the Spanish language can be used for other Romance languages with little adaptation. Notwithstanding, for the Persian or Arabic language we may require much effort to localize these applications, or we better should create and develop original extraction systems.

“The interaction between domain languages and general language” is another linguistic factor that has been addressed in the literature. Phenomena such as *terminologization* and *determinologization* are the main representatives of this interaction (Infoterm, 2005, p.10) that not only affect the term extraction methodologies but also may cause some difficulties in distinguishing *general words* from *terms*. This fact can be more challenging when it applies to bilingual or multilingual standardizations.

Identifying linguistic differences between the source and target languages and solving problematic cases in harmonization procedure or choosing final representation format of terminology

resources are operations which directly deal with linguistic factors and thus necessitate a major consideration.

### 1.2.1.2. Sociolinguistic and sociocultural factors

Terminological needs are not dissociated from their sociolinguistic contexts. Sociolinguistic circumstances underlie terminological requirements and would orient either the chosen approaches toward terminology or strategic decision-making. In other terms, the significant position of TP in LP entails that sociolinguistic circumstances and LP goals affect the terminological activities in one way or another. One of the most evident influences, for instance, can be the explicit primacy of terminological activities in LP processes with reference to LP objectives and visions (e.g. Iran and Catalonia).

It goes without saying that any significant change in the structure of a language (language reform), or any restoration (language revival), simplification, purification, or any other considerable modification regarding the corpus or the policy, would affect the terminological works as well.

One example from the Norwegian terminology work, presented by Myking (1997), shows how theoretical debates in LP, visions, and goals can influence the practice of TP and its proper objectives in a specific social context. In Myking's terms, TP is an intersection of specialist's needs and "sociocultural climate of the society."

Terminology planning is an intersection of two sectors: the needs of the specialists and the socio-cultural climate of the society as a whole. There may be conflict as well as harmony between these two concerns.

(1997, p. 227)

Regarding the "cultural and sociolinguistic implications" of Norwegian LP, Myking has stressed the role of nationalism and democratism as underlying ideologies that formed the current picture of terminology activities in Norway.

The ideologies underlying Norwegian language planning for the last 150 years can perhaps be characterized as a combination of "nationalism", that is, creating a distinct and autonomous standard

language, and "democratism", i.e. the doctrine that language should belong to all classes and groups. (1997, p. 229)

His contribution has also shed light on the diversity of Nordic terminological activities, yet homogeneous (p. 229). In the context of Nordic terminology experiences, he emphasizes the pragmatic aspects of terminology and terminology harmonization as the primary objectives of Nordic approach to terminology.

One of the most important aims of the Nordic linguistic cooperation is to prevent the Nordic languages from drifting apart. In order to achieve this it is important to promote linguistic harmonization whenever possible. Lexical and above all terminological harmonization is perhaps the most important aspect of this work, (p. 232).

Sociolinguistic studies have affected terminology either in theoretical or practical aspects. Gaudin discusses about four different factors that changed traditional aspects of terminology and brought about its current modern situation (Gaudin, 2005a; 2005b, p. 80). Among these factors two of them are related to sociolinguistics studies and methodology.

1. La sociolinguistique théorique a permis de reprendre à nouveaux frais les conceptions en matière de discours dans une perspective héritière de la sociolinguistique de la covariance et des travaux sur les interactions verbales.
2. La sociolinguistique de terrain est ici celle qui a dû chercher des solutions à des problèmes concrets de gestion des langues.
3. La linguistique générale a tardé à se préoccuper de terminologie.
4. La linguistique de corpus a imposé une réforme des méthodes et des conceptions en raison du développement de la gestion informatisée des écrits et de l'apparition de nouveaux outils langagiers.

Given these debates, sociolinguistic factors are conceived here as factors which are originated from LP and affect either terminology policies or the corpus of a particular language in one way or another. It is evident that in this context, sociopolitical and socioeconomic status and the government as the most relevant



authority entity are the main driving forces, influencing TP regarding policies and practices entirely.

Robert Kaplan (2013) proposes some critical points regarding the LP assumptions over the history and describes the evolution of LP emphasizing the explicit relation between politics and LP.

Language planning is really about power distribution and political expediency; it is about economic issues, and it is about the distribution of time and effort of administrators, scholars, teachers and students (p.10).

He believes that early arguments on LP failed to evaluate policies from a political view:

Another problem in early language planning was its failure adequately to analyze the impact of local contexts on national policies, partially the consequence of an emphasis on technical rather than political evaluation of policies as well as a general separation of language planning from political analysis.

Among those scholars who stress the sociocultural aspects of TP, Fishman (1983) discusses the complex social contexts and emphasizes the role of cultural expertise in corpus planning (terminology planning):

It is a devastating mistake to assume that corpus planning merely requires the interplay and coordination of linguistic expertise and technological expertise, devastating certainly if one's goal is not merely to do corpus planning (i.e., not merely to create a nomenclature in chemistry, or in some other modern technological area) but to have it accepted (i.e., to have it liked, learned and used). If the latter is our goal (and anything less strikes me as a travesty), then cultural expertise in all its ramifications is called for as well (Fishman 1983, as cited in Antia 2000, p. 12).

One of the manifestations of the interrelation between terminology and culture is the cultural approach to terminology (*terminologie culturelle*) proposed by Marcel Diki-Kidiri. He believes that the culture is in the center of any linguistic and terminological process, including the production of knowledge and any type of understanding of new realities.

Enfin, avec la terminologie culturelle, la culture d'une communauté humaine donnée est au centre de la démarche. Cette culture se nourrit de toute l'expérience humaine en terme de productions, de savoirs et de savoir-faire de tous genres. Chaque nouvelle réalité est perçue et reconceptualisée de manière à intégrer la culture, et devient à son tour un archétype, une grille d'interprétation pour la compréhension et l'appropriation de nouvelles réalités (2000a, p. 6).

Cultural Terminology by addressing the cultural diversities follows two distinct objectives (free translation from French):

1. Contributing to the development of a terminological theory that takes into account cultural diversity and preserves the identity needs of different human communities.
2. Developing a consistent methodology for the development, production and implementation of terminologies with the aim of effective language and cultures development, especially in Africa.  
(Diki-Kidiri, 2000b, p. 27-28)

Cabré also believes that terminological units are not separated from the cultural conceptions (scientific culture included) of producers of terms (or users as well):

[...] las unidades terminológicas no podían ya ser percibidas únicamente como unidades de representación y transmisión de un conocimiento preciso, homogéneo y totalmente controlado, sino como unidades dinámicas que en su uso discursivo construyen conocimiento y al mismo tiempo no pueden separarse de las concepciones culturales de quien las produce (2005<sup>6</sup>).

Another contribution, regarding cultural and social bonds in LP and TP, is by Nkonko M. Kamwangamalu whereby he stresses the role of social and cultural contexts by giving references to Cooper (1989) and Schiffman (1996).

[...] a language planning activity is context-bound, that is, it cannot be understood apart from its social context or apart from the history which produced that context (Cooper, 1989, p. 183). In other words, "language policies do not evolve *ex nihilo*; they are not taken off a shelf, dusted off, and plugged into a particular polity; rather, they

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<sup>6</sup> Debate Terminológico, n° 1, 2005

are cultural constructs, and are rooted in and evolve from historical elements of many kinds, some explicit and overt, some implicit and covert” (Schiffman, 1996, p. 22).

(Nkonko M. Kamwangamalu, 2016, p. 10-11)

In terms of the production of terms and formation process, in GTP the cultural conventions in languages are highlighted:

Concepts are formed and constantly changed in any professional activity and in all forms of professional communication. Concept formation is also driven by cultural conventions, and language is the main manifestation of culture. The complex and dynamic interaction between term formation and concept formation needs to be taken into account at all stages of terminology development and terminography (Infoterm, 2005, p. 12).

As a matter of sociocultural factors, language plans and terminology activities can be subject to social development. In other words, the governments and societies can also benefit from the linguistic consequences and language development in the social development plan, as it is described by Kaplan (2013, p.2):

In early language-planning research, practitioners were seen as having the expertise to specify ways in which changes in the linguistic situation would lead to desired social and political transformations (i.e., supporting the development of unity in the socio-cultural system, reducing economic inequalities and providing access to education).

This approach of controlling language changes to achieve non-linguistic goals is a prevalent attitude among developing countries. This attitude can go further to choose or omit some specialized fields in favor of pre-established political goals. For instance, in Iran, official terminological activities have started due to the modernization of the Army (1925-1941), and currently, there is no active terminology committee working on legal terminology because they do not tend to change ideological and political Arabic terms. The unity with Arab countries can be considered as another motivation for not working on this domain.

Also, there is a sociopolitical categorization regarding the focus of language plans proposed by Neustupný (1970, 1974, and 1983). He differentiates developing countries and developed countries due to

their social and political needs which influence their approach to LP and consequently might affect the whole process of TP:

[...] language planning in developing and developed countries (or speech communities) could be distinguished on the basis of approach. The former societies are characterised by what is called the policy approach and the latter by the cultivation approach (as cited in Antia 2000, p. 15).

This issue is also a matter of political behaviors, geopolitical decisions, authority, forces, and ideology. Evidently, the more policy-planning endeavors are relevant to the users' expectations and ideology, the more successful the plan will be. This is basically due to the fact that although implementation of policies and plans is institutional performance, implantation of the norms and normative products (e.g. standardized terms, orthographical or grammatical changes) is highly dependent on the users' attitudinal behavior. However, this relevance cannot be feasible in all cases, and once conflicts arise (for a variety of reasons), three factors can be identified: *persistence*, *resistance* or *change* (Bastardas-Boada, 1995).

This argumentation opens a new window to the “*complex ecosystemic organization of language behavior*” discussed by Bastardas-Boada (2013). He describes *psycho-sociocultural order* and the *sociopolitical order*<sup>7</sup> in a communicative environment of interactions between individuals and institutions. Adopted the concept of “*individualized communication*” from Corbeil (1980), he believes that “*institutionalized communication*” and “*individualized communication*” perform inter-influences that form the language behaviors in an ecolinguistic context (Bastardas-Boada, 1995, p. 20; Bastardas-Boada, 2013, p.5).

The first broad distinction that we can make is perhaps the distinction between the psycho-sociocultural order and the sociopolitical order, in the context of which systems of language behaviour and linguistic communication exist. In these two major orders, we find what Corbeil (1980) calls ‘individualised’ communications, which are informal and more spontaneous, and

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<sup>7</sup> Comparable to top-down and bottom-up forces (social dynamic forces) discussed in Zarnikhi's thesis (2014) which imply interactions of various levels in an “open system exchanging information with its environment” (p. 59).

‘institutionalised’ communications, which are formal and more planned. Each contains a variety of systems that are interrelated internally and externally to a varying degree and intensity.

According to these discussions, we can identify some aspects of TP in which sociolinguistic and sociocultural varieties are involved:

1. Authority, Implementation of policies, political identities, and ideologies conducting the goals and objectives of plans;
2. Authority, policies and political issues resulting in resource attribution in specific domains of study;
3. Cultural background, ideologies and prestige influencing decision making and interventions in term production;
4. Cultural connotations of terms and linguistic properties affecting the process of production or the real use;
5. Cultural background, ideologies, and prestige influencing the use of terms in particular contexts.

### 1.2.2. Intrasystemic factors

Terminological works are also dependent on the institutional works. TP cannot be implemented without a systematized plan at organizations and centers responsible for formulating and realizing terminology activities.

There are guidelines and manuals prepared by distinct institutions that provide terminologists and planners with a series of effective and systematized procedures. These procedures range from preparation to the presentation of final products, also called as methodology of terminology work (or working methods).

In this section, I review some of the proposed regulations at the institutional level to find the addressed intrasystemic factors in these methodologies. It is worth noting that these methodologies have formed the foundations of TP models afterward, which are presented in the next section (Models and stages). However, the initial objective of developing these methods was systematizing

terminographical works and presentation of final products in the format of terminological databases or terminological records.

Regarding the methodology, Quebec manuals of terminology work are among the most pioneering documents in the context of LP and socioterminology that reflect the role of systematized works in achieving the pre-defined objectives.

In Quebec, the methodology of terminology work (*méthodologie de la recherche terminologique*) comprises two types of practice: ad-hoc<sup>8</sup> (*ponctuelle*) and thematic<sup>9</sup> (*thématique*<sup>10</sup>). The objectives of these documents were mainly assisting in terminology development, standardization, preparation of specialized dictionaries and glossaries. For this purpose, a systematic institutional work is described that shows how collaboration and harmony among distinct sub-systems can result in effective and efficient outcomes.

Auger and Rousseau (1978), based on the experiences in the *Office québécois de la langue française* (OQLF), directed and coordinated by Jean-Claude Corbeil, prepared these documents and elaborated the systematic terminology work under the five headings (my translation):

1. Presentation: preparation of terminology work
2. Description: terminology work (from corpus compilation to standardization)
3. Terminological approach to neology

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<sup>8</sup> According to Corbeil (1999a, p. 86), ad-hoc work methodology is more related to translation, technical writing and interpretation, on the one hand, and responding users' questions via consultation services on the other hand. The document is available at: [\*Méthodologie de la recherche terminologique ponctuelle - Essai de définition\*](#), Célestin, Tina, Gilles Godbout et Pierrette Vachon l'Heureux, *Office de la langue française*, Québec, 1984, 171 pages.

<sup>9</sup> In Quebec context, there is a difference between “systematic” and “thematic” research methodology. Systematic is more oriented to the concepts and conceptual systems and thematic is more oriented to the terms and the use of terms in certain domains.

<sup>10</sup> “Recherche terminologique qui porte sur un sur un ensemble des termes appartenant à un domaine particulier”. (*Vocabulaire systématique de la terminologie*, 1985, p. 17)

4. A Study on ad-hoc terminology research
5. A protocol for terminology records

(Auger & Rousseau, 1978)

This document, which is a descriptive and prescriptive guideline, highlights the preliminary research on the users' needs and the terminology resources. Another aspect is corpus-based orientation and recommending to make the final decision based on the specialists' choice, respecting the nature of the subject fields and their special characteristics (non-linguistic criteria). This document seems that formed the principal bases for the widely known Auger's functions in TP. According to L'Homme (2006, p. 55), Quebec groups have applied "models that originated from Vienna school and have adapted them to their own specific needs".

Jean-Claude Corbeil, one of the important references to Quebec approach, in his article "*Le rôle de la terminologie en aménagement linguistique : genèse et description de l'approche québécoise*" (2007) restates the successive phases and relevant stages of Quebec terminology work methodology (1987) from preliminary researches to dissemination of terms. According to Corbeil, these phases represent the Quebec methodology of terminology work which has been performed since 1970 and during the years 1986-1992 has diffused to Catalonia by M. Teresa Cabré and Isidor Marí i Mayans. These phases are as follows (2007, p. 98-101):

- A) Preparatory phase in terminology work
  1. The domain
  2. The knowledge about target users
  3. Recognising and evaluating existing resources
  4. Objectives: based on the users' needs and specialization level
  5. Meetings and critical analysis about documents (preparation of the corpus)
  6. Experts recruitment for validating the results (scientific and technical committee)
- B) Terminological research
  7. Extraction of concepts/terms and selecting the appropriate denomination/equivalents
  8. Terminology records (problem identification and decision-making by consulting the scientific committee)

C) Conclusion and dissemination

9. Drafting the terminology record, and decision-making about dissemination format

In Catalonia, “*Metodologia del Treball Terminològic*” prepared by TERMCAT (1990) is an adaptation of *Méthodologie de Recherche Terminologique Thématique* which was translated for the first time by M. Teresa Cabré presented with additional complementary parts such as Catalan examples and bibliographic references adjusted to the framework of the Catalan language (Marí i Mayans, 1990, p. 9).

Concerning the role of organizations, Marí i Mayans (1992) believes that effectiveness of terminology work is conditioned to a systematic and comprehensive terminology work method that can comprise all aspects from status and corpus planning (p. 18). That was one of the reasons for the creation of TERMCAT:

I aquesta és una de les raons que van determinar la creació del TERMCAT, com a centre de coordinació general de l’activitat terminològica a l’àrea catalana, punt de confluència dels responsables de la política lingüística, de l’autoritat normativa de l’IEC i dels cercles d’especialistes, i alhora banc de dades i centre de consulta o punt de referència per a tots els usuaris i per a les relacions internacionals (p. 18).

In *Handbook of Terminology*, Silvia Pavel & Diane Nolet (2001) have also elaborated a terminology work methodology showing the main steps in terminology work. Apart from the details of the methodological aspects, the handbook reveals the role and the importance of constant revision and updates.

There are some practical guides for terminological works oriented to translation that can also be useful, to some extent, in other areas of interest. *Recommendations for Terminology Work*<sup>11</sup> (COTSOES, 2002-2003) provides a comprehensive overview of terminological working methods. Regarding systematic work methodology, it points that “to achieve the desired result that is satisfactory in terms

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<sup>11</sup> The recommendations were drafted by the Working Party on Terminology and Documentation of the Conference of Translation Services of European States (COTSOES). The publication is available in German, French, Italian, English, Spanish and Dutch.



of quality and reliability, the working methods must match the requirements” (p. 48). For this purpose, the document recommends a set of preparatory activities to manage the terminology research as follows:

- Familiarisation with the subject field (reading introductory works);
- Clear delimitation and structuring of the subject area (consult experts), so that the research does not digress;
- Collection of sufficient documentation (ask experts) - the quality of terminology work is heavily dependent on this;
- Finding out whether terminology collections in the subject field already exist, e.g. from other translation or terminology services or professional organisations (avoid duplication of work);
- Early formation of a working party comprising language and subject experts.

Afterwards, the terminological records should be prepared and verified before entering the terminological data banks (COTSOES, p. 49):

- Evaluation of source texts (first in one language)
- Compilation of monolingual lists of specialised terms and deciding on the concepts to be defined;
- Preparation of working files in all working languages (with the minimum data set); here, particularly in the case of computer-aided work, it is worth keeping the different versions of a working file with the in some cases extensive background information for later stages;
- Compilation of definitions and contexts;
- Compilation of other terminological and general information;
- Checking of the terminology collection by experts;
- Final editing of the records and entry into the database.

Another useful document for institutional works is GTP. This guideline defines the role of the national institutions as centers that are responsible for supporting the government's policies (Infoterm, 2005, p. 16):

The role of institutions providing terminology services is to advise and support the government in the formulation, development, implementation and maintenance of strategies concerning terminology and terminology development.

In GTP, clear objectives and perspectives are given a prominence, and it is emphasized that for achieving the objectives it is important to establish "organizational and technical infrastructures in connection with a terminology policy" (Infoterm, 2005, p. 14). GTP has also provided some information on positive and effective operations that should be taken into account in institutional terminology work. The most crucial elements (among many others) are as follows (Infoterm, 2005, p. 16):

- Effective coordination,
- Workflow management,
- Managing external terminological contributions,
- Systematic action plans,
- Partnerships with collaborators and stakeholders,
- Managing national terminology database

GTP (Infoterm, 2005) convergent to managerial strategies, also presents a series of administrative operations that are useful for policy makers and institutions:

### **1. Preparation**

- assessment of the language and terminology environment and of existing legislation;
- activities designed to create language awareness and efforts to obtain official recognition for these activities;
- recommendation of methodology and available or conceivable procedures;
- preparation of preliminary documents;

- organization of a national consultation process.

## **2. Formulation**

- drafting the terminology policy proposal;
- drafting a plan for the coordination of the terminology policy with other strategic planning policies;
- preparation of a plan for the implementation of the project;
- presentation of the draft final policy (document and implementation plan);
- decision on the final policy (document and implementation plan).

## **3. Implementation**

- the overall management of the implementation;
- the operational and organizational planning of the implementation;
- the planning of publicity and promotional activities.

## **4. Sustaining the terminology infrastructure**

- sustained operation & adaptation mechanism

Drame (2009) asserts that GTP can perform a universal validity and believes that it is applicable in various sociocultural situations:

It was the intent of the UNESCO Guidelines to suggest a practical methodology for the formulation and implementation of terminology policies which can be applied across the sometimes vastly different cultural, socioeconomic and administrative environments (p. 57).

In my opinion, the word *policy* in GTP addresses the strategies with a general reference to management policies. It is designed more about project and sustainable management. As far as the political and legal aspects of language are concerned, the application of the “*policy*” in this document seems different to the perception of *policy* in LP, particularly its notion applied in status planning. Policies in GTP give a reference to strategies that are effective in improving the quality of terminological works and resources. Also, it gives guidelines to enhance the public awareness about terminological products.

Concerning the intrasystemic factors, a recent attempt is the Bhreathnach’s thesis in which she has proposed 88 measures that

should be taken into account for managing an effective institutional terminology activity (2011, pp. 135-139). These measures are presented in Table 3.3.

Aspects	Sub-aspects	Measures
<b>Preparation/ Planning</b>	Organizational structure	1: Create a structure that allows dynamism and flexibility 2: Involve language planning institutions and other interested parties in the executive structure 3: If there are two or more organisations, ensure that there is close cooperation and a coordination point for leadership and decision-making 4: Ensure that there is an organisation with clear responsibility for each aspect of term planning
	Staff	5: Ensure staff have a variety of backgrounds 6: Have professional terminologists; do not rely on volunteerism
	Budget	7: Have a reliable funding source 8: Supplement funding, if necessary, with charges and sponsorship
	Networks and relationships	9: Ensure cooperation in provision of language resources 10: Maintain contact with user groups 11: Find out who users are and plan for their needs 12: Maintain structured links with academia
	Resource planning	13: Develop a strategic plan for terminology development 14: Consider criteria such as need, likely results, adaptability, distribution and likely implantation 15: Carry out terminology work on request
	International involvement	16: Ensure involvement in international organisations 17: Participate in partnerships and international projects
<b>Research</b>	Ad hoc research	18: Respond promptly to enquiries. 19: Publish responses promptly 20: Use an enquiry form 21: Refer general-language queries to a separate service. 22: Have a documentation and training system that ensures quality. 23: Record all enquiries and responses. 24: Maintain a network of useful contacts. 25: Maintain useful reference works and/or a corpus.
	Project-based research	26: Set up a project team. 27: Provide training in terminology methods. 28: Identify content, scope, users, sources and helpers.

		<p>29: Make decisions about dissemination and maintenance.</p> <p>30: Use a database to organise the work, if practicable.</p> <p>31: Carry out term extraction and corpus research.</p> <p>32: Gather information from as many sources as possible, including expert and media contacts.</p> <p>33: Follow international standards if possible.</p> <p>34: Create new terms if necessary.</p> <p>35: Document the work.</p> <p>36: Review the work.</p>
<b>Standardization</b>		<p>37: Define the meaning of ‘standardisation’ in the administrative/legal context.</p> <p>38: Have a representative standardisation committee.</p> <p>39: Only standardise terms which have been exhaustively researched.</p> <p>40: Review standardisation decisions when necessary.</p>
<b>Dissemination</b>	Publication of term resources	<p>41: Disseminate term resources online; make everything available online.</p> <p>42: Make the resource easy to use.</p> <p>43: Monitor the user experience</p> <p>44: Maintain close links with general language resources.</p> <p>45: Keep resources dynamic and modern.</p> <p>46: Provide an ad hoc query service and respond to users. 47: Make other tools available.</p> <p>48: Develop resources for online publication first.</p> <p>49: Publish paper dictionaries if necessary and if resources allow.</p>
	Interaction with the media	<p>50: Develop a media contact network.</p> <p>51: Spread the terminology ‘message’ in the media.</p>
	Marketing and awareness-raising	<p>52: Have a communications department and a communications plan.</p> <p>53: Identify target groups.</p> <p>54: Share information about terminology work.</p> <p>55: Bring terms into circulation.</p> <p>56: Use inexpensive and innovative marketing resources.</p> <p>57: Encourage users to value terminology.</p> <p>58: Attend conferences and publish research.</p>
<b>Evaluation</b>		<p>59: Establish an evaluation and assessment mechanism.</p> <p>60: Have a range of participants in evaluation: staff, user groups, external evaluators.</p> <p>61: Encourage research as an evaluation mechanism.</p> <p>62: Work towards quality certification.</p> <p>63: Evaluate dissemination and implantation.</p> <p>64: Evaluate research, term production and standardisation.</p>

		65: Evaluate term resources. 66: Evaluate database/website user behaviour. 67: Evaluate marketing work. 68: Evaluate training. 69: Evaluate evaluation.
<b>Training</b>	Training of terminologists	70: Provide training for the jobs to be done 71: Provide in-house training to new staff. 72: Give training in both terminology theory and methods. 73: Provide documentation and user manuals. 74: Provide continuous training to staff. 75: Provide opportunities for research. 76: Provide training opportunities for future terminologists.
	Terminology committee members	77: Provide introductory training on terminology principles and methods.
	Professionals working closely with terminology	78: Ensure terminology training is provided on professional courses, if needed. 79: Provide workshops and seminars as needed.
	The general public	80: Assume term users have not been trained. 81: Provide information resources online 82: Give training to students.
<b>Modernisation/ Maintenance</b>		83: Implement changes suggested by evaluation. 84: Plan and carry out technical improvements to databases and work methods. 85: Keep resources up to date. 86: Maintain research standards. 87: Keep up with and use new research technologies. 88: Carry out organisational modernisation

Table 3.3. Overview of the best-practice model for term planning (Bhreathnach, 2011, p. 135-139)

Through these guidelines and manuals, one can identify some intrasystemic factors that are addressed implicitly or explicitly. These factors are both managerial and methodological which can be categorized as follows:

- Explicit objectives
- Systematization
- Corpus-based methodology
- Harmonization and coordination of sectors and procedures

- Collaborative work methodology among linguists, terminologists and domain experts
- Formulating criteria for neologisms and loan words
- Institutional evaluations
- Training offered by the organizations
- Dynamic and constant revisions

### 1.3. Synthesis

Given all aspects of TP discussed above, we can distinguish two main types of TP:

- a. TP in the broader context of social development
- b. TP in the broader context of knowledge development

For these two views, probably, we can define two perceptions for terminology development as well. The first perception of terminology development can be manifested in sociolinguistic aspects and consequently can be analyzed qualitatively. On the one hand, it can be projected regarding the ability of a language to adapt itself in specialized contexts and systematized planning to fulfill sociolinguistic and terminological needs, and on the other hand, it can be developed in terms of social behaviors towards terminology phenomenon (modernization and cultural aspects).

The second perception of terminology development, however, is related to the expansion of terminological resources, documentations, and terminological databases and as a consequence can be analyzed quantitatively and qualitatively (knowledge and information literacy). It can be analyzed quantitatively regarding terminological productions and knowledge management systems due to communicative needs; while, a qualitative analysis can be conducted on the quality of terminological resources and systematized works concerning norms and standards.

Moreover, we can conclude that in terminological studies there are epistemological issues resulted from several dimensions (e.g. socio-cultural, sociolinguistics, linguistic, etc.) and horizons of analysis (e.g. national or international or regional studies, diachronic or synchronic studies, etc.). These conditions affect not only the terminological practices but also any evaluation (Fathi, 2017, p. 330).



## 2. Models and Stages

The central concern of TP has been the expansion of terminological resources and the development of a language regarding improving its ability to adapt to sociolinguistic and terminological dynamics. Terminology activities in the form of systematized and planned procedures, fundamentally, follow this focal point as the main objective. Practically, terminology plans should be coherent and are considered as an integrated whole in which their planned stages function like organisms, with their own objectives and operational activities making parts of a larger system. Any stage is necessary as a functional contribution to a broader range of operations.

During recent decade, research on the performance of terminology activities and management systems in terminology has an upward trend (yet few), and various indicators or modeling proposals are presented to support decision-making in TP processes. These efforts have resulted in different types of quantitative and qualitative approaches in terms of methodologies and parameters identification. It is worth mentioning that these models are not terminographical work methodology (presented in *intrasystemic factors* 1.2.2), but standardization and normalization processes designed according to theoretical predications and practical implications.

After the introduction to the conception of TP, to develop an evaluation methodology, first, we need to identify distinct phases and stages in TP and second, to recognize how evaluation is tied up with several TP constituents. In this regard, this section deals with relevant stories about TP structure and component identification to provide a coherent context to create the evaluation methodology. This section is diachronic to review the progress of TP modeling from Quebec contributions to more recent proposals.

This review contains the research carried out by Auger [TP functions], Bhreathnach [interactional model], Cabré [TP and standardization stages], Drame [terminology management], Galanes Santos [resource management and training], Galinski, Budin & de V. Cluver [communication planning model], Nuopponen [satellite method], Zarnikhi [multidimensional systemic model] (alphabetically ordered). To my knowledge, these endeavors are the

most relevant modeling attempts or the best representatives of distinct trends in TP domain.

## 2.1. Model representations

In the form of a systematic arrangement, Auger (1986) identified six different fundamental functions in TP<sup>12</sup>:

1. Research function (fonction recherche)
2. Standardization/normalization function (fonction normalization)
3. Dissemination function (fonction diffusion)
4. Implantation function (fonction implantation)
5. Evaluation and control function (fonction évaluation et contrôle)
6. Updating/modernisation function (fonction mise à jour)

Since then, almost all TP models are formed based on the elaboration of these elements. In many cases efforts are oriented to make elaboration and provide descriptions for these main components, where variations can emerge. These variations are mainly due to the details and the steps of each function or cooperation and interactions between these stages and other organizations.

Based on the functions proposed by Auger and under the influence of Quebec methodology in terminology work, Cabré (1999b, p.49) presents eight successive stages for TP and standardization processes:

- a) Analysis of terminological needs of a situation in accordance with the overall situation, and selection of the most suitable strategies for interventions;

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<sup>12</sup> In Drame (2009, p. 85) is said that : “Among the first papers and documents to explicitly mention *terminology planning* or *terminology policy*, are a small number of Infoterm documents, notably by Felber, Budin, Galinski and Krommer-Benz”. However, the first TP modeling and elaboration of phases, to my knowledge, is the Auger’s functions (1986).

- b) Preparation of a terminological research plan adapted to the needs of the environment in question;
- c) Preparation of the terminology with the participation of relevant users;
- d) Standardization of prepared terminology;
- e) Choice of the suitable format and presentation for the prepared terminology;
- f) Implementation [implantation] of the terminology in practice by suitable policies;
- g) Monitoring the use of the terminology
- h) Constant updating of the terminology

Given these stages, Cabré also discusses “overall situations” and “strategic interventions.” This model can accommodate performance indicators varying from the internal mechanism of the terminology work to the external regulations. The internal mechanism involves an ongoing dynamic process, in which elements like users’ needs, standardization, implantation, and updating are highlighted. Regarding external regulation, it stresses circumstances, strategic interventions, and policies (Fathi, 2017, 330).

Partially different to what has been experienced in Quebec and Catalonia, German-speaking communities have been developing their TP model in the framework of communication planning. Galinski, Budin & de V Cluver (1999) proposed their new model in which they discuss “language-oriented” and “subject-oriented” aspects of TP. In this model elements like *knowledge organization*, *concept cognition*, and *representation* can be representatives of their management approach to TP. Galinski, Budin & de V. Cluver are pioneering researchers in the development of TP in the framework of knowledge management (Figure 3.1). This approach is also confirmed by Drame (2009):

Unlike language planning, whose goal is the development and implantation of a language at large for a particular use in society or parts thereof, terminology planning is primarily concerned with the

improvement of communication within a domain or community of use. Terminology planning is a management process which is goal-oriented. Therefore the main aim of terminology planning is to make specialized, or subject-field communication clearer, more comprehensive, and less cumbersome and ambiguous (p. 87).

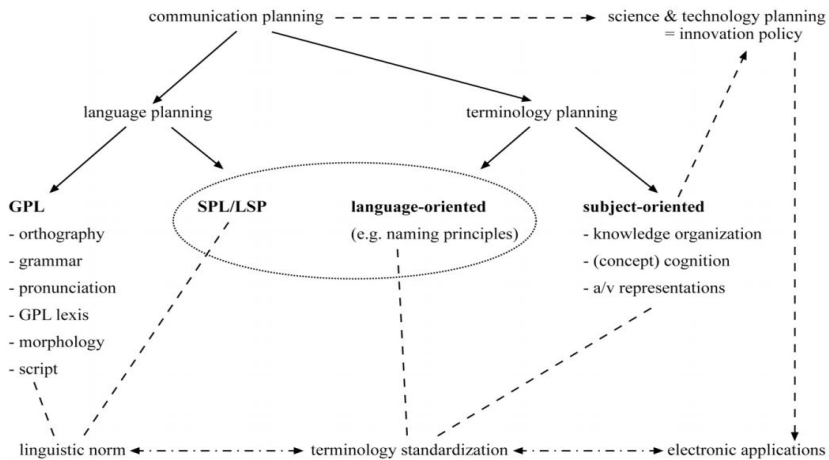


Figure3.1. Galinski, Budin & de V Cluver TP model (1999, as cited in Drame, 2009)

Another categorization in TP is endeavors of Iolanda Galanes Santos (2003), in Galicia, who has added two more stages to the TP fundamental elements proposed by Cabré. She discusses the importance of “planning of terminographical works” (my perception: *terminology resource management*) and academic terminology education at academic levels. She also emphasizes the role of infrastructures and organizations in terminology coordination and efficient planning (p. 267-271).

Anja Drame, following Galinski, Budin & de V Cluver (1999) and GTP (Infoterm, 2005), developed her argumentations on terminology policy at decision-making level and operational aspects of terminology activities (2009). Her focus is on communicative services and knowledge management applications which enhance the accessibility to terminology products. Although she has performed a sociolinguistic analysis in South Africa, the emphasis of her research is on the role of dissemination and communication channels.

Bhreathnach (2011, p. 142) made some comparisons among various terminology work patterns (with a focus on Ireland, Sweden, and Catalonia), and presented an interactional model consisted of eight components which are not successive, but connected according to the output of one stage that feeds one or more other stages as input. In this model, she did not consider implantation as an independent stage. However, as the most important aspect of TP, the interactions of all stages with implantation and their effects are discussed (Figure 3.2).

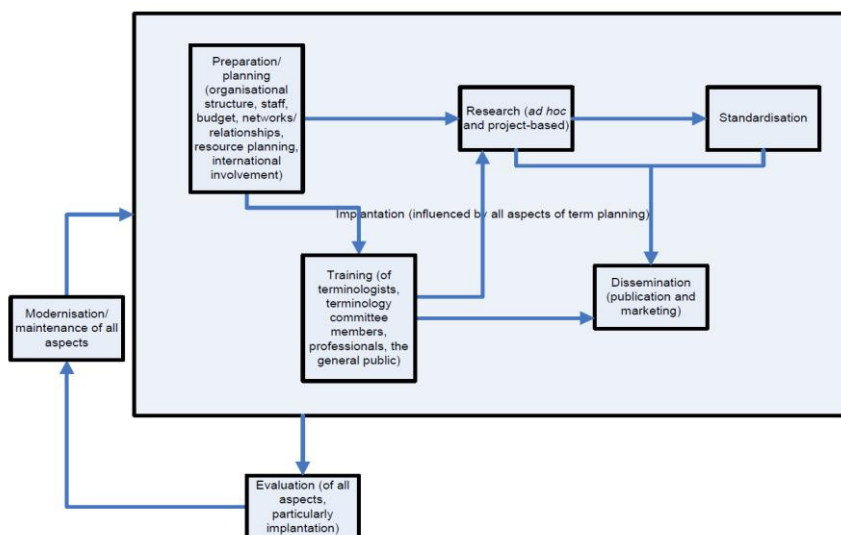


Figure 3.2. Aspects of term planning by Úna Bhreathnach (2011, p. 142)

In this diagram, except for “training” phase, the main elements are almost the same as above mentioned functions or stages proposed by Auger and Cabré. Her approach to TP is a sociolinguistic approach and in the framework of language planning. However, according to Zarnikhi (2014, p. 66), her model is “a series of do’s and don’ts, a list of measures” which does not consider diverse sociolinguistic situations and is limited to provide guidelines and instruction rather than a sociolinguistic model.

In my opinion, one of the most potent features of Bhreathnach’s model is the relation between evaluation stage and other stages. She discusses the dimensions of evaluation and proposes organizational evaluations as one the most effective analysis. In her model, she

also emphasizes “evaluation of all aspects” which means all stages need to be assessed regarding their efficient functionality.

As the most recent instance, Zarnikhi (2014) reviewed efficiency and deficiency of the existing models and came to the conclusion that proposed guidelines and models do not cover all aspects of TP; i.e. they fail to examine and contain linguistic, sociolinguistic, socioterminological and sociocultural aspects at the same time. He has applied a complex systemic approach in his Ph.D. thesis to build his own TP model. Zarnikhi (p. 350), proposes a multidimensional (multiscale) model in which he discusses dynamic nature of TP system and nonlinear interactions among different layers of TP modeling (Figure 3.3).

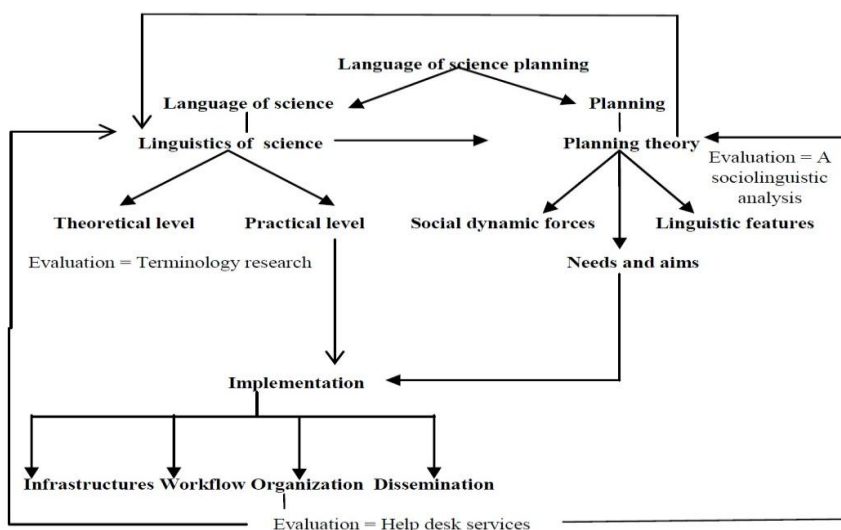


Figure 3.3. A systemic terminology planning model representing interactions among the layers through their principles by Zarnikhi (2014, p. 350)

In this model, he uses the term “language of science planning” as an umbrella term addressing all theoretical and practical aspects of TP. Although his model contains the main elements of TP stages proposed by other scholars- mainly at the practical level (p.351), he deconstructs the common order of these elements and, in his terms, he adds “sociolinguistic parameters” in the model to “be adapted to any ecolinguistic situation” (p. 356).

One of the most significant parts of Zarnikhi’s model is multidimensional evaluation; i.e. *sociolinguistic analysis*,

*terminology research*, and *help desk services*. Another characteristic which differs from other modeling efforts is to include *planning implementation* as a layer which is “responsible for actualizing planning.” This implementation layer deals with infrastructures, workflow, organization, and dissemination.

Zarnikhi (p. 351) in descriptions of “practical levels” recognizes six distinct elements:

- Terminology research
- Terminology approaches
- Standardization
- Terminology resources
- Terminology formation methods
- Implantation criteria

His efforts are oriented to a theorization based on broad case studies; however, the model is an ideal which has to be examined in practice. His model is the most pioneering modeling effort in multiscale modeling in TP. It is worth mentioning that in his model *implantation* is affected by linguistic and non-linguistic criteria from different layers. In this sense, he agrees with Bhreathnach where she discusses implantation as a passive stage influenced by all aspects of TP.

One of the interesting contributions to modeling is the terminological analysis model proposed by Anita Nuopponen (1997-1998). She has presented a model called “satellite method” which is useful for multiple purposes including standardization. Although it is not a TP model (the reason for which it comes at the end), the methodology can be used in classification, preparation and representation of terms and concepts in TP processes as well. Her method “comprises the terminological analysis based on concept systems”. This method is based on her thesis (1994) in which she studied concept relation and system types to propose a classification (Nuopponen, 2005, p. 271).

The basic phases of satellite analysis consist of (1998, p. 364):

- a) Restricting and defining the field of study;

- b) Extracting or collecting data and organizing it in a macro level satellite system covering the concepts and terms or different aspects of the field;
- c) A thorough concept system analysis; and
- d) A synthesis of the individual micro level concept system.

This methodology, mainly for being convenient, can be used in technical terminological committees and standardization processes where drafting a “provisional schedule of concepts” can function as a useful base list for further terminology work. The model is also developed later to accommodate specialists’ needs (Nuopponen, 2007).

## 2.2. Characteristics and common components

A comparison of these TP models and their descriptive styles reveals various points about their perspectives to terminology and at the same time facilitates the identification of common components employed in these models. From these studies, it can be understood that the variations and divergence of TP, in many cases, are consequences of sociolinguistic needs and terminology settings.

For instance in German-speaking countries without the language policy exigency the reference of terminology policy is management operations and strategies to support the knowledge management and knowledge representation activities. On the contrary, in Spain, French-speaking countries and in Iran the only form of undertaking terminology activities is to integrate it within language planning models and hence the policies are political forces by authoritative bodies and governments.

A chronological view of the evolution of TP models shows a growing interest in non-linear and retroactive models oriented towards systemic and multi-level studies. Furthermore, the role of contexts and the relation between terminological works and their discursive or social circumstances are given a prominence. In the most recent models, e.g. Zarnikhi’s model, the constant interaction among distinct levels and the ecosystem of the TP systems are emphasized. In general, we can identify these characteristics as follows:



- The evolutionary trend of TP from linear functions to multiscale modeling;
- Theoretical and practical aspects are equally considered;
- Needs identification is prerequisite for all terminological activities;
- Needs identification is developed according to either subject-field characteristics or target users;
- Sociolinguistic aspects are discussed (at different elaborative levels);
- Implantation and target users' feedback are addressed;
- TP is not limited to standardization and terminology management;
- The emerging need of academic education and training in terminology is recognizable in the most recent approaches;
- Evaluation stage is not limited to implantation phase.

### 2.3. Synthesis

In light of these debates, TP is a process aiming at developing a procedural model of actions and operations to fulfil the specific terminological needs. Dynamicity is intrinsic to terminology. It is reflected in the planning process and implies systematic strategies with the support of terminology policy and principles. The concepts such as “monitoring” and “constant updating” are also good references to these dynamic characteristics. It goes without saying that constant updating requires continuous analyses and evaluations from the earliest stages to the end of the process (Fathi, 2017, p. 330).

As a conclusion, based on these TP modeling efforts we can identify the key elements of TP stages in three main categories, i.e. theoretical aspects, practical aspects, analytical aspects. These elements come as follows:

### **Theoretical aspects**

- Modeling
  - Frameworks
  - Elements identification
- Planning
  - Preparation
  - Formulation
  - Validation
- Policies
  - Preparation
  - Formulation
  - Validation

### **Practical aspects**

- Policies
  - Implementation
  - Sustaining
- Standardization
  - a) Methodology and principles/ horizontal standardization (Drame, 2009, p.93)
  - b) Terminology for the specific subject fields/ vertical standardization (Drame, 2009, p.93)
  - Data gathering
  - Coordination/ harmonization
  - Authorization/ approval
  - Validation
- Terminology resources
  - Compilation
  - Preparation
  - Presentation
- Diffusion/ dissemination
- Implantation
- Monitoring systems: applications/platforms

### **Analytical aspects**

- Sociolinguistic analysis
  - Diachronic analysis
  - Synchronic analysis
- Functional analysis
  - Implementation analysis/performance analysis
- Socioterminological analyses

- Professional feedbacks by real users
- Implantation evaluation/terminometric analysis
- General critiques or non-professional feedbacks
- Verification and validation

### 3. Evaluation

Evaluation is addressed as an essential element of any plan providing information about the areas that need to be adjusted or leading the planners to better decision making. Given the analytical aspects of TP, a comprehensive and strategic multi-method evaluation system is needed to determine the impact of the implemented terminology plans. In other words, the benefits of evaluation in TP are conditioned to the possibility of applying methodologies which can involve all macro- and microstructural elements of the models. These elements have been studied in previous sections by reviewing several attempts in defining TP and relevant modeling.

Efforts to evaluate distinct elements or functions of TP are not recent. However, the application of several methodologies to cover all aspects of TP and the establishment of an integrated analytical framework are still in their embryonic stages.

The study on factors and models has shown two main categories; i.e. intersystemic and intrasystemic interactions. Intersystemic interactions are more related to the use of terms, and hence, involves socioterminological aspects of TP, implantation, and modernization; while, intrasystemic interactions comprise the institutional procedures in relation with standardization and dissemination. These aforementioned categories can be studied regarding case studies (empirical research) or methodologies (theoretical research). Therefore, evaluation can be addressed from four distinct perspectives to reduce the complexity of the process that are better to be included in holistic evaluation models:

- a) Empirical approach to intersystemic interactions (e.g. corpus-based implantation studies)
- b) Empirical approach to intrasystemic interactions (e.g. criteria and strategies, lexical resources, terminological resources, workflow, and procedures)
- c) Theoretical approach to intersystemic interactions (e.g. language contacts and its implications in TP, terminology management)

methodologies, language and terminology policies, measurement criteria)

d) Theoretical approach to intrasystemic interactions (e.g., implantation policies, parameters, term extraction methodologies, corpus preparation)

In theoretical research, in relation to LP or TP, researchers such as Fishman (1974), Daoust<sup>13</sup> (1995), Gaudin (1993, 2003, 2005a, 2005b), Maurais (1993, 1994), Auger (1986), Cabré (1992), Antia (2000), Quirion (2000, 2003, 2004, 2005, 2013), Galanes Santos (2003), Bhreathnach (2012), Zarnikhi (2014) and Montané March (2015), among others, have studied the importance of evaluation and the associated parameters to examine planning phases.

In empirical research some instances are: Myking (1997), Montané March (2007, 2012), Ní Ghearáin (2008, 2011), Karabacak (2009), Zarnikhi (2010a, 2010b), Zarrin Ghalam (2011), Barzegar & Khemlani (2012a, 2012b), Yazdani Moghadam & Sedighi (2012), Hesami & Ghanbari (2012), Hazbavi (2012), Talebinejad, V. Dastjerdi, & Mahmoodi (2012), Montané March & Cabré (2013), Saint (2013), Barzegar (2015), Alipanahi & Mahmoudi (2015) etc.

In the following, I review some of the most frequent debates on evaluation and methodologies that have been addressed in the literature. This section intends to look for the explanation and rationales of methodologies and frameworks to discover the underlying theoretical basis of empirical surveys as well as the theoretical evolutions. For this purpose, I have organized the literature into four essential sections:

1. The foundations of evaluation in TP
2. The purpose of evaluation
3. The types of data need to be collected
4. Basic questions to address

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<sup>13</sup> Cited in Quirion 2003

### 3.1. The foundations of evaluation in TP

The very initial point of terminology evaluation was the prediction and analysis of acceptability of terms and term formation criteria by Ray (1963) and Tauli (1968) (as cited in Antia, 2000). This initial point has been addressing the success in terminology by focusing on linguistic and formal aspects of terms.

Taking a *tool* view of language, both authors set up their postulates of the *ideal language*. Ray postulates *efficiency, rationality, commonality*, while Tauli puts forward *clarity, economy, beauty* (p.11).

Fishman (1974) has addressed evaluation as a broad area of which *policy-oriented evaluation* and *process-oriented research* are acknowledged. He also emphasized the “*locally pre-specified criteria*” in any evaluation process or feedback analysis (p.26). This approach to evaluation rationalizes a systematic evaluation which intends to determine the quality, efficiency, and effectiveness of specific planning systems. In such evaluation, identification of local (regional) factors due to the cultural and societal differences can facilitate the improvement or adjustment of planning systems and will provide additional information for policy makers and planners.

Auger (1986, p. 52) has also mentioned the *implantability* of standardized terms. For this end, he stressed the effects of a constant monitoring over the whole process of standardization. Cabré (1999b, p. 20) also believes that not only the standardized terms should be monitored but also “alternative terms used to designate a single concept” (terminological variations) should be taken into account. She goes further and proposes that in the preparation phase of terminological resources “evaluation of texts”, regarding specialization levels, are also necessary.

Cabré addresses the controlling and monitoring activities which track the trends, patterns, and behaviors of terms. This type of evaluation, with a broad knowledge of conceptual relations and textual analysis, complements the information needed for implantation evaluation. In other words, adoption and use of new terms are dependent on the existence and the frequency of alternative forms and their positive or negative behavior in

specialized texts. This fact later formed the base of the concept of “*relative frequency*” in implantation measurement proposed by Quirion (2003).

### 3.2. The purpose of evaluation

The first and perhaps the most important purpose of conducting an evaluation in terminological activities is “monitoring” the use of terminological units in their real circumstances (specialized texts) or to control the status of scientific language in particular regions. The importance of controlling the units and the observation of the conditions of a language regarding domain-specific properties are discussed in many articles by Cabré (examples are: 1992, 1997, 1999b & 2005). In relation to implantation evaluation, Cabré (2010, p. 2) emphasized the role of terminometric analysis in obtaining knowledge about sociolinguistic conditions and planning process:

[...] no puede ponerse en duda que los estudios sobre implantación son necesarios: por un lado para conocer mejor las condiciones sociolingüísticas de los términos, y, por otro, para evaluar el propio proceso de planificación.

She also addresses evaluation as an indicator of the efficiency of terminological activities and organizations:

La implantación terminológica es sin lugar a dudas un indicador de la eficacia de las acciones de política lingüística realizadas sobre los términos que todo proceso de planificación debe evaluar. (2010, p.17)

The analysis of terms in their real contexts also helps us to obtain useful information about the position of terms and their behaviors in certain discourses:

Les résultats de la veille socio-terminologique contribuent à l'évaluation, car celle-ci donne aussi une mesure de la situation de l'usage des termes – situation expansive, régressive ou stationnaire (Diki-Kidiri 2007, p. 22).

For Galanes Santos (2003), evaluation means the assessment of each stage of TP, and it only in this case can be useful for concluding about the whole situation. She believes that this type of

evaluation can improve the future terminological products and hence their implantation.

A avaliación de cada unha das etapas é unha tarefa fundamental e proveitosa nunha xestión planificada, posto que dela se poden tirar conclusións que orienten a planificación da produción terminográfica posterior e a súa implantación (p. 263).

In GTP (Infoterm, 2005), the focus is on the evaluation of skills and operations undertaken by centers and institutions. Consequently, the conception of evaluation is in accordance with “assessment mechanism, which allows for timely corrections and adjustments in the operational and organizational planning of the implementation” (p. 30). This type of evaluation aims to organizational assessment and accountability the primary use of which is terminological works improvement.

Another purpose of conducting evaluation is data providing for policy formulation. The fact that some countries do not enjoy an explicit terminology policy entails the need for the establishment of appropriate criteria in the light of systematized evaluations. It is also essential for verifying the implementation of existing language policies:

L'évaluation est encore bien plus indispensable quand le travail terminologique fait partie d'un programme d'aménagement linguistique en application d'une politique linguistique (Diki-Kidiri 2007, p. 21).

The most recent researchers stress the importance of holistic evaluations to achieve comprehensive information ranging from organizational activities to methodologies and outcomes. Bhreathnach (2012) discusses the need for “regular external reporting”. In her terms, TERM-CAT, as one of the most successful TP bodies, apart from quantifiable measurements, carries out the “evaluation of the performance of the organization at all levels” (p.107). Zarnikhi considers evaluation as a system that can measure “covering entities, methods, processes and products” and emphasizes the importance of continuity and sustainability of the evaluation system (Zarnikhi 2014, p. 335). Another function of evaluation according to Zarnikhi is verifying TP regarding “scientific growth”:



The evaluation device could be a kind of hidden camera to catch reasons of acceptance or rejection and to record sociolinguistic variables leading to parameters. Certainly the ultimate goal is not just to put terms into circulation but it bears something else, e.g. whether planning and equipping a language has any role in scientific growth. Although it may seem a long distance, it could be measured step by step in a period of a terminology planning implementation (p. 60).

Due to the importance of evaluation in TP, almost all researchers have dealt with it, even if the focus of their works is not specifically on the evaluation analysis. The above-discussed arguments illustrate the evolutionary path of evaluation goals from linguistic improvements to sociolinguistic advances. A group of objectives has been proposed by scholars considering linguistic or non-linguistic variables. Given these discussions, the main purposes of evaluation can be classified as follows:

1. To control the planning process and the condition of a particular language regarding terminology expansion;
2. To monitor the behavior of terms in their real context of use;
3. To evaluate the effectiveness or otherwise of explicit or implicit policies;
4. To evaluate the effectiveness or otherwise of organizations and centers in implementation of TP;
5. To improve terminological activities regarding inner mechanisms and workflow.

### 3.3. The types of data need to be collected

It is assumed that the majority of terminology activities aimed at terminology development and expansion, i.e. terminological modernization. This assumption put the emphasis on gathering data to examine if a considerable amount of terms are implanted or not, or to what extent a certain language is modernized in scientific and technical domains.

Quirion (2003) with the purpose of conducting a quantitative data analysis, has classified the required data based on statistical foundation into two groups, i.e. *official terminology* and *ordinary terminology*. By official terminology, he refers to standardized terminology, and by ordinary terminology, he refers to “initiatives undertaken within government terminology planning programs”:

This terminology, called terminology of reference, is divided into two groups. The first group is the official terminology, which is the recommended or standardized terminology that is approved of by government authorities. On a simple numbers basis, official terminology is far outweighed by ordinary terminology, which constitutes the second group. This latter group includes all the other word forms addressed by initiatives undertaken within government terminology planning programmes (p. 36).

Moreover, it is reasonable to consider the competitive nature of terms in languages in contact. For this reason, Quirion believes that the study should include terminological units from other languages as well. In other terms, terminological variations should not be limited to existing native forms, but also any foreign form used in the corpus should be studied. In addition, the consultation phase to experts, lexicons, and glossaries is recommended.

This terminological census can be done by querying terminological data banks, by using various lexical sources (lexicons, vocabularies, glossaries, terminological or linguistic notices) or by consulting experts, etc. (Quirion 2003, p. 37).

TP modeling entails specific types of evaluation and assessment based on testing current models from various points of view. This evaluation can be associated with comparative studies or investigating a certain case study in distinct periods. The existing modeling efforts deal with either a certain case study (e.g. Galanes Santos 2003, Drame 2009) or a combination of various cases (e.g. Bhreathnach 2012, Zarnikhi 2014). The types of data they have collected can be useful as they have conducted a type of analysis, although not explicitly designed in the framework of an analytical model.

The data used in Galanes Santos (2003) and Drame (2009) are chronological information about the evolution of terminological

activities, sociological analysis based on evidence collected mainly from written documents, and the conclusion is based on social and linguistic demands. Therefore the focus is on sociolinguistic information and the output is highlighting new functions of TP to be taken into account.

Bhreathnach (2012) with the purpose of conducting a comparative study and testing current practices, based on socioterminological foundations, classifies the reference lines of her research into six areas. These areas justify the type of data collection as well, as she explains interview was the main means of data gathering. The output of her research is a model proposal as the best-practiced model (in Catalonia):

- The social, cultural and linguistic context and situation. Terminology is to be examined as part of the culture of the language and of the community.
- Terminology management as an aspect of language planning, particularly in light of the phenomenon of popularisation.
- LSP and LGP as a continuum, so that LGP planning, if any, must also be considered.
- The promotion and diffusion of terminology.
- Questions of language in practice and term use.
- A practical focus on how terminology work is actually done.

Zarnikhi (2014, p. 110), stressing the importance of unnoticeable manner of data collection, classifies the data used in his thesis into macro- and micro-structure. For the former, linguistic and non-linguistic information are needed; while, for the latter, organizational information and real practices are concerned. The output of his research is a systemic model which is not practiced by any of those cases involved, but it is a combination of positive aspects of each.

A rational sequence is recognizable in these endeavors. First, an examination of required data based on the purposes of the research is done. In this stage reliability, credibility and state-of-the-art research are at the highest preference. At the second level, after data collection, once the analysis starts delimiting the lines of analysis and testing the performance of the subject of the study will be progressed over the whole research. The key evaluation-relevant

data are dependent on the subject of study; however, we can identify five headings that can be assessed separately or thoroughly:

1. *Input*: The information regarding the preparation phase of TP (types of resources in the process, terminology database gathering methodology, the knowledge about current situations, etc.) [e.g. Zarnikhi 2014]

2. *Activities*: The information regarding the processing phase including standardization and dissemination (workflow, organizational charts, funds, research support, training activities, etc.) [e.g. Galanes Santos 2003, Bhreathnach 2012, Zarnikhi 2014]

3. *Outputs*: Criteria, manuals, institutional investigations [e.g. Bhreathnach 2012, Zarnikhi 2014]

4. *Outcome*: The data regarding standardized forms (the quantitative data, the dates, the number of standardized terms, the number of fields of study, the number of publications, dissemination manners and etc.) [e.g. Drame 2009, Bhreathnach 2012, Zarnikhi 2014]

5. *Impact*: The implantation evaluation (the terms in real use, the function of proposed terminology in textual researches and scientific advances, the quality of glossaries with the aid of standardization process, etc.) [e.g. Quirion 2003] and the sociocultural status of the authoritative bodies (the prestige of the organization, the accountability of the organization, etc).

Regarding the data collection, some primary steps are indispensable.

a) Clarifying the purpose: Depending on the purpose of the evaluation the data needed vary from terminological information collected through corpus-based studies to sociological or political facts.

b) Evaluation approach: It is crucial to know which components or aspects should be analyzed, i.e. methodology, standardization, implantation, policies, implementation, management performance, cultural perceptions and feedbacks, etc.

c) The methodology: The type of data and the aspects may influence the data processing as it could be quantitative or qualitative or a combination of both.

Generally speaking, the most relevant data, basically, is the information associated with the TP goals and objectives to analyze afterward if the plan has achieved them or not. Since the objectives of plans vary from a particular context to another, the definite data type cannot be prescribed.

### 3.4. Basic questions to address

The evaluation of any terminology system begins with drawing some relevant questions that serve to organize and employ the data for progression of the analyses and eventually for concluding about the subject under the investigation.

In terms of sociolinguistic aspects of terminology, Aleong, Chretien, Ostiguy & Martin (1981, p. 47) have proposed questions which addressed the acceptability or rejection of terms in particular social environments respecting the fulfillment of users' needs:

Quels sont les processus sociaux qui déterminent l'acceptation ou le rejet de la terminologie recommandée? Comment mettre en oeuvre les termes nouveaux de telle sorte qu'ils soient utilisés? Est-ce que la terminologie proposée répond aux besoins véritables de la population cible? Voilà autant de questions qu'il convient de se poser. (as cited in Cabré 2010, p. 3).

Above proposed matters are associated with the factors contributing to the socioterminological aspects of terms. Questioning the satisfaction of real users and looking for appropriate criteria to implant neologisms to be used are fundamental issues that have been tackled from earlier investigations on evaluation.

Louis Guespin & Jean-Baptiste Marcellesi (1986) questioned many social aspects of terminology as well as the credibility of authoritative agents in terms of tendencies and correctness:

Quels sont les agents propagateurs d'anti-normes? Comment ces agents interviennent-ils dans les conflits normatifs, avec quelle autorité, quel soutien et quel succès? Un ministre proposant

"bouteur" pour "bulldozer" croit normaliser; est-il entendu? Un journaliste lançant tel prétendu "mot dans le vent", éventuellement fabriqué pour faire événement est-il mieux placé pour réussir l'opération néologique? Comment sont lancés mots, affixes, structures syntaxiques? (as cited in Gaudin 1993, p. 298).

These questions address the authorization of individual or organizational interventions and look for a response to establish relevant criteria either for the creation of terms (or equivalents) or for defining the normative interventions. The questions such as "*who affects the norms and the selection or preference of a term?*" or "*To what extent this intervention can affect the result, the acceptance or the rejection of proposals?*" can be taken into account in various evaluations either in implantation studies or organizational assessments. These topics highlight the need for verified criteria regarding implementation and implantations.

### 3.5. Synthesis

The above-discussed arguments have viewed the issue of evaluation from various perspectives, ranging from linguistic data to sociolinguistic contexts and policy formulation to deal with it as a whole. However, a coherent framework for carrying out a holistic evaluation is still missing. Indeed, for undertaking an integrated evaluation in TP, there are epistemological challenges resulted from several dimensions and scales of analysis.

It should be taken into account also, that the information resulted by examination and evaluations should be useful for organizations even not involved in the case study. In other words, it is not only a certain ecolinguistic environment that benefits from the results of the evaluation, but also concerning methodology and development of the ideas the beneficiaries of systematic evaluations will be increased.

Furthermore, measuring the effectiveness of terminology plans differs from measuring other dimensions of terminology in several important respects. First, this practice is relatively new. Second, TP is complex in nature which covers a broad range of subjects from sociology to communication and cultural studies to target users'

satisfaction and linguistic behaviors. Third, measurement of TP extends beyond the boundaries of a single system and typically addresses the performance of upstream specialist organizations and government and downstream users and specialists in the chain of activities.

Thus, at a systemic level, it is important to know how various systems work together and influence each other; while, at the systematic level, the functioning of sub-systems and their interactions may provide us with useful data and information. It goes without saying that psychological, social, political, or even historical factors are also involved in prompting a terminology work to become successful in a certain context. It is the matter of TP models' capability to conduct all these factors and elements to reach their objectives.





## CHAPTER IV. METHODOLOGY

The importance of evaluation is acknowledged in strategic and complex interventions. In general, documents on evaluation systems offer a wide explanation on the definition, function, and managing of evaluation processes. According to “*Evaluation Handbook*” (IOS/EVS<sup>14</sup>, 2007), evaluation is defined as “the systematic and objective assessment of an activity, project, programme, strategy, policy, topic, theme, sector, operational area or institution”; and, it is considered as the “essential part of the policy development process” (p. 5). In “*Guidelines for Project and Programme Evaluations*” (Austrian Development Agency, 2009, p. 1) evaluation is presented as “the systematic and objective assessment of an on-going or completed project or programme, its design, implementation and results.”

In “*Responding to Strategic Needs: Reinforcing the use of evaluation*”, published by Commission of the European Communities, evaluation is considered crucial because “it can provide rational, structured and systematic means of informing decision making in complex interventions and policy arenas” (European Commission, 2007, p. 3<sup>15</sup>). “*DAC<sup>16</sup> Glossary of Key Terms and Concepts*” defines evaluation as:

The systematic and objective assessment of an on-going or completed project, programme or policy, its design, implementation and results. The aim is to determine the relevance and fulfillment of objectives, development efficiency, effectiveness, impact and sustainability [...].

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<sup>14</sup> Internal Oversight Service Evaluation Section

<sup>15</sup> Communication to the commission from Ms. Grybauskaitė in agreement with the president (Document No. SEC (2007) 213). Brussels.

<sup>16</sup> Development Assistance Committee (DAC): The committee of Organisation for Economic Co-operation and Development (OECD) which deals with development co-operation matters. Currently there are 29 members of the DAC: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, The Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, the United States and the European Union. [<http://www.oecd.org/development/dac-glossary.htm>]

Evaluation also refers to the process of determining the worth or significance of an activity, policy or program. An assessment, as systematic and objective as possible, of a planned, on-going, or completed development intervention.

**Note:** Evaluation in some instances involves the definition of appropriate standards, the examination of performance against those standards, an assessment of actual and expected results and the identification of relevant lessons<sup>17</sup>.

As the concept of evaluation in development planning implies, evaluation of various aspects of terminological works is the most fundamental part of TP and terminology development that can be considered as the key success factor of any TP implementation. Evaluation is crucial to assess the “*relevance*”, “*efficiency*”, “*effectiveness*”, “*impact*” and “*sustainability*” of interventions in planning and development processes (IOS/EVS, 2007, p. 5). Evaluation in TP is not merely quantitative and statistical data about the disseminated and implanted terms; it is rather understood as a controlling and monitoring tool in a system in which terms are processed, produced or standardized. Indeed, terms, as the final products of the system, need to be analyzed as well.

However, terms are unpredictable elements that would behave distinctly in contexts. For instance, terminologization or appearance of a term and determinologization or getting obsolete are not intrinsic properties that can be controlled. Zarnikhi (2014, p. 308) states that although many traditional communities emphasize the linguistic criteria in terminology evaluation (particularly in implantation studies), the recent studies shed light on the importance of non-linguistic factors.

Besides, the use or behavior of words and terms are not clear and cannot be predicted over the production or the standardization process. One cannot rely on the linguistic characteristics or statistical analyses merely based on the previous studies. Each term is a unique case of study. This suggests that the most important part of the TP evaluation is to know if the system functions correctly to achieve desired results or not. In other terms, “evaluation is

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<sup>17</sup> See also: Glossary of Key Terms in Evaluation and Results Based Management, available online: <http://www.oecd.org/dac/2754804.pdf>

essentially about – are we doing the right thing, are we doing it right and are there better ways of achieving the results?” (IOS/EVS, 2007, p. 5). These desired results are not only the organizational visions and goals (internal vision) but also the contextual needs and socioprofessional demands that should be fulfilled. On this path, conformity, harmonization, systematization, and strategic policies facilitate the process of standardization and permit organizations to follow the behavior of terms once they are released and disseminated. Notwithstanding, none of the language agencies benefit from an evaluation procedure (Zarnikhi, 2014, p. 337).

This chapter is dedicated to developing an analytical mechanism which will be used later to evaluate the terminology planning in Persian context. It draws outlines of an analytical framework to evaluate components and describe the connectedness of information and data generated at micro, meso and macro levels. This analytical framework can gather the comprehensive data needed by researchers to evaluate the whole TP process.

Precisely, this current chapter is an attempt to explain the need for a holistic methodology for terminology planning evaluation and to provide an analytical framework that can be employed for evaluating any TP case. The key issues that have to be considered are “what types of evaluation can form or assist a holistic evaluation” (inclusion) and “to what extent each single evaluation can be informative and significant” (value). The former will be discussed in this chapter, while the latter is the matter of the scenarios and case studies, and hence, will be discussed at the end of conducting the evaluation in Chapter V.

For this purpose, this chapter is designed in three distinct sections:

1. Addressing the challenges
2. Developing the analytical framework
3. Synthesis

# 1. Addressing the challenges

It is presumed that any evaluation aims to assess the implementation of a system (or plan or program) and to find applicable solutions for probable problems found over the analysis. The same applies to TP. Nevertheless, the greatest challenge in TP evaluation is “which aspects should be analyzed.” As a complex system, it should be simplified and divided into subsystems, and then the relevant issues should be identified to avoid misleading factors. The choice among a variety of elements and subsystems, probably, is one of the most difficult parts of evaluation. Based on the literature, and planning specifications presented in Chapter I and II, the main challenges in TP evaluation and similar institutional terminology works comprise the following main issues:

- 1.1. Complexity of the grounding factors and the circumstances
- 1.2. Using appropriate methodology
- 1.3. Subject field background
- 1.4. Limited guidance on how to approach evaluation studies in TP

In the following, I describe these challenges and possible solutions that might facilitate the evaluation process.

## 1.1. Complexity

TP is a dynamic and complex system functioning in an interactional and exchanging setting effectively in contact with the other systems. TP procedures tend to have long-term objectives, multiple operations and unpredictable outcomes truly dependent on local and cultural contexts. Nevertheless, many of the social and political actions, underpinning the strategies, such as language policy and political orientations, are not adequately theorized or are untouchable and subtle issues.

Due to the sociolinguistic and sociocultural aspects of TP, in fact, a single “manual” may never be achieved. The pre-determined goals and outcomes that specialist organizations plan vary from an environment to another. Thus, no single metric or measurement method can

- (1) address the diversity and complexity of terminology work outputs (i.e. neologisms and standard terms),
- (2) describe non-organizational activities whose impact might be noticeable in any organizational terminology work, and then finally
- (3) accurately obtain or estimate the resulting terminological modernization.

However, certain methodological phases might be considered common to all types of evaluation<sup>18</sup> which are also applied to implantation measurements (Cabré, 2010; Quirion, 2003). These include:

- (1) Predefined goal and standards & selecting the phases or areas for study
- (2) Identifying the modules and measures,
- (3) Developing hypotheses and assumptions,
- (4) Identifying data sources,
- (5) Designing and conducting data collection (e.g. corpus, evidences, official documents, interviews, etc.)
- (6) Data processing and analysis,
- (7) Compilation of the analysis and carrying out the final evaluation that effectively provides essential terminological information.

## 1.2. Appropriate methodology

In practice, evaluation of TP has presented many challenges in specialized communities for researchers and language planners. While they may be able to accurately measure how many terms are standardized, or how many organizations or institutes or societies receive the final products (evaluation of dissemination), or how many standardized terms are applied in specialized contexts (evaluation of implantation), it has been far more difficult to measure the qualified outcomes or to evaluate the structure of terminology planning, since there is no standard model of organization which can be valid for all countries (Cabré, 1999a, p.311).

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<sup>18</sup> These elements can be considered as basic elements of any performance measurement widely analyzed in business and economics studies (Lichiello, 1999; Callahan & Kloby, 2009 etc.).

One of the problems associated with managing for results and measuring outcomes is determining, in a specific society and cultural context, what the desired performance and results of TP look like. What the desired results of specific strategic plans are in domains of study and what impact these strategic plans have on improving TP conditions and overall quality of terminology development.

In addition, assuming that TP is not made of only one single component, separate assessments are needed to examine the performance of each component considering the wide range of factors and agents. However, each single assessment should be part of a broader evaluation category to identify the parameters, objectives, visions, and specific needs and desires. Therefore, holistic evaluation, in TP, has to be associated with a multi-level analysis, which, by nature, is complex and dynamic. As a consequence, it requires:

- 1) Preliminary analysis to recognize and define the relevant factors and components,
- 2) Identifying the indicators and options at each level,
- 3) Developing an effective mechanism to analyze the descriptive and prescriptive aspects of TP, performing by authoritative bodies regarding decision making or affecting the procedures by interventions.

Moreover, TP evaluation studies require a multidisciplinary focus. Specifically, it needs to benefit from the methodologies of its related disciplines like sociology, microeconomics, and linguistics to provide an acceptable framework for the desired analysis.

The nature and the use of criteria is a crucial part which can be managed due to the specific needs and characteristics of domains. As a preliminary step in the application of TP analysis, criteria should be applied to determine what approaches will be employed and what are the reasons for the selected approach. All approaches in evaluation studies should begin with a careful analysis of objectives to avoid misinterpretations, as this would cause a poor selection of terminology measures and metrics.

### 1.3. Subject field background

In TP evaluation, the history and the background of the domains matter. As scholars emphatically mention it, the selection of domains is a very initial phase of any study and the data used in the implantation studies should be provided from specific subject fields. However, the terminology of the domains, in many cases, has no similar background. This fact is due to either the different establishment dates of the technical committees or the differences among basic sciences and interdisciplinary fields or the policies that prompt the focus on some specific subjects.

Besides, the growth, dynamicity, and proliferation of science would affect the evaluation materials as well. For instance, one cannot collect the data on *Proteomics* terminology as the same as *Biology* terminology as the latter has a considerably older history. Indeed, the quantity of accessible information, articles, dictionaries, and scientific resources, in general, varies from a subject to another. Besides, due to their history, the terminological works done in each domain is progressed differently. For all that, a brief presentation on the historical aspects of domains seems useful in evaluations.

Another aspect regarding the subject fields is the type of data we need. It is assumed that for analyzing terminological needs two types of data are needed:

- 1) Data on the finished projects or works that can provide us information about the adequacy and appropriateness of the outcomes and the satisfactory degree of the users;
- 2) Data about the expectations and needs that have been supposed to be met, or should be planned to fulfill.

The former is useful to assess the impact of plans and policies, whereas the latter accounts for the evaluation of identification of needs and assessing the preparation and formulating the plans and policies. For the sake of simplicity and convenience, I propose two different approaches in corpus-base studies to select when they apply (Figure 4.1):

a) *Retrospective studies*: Conducting analysis and evaluations on finished activities in domains of studies which have a historical background in terminology planning and adequate terminological resources are available. The aim of this approach would be to improve the terminology functions and TP performance. This approach is useful for instance in implantation studies and further updates and revisions.

It is called *retrospective* because the analysis will be conducted on the terminological activities that precede the textual corpus schedule.

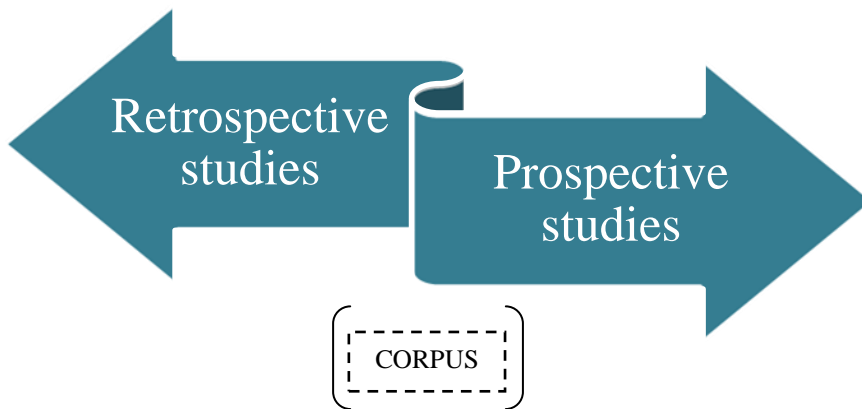


Figure 4.1. Retrospective & prospective studies

b) *Prospective studies*: Conducting analysis and evaluations on in progress activities to discover the needs or to measure the degree of fulfilled terminological needs over a period that comes after the corpus schedule. This approach is applicable to all domains, including those without a considerable terminology background. The analysis also can function as an intermediate or primary stage that is it can help terminology planners and organizations to detect problematic terminological situations before making decisions. Hence, the prospective approach can be useful in strategy planning and for any preparation or formulation functions.

The choice between these approaches depends on the objectives of the analyses and the availability of required information. The retrospective analysis will provide decision makers with information about the original reasons or causes of terminological



gaps for reassessing preliminary criteria, modifications, and updates. This suggests that retrospective analyses are not just a critical mechanism for detecting weaknesses or strengths. They should be truly management tools that can help to significantly improve planning endeavors for the future terminology work or regulating committee's activities.

In prospective studies, the objective is to develop considerable quantitative and qualitative information that assesses the scope and areas of a set of related terminology works. As a complementary part of the "research function" in TP models, it can facilitate preparation and standardization function at the systematic level by focusing on characterizing barriers and predicting the possible solutions.

#### 1.4. Limited guidance on how to approach evaluation studies

Organizations involved in TP are established without a systematic evaluation function of the realm and extent of the needed intervention. Although the strategies should be formulated at the level of political and organizational decision making (Infoterm<sup>19</sup>, 2005, p. 4), some organizations have no clear plan about effective strategies and interventions. This complicates both planning and subsequent studies and, in fact, can lead to prolonged issues and even confusing results in the form of either no function or unintended negative functions.

Hence, the initial use of terminology evaluation can be to provide information on the appropriateness of an organization role in supporting the evolution of terminological activities. Identification, characterization, and measurement of probable problems in specific contexts and barriers can facilitate the process of terminology planning. At the institutional level, this evaluation can provide information that helps to implement the objectives due to the local

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<sup>19</sup> "A national terminology policy is a public strategy formulated at the level of political decision making in a country or in a more or less autonomous language community (within a country or a region that spreads across the borders of two or more countries) with the aim of developing or regulating emerging and existing terminologies for an array of purposes" (Infoterm, *GTP*, 2005).

terminology policy. Such an evaluation requires a set of analytical and empirical tools to:

- (1) Identify the elements of terminology activities;
- (2) Enable organizations to construct metrics that reflect the terminological outputs and project outcomes of their respective pre-determined goals;
- (3) Gather comprehensive and accurate data from organizations, and construct term policy-relevant analyses from the metrics and data to guide terminology work; and
- (4) Collect accurate data from organizations on the impacts of ongoing or completed terminology projects.

Studies on TP evaluation are inclined to analyze standardized terminology either as the final output or as the means to achieve a communicative objective. As a consequence, current evaluations tend to measure the use of standardized terminology and implantation impacts and not the implementation of the plan. I believe that guidelines for the management of metrics in terminological research should be beyond the implantation function.

On the one hand, the dynamics of terminology planning is not caused only by the constant changes and evolutions in concepts and terms but also the multidimensional nature of terminology planning which is influenced by the social and political changes (Chapter I). On the other hand, the centric role of organizations (in many cases government and public organizations) in TP intensifies the importance of systems' performance. Thus, dynamics in terminology planning implies a continuous assessment of the systems, models, resources, management, result, and meaningful improvement which is not applicable unless by benefitting from well-systematized evaluation guidance.

The literature on implications of strategic decision-making in TP activities and terminology dynamics is comprehensive. However, discussions on analytical approaches and monitoring are scarce. While some characteristics of "good TP practices" are described, methods for designing and implementing evaluation systems are

still being developed, and on some issues, there is no consensus yet on what is “the best practice”. This suggests the use and adaptation of existing evaluation standards in TP to applying and developing the framework corresponding TP characteristics and requirements. For this purpose, it seems that the most relevant structure is the standard evaluation guidelines in development context.

In “*Quality Standards for Development Evaluation*” (DAC, 2010, p. 4), the term “*development intervention*” refers to “any activity, project, programme, strategy, policy, theme, sector, instrument, modality, institutional performance, etc, aimed to promote development.” In this sense, TP as an activity, strategy, policy and institutional performance which assist in the promotion of language and aimed at social development can be recognized relevant enough to apply the standard guidelines presented in the development context. Nevertheless, adaptation and modification remain crucially important.

## 2. Developing the analytical framework

As it is described thus far, apart from the internal and institutional aspects, the implementation of TP is influenced by intersystemic forces; i.e. external interventions. These forces, as have been identified in Chapter III, comprise linguistic, sociolinguistic and sociocultural forces. It is crucial to observe and analyze all of these forces corresponding to their levels due to their proper progress and conditions. In other terms, “evaluations must be conceived and designed with a thorough understanding of the initiative and the context within which it operates” (UNDP, 2009, p. 164). For instance, in Iran, functional aspects should be defined according to all possibilities, challenges, and advances (as it can apply to any other cases).

However, there are some assumptions that are independent of the context and can be considered as universal principles. Regarding the methodology, it is assumed that all TP activities require a formulated methodology to detect and collect the specialized terms in use. Regarding policy, it is assumed that TP must follow the language policy of the language it applies to. In terms of resources, it is assumed that terminological resources should reflect the real use of the units. These assumptions can be used for the initial steps

of TP evaluation to articulate a framework for the essential aspects that need to be analyzed.

Because TP evaluation as a systematic and systemic practice is a very new scope, much more efforts are to be allocated to achieve an evaluation model that can be practiced by all TP systems. Hence, the objective of this section is to propose a prototypical framework that can be used to carry out the TP analyses and the evaluation model will be examined through the analyses to find out the specific indicators of the context under the study.

For this aim, a clear prototypical framework is necessary to guide over the analysis process. The framework should explain how the analysis is supposed to be done by laying out the components and the order. The objective of this framework is to define the relationship among distinct levels and to articulate the elements that could affect the TP success. According to “*Handbook on Planning, Monitoring and Evaluating for Development Results*”, developing an evaluation design “involves following key elements and how each will contribute to valid and useful evaluation results”:

1. The purpose of the evaluation
2. The focus of the evaluation, that is, the key questions that the evaluation seeks to answer
3. The sources and methods for obtaining information that is credible and defensible
4. The procedures that will be used to analyse and interpret data and report results
5. The standards that must be reached for the initiative to be considered successful
6. The evidence that will be used to indicate how the initiative has performed and demonstrate its results (outputs and outcomes)

(UNDP, 2009, p. 163-164)

These evaluation elements almost conform with evaluation elements identified and discussed in Chapter II. The following sections explain how the proposed evaluation will progress respecting these key elements.

## 2.1. The purpose of the evaluation

Evaluation is a methodical tool for ascertaining the success of terminology system. In practice, evaluation has been used thus far to appraise the performance of the system's products; i.e. terms. However, in theory, the concept of evaluation is not limited to the evaluation of terms and includes any assessment or measurement to obtain credible information about sociolinguistic, functional, socioterminological, and sociocultural conditions. According to *Evaluating EU activities*<sup>20</sup> (2004), the general purposes of evaluation are:

- To contribute to the design of interventions, including input when setting political priorities.
- To assist in efficient allocation of resources.
- To improve the quality of the intervention.
- To report on the achievements of the intervention (i.e., accountability).

(as cited in Stern, 2009, p. 72)

These purposes indicate that evaluation process is required to observe the current activities and to obtain knowledge to improve them. Table 4.1 shows a comparison between the European Commission's standards for evaluation's purposes and what has been remarked thus far by terminologists.

<b>European Commission Evaluation Guidance</b>	<b>Terminology Scholars</b>
To contribute to the design of interventions, including input when setting political priorities	<ul style="list-style-type: none"> <li>- To obtain knowledge about sociolinguistic conditions and planning process (Cabr�, 2010)</li> <li>- To obtain useful information about the position of terms and their behaviors in certain discourses (Diki-Kidiri, 2007, p. 22)</li> <li>- Data providing for policy formulation and verifying the implementation of existing language policies (Diki-Kidiri, 2007, p. 21)</li> </ul>
To assist in efficient allocation of resources (mostly financial resources, aids, funds, etc.)	(Bhreathnach, 2012)

<sup>20</sup> European Commission Evaluation Guidance [*Evaluating EU activities: A practical guide for the Commission Services*. (2004). July DG BUDGET, Evaluation Unit. Brussels]

To improve the quality of the intervention	<ul style="list-style-type: none"> <li>- To catch reasons of acceptance or rejection and to record sociolinguistic variables leading to parameters (Zarnikhi, 2014, p.60)</li> <li>- To measure “covering entities, methods, processes and products” (Zarnikhi, 2014, p. 335)</li> <li>- To obtain an overview about the terminological works situation in a specific context (Galanes Santos, 2003, p. 263)</li> <li>- To achieve comprehensive information ranging from organizational activities to methodologies and outcomes (Bhreathnach, 2012)</li> </ul>
To report on the achievements of the intervention (i.e. accountability)	(Bhreathnach, 2012)

Table 4.1. European Commission’s evaluation purposes vs. terminologists’ remarks

The contribution of evaluation to the intervention design and decision-making is considered equal to the knowledge that can be employed in the policy formulation, sociolinguistic factors identification, and preparation of new input (i.e. rejected or less frequent terms in their real context) for revising them in the standardization process. All other information about reasons for acceptance or rejection as well as the measurement on covering entities or comprehensive evaluation could account for improving the quality of the interventions and in-process activities in TP systems.

The remarkable point in this comparison is that “allocation of resources” and “accountability” have been given less concern. In other words, the obligation to report on the achievements or acknowledgment of responsibility for policies and decisions by the authoritative bodies have not been considered as the primary purpose of TP evaluation. It is needless to mention that the achievements are not only quantitative reports but also qualitative report upon resulting consequences.

Respecting these discussions, and given the limits and challenges of the TP evaluation, the purposes of the evaluation in TP are proposed as follows:

1. To contribute to the improvement of interventions and decision-makings at sociolinguistic level;
2. To improve the quality of terminological activities, explicit or implicit policies, inner mechanisms and workflow at functional level;
3. To improve the effectiveness of decision-making at socioterminological level;
4. To improve the effectiveness of TP implementation;
5. To assist in accountability by reporting on the terminological achievements.

## 2.2. The focus and key questions

In Chapter III some frequent questions, regarding the evaluation process remarked by the terminologists are presented. Satisfaction of real users and the acceptance of term proposals are the most highlighted questions; however, the credibility of authoritative agents and the impact of interventions on the final outputs are proposed in the literature as well.

In *Responding to Strategic Needs: Reinforcing the use of evaluation* (European Commission, 2007, p. 8) analyzing the contribution of interventions to strategic objectives and the coherency of the interventions as well as the progress towards reaching the objectives are introduced as the most important issues to be questioned over the evaluation process. In “*Guidelines for Project and Programme Evaluations*” (Austrian Development Agency, 2009, p. 2), “relevance and appropriateness”, “effectiveness”, “efficiency”, “impact” and “sustainability” are considered as the principal criteria in the evaluation process (see also *Quality Standards*, DAC, 2010). Documented definitions of these criteria are presented in Table 4.2.

<b>Evaluation Criteria</b>	<b>Definitions and Sources</b>	<b>In TP context (author's adaptation)</b>
Relevance	<p>The relationship between the needs and problems in society and the objectives of the intervention. [EC, 2015<sup>21</sup>]</p> <p>Assessing whether the project is in line with local needs and priorities. [Austrian Development Agency, 2009, p. 18]</p> <p>The extent to which the aid activity is suited to the priorities and policies of the target group, recipient and donor. [DAC <sup>22</sup>]</p>	<p>The relationship between the sociolinguistic and socioterminological needs and problems in society and the objectives of the TP interventions. The focus is on the identification of sociolinguistic and socioterminological needs and the comparison between objectives and the real needs.</p> <p>It may include the credibility of authoritative agents regarding tendencies and correctness (Louis Guespin and Jean-Baptiste Marcellesi, 1986) and prospective studies for users' needs identification.</p>
Efficiency	<p>The relationship between the resources used by an intervention and the changes generated by the intervention (which may be positive or negative). [EC, 2015]</p> <p>Efficiency measures the outputs -- qualitative and quantitative -- in relation to the inputs. [DAC]</p>	<p>The relationship between the input (terms, criteria, guidelines) and the output (standardized and processed terms) in functional and organizational procedures; i.e. workflow.</p> <p>In evaluating organizational performance, funds, expertise, time, training program, etc., can be assessed as well to observe how they convert into outputs.</p>
Effectiveness	<p>The extent to which a project or programme achieves its objectives and outcomes. [UNODC<sup>23</sup>]</p>	<p>The relation between the objectives of TP (explicit or implicit) and the achieved outcomes (standardization criteria, dissemination, and implantation function).</p>

<sup>21</sup> Online access via: [http://ec.europa.eu/smart-regulation/guidelines/docs/br\\_toolbox\\_en.pdf](http://ec.europa.eu/smart-regulation/guidelines/docs/br_toolbox_en.pdf)

<sup>22</sup> Online access via: <https://www.oecd.org/dac/evaluation/dcdndep/39119068.pdf>

<sup>23</sup> Evaluation handbook. Online access via: <https://www.unodc.org/unodc/en/evaluation/evaluation-handbook.html>



<b>Evaluation Criteria</b>	<b>Definitions and Sources</b>	<b>In TP context (author's adaptation)</b>
	A measure of the extent to which an aid activity attains its objectives. [DAC]	It may include the availability of appropriate criteria to create and implant neologisms (Aélong et al., 1981, p. 47) and retrospective studies for evaluating the standardization results.
Impact	<p>The positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended. This involves the main impacts and effects resulting from the activity on the local social, economic, environmental and other development indicators. [DAC]</p> <p>The strategic orientation of the project towards making a significant contribution to broader, long-term, sustainable development changes. [International Labour Organization (ILO), 2013, p. 27]</p>	<p>The terminological changes produced by TP activities, or any sociocultural and sociolinguistic impact resulted by TP interventions.</p> <p>It includes the consequences of dissemination (awareness), implantation (application) and standardization functions; e.g. satisfaction of target users.</p>
Sustainability	<p>The likelihood that the results of the intervention are durable and can be maintained or even scaled up and replicated by intervention partners after major assistance has been completed. [ILO, 2013, p. 27]</p> <p>Measuring whether the benefits of an activity are likely to continue. [DAC]</p>	Language and terminology modernization, and any aspect that results in continuous and stable terminology activities.

Table 4.2. Definitions of key evaluation criteria

It is worth mentioning that the *Result-Based Management Handbook* put emphasis on “context” and explains:

A results chain will always be embedded in a given context that reflects the overall situation, needs, issues, priorities and aspirations of key stakeholders. A diversity of factors – economic, political, social, environmental or cultural – will affect the achievement of results. This is why results chains may vary from country to country. What may be an output in one country may be an outcome in another country [...].

(UNDG 2010, p. 14)

Therefore, “a thorough understanding” of the activities and the knowledge about “the context within which they operate” are necessary to recognize how distinct operations adapt to the contexts and “how and why they contribute to outputs and outcomes” (UNDP, 2009, p. 164).

However, the concept of “context” in evaluation studies has a twofold meaning. On one hand it refers to the implementation context in TP which is associated with sociocultural, sociolinguistic and geopolitical underlying factors. On the other hand, the evaluation limits and factors that can affect the evaluation results are also considered as the “evaluation context” (UNDP, 2009, p. 166).

“A clear and concise set of the most relevant questions ensures that evaluations are focused, manageable, cost efficient and useful” (UNDP, 2009, p. 171). Based on these criteria, and given the TP evaluation elements, Table 4.3 and 4.4 show how questions can be developed for TP purposes.

Criteria	Questions
Relevance	<ul style="list-style-type: none"> <li>- To what extent terminology activities correspond with the needs and practical requirements of the sociopolitical contexts in which they apply? (sociolinguistic level)</li> <li>- To what extent do the objectives of TP correspond with the objectives of language policies? (sociolinguistic level)</li> <li>- To what extent does the basic approach towards terminology development and standardization correspond with the most recent studies in terminology? (theoretical updates)</li> <li>- To what extent terminology activities correspond with the needs and practical requirements of the domains and target users? (socioterminological level)</li> <li>- Were interventions in some domains more successful and appropriate than in other domains? (socioterminological level)</li> </ul>
Efficiency	<ul style="list-style-type: none"> <li>- Were the resources and inputs efficiently used to achieve results? <ul style="list-style-type: none"> <li>o Criteria used in the selection of terminological input</li> <li>o Criteria and guideline used in the process of standardization</li> <li>o Use of progress and achievements monitoring</li> <li>o Coordination of the technical committees' activities</li> <li>o Appropriateness of the institutional resources to the terminological needs of committees</li> </ul> </li> </ul>
Effectiveness	<ul style="list-style-type: none"> <li>- To what extent were the originally defined objectives of TP realistic? To what extent have the objectives of the TP been achieved?</li> <li>- What factors were crucial for the achievement or failure to achieve the TP objectives so far (indication of strengths and weaknesses, e.g. the monitoring and evaluation system)?</li> <li>- What are the contributions of interventions of an authoritative body for achieving the objectives of the terminology standardization?</li> <li>- What are the contributions of interventions of an authoritative body for achieving the objectives of the terminology dissemination?</li> <li>- What are the contributions of interventions of an authoritative body for achieving the objectives of the terminology implantation?</li> <li>- Has the authoritative body contributed to the improvement of the terminological awareness?</li> <li>- Has the authoritative body contributed to the improvement of the terminological resources?</li> </ul>

Criteria	Questions
Impact	<ul style="list-style-type: none"> <li>- What has happened as a result of the plan?</li> <li>- Does the organizational intervention contribute to the achievement of terminology development?</li> <li>- To what extent the TP intervention created structure and/or had a broad effect/impact regarding modeling, criteria or success indicators (e.g. adaptation among other centers and organizations)?</li> <li>- What would the development have been like without the authoritative body's interventions?</li> </ul>
Sustainability	<ul style="list-style-type: none"> <li>- Are the positive effects sustainable?</li> <li>- To what extent will activities, results, and effects be expected to continue?</li> <li>- To what extent does the TP intervention reflect on and take into account social and cultural aspects?</li> <li>- How stable is the situation in the surrounding field of the TP intervention regarding social justice, economic efficiency, and political stability?</li> <li>- What risks and potentials are visible regarding the sustainable effectiveness of the TP and how likely is their occurrence?</li> <li>- Will the effectiveness of the TP interventions most likely improve or worsen in future?</li> <li>- To what extent did the TP system improve the overall terminology situation?</li> </ul>

Table 4.3. Examples of questions in TP evaluation corresponding to evaluation criteria<sup>24</sup>

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<sup>24</sup> This table is adapted to the TP context by the author, based on the information provided by *Guidelines for Project and Programme Evaluations* (UNDP, 2009) and *DAC Criteria for Evaluating Development Assistance* (DAC).

For defining the context, the following questions are proposed:

What is the terminology setting within which the TP is implemented? (i.e. regional, national, international)
How might factors such as history, geography, sociolinguistic, political and economic conditions affect implementation of the TP, its strategy, its outputs or outcomes?
How do the evolving sociopolitical, social and organizational circumstances affect the decision-making and desired outcomes?
How might the context within which the evaluation is being conducted (for example, cultural language, institutional setting, community perceptions, etc.) affect the evaluation?
What is the surrounding policy or political environment in which the TP should be implemented?
How might current and emerging policy alternatives influence outputs, outcomes, and impact?

Table 4.4. Examples of questions regarding the context

### 2.3. The sources and methods

The evaluation process needs an elaborate structure that specifies the methodology and the data needed “to address the evaluation criteria” and “answer the evaluation questions” (UNDP, 2009, p. 172). This structure should also reflect the connectedness of the subsystems and levels; and, it can serve either to illustrate and justify the procedures or to interpret the data.

In Chapter III five key evaluation-relevant data are identified which have been addressed in the literature thus far (i.e. input, output, activities, outcome, and impact). It is important to show how these data can be associated with the criteria within a methodological framework and to describe the application of method or methods due to each criterion.

Outputs are the results which can be achieved in short-term plans. In this methodology proposal, I use output to refer to basic and short-term achievements that guide or facilitate the outcomes; i.e. guidelines, methodologies, and criteria as well as processed and verified terminological resources used by the authoritative body. By outcome I refer to the mid-term achievements.

Outcomes are standardized terms, resource development, or any services or dissemination success resulted from the systematic

activities. Whereas, the impact of TP process is the long-term achievement of the implantation of standardized terms, or successful interventions resulting in model proposals and best practice examples. Table 4.5 shows the relation between needed data types and the methods that can be employed for assessing each criterion.

Criteria	Key data interactions	Information	Methodology	
Relevance	context ↔ input ↔ activity	<ul style="list-style-type: none"> <li>▪ Objectives</li> <li>▪ Sociolinguistic characteristics</li> <li>▪ Context</li> <li>▪ Socioterminological demand</li> <li>▪ Requirements' identification</li> <li>▪ Language conditions</li> </ul>	Systemic approach <ul style="list-style-type: none"> <li>▪ Linguistic</li> <li>▪ Sociolinguistic</li> <li>▪ sociocultural</li> <li>▪ sociocognitive</li> <li>▪ Prospective socioterminological studies</li> </ul>	
Efficiency	input ↔ activity ↔ output	<ul style="list-style-type: none"> <li>▪ Infrastructure model</li> <li>▪ Workflow</li> <li>▪ Systematization</li> <li>▪ Guideline and standardization criteria</li> <li>▪ Term-formation methodology</li> <li>▪ Monitoring guideline</li> <li>▪ Coordination procedure</li> <li>▪ Terminology database gathering methodology</li> </ul>	Systematic approach <ul style="list-style-type: none"> <li>▪ Institutional performance analysis</li> </ul>	
Effectiveness	output ↔ activity ↔ outcome	<ul style="list-style-type: none"> <li>▪ Standardized terms</li> <li>▪ Resource development</li> <li>▪ Training activities</li> <li>▪ Dissemination approach</li> <li>▪ Services (e.g. research supports, funds, etc.)</li> </ul>	Systematic approach <ul style="list-style-type: none"> <li>▪ outcome-oriented analysis</li> <li>▪ Document analysis</li> </ul>	

Qualitative &amp; Quantitative

Impact	outcome ↔ impact	<ul style="list-style-type: none"> <li>▪ Implanted terms</li> <li>▪ Model proposals</li> <li>▪ Best practices (if apply)</li> <li>▪ Feedbacks</li> <li>▪ Available results of finished implantation studies</li> </ul>	<ul style="list-style-type: none"> <li>▪ Retrospective socioterminological studies</li> <li>▪ Field research</li> </ul>	
Sustainability	impact ↔ context		Generative evaluation	

Table 4.5. Criteria and examples of corresponding data and methodology involved



## 2.4. Procedure

Table 4.5 reveals the integration of distinct levels of TP system that are relevant for the implementation of a holistic evaluation. In particular, the key data and the methodology involve four main levels (Figure 4.2):

a) *Systemic level*: Consists of the politics, sociolinguistic exigencies, sociocultural forces and forces in relation to the language associated with a system-wide level. At this level, a set of external constraints affecting the dynamics of terminology and planning, in particular, can be visualized.

b) *Systematic level*: Consists of the institutional and organizational aspects of TP, the functionality of entities in charge of terminology production. On the one hand, this level should conform to the systemic needs; and on the other hand, it should be structured efficiently and effectively to meet the institutional goals.

c) *Socioterminological level*: The terminological context in a certain society that orients the actions and decision-making at systematic level by exposing terminological needs; and, at the same time, it is affected by the systematic and systemic level. Therefore, the socioterminological level has two predicates:

- i) terminological needs
- ii) terminological impact

The latter is addressed in the literature and by empirical implantation research titled as “terminometric studies” (as it is understood in Quebec and Catalan contexts) [retrospective studies<sup>25</sup>]. Whereas, the former refers to the evaluation of the terminology work in regard with anticipation of needs and expectations underpinning the objectives and strategies in TP process. This analysis includes the research to identify and

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<sup>25</sup> In this thesis I rather use *retrospective studies* as an umbrella term for all studies based on the use of standardized terms and not only those that fall into the terminometric protocol.

detect the terminological needs in domains of studies [prospective studies] for future activities.

d) *Generative level*: The generative level surrounds the interaction among the three above mentioned levels; e.g. cultural behavior, political conditions psycholinguistic factors (including latent or hidden variables). The sustainability criterion falls into this level affected by generative values and underlying dispositions on the one side and reflecting the functionality of other levels on the other side. For the sake of the limited time and resources, this thesis does not focus on this level. However, it is considered as the part of the evaluation model to give a better explanation on the interactions among all levels.

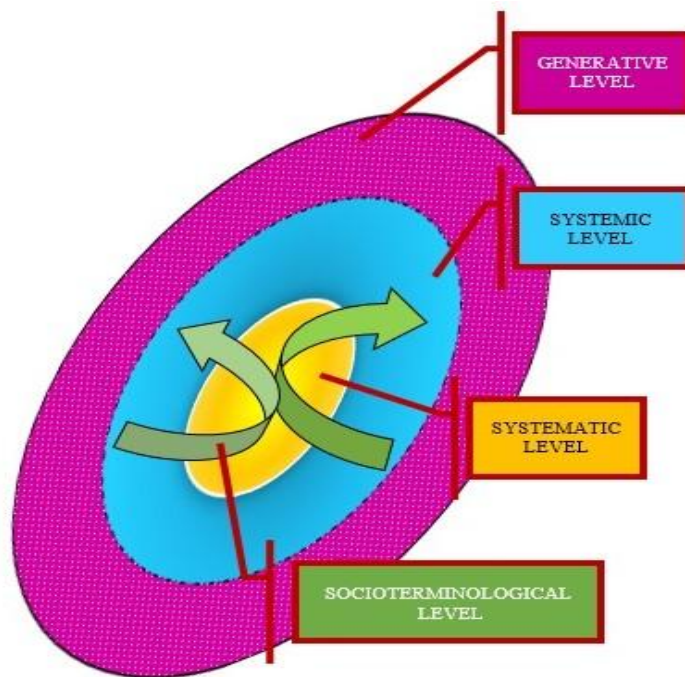


Figure 4.2. Interactions among TP levels<sup>26</sup>

<sup>26</sup> The purpose of this thesis is not designing a model for TP. However, a simple visualization felt necessary in order to show how different elements are affected by their contexts and levels. Further research and study is needed to elaborate this model.

To implement the evaluation process in a complex system (or multi-level systems) the data obtained from each level should be observed attentively considering their connectedness to the whole system. However, for reporting the final evaluation results, the results should be classified corresponding the criteria. In other words, analysis at each level should be managed due to the corresponding criteria and look for the answers to the questions prepared for each.

At the systemic level, the relevance of the context and input to the activities and goals should be observed. At the systematic level, the interactions among input, activity, output, and outcome represent the efficiency and effectiveness of the TP process. At socioterminological level, corpus-based studies can provide the most relevant information on the relevance of the decision-making and strategies to the terminological needs on the one hand, and on the other hand, show the impact of the efforts based on retrospective studies. The main characteristics of such procedure are as follows:

1. It covers all stages required to obtain the relevant information from distinct levels.
2. It is based on the theoretical discussions and standards of terminology context to ensure the quality and effectiveness of the process.
4. It is a practical and feasible solution to obtain the most relevant information in a complex system such as TP wherein interactions among various aspects are constant and nonlinear.

## 2.5. The standards

In Chapter III, success indicators are presented. The existence of constant monitoring (Auger 1982, p. 52; Cabré 1998, p. 20) and implantability of standardized terms (Auger 1994), locally pre-specified criteria (Fishman 1974, p. 26), controlling and tracking the activities to identify the trends and patterns (Cabré 1999a, p.20; Quirion 2003) and corpus-based evaluation (Cabré 1999a, p. 20) can indicate if a TP system can successfully function. Nevertheless, it is assumed that such standards should be established by the standardization centers specifically to conduct evaluation processes

which are not available at this moment. Table 4.6 shows some examples of success indicators that can be used in TP evaluation.

Criteria	Additional information	Success indicators
Relevance	<ul style="list-style-type: none"> <li>▪ objectives</li> <li>▪ sociolinguistic characteristics</li> <li>▪ context</li> <li>▪ socioterminological demand</li> <li>▪ requirements' identification</li> <li>▪ language conditions</li> </ul>	<ul style="list-style-type: none"> <li>- relevance between sociolinguistic needs and LP objectives</li> <li>- relevance between TP objectives and LP objectives</li> <li>- relevance between terminological needs and standardized terms</li> <li>- conducting research to identify terminological requirements</li> <li>- revisions based on independent evaluations</li> </ul>
Efficiency	<ul style="list-style-type: none"> <li>▪ infrastructure model               <ul style="list-style-type: none"> <li>▪ workflow</li> </ul> </li> <li>▪ systematization</li> <li>▪ guideline and standardization criteria</li> <li>▪ term-formation methodology</li> <li>▪ monitoring guideline</li> <li>▪ coordination procedure</li> <li>▪ terminology database gathering methodology</li> </ul>	<ul style="list-style-type: none"> <li>- coordination among sectors</li> <li>- the existence of term formation methodology</li> <li>- locally established guidelines and criteria</li> <li>- the existence of monitoring guidelines</li> <li>- the existence of terminology databases</li> <li>- updating terminology databases</li> <li>- the positive role of the coordinators in solving problems</li> </ul>
Effectiveness	<ul style="list-style-type: none"> <li>▪ standardized terms</li> <li>▪ resource development</li> <li>▪ training activities</li> <li>▪ dissemination approach</li> <li>▪ services (e.g. research supports, funds, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- the quantity of standardized terms</li> <li>- developing terminological resources based on standardization outcomes</li> <li>- effective dissemination modes</li> <li>- providing funds or supporting terminological research</li> <li>- planning for poll or any consultation opportunity for updating standardized terms</li> <li>- supporting implantation studies</li> </ul>

Impact	<ul style="list-style-type: none"> <li>▪ implanted terms</li> <li>▪ model proposals</li> <li>▪ best practices (if apply)</li> <li>▪ sociocultural feedbacks</li> <li>▪ available results of finished implantation studies</li> </ul>	<ul style="list-style-type: none"> <li>- positive implantation reports</li> <li>- existence of models, activities or mechanisms presented as the best practices</li> <li>- positive feedbacks from the society</li> <li>- positive feedbacks from the specialists</li> <li>- positive reporting in social media</li> <li>- publishing the implantation results</li> <li>- using evaluation results to update standardized terms</li> </ul>
Sustainability	<ul style="list-style-type: none"> <li>▪ the results from all above mentioned aspects</li> </ul>	<ul style="list-style-type: none"> <li>- being relevant, efficient, effective with a positive impact</li> </ul>

Table 4.6. Evaluation standards

## 2.6. The evidence

In “*Results-Based Management Handbook*” (*RBM Handbook*) (UNDG 2010, p. 26) three key functions of evaluations are identified:

- (1) Utilization. As an input to provide decision-makers with knowledge and evidence about performance and good practices;
- (2) Accountability. To donors, funders, political authorities, stakeholders and the general public, and
- (3) Contribution. To institutional policymaking, development effectiveness and organizational effectiveness.

These key functions shed light on the importance of validity and reliability of the evidence presented and reported in any evaluation. It is important to describe precisely what resources are used and what evidence is obtained in relation to each criterion. In UN documents a balance between positive and negative evidence is also recommended. The main application of the evidence is in follow-up process wherein the institutions and authoritative bodies can benefit

from the evaluation results to revising their activities (UNEG<sup>27</sup> 2010, p.4).

Given the implication of the evaluation in general, in TP evaluation an explicit report on the evidence is suggested. Evidence based on reliable theoretical and empirical research is entailed as well as verifiable institutional facts such as documented outputs, outcomes, workflow, published guidelines and explicit policies or strategies. In other terms, individual interpretations or implicit policies cannot be relevant to be used in an evaluation.

### 3. Synthesis

In this chapter, the evaluation elements in development programs have been studied to design an interdisciplinary framework for evaluation implementation in TP. In many aspects, the elements identified in the terminology literature match the elements from development programs and are harmonious. This sheds light on the position of TP in development horizons.

The next chapter deals with the analyses carried out in Persian terminology context to verify how these elements practically guide, and to what extent they can be implemented.

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<sup>27</sup> United Nations Evaluation Group

## CHAPTER V. ANALYSES

In this chapter, the methodological framework proposed in Chapter IV is employed to carry out a holistic evaluation on TP in Iran. For the purpose of this thesis, this chapter is organized into four sections:

1. Systemic analysis
2. Systematic analysis
3. Corpus-based analysis
  - 3.1. Review
  - 3.2. Retrospective analysis
  - 3.3. Prospective analysis
4. Concluding remarks

Each section starts with its objectives, and it is followed by the corresponding criteria and questions. At the end of each section, a brief synthesis is given to conclude about the discussed topics. In the section “*systemic analysis*” the activities on terminology, policies, LP, TP and some linguistic and political movements that have affected the terminological activities in Iran are described. The approach is both diachronic and synchronic. In the second section, i.e. “*systematic analysis*”, efficiency and effectiveness of the terminological activities at the current Academy of language are questioned.

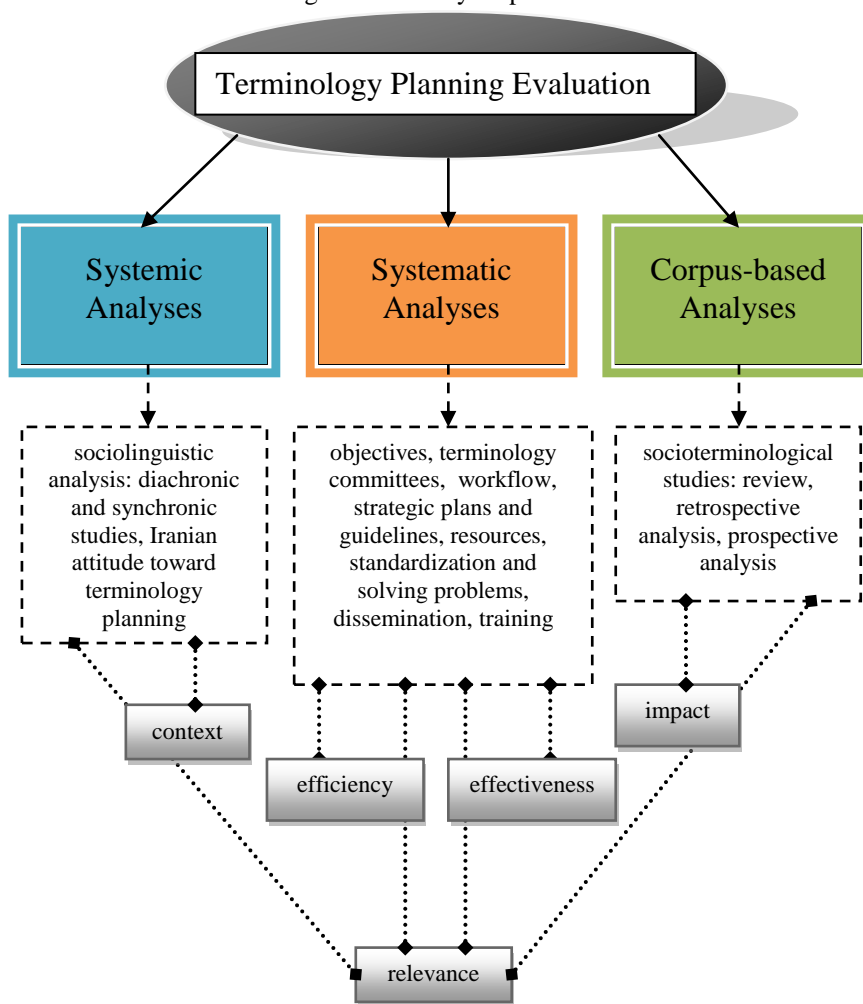
The third section analyzes the impact of the done terminological activities in a selected domain on the one hand, and the relevance of the ongoing projects and activities to the terminological needs in the same domain on the other hand. Hence, it deals with socioterminological studies in the Persian context. However, a review of the previous empirical studies is also presented for some important reasons that come as follows:

- Comparing the methodologies applied in the studies and observing if they have followed common methodological protocols or not.

- Analyzing the factors that have been identified in various subject fields and comparing those factors with the final results of my analyses.
- Observing if these studies have been supported by either the public sectors or the current Academy of language.

Figure 5.1 visualizes the organization of this chapter and the relation among sections to conduct the evaluation.

Figure 5.1. Analyses procedure





## 1. Systemic analyses<sup>28</sup>

This section aims to conduct an evaluation of some aspects of the relevance criterion on Persian terminology in Iran. For this purpose, both approaches diachronic and synchronic have been employed to collect relevant information on the context and current situation.

To evaluate the relevance of terminology works in Iran to its context, following questions are drawn:

Criteria	Questions
relevance	<ul style="list-style-type: none"><li>- To what extent terminology planning in Iran conform to its proper needs and practical requirements of the sociopolitical contexts?</li><li>- To what extent do the objectives of TP in Iran correspond with the objectives of its language policies?</li></ul>

Table 5.1. Questions for conducting systemic analyses in Persian terminology

The methodology is descriptive and through this analysis information and evidence about the sociolinguistic situation, the background, movements, language policy and language planning objectives are collected and presented. Regarding the context, elements such as history, geography, language policies, and planning are addressed to clarify the overall setting in which the TP is implemented.

This section first sketches a brief historical overview of terminology evolution and Iranian linguistic movements which have contributed to give terminology in Iran its current and special character. Then it presents those aspects of Persian terminology which are relevant to language planning to broaden our perception of the current situation of terminology in Iran.

Although it is not the purpose of this section to do a sociopolitical analysis, I address some political changes over the history to identify those factors which have contributed to form linguistic

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<sup>28</sup> Some parts of the historical backgrounds of the academies in Iran are used in “*Towards a Methodology for Performance Evaluation in Terminology Planning*” (Fathi 2017).

movements in Iran and to show how these movements left some footprints on the path of perception of terminology in Iran thus far.

## 1.1. From lexical modernization to terminology planning

Terminology activities and linguistic efforts for replacing foreign words with newly coined Persian words never had a same attitude towards the language, neither have they been established for similar motivations or in similar situations. That is the reason that in spite of a long history of terminological works in Iran we cannot track a similar strategy or expect a univocal policy. For observing and analyzing the tendencies or differences between periods of terminology activities in Iran, one needs to recognize needs and values of each period.

### 1.1.1. Lexical modernization

“Conquest is a, or the, cause of language endangerment and death if the conquerors’ language replaces the language(s) of the conquered” (Thomason & Grondona, 2015, p. 19). This was what would have happened for the Persian language during the domination of Arabs in Iran.

Fortunately, after two centuries during the ninth century, Persian regained its validity “as a language of poetry and epics”, albeit many Arabic borrowings entered Persian as “potential loanword in literary Persian” (Paul, 2010, p.80). Its old tradition and being “one of the three most important written languages in world history” can explain the resistance and Persian survival in literature (Schiffman, 2011, p.116).

Logically, acceptance of Arabic loan words initially was due to adaptation and conservation of Persian language against Arabs cultural invasion. The same story happened in religious ideologies, namely, adaptation of pre-Islamic Iranian religions to Arab’s Islam which resulted in a new and Iranian version of Islam.

The language also has undergone inevitable changes to survive. In other words, Iranians had accepted Arabic loan words but gradually intended to replace Arabic words by originally Persian words which finally caused contemporary Persian with adapted Arabic script.

The efforts of coining new words in scientific fields and replacing Arabic terms with Persian terms have been started from centuries ago (circa 11<sup>th</sup> century) by Avicenna and Al-Biruni (Perry 1985, as cited in Marszałek-Kowalewska, 2011, p. 94). However, official terminology work “dated back to Naser al-Din Shah Qajar, around 130 years ago” (Rustaei 2006, as cited in Zarnikhi 2010a, p. 1).

Educational exchanges between *Dar al-Fonun School* (House of Techniques), founded in 1851, and western universities resulted in “translation movement”. Graduate students from Western universities started translating scientific textbooks into Persian and preparing specialized dictionaries and glossaries to transfer their knowledge to Iranian students (Azizi, 2012).

It was from this movement that the urgent need for Persian equivalents felt by scholars and caused consequent linguistic movements, like purism.

Purism is one of the most important linguistic movements in Iran, starting before Constitutional Revolution and going on afterwards by literary societies whose objective was to coin new words for new concepts and ideas mainly by replacing Arabic words with pure Persian words (Mehrdad, 1998, as cited in Marszałek-Kowalewska, 2011, p. 95). This movement has roots in nationalism<sup>29</sup> and still has advocates and followers amongst scholars and intellectuals who believe Persian language should be renovated by the use of pre-Islamic and *pure* Persian words.

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<sup>29</sup> Iranian nationalism is not entirely a consequence and reaction against western imperialism in Iran. It has a long history in tradition and literature. However, this nationalism movement in twentieth century is the spirit of Iranian nationalism intensified by the atmosphere of chauvinism in France after the Franco-Prussian War which impressed Iranian young students and intellectuals who went to Europe for academic purposes (*The modernization of Iran 1921-1941*, Amin Banani 1961, p. 14).

Simultaneously, the Persian language was influenced by the French language, not only for academic exchanges but also for cultural exchanges, as for Iranians, French culture was “the most important model of modern secular culture” (Marszałek-Kowalewska, 2011, p. 91).

Regarding the role of Constitutional Revolution in linguistic movements, according to Karimi-Hakkak (1989), the Revolution in 1906 demonstrated an urgent sociopolitical need for language reform. This reform prompted a great deal for replacing Arabic words (used for old sociopolitical concepts) with newly combined Persian words (for new imported concepts from French culture) by using classical Persian stems:

In translating the ideals of French Revolution into their equivalents within the Iranian context, the Constitutional Revolution in 1906 had brought with it new legal, political and social institutions that needed to be called by new names...

Nevertheless, the common denominator in such early neologisms, the use of a combination of classical Persian affixes and nouns, was to remain constant in a great many subsequent coinages. In its almost constant utilization of classical native resources the fact of word coinage provided the first links between the need for the modernization of Persian and a growing tendency toward language purification. (Karimi-Hakkak, 1989, p. 88).

After Constitutional Revolution, the most important political change which has marked terminology history of Iran is the modernization of the army (1925-1941). It brought about a demand “for replacement foreign words with Persian equivalents in Army and Police.”

This need resulted in forming a specialized committee in the army whose objective was “Persianization” and “translating military rules and ranks” (Marszałek-Kowalewska, 2011). In this process also purism showed a great success and many coined words have been accepted by the majority of the society and came into everyday use effectively.

### 1.1.2. The first Academy

A significant change that prompted the establishment of academies in Iran is educational reform started during the years 1925-1930.

“A uniform school curriculum on the French model and emphasizing academic training was adopted. In 1928 foreign and private schools were required to teach in Persian and follow the public school curriculum. Another 1928 law provided for sending Iranian students abroad each year.” (Keddie & Richard, 2006, p. 91).

Education system principally based on French education system confronted with new curriculum and hence new concepts from western science and expectedly new foreign terms. At the same time for training experts in various domains of science and technology, young students have been encouraged to go to other countries to improve and expand their knowledge.

During the Pahlavi period, the idea of transforming social, economic, military, and cultural institutions in the country, and the shortage of an expert workforce to effect these changes, made it necessary for young people to revitalize the idea of going to other countries to pursue their education. (Riazim 2005, p. 105)

Intercultural relations increased by academic and cultural exchanges significantly showed a lexical deficit for the Persian language in scientific domains. Consequently, in 1935, the first academy, called *Færhaengestan-e Iran* (Iranian Academy<sup>30</sup>) was established in 1935. This academy “modelled organizationally after the *Académie Française*” (Karimi-Hakkak, 1989, p. 91), and inspired by political and social and language reforms in Turkey (Paul, 2010, p.81), started working with these objectives:

“Protection and promotion of the Persian language, with the aim to locate or make appropriate equivalents for popular foreign words, which included scientific terms”

(Azizi, 2012, p. 61)

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<sup>30</sup> In Marszałek-Kowalewska (2011) the first Academy is called *Iranian Academy of language* but the correct name according to the official web page of the APLL and Sadeghi (2001) is *Iranian Academy*; the second Academy is called *Iranian Academy of language*.

“To compile a list of classical and dialect words, compile a Persian dictionary, standardize the derivational morphology, and, most importantly, coin and propose new Persian terms”;

“To set rules of creating these new words”

(Perry 1985, as cited in Marszałek-Kowalewska, 2011, p. 96)

One of its linguistic achievements was a set of rules by Foroughi (president of the Academy<sup>31</sup>), referring to specific situations in which selecting between Arabic or Persian coinage might be crucial.

Very similar criteria also proposed by Esmail Mera't (another president of the first Academy) in which classifies four groups of situations for decision making about loan words and new coinages in Persian corpus (Marszałek-Kowalewska, 2011, p. 97):

1. Arabic words used for a long time (acceptance)
2. Heavy Arabic words (replacement)
3. Internationalism (acceptance)
4. European words mainly from technology (replacement)

Another achievement was the significant amount of Persian equivalents and their successful implantation over the time:

Until 1941, the major achievement of the First Academy was the designation of 2000 Persian equivalents for popular Arabic, Turkish, English and French words as well as medical scientific terms, most of which were gradually popularized in the Persian texts (Azizi, 2012, p. 61).

Confirming the success of the first Academy, Kafi (1992) has reported that in Army 90% of the Persian equivalents coined by the first Academy has implanted successfully and are still in use (as cited in Khormai 2008, p. 80). Kafi believes that power and authority played the leading role in this success.

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<sup>31</sup> Also Iran's prime minister, a renowned literary historian (Paul, 2010)

Although purism movement had shown positive impacts and success through previous efforts, the first Academy approach was in favor of moderation and gradualism for maintaining the connection between intellectuals and average people. Thus, its tendency was concentrating on contemporary Persian and its shortcoming instead of replacing all Arabic words and elements.

Foroughi believed that replacement of those “words with Arabic origin, naturalized in Persian through centuries” will be “an exercise in impossibility” since it is a “result of a complex of historical and cultural occurrences” (Karimi-Hakkak, 1989, p.97).

Due to the influence of personalities like Foroughi, words of Arabic origin were not deleted excessively, and the number of proper “inventions” of words by the first Farhangestān was rather limited. Farhangestān preferred words of Iranian origin that had existed in classical literature but fallen into disuse, partly by means of re-semanticisation, i.e. by assigning to them new meanings. (Paul, 2010, p. 81)

Despite its great success, the first Academy stopped its terminology activity in 1941 and finally in 1953 was shut down. Nevertheless, as the first official organization in language planning and terminology, the first Academy has left a big influence on terminological works in Iran afterward.

It was the first real attempt in terminology since we can consider former attempts simply as lexical modernization. Councils and committees constituted of specialists and linguists, awareness about sociolinguistic demands, and providing an interactive environment for linguistic research are good evidence.

This academy, as the main entity for language decision-making, played an effective part in linguistic research and language behavior regarding potentialities and capabilities of Persian Language:

A major part of *Farhangestan*'s energy ought to be channeled toward research into the capabilities of Persian, to uncover the rules according to which this language behaves and form there to reach conclusions about its potential for word coinages (Karimi-Hakkak, 1989, p. 97).

Besides, the organizational model of the Iranian Academy is what is practiced so far by other Academies in Iran with very small changes. The first Academy attitude is acknowledged for many aspects; first for its systematized endeavors in terminology, second for its sociolinguistic and socio-terminological approach, third for its rational approach that deliberately separated the concept of Iranian identity and religion from Arabic elements in the language. The latter is still one of the premises of the current Academy (third Academy).

However, the first Academy confronted waves of criticisms from literary men to the religion leaders (for further readings: Karimi-Hakkak, 1989; Sadeghi, 2001).

### 1.1.3. The second Academy

After years, the second Academy, *Færhængestan-e zæban-e Iran (Iranian Academy of language)*, founded in 1971 to fulfill all current and future linguistic needs of scientific and technical fields by *maintaining* Persian language (Karimi-Hakkak, 1985, p. 102). This academy was only active from 1969 till 1979 for political changes and Islamic Revolution. However, there are around 35000 coinage proposals for 15000 foreign terms with a tendency to Persian purification. According to Sadeghi:

Apart from a few pamphlets comprising a number of accepted and finally approved words, other proposed words never appeared. However, the first published booklet of the Academy's coinings provoked intense reactions on the part of some linguists and men of letters.

For, contrary to the initial aims of the Academy, to the effect that the Academy's first priority is to choose and coin equivalents for newly arrived foreign words, most of its efforts were to replace old Arabic or Western words. Moreover, most of its suggested words were opaque and unintelligible even for educated people (Sadeghi, 2001, p. 27).

Despite the opaque and unintelligible formation, these proposed equivalents are still under study in the terminology committees of the third Academy. Wherever they seem to be appropriate for



replacing foreign terms and borrowings, the committees would consider and observe the possibilities.

Therefore, although taking the purism approach and the short course of activities caused an unsuccessful profile at that time, the terminological proposals of the second Academy are considered among lexical and terminological resources for their formation mechanisms and the use of classical Persian stems.

According to Azizi (2012, p. 62), “the first and second academies were actually the forerunner of the third Iranian Academy that was established eight years after the Islamic Revolution of 1979.”

#### 1.1.4. The third Academy

After Islamic Revolution, a new institution was issued with the main task of term formation called Academy of Persian Language and Literature (APLL). The establishment of the Academy was the result of the Iran’s constitution. On the one hand the Persian language is recognized as the official language of Iran; and on the other hand, the Arabic language is also considered as the first foreign language which should be taught at schools.

The statutory entity primarily responsible for terminology activities for Persian, currently, is the APLL. In 1990, the Supreme Council of the Cultural Revolution (SCCR), for maintaining, enriching, and disseminating Persian in general; and, for equipping it to meet the cultural and scientific and technical needs in particular, approved the statute of the APLL.

The first president of the APLL was Hasan Habibi. He held a doctorate of law and sociology from France and was one of the important figures of Islamic Revolution and one who was also asked for drafting the prospective constitution of Iran<sup>32</sup>. Undoubtedly, for his background and his positions, he had a big influence on language policy of Iran. Currently, the president of the

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<sup>32</sup> The final edition of constitution of Iran had many changes; however Hasan Habibi had a significant role in drafting current constitution. The main part of the prospective constitution of Iran was based on constitutions of other countries, but mainly inspired by current republican constitution of France (Fifth republic).

Academy is Gholam-Ali Haddad-Adel, an Iranian philosopher, politician and former chairman of the Parliament.

The APLL consists of thirteen research groups and departments like lexicography, contemporary literature, comparative literature, and so on; and, among these departments, Terminology Department started its activities in 1992 with coining Persian equivalents for general foreign words.

In the beginning, seventeen experts and leading specialists in the field of language and literature have been selected and presented to the president as the main members of this newly-constituted language body. According to the official web page of the APLL, the Academy's goals are as follows<sup>33</sup>:

- To preserve Persian and advance its capabilities, in accordance with the development of science and technology, to meet present era requirements.
- To protect the authenticity of the Persian language, as one of the pillars of Iranian national identity and the second language of Islamic world;
- To enrich the language's capacity to express scientific and literary thought;
- To promote Persian language and literature inside and outside Iran.

The approach of the third Academy toward the language is similar to the first Academy<sup>34</sup>. In other terms, the third Academy deliberately avoids purification of contemporary Persian and focuses on *Persification* of Persian words.

As it was during its first phase, the approach has been rather pragmatic and cautious so far, dealing mostly with modern words from technical and scientific fields and trying to avoid harsh or

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<sup>33</sup> Translated by Akbari (2014, p. 41); The extended information (in Persian) is available in the official webpage of the Academy:

<http://www.persianacademy.ir/fa/VG.aspx>

<sup>34</sup> As it is discussed earlier, the manifest ideology of the first Academy, or what it was supposed to happen, was purification of the language; however the practice was more moderate and conserved.

excessive measures against well-established words of foreign origin. (Paul, 2010, p.82)

### 1.1.5. Other institutions

There are other organizations which also contribute to terminology development. Institute of Standards and Industrial Research of Iran (ISIRI) which is active in many ISO technical committees and subcommittees joined ISO in 1960, and one of its responsibilities is translation of the standardized technical terms by ISO.

Nevertheless, ISIRI is not responsible for terminological works on a big scale, and its focus is on industrial standardization. The committees and groups at ISIRI have to use standardized terms of the APLL in their documents. The final translated documents also are reviewed by the APLL's researchers.

Another body which deals with terminological works is Iran University Press (IUP) which broadly works in publishing and editing academic books and dictionaries. There are technical committees at IUP where specialists work on technical vocabulary in different fields of studies. In the process of term selection at APLL, final results and published glossaries of IUP are among the reliable materials.

It is worth noting that these institutional activities are not organized in a network format, and coordination among them is limited to some consultations. The lack of systematization and active collaboration among the Academy and other institutions can bring about barriers to terminology dissemination as well as inconsistency in the context of TP.

## 1.2. Iranian attitude toward terminology planning

“Terminology work throughout the world reflects the needs it is designed to meet” (Rousseau, 1993, p. 38). Therefore, studying the history of terminological activities in a specific social context, first, can show those needs that terminology work was supposed to fulfill; and second, studying terminology practices can reveal if

their orientations functioned effectively or not. Rousseau (1993, p.38) distinguishes four distinct practices due to the particular needs in different contexts<sup>35</sup>:

- a) Practices common among technical standardization organizations, characterized by the creation of systems of concepts and terminological systems (Structured by the Soviet school and Wüster)
- b) Practices arising from translation, based on inter-linguistic terminological studies which seek to establish equivalences between the terminologies of different languages
- c) Studies describing terminology, based on linguistics and deal with term formation and the meaning of terminological units
- d) Terminological planning, falling within language planning or within a social development project.

However, as it is stated by Rousseau as well, these attitudes in some cases are not clear-cut, and the inclusion of one does not imply the exclusion of the others. Iran to some extent has experienced almost all of these practices in different periods.

Terminology work in Iran has been started from a big shift in its status (language reform) which brought about an urgent need of modernization in its corpus. In the history of terminological activities in Iran, two most significant motivations can be detected:

- a) Lexical deficits in Persian language revealed in translations and knowledge transmission,
- b) Political forces of modernization;

Wherein, the latter gave rise to the former in some particular contexts like army or education materials. The diachronic study shows that terminological practices in Iran aroused originally from translation movements and then they involved in language reform

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<sup>35</sup> This classification, with some small differences, is close to the Cabré's idea, differentiating among attitudes toward terminology concept (Chapter.III- section 1.1, p. 29-30).

and policies, following by standardization practices as well as supporting studies on Persian formation resources.

Nevertheless, the dominant practice can be recognized as TP falling within language planning and social development project. After Constitutional Revolution all further activities have been authorized and governed by language academies.

### 1.2.1. Language policies

Language policy in Iran is manifested by two main Articles in the body of Iran's constitution. According to Article 15 and 16 of Iran's constitution:

Article 15: The official language and script of Iran, the lingua franca of its people, is Persian. Official documents, correspondence, and texts, as well as text-books, must be in this language and script. However, the use of regional and tribal languages in the press and mass media, as well as for teaching of their literature in schools, is allowed in addition to Persian.

Article 16: Since the language of the Qur'an and Islamic texts and teachings is Arabic, and since Persian literature is thoroughly permeated by this language, it must be taught after elementary level, in all classes of secondary school and in all areas of study.

(as cited in Marszałek-Kowalewska, 2011, p. 99)

These two Articles form the sociolinguistic image of the authoritative bodies in Iran and discard the purism approach. This approach is reflected in all documents of the third Academy as well.

Before Islamic Revolution, Iranian academies were established deliberately to fulfill communication needs with the aim of purifying the Persian language by revitalizing classical linguistic elements and replacing all foreign words including Arabic lexicon. Notwithstanding, the practice shows that sociolinguistic needs are satisfactorily fulfilled by a moderate and gradual approach.

Although the current policy of APLL (Persification instead of purification) has some ideological roots, it is a conscious decision making based on earlier experiments of previous academies. In other words, the relative success of the first Academy in its practical

methodology and implantation of approved terms has changed the status of purism amongst linguists and elites.

### 1.2.2. Terminology and language planning goals

As it is mentioned earlier, according to Nahir (2003), eleven language planning goals can be identified: language purification, language revival, language reform, language standardization, language spread, lexical modernization, terminology unification, stylistic simplification, interlingual communication, language, auxiliary-code standardization.

Language planning in Iran has never had one unique goal. The history shows that it was always dealing with a combination of language purification, language reform, lexical modernization, as well as stylistic simplification. However, according to Sadeghi (2001, p. 19), “language planning in Iran has been predominantly aimed at the modernization of Persian through word coinage.”

This domination is also reflected in terminology planning goals wherein the terminology works are characterized as *terminological modernization*, concentrating on terminology production.

### 1.2.3. Language of science policy

In *Terminology Guideline*, published by the APLL (2009), the language of science policies are called as *axioms* (literally translated) and are defined as principles that are stated or proposed after extensive debates and discussions, which are regarded as being established and accepted for a long period (if they are not permanent).

According to the guideline, these principles should be concerned from the beginning of any terminology work, and are as follows (my translation):

1. Scientific development entails language of science.
2. The language of science in Iran is Persian and should remain Persian.

3. The Persian language of science necessitates organized and systematized terminological activities<sup>36</sup>.

(*Terminology Guideline*<sup>37</sup> 2009, p. 11)

It is worth noting that in 2011 the Supreme Council of Cultural Revolution in Iran has published the “*The Document of the National Master Plan for Science and Education*”<sup>38</sup>. In this 20-year horizon, the role of the Persian as the language of science is stressed. Some of these emphases are as follows:

- Promoting the status of Persian language among international scientific languages (p. 12)
- Allocation of a considerable share of the programs of the National Radio and Television to topics relating to science and technology, couched in a simple language comprehensible to the public (p.29)
- Development of Persian language as an international scientific language (p. 45)
- Translation of Irano-Islamic scientific sources; and submission of Persian-language reference works, including the scientific publications and theories of the scholars of the country, to major centers and libraries of the world (p. 47)
- Expansion of the use of Persian language in specialized scientific fields, with an emphasis on the coining of conceptual synonyms for technical terms, and their promotion in scientific forums; and endeavor to transform the Persian language into the language of science (p.50)

Given the emphasis on the Persian language in this document, the APLL has also been accredited to compile “*The National Document of Persian Language Promotion*” which is supposed to be published in the near future.

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<sup>36</sup> The guideline uses the term “word selection” (literally translated). In this context, it refers to *terminological activities*. More explanations have come in the Section 2.1. (Chapter V, p. 144).

<sup>37</sup> Originally is titled as “*Osul va Zavabet-e Važegozini*”.

<sup>38</sup> <http://en.farhangoeim.ir/getattachment/National-Master-Plan-For-Science--and-Education/final-rahli2.pdf.aspx>

### 1.3. Synthesis

This section was an attempt to identify the relatedness of terminology planning in Iran to its language planning context in two ways:

The diachronic study reveals that TP in Iran is significantly affected by the sociopolitical changes. Modarresi also confirms this result (1993, p. 98) and states that “the sociopolitical changes in Iran have had considerable effect on the lexicon of Persian.” Although the language policies have not followed univocal strategies, they have been subjected to development policies.

The synchronic study shows that current TP in Iran follows the language policies. The recent efforts on drafting national documents and science promotion have prompted significant changes in the political attitudes toward the terminology science. TP in Iran is evolving into a substantial element contributing to the development plans. This situation, on the one hand, shows the delicate state of TP, and on the other hand, calls for a strategic managing.



## 2. Systematic analyses

This section aims to conduct an evaluation of efficiency and effectiveness of the terminology activities at the Terminology Department. For this purpose, it seeks answers to the following questions:

Criteria	Questions
efficiency	<ul style="list-style-type: none"> <li>- What are the operational objectives at the Terminology Department? (short-term objectives)</li> <li>- What are the strategic objectives at the Terminology Department? (long-term objectives)</li> <li>- Which criteria are used in the selection of terminological inputs (foreign terms)?</li> <li>- Which criteria are used in the process of standardization at the APLL? (terminology policies and term formation methodology)</li> <li>- Is there any monitoring function through the implementation of the activities? (supervisory board)</li> <li>- How can the monitoring function contribute to the final results? (correction, improving the records, coherency, etc.)</li> <li>- Is there any coordination among terminology committees? (coordination councils)</li> <li>- How can terminology coordination contribute to the final results? (reducing the problematic situations, regular meetings, etc.)</li> <li>- Do terminology committees benefit from appropriate resources for managing their term proposals? (paper-based or database, and updates)</li> <li>- Is there any mechanism at Terminology Department to solve terminological problems efficiently? (revisions and efficient coordination)</li> </ul>
effectiveness	<ul style="list-style-type: none"> <li>- To what extent short-term and long-term objectives have been achieved?</li> <li>- What are the contributions of interventions to achieve the</li> </ul>

	<p>objectives? (in standardization, dissemination and implantation)</p> <ul style="list-style-type: none"> <li>- Has Terminology Department contributed to the improvement of the terminological awareness? (dissemination function, supporting terminological researches)</li> <li>- Has Terminology Department contributed to the improvement of the terminological resources? (updates)</li> <li>- Is there any training activity for improving terminology knowledge of the current employees and educating future terminologists?</li> </ul>
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Table 5.2. Questions for conducting systematic analyses in Persian terminology

The methodology is descriptive and through this analysis information and evidence about the infrastructure model, workflow, guideline, procedures and mechanisms of terminology works at the APLL are collected and presented.

## 2.1. The concept of *važegozini* (word selection)

In research that I have done on the terminological variations in the *Terminology Guideline*, I have observed the meaning of “*važegozini*” (word selection) in different contexts (Fathi, 2016); and, the results show that this term stands for distinct meanings. However, this distinction is not explicitly defined in the original text.

In the organizational context, *word selection* is used to refer to terminology standardization or terminology activity in general. For instance, the “Department of *word selection*” in many contexts has been translated into the Terminology Department. However, the term is also used for the concept of term formation<sup>39</sup>. In the *Terminology Guideline*, when the *methodology of word selection* is described (2009, pp. 11-13), it can be understood as term formation methodology. Besides, when the *word selection criteria* is

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<sup>39</sup>Also translated as wordformation, word-selection, equivalent selection, equivalents formation (Parvizi 2004).

explained, it can be understood as terminology policies in the context of standardization (2009, pp. 13-14). Notwithstanding, the Guideline only provides one definition:

“*Važegozini*” is a process through which for a specific technical, scientific, professional or artistic concept a word (or in some cases more than a word) is chosen or created. (*Terminology Guideline* 2009, p. 9)

All of these inconsistencies have origins in the inadequacy and ambiguity of the *važegozini*. This term is coined for the first time in the context of the Academy’s activities and by the Academy’s members when there was another term “*estelah-shenasi*<sup>40</sup>” available in the Persian language standing for “terminology”. However, the Academy has created *važegozini*, for some reasons:

a) Applying *važe* (word) in a broader context referring to either word or term.

b) Applying *važegozini* for the terminology in practice, and applying *estelah-shenasi* for the terminology science.

However, these distinctions are not explicitly described and justified. In many cases, *važegozini* is neither clear nor transparent, so authors utilize other variations to explain their intentions (including *Terminology Guideline* represents a considerable amount of terminological variations for this concept).

Also, people who are not familiar with these contexts has started to coin “science of *važegozini*” (which is completely nonsense if we consider its origins and the history) and the relation between *estelah-shenasi* (terminology) and *važegozini* remains blurred. In addition, recently, they have started to use “*važe-shenasi*<sup>41</sup>” in some dissemination channels for the concept of terminology which complicates the situation more. Indeed, it is supposed that the Academy, as the center of standardization, should be a pioneer in the consistency in terminology use and vocabulary control.

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<sup>40</sup> *Estelah* (term)+ *shenasi* (-logy)

<sup>41</sup> Originally means and stands for lexicology.

For avoiding transmitting the same vagueness and inconsistency into this thesis, I rather use the frequent English terms instead of literally translating the Persian words. Besides, a short glossary is proposed in Table 5.3 that consists of some frequent concepts with their corresponding English terms to avoid misconceptions.

The translated variations are also presented for further comparison if it is needed. It is worth noting that all these variations are used by the authors who work or have been working at the Academy including the deputy director of the Terminology Department. In other words, these authors are familiar enough with the concepts and their references in the *Terminology Guideline*.

Table 5.3. Some frequent terms from the *Terminology Guideline* and their translated variations in English by Persian natives

<b>Persian Terms</b>	<b>Translated variations by Persian natives</b>	<b>My proposals</b>
važegozini 1	Word-Selection (Sadeghi 2001), terminological work (Ghanatabadi 2013)	terminology, standardization
goruh-e važegozini	word-selection department (Sadeghi 2001), Terminology Department (Akbar 2014; Parvizi 2004; Zarnikhi 2014), Terminology department (Fathi 2017)	Terminology Department
goruh-e tækhæso-si-e važegozini	technical committee for wordformation (Parvizi 2004), Terminology committee (Akbari 2014), terminology group (Zarnikhi 2010b, 2010a, 2014), scientific committee (Fathi, 2017)	Terminology committee
fæaliat-e važegozini	word-selection activity, terminology activity, terminology work, standardization, terminological work	terminology activity, terminology work, terminological activities
heiæt-e fanni	technical committee (Zarnikhi 2010a, 2010b), editorial board (Zarnikhi 2014)	supervisory board
osul væ zævabet-e važegozini	Principles and Criteria of word-selection, Principles and Criteria for Terminology, Principles and Regulations of Terminology, Official Persian Terminology policy principles (Akbari 2014), official	Terminology Guideline

	terminology policy and planning (Akbari 2014), principles and methods of wordformation and word-selection (Parvizi 2004), Word Selection Criteria, Word Selection Principles and Criteria (Fathi, 2017)	
osul-e mozue	- (literally means <i>axioms</i> )	language of science policies
važegozini 2	Word-Selection, wordformation, equivalent formation (Parvizi 2004)	term formation
moadel-yabi	finding equivalent, equivalent selection, equivalents formation, equivalent formation (Parvizi 2004)	- [I rather use the phrase “choosing equivalent”]
rævesh-e važegozini	term formation methodology (Akbari 2014)	term formation methodology
shive-e moadel-yabi	equivalent selection methodology	-
mænabe-e važegozini	terminological resources (Zarnikhi 2010b), term formation resources (Akbari 2014)	term formation resources
estelahshenasi	terminology	terminology, terminology science

In other contexts of this thesis, if it has been necessary to use the exact Persian terms, I left those terms literally translated and written *Italic* (e.g. Section 2.5.3).

## 2.2. Objectives

“The Terminology Department is one of the most active departments of the Academy and benefits from being well-known among the country’s authorities as well as ordinary people” (Akbari 2014, p. 42). The genuine aim of terminological activities at the APLL is to enrich the Persian language due to the increasing linguistic needs in cultural, scientific, and technical situations. Thus, we can perceive that the primary function of the terminology process at the Academy would be to facilitate the process of language modernization in two distinct use situations:

1. General use situation (corresponding to cultural needs)

2. Specialized use situation (corresponding to scientific and technical needs).

Objectives of a process usually define the tasks and operations which should be carried out. Then, by identifying the tasks, one can design and moderate the workflow. Hence, it is crucial to find out how declared duties of the Terminology Department orient the terminology process. According to the official web page of the APLL, main objectives (long-term) and duties of Terminology Department are mentioned as follows (my translation)<sup>42</sup>:

**Objective:** To empower, expand and equip Persian language to fulfill increasing cultural, scientific and technical needs, and to coordinate all activities in terminology and word coinage as well as finding equivalents for foreign words.

**Duties:** (a) Terminology management and planning (b) organizing the situation of imported foreign words into Persian (borrowed terms) and finding equivalents for them (c) to assist in standardization of technical and professional concepts and terms in the Persian language.

Regarding short-term objectives, Terminology Department has planned for the annual publication of standardized terms in various fields of study. Each Terminology committee is responsible for submitting around 80-100 proposals over an annual course of activities to the Terminology Council, and those approved proposals will be published in a collection of terms. Thus far 13<sup>43</sup> volumes are collected and published wherein near 60,000 standardized terms are presented.

It is worth mentioning that the annual quantity of standardized terms has risen dramatically over the recent years. Parvizi (deputy director of the Terminology Department) has reported that until 2003, 1717 terms had been coined:

APLL after eight years of Terminological activity has been able to form or select or coin 1717 terms equivalent to their foreign terms. These terms have been chosen from two fields of general and specialized terms. (2004, p. 377)

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<sup>42</sup> See also Akbari (2014, p. 42).

<sup>43</sup> Until 2016 (Spring)

This number increased up to near 34,000 terms in 2011 and around 51,000 up to 2015. In other words, the short-term objectives regarding the number of standardized terms have changed recently. In the beginning, the Terminology Department had fewer workforces and committees. Since 2007, some initiatives such as recruiting new workforces, outsourcing projects and increasing the Terminology Council's meetings have prompted major enhancement in the rate of standardized terms.

Moreover, the Academy has decided to publish special volumes once the standardized terms in some related domains (or a specific domain) reach the number 1000. For instance, two volumes of geosciences terms have been published that include all approved terms in oceanography, geology, geophysics, and meteorology from 1998-2013, called "*A Collection of Geosciences Terms*" [Vol.1 and Vol.2].

For realizing these objectives, the department has formulated *Terminology Guideline* (3rd edition, June 2009) containing information about terminology policies, term formation resources, term formation methods and standardization guideline.

Besides, it has designed its proper workflow to manage terminological activities effectively among different Terminology committees and councils. In other words, "the department fulfills its function through ensuring the cooperation among *terminology groups* [**Terminology committees**], the coordination council[s], the technical committee [**supervisory board**<sup>44</sup>] and the terminology council" (Zarnikhi 2010a).

### 2.3. Terminology committees

Terminology Department appoints various committees consisting of well-known and highly professional experts; and, one or two permanent moderators for each committee (researchers and linguists) will be responsible for managing the activities and monitoring the appropriate use of the guideline.

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<sup>44</sup> Bolds are mine.

These moderators, so-called representatives of the Academy, coordinate terminological works and meetings, follow the procedure and workflow of the department, assist professors and members of committees in choosing the most appropriate equivalents based on the guideline or linguistic and grammatical rules, fill terminological records, and participate in all meetings of councils to achieve the best outcomes. Regarding the terminologists' profile, Zarnikhi (2010a) explains:

The representatives also called researchers mostly hold MA or PhD in Linguistics but some of them BA in Translation and the department also has welcomed some interested people graduated from other subject fields such as dentistry, biophysics and the arts.

Committee members are appointed for a one-year scientific cooperation (with the possibility of extension) in the form of active participation in technical meetings and role as scientific informants or consultants. Since 2007, the Terminology Department has supported terminology contracts with specialized and scientific societies to carry out terminology work hosting out of the Academy, in the form of *outsourcing* (web page of the Academy & Fathi 2017, p. 339).

In 2003, there were 43 active committees (Parvizi 2004, p. 378) and in 2008, 48 committees. In 2011 the number of committees increased to 61<sup>45</sup> and currently Terminology Department has over 70 active committees (including outsourcing committees) in various fields of study (Akbari 2014, p. 42). As Zarnikhi describes it (2010a), "these committees are expected to carry two main duties: filling in terminology records and providing the coordination council with a list of source language polysemous and suggested Persian synonymous terms". According to Akbari (2014, pp. 42-43), "they are primarily engaged with the construction of Persian equivalents for borrowed terms, most of which are from English".

However, these duties are described extensively by the Terminology Department in Terminology Workflow with an interactive nature which involves committees in all stages of terminology work.

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<sup>45</sup> <http://www.persianacademy.ir>. Accessed Feb. 2017



## 2.4. Terminology workflow

Terminology workflow from an institutional view is an actual practice of terminology planning which reflects either the perception of organizations about the process of language evolution or their conception about problematic situations in the level of specialized corpus planning. According to the published workflow of the Terminology Department the procedure is classified and described in fourteen stages (my translation):

1. To establish Terminology committees and prepare a term list based on the preferences of the Academy; and, collecting related information to fill the terminological records and files
2. To submit the term proposals to the Coordination Council
3. To review the terminological files in Terminology committees and prepare the final list to submit to the Supervisory Board (so-called *technical committee*); if there is any disagreement the committee should postpone controversial terms to the future
4. To review terminological records by Supervisory Board linguistically and structurally; in the case of any error, these records should be revised in the committees again.
5. The final revision of terminological files by Terminology committees and preparing them for presenting in Terminology Council.
6. Presenting the proposals in Terminology Council and approval process due to the concept and equivalent adequacy; in the case of any disagreement, committees are responsible for revising their records again and present the final decision to the Council again.
7. To review the final records and definitions, to submit the booklet of all approved terms to the department directory, to appoint time limit for temporary version of approved terms (in many cases is a 3-year limit)
8. To submit the booklets to the President for final confirmation
9. To receive the confirmation and send to the publication section

10. To publish the temporarily approved terms, and in case of receiving any recommendation or feedback the Terminology committee is responsible for revising the records
11. To review the files in the committees, and prepare the revised term list for submitting to the Terminology Department Directory
12. To approve the term proposals permanently by the Academy Council
13. To prepare the term lists for publishing
14. To publish the final approved terms

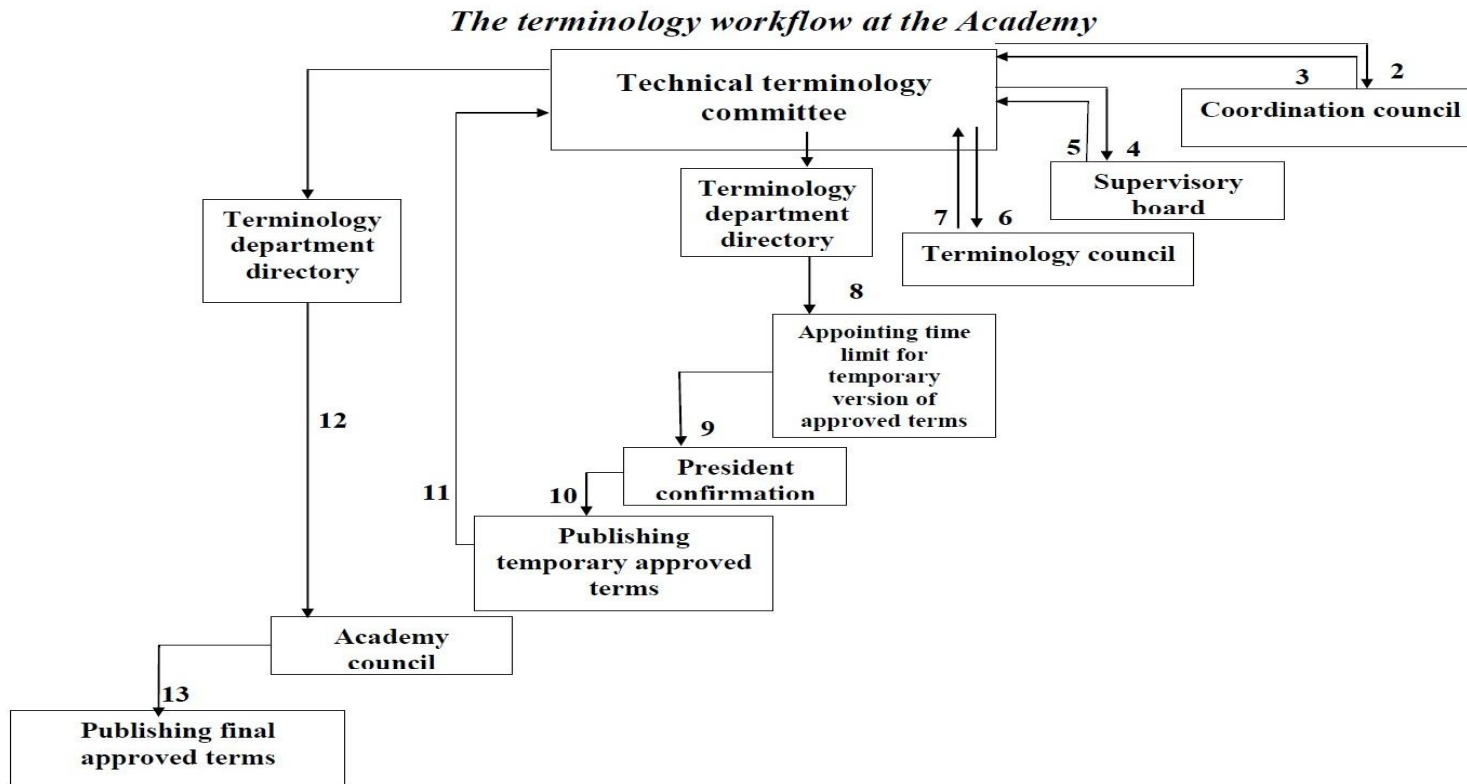


Figure 5.2. Workflow at the APLL

Regarding the preferences, mentioned in the first stage of the workflow, these preferences are presented in the *Terminology Guideline* as follows (my translation):

1. Basic specialized terms;
2. Professional and highly specialized terms;
3. Interdisciplinary terms.

In this classification, the first two cases refer to the terminological units that are used only in a certain field with different specialization levels; while the third case refers to the units that originate from other related fields or are mutually used among them (polysemous terms).

## 2.5. Terminology Guideline

Since 2009 the third edition of the *Terminology Guideline* has been used; and, it assists terminologists and the committees in choosing the most appropriate equivalents among existing forms, creating new equivalents or borrowing. According to Akbari (2014, p. 44), “these principles form the basis of term construction undertaken by the Terminology Department, at least theoretically.” This document is available on the web page of the Academy for the public consultation.

The *Terminology Guideline* consists of various themes ranging from language policy to terminology policies and Persian term formation guides. However, to my opinion, the document is not easy-to-use for distinct reasons.

First, the definitions provided in the document are not clearly explained and in many cases are confusing. Second, the semantic relations between the terms are ambiguous, or in some cases perplexing. Third, the document itself does not distinguish between language policy, terminology policy, formation methods and many other topics, but uses some general words like “*principles*” or “*criteria*”, “*methodology for word selection*” or “*axioms*” without addressing the TP related areas. Therefore, in the research and

studies, there is an inconsistency in the use of terms or presentation of the details.

### 2.5.1. Terminology policies

Terminology policies, called principles and criteria (literally translated), are defined as do's and don'ts and some priorities that are worthy of consideration in standardization (*Terminology Guideline* 2009, p. 13). These policies are presented in seven sections (translated by and cited in Zarnikhi, 2010a):

- 1) In creating terms, Persian grammatical rules should be observed.
- 2) It would be better to select an equivalent which goes through productive morphological processes such as derivation and compounding.
- 3) Persian phonetic rules should be observed. Loan words should be phonetically adapted.
- 4) Spelling should be based on *Dæstur-e Khaet-e Farsi* [**Persian Orthographical Norms**<sup>46</sup>] set by the Academy. If it is required, some of punctuation marks which have not yet been common in Persian can be used.
- 5) The Academy, if it is required, can use rare or unprecedented morphological processes.
- 6) Words which have been considered as Persian words, without regarding their origins, can be combined with Persian words, suffixes and prefixes.
- 7) For interdisciplinary terms and polysemous terms following criteria should be followed:
  - a) When a term designates some concepts [polysemy in the source language], each of them can be expressed by an individual equivalent.
  - b) When a concept is expressed by some terms [synonymy in the source language], it is better to use only one equivalent, but, if it is

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<sup>46</sup> Bolds are mine.

required, it is permitted to find or create equivalents for each of them separately.

c) It is permitted to use an equivalent for different terms [polysemy in the target language].

d) When a term designates a certain concept, it is suggested that one equivalent is used, except that it has different long-established equivalents in different disciplines [synonymy in the target language].

e) When a term is used in a certain field, only one equivalent should be used, except that it designates different concepts in that field.

### 2.5.2. Term formation resources

Term formation resources are understood in this context as all vocabulary that can be used in the standardization process. On the one hand, these resources include all Persian vocabulary which is translated as “*vocabulary repertoires*<sup>47</sup>” and presented by Akbari (2014, p. 44):

1. All originally Persian words that are registered in reliable dictionaries;
2. All originally Arabic words that are used in contemporary Persian and/or that appear in reliable Persian texts written before the 11th century;
3. Words from Indian, Turkish, Greek, Mongol languages and the like which are used in contemporary Persian or have been used in reliable technical texts;
4. Originally European language terms which have simple word formation (otherwise the relevant concepts must undergo Persian word formation) and, for any reason, making Persian equivalents for them is not necessary.

On the other hand, the guideline presents more resources that would assist the terminologists and the committees in creating new terms or borrowing process which are as follows<sup>48</sup>:

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<sup>47</sup> Also called “terminological resources” by Zarnikhi (2010b, p. 138)

<sup>48</sup> See also Akbari (2014, pp. 45-46) and Zarnikhi (2010a)

1. All Persian vocabulary (mentioned above) regardless of their origin;
2. Words that belong to contemporary Iranian languages and varieties and dialects;
3. Words and roots originated from Old and Middle Iranian languages;
4. European loan words and combining forms that are conditioned upon:
  - a) Being frequent among Persian speakers,
  - b) Having simple word formation (otherwise the relevant concepts must undergo Persian word formation)
  - c) Decision making by the Academy considering that making Persian equivalents for them is not necessary.

### 2.5.3. Term formation methodologies

In the *Terminology Guideline*, these methodologies are described in two distinct sections differentiating between *word selection* [term formation] methodologies and *finding equivalent* methods. However, it is not clear or well-justified why they have chosen this puzzling structure and why they have separated these two categories. According to the *Terminology Guideline*, term formation methodologies are presented as follows<sup>49</sup>:

- a) *Selection*: results in the standardization of a selected form among other Persian denominative variations.
- b) *Re-semanticization*<sup>50</sup>: results in semantic neologisms.
- c) *Neologization*: results in lexical neologisms.
- d) *Borrowing*: understood here as lexical borrowing<sup>51</sup>.

On the other hand, it is also explained that *finding equivalent* is based on “loan translation” or “conceptual equivalents” that in any case falls into one of the term formation methodologies. However,

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<sup>49</sup> Descriptions are mine.

<sup>50</sup> The term is used by Zarnikhi (2010a) while Akbari (2014, p. 46) used the term “selection anew”, and in her terms this process “leads to semantic neologisms (terms used by Pavel and Nolet: 2001, p. 20-21)”.

<sup>51</sup> According to its definition in the *Terminology Guideline*.

obviously, loan translation or conceptual equivalents cannot be categorized as lexical borrowing (for example). Besides, the semantic relation between *finding equivalent* and *word selection* still has remained obscure and undefined. Indeed, further studies are needed to revise these sections and to update these methodologies and processes.

## 2.6. Terminological resources

A large number of terminological resources are available at the APLL and the Terminology Department. Some of the most important basic types of terminological resources are dictionaries, glossaries, handbooks, and thesauri both monolingual and multilingual resources.

In technical and scientific areas, each Terminology committee benefits from a considerable number of resources and they have access to all general reference resources available at the library of the department or the APLL. Besides, there are many documents and reference books in electronic format that are recommended by the committees' members which are used for further consultations.

Notwithstanding, there are some shortages affecting the terminological works. The most important points are as follows:

1. There is a general lack of up-to-date resources.
2. There is a lack of systematic textual corpora to detect and track neologisms (given that only a few countries have systematically organized corpora for this purpose). The process relies on individuals' knowledge and hence it is not precise.
3. The current Academy's term-base includes equivalent proposals of the second academy and some specialized dictionaries. These lexical resources are not sufficient to manage and solve terminological problems.

On the one hand, terminology resource management would facilitate updating existing terms and the denomination coordination among interdisciplinary domains. On the other hand, systematic



documentation with the establishment of dynamic terminological database would accelerate the term processing phase corresponding to the users' needs (Fathi 2017, p. 344).

## 2.7. Solving problems

What makes a terminology process to become effective is its ability to solve or to assist solving problematic situations. Indeed, this ability is directly associated with the effectiveness of interventions.

The main terminological problems in standardization can be identified as problems that have origins in the coordination among distinct areas of knowledge (polysemous problems). Also, one can recognize problems that are related to the translation (i.e. conceptual perception, creating new terms, selecting the most adequate equivalent, denominative variations, decision making about synonyms and quasi-synonyms, revisions).

In the Iranian context, the problematic circumstances can be even more complicated. Based on my professional experience at the Academy, I can identify some communicative difficulties and cases in which the use of Persian term is not feasible, and they may cause some problematic situations at the level of usage or standardization:

- a) When there is no Persian equivalent for a concept or a foreign term (often in interdisciplinary domains and for new concepts); e.g. *veganism* (sociology)
- b) When there is a standardized form but it is not adequate or appropriate in every context of use; e.g. *profile* (biology, proteomics) پروفایل comparing to profile (geophysics) پروفایل [borrowed term]
- c) When the standardized form is not applicable in all contexts due to the conceptual expansion and terminological evolutions; e.g. *vegan* (nutrition), and *vegan* (sociology)

d) When there is an equivalent but the original term is more frequent and known; e.g. *mobile, system, control*, etc.

e) When the use of abbreviations is more frequent, and there is no corresponding abbreviated form in Persian; e.g. *ADHD* (psychology) اختلال کم توجهی - بیش فعالی

In addition, some problems can be due to the current decision-making system and the criteria. For instance, the workflow (presented earlier in section 2.4) shows that within the interactions among the committees and the councils, interdisciplinary Terminology committees receive the least concern regarding their specific communicative needs.

The Terminology Department explicitly has stated that preliminary term candidates should be based on the preferences of the Academy in which interdisciplinary terms are at the third level. Thus, in theory, polysemous foreign terms in different fields of studies or synonymous terms in Persian are not highly concerned, i.e. with the least chance to be analyzed and standardized.

This criterion is evidently in favor of some basic fields of studies, e.g. basic sciences, or domains with the longer history of terminology work and with the opportunity of having frequent Persian equivalents; while, it disregards the essential needs of increasingly growing interdisciplinary domains. Zarnikhi (2010a) also has explained this issue by giving some real examples:

Another problem which persists during data collection is that some experts have a feeling of property towards terms and there are always quarrels with them. For example, which terminology group, linguistics or library sciences, should make a decision for terms such as *dictionary, thesaurus, vocabulary, terminology* and *lexicon*?

It seems that they are linguistic products and librarians are only consuming them but they classify and designate them in a different way. Other examples of this kind of problem, using different terms for the same concept, are *geopolitics* and *romanticism* shared by various disciplines. For instance, *romanticism* was not imported by literature, the arts and philosophy simultaneously and then each of them has its own term referring to that concept. Therefore, it puts an impenetrable barrier for communicating interdisciplinarily.

Table 5.4 shows some examples of these real situations that would complicate the terminological activities in Iran. Given that there is no particular mechanism for problem-solving at the Terminology Department, and due to the existing problematic situations, it is suggested that for solving such problems terminological needs of the subject fields should be addressed regarding political, methodological and strategic exigencies.

<b>Facts</b>	<b>Terminological Needs</b>
Domains of studies neither do enjoy the same terminology history nor do have the same level of sufficiency in terms of terminological resources and data	Decision making and coordination among domains should be systematized (political needs)
The decision making process at the APLL is based on linguistic criteria employed for all domains of studies (Zarnikhi 2010b)	Different approaches are needed in distinct domains; e.g. in technical fields or humanities or medical sciences (methodological needs)
The decision making process at the APLL is based on the preferences of the Academy and not the real needs of domains of studies	Different strategies and preferences are needed (strategic needs)

Table 5.4. Examples of terminological needs and problematic situations

Furthermore, the committees usually start their terminology activities with a terminological list as their base list. Then, they continue searching for the meanings and definitions in various available resources. Finding terminological variations and synonymous terms is also part of this stage.

The focus of the term processing is on standardization and term approvals. For this purpose, all terminological records should provide documented definitions in glossaries or any type of technical dictionaries. In other terms, the Academy does not accept definitions given by the committees' members. Therefore, terminological problems that are related to denominative variations cannot be solved easily. There is no term base or corpus-based approach that can automatically detect all variations and this affects the process for two main reasons:

- a) Frequent abbreviations that are used by authors, and are not entered the glossaries can be skipped.

b) Those neologisms that are recently coined and are not still entered the dictionaries are omitted (also described in the section 2.6. p. 153).

These challenges also shed light on the role of Terminology committees. Although they should be considered as specialists and informants, the real activity in the committees is practically oriented to translating dictionary entries which in many cases is frustrating for the committee members (i.e. specialists)

This means that those problematic terms that encounter challenges in the Coordination Councils or at upper levels in Terminology council are either doomed to be out of the processing cycle or postponed to an undetermined future (Fathi 2017, p. 344). One can conclude that there is no criterion or mechanism at all being of use to problem-solving. This insufficiency applies to the revisions and updates as well. The revision and updates are arbitrary activities without having a mechanism or criterion to follow.

[...] the scattered and irregular polls in which the Academy does seek experts' opinion on the approved terms usually receive no response (Who proposed bæspār?, 2010). (Akbari 2014, p. 160)

To sum up, the probable situations which need further attention and, indeed, some effective mechanisms to manage are recognized as follows:

- a) Solving pre-standardization existing problems (preparation and adaptation)
- b) Solving problems during the standardization (coordination)
- c) Solving post-standardization problems (dynamism)

## 2.8. Dissemination

Dissemination is associated directly with either terminology awareness (Drame, 2009) or implantation impact (Zarnikhi, 2014). Dissemination is a universal principle that in all sociolinguistic context is (or should be) available (Zarnikhi, 2014, p. 30).

Bhreathnach also addresses dissemination and believes that it is important to evaluate dissemination function (2011, p. 166). However, planning for term dissemination is still a challenging condition in Iran.

Challenges in dissemination are mostly related to the accessibility of social media (what is considered so useful in many countries) and the lack of cooperative networks. For instance, to benefit from social networks like Twitter or Facebook, for some political limitations and filtering, is not feasible conveniently (Fathi 2017, p. 344). Zarnikhi (2014, p. 338) believes that “shortcomings of dissemination are caused by the implementation layer.” Nevertheless, in some cases (such as Iran) it is not merely an organizational deficit, but also the political situations can affect this function.

Dissemination mode in Iran has been limited to the organizational publications of annual term collections. Recently, the Academy has started to develop its communicative channels via mass media (e.g. radio program called *Shenasa*) and some mobile application (e.g. Telegram). The consequences of these recent activities are not clear yet; however, they have facilitated the direct connection between target users and the authoritative body in charge (Fathi 2017, p. 344).

Dissemination is also dependent on the financial resources. For public organizations, planning on dissemination initiatives should be supported and funded by the government. If there is no sufficient support and supply, the organization cannot develop new strategies.

Communicative channels like direct contact with domain experts and target users, contact with the public via mass media interviews and regular programs, and benefiting from the government’s support are all the signs of an effective terminology plan (Fathi 2017, p. 343). In this sense, although the impact of current activities cannot be evaluated at this moment, the Academy has moved noticeably toward effective dissemination. To sum up, dissemination and promotion of standardization products of the Academy are carried out currently via:

- a) Online access to approved terms (i.e. via the web page of the Academy)
- b) Collections in print
- c) Experts cooperating with the APLL
- d) The mass media: *Shenasa* radio channel
- e) Other resources: Online database (i.e. *Važeyab*)

## 2.9. Training

Terminology training has received little attention in many countries. As it is studied by Zarnikhi (2014), in many cases, there are only basic training programs available for terminologists and specialists (p. 317). However, the Terminology Department, since 2007, has started to provide its recently recruited workforces with basic courses in terminology, phonology, morphology and standardization procedure at the APLL. Besides, from the beginning of its activities, arbitrary courses in foreign languages (free courses in German, Urdu, French, and English) were also available to upskill staff and expand their proficiency in different languages.

Furthermore, the Academy has been accredited by the *Ministry of Sciences and Research* to offer Master's Program in terminology since 2015. The overall aims of this new program are to raise terminology awareness in the society in general, and to educate future terminologists.

## 2.10. Synthesis

The objectives and duties presented by the APLL give the major importance to the lexical and terminological standardization to the extent that crucial aspects such as preparation and implantation are omitted over the workflow. This fact has resulted that one cannot obtain enough information about the role of the Academy in terminology management and planning. In this sense, some planned duties have been remained in theory and are not practiced thus far.

Besides, the Terminology Department has not provided any indicator accounting for effective strategies. It is perceived that as long as standardized forms are in accordance with the methodologies presented in the *Terminology Guideline*, the acceptability of the terms will be guaranteed. In other words, the focus is on formal linguistic factors.

Regarding short-term objectives, the Academy has contributed to the standardization of a significant number of terms. This result is only possible with the best endeavors of the committees, councils, moderators and all sections involved.

Participation of domain experts, linguists, and committee moderators in making decisions, constant supervision to ensure the coherence of activities, preparation of the *Terminology Guideline* and recent attempts in term dissemination represent some efficient and effective aspects of terminology work at the APLL.

However, there is a need to revise and improve those aspects that are associated with the long-term objectives, strategies, implantation plans, evaluation plans and the Terminology guideline. For summarizing the results, Table 5.5 shows the final report of the systematic analysis.

Criteria	Indicators	Results
efficiency	existence of short-term objectives	<input checked="" type="checkbox"/>
	existence of long-term objectives	<input checked="" type="checkbox"/>
	existence of criteria in the selection of terminological inputs	<input checked="" type="checkbox"/>

Criteria	Indicators	Results
	existence of criteria in the process of standardization	<input checked="" type="checkbox"/>
	existence of monitoring function	<input checked="" type="checkbox"/>
	monitoring function efficiency	<input checked="" type="checkbox"/>
	existence of coordination	<input checked="" type="checkbox"/>
	coordination among all committees	<input checked="" type="checkbox"/>
	appropriateness of resources in print	<input checked="" type="checkbox"/>
	appropriateness of resource management	-
	solving problem mechanisms	-
effectiveness	achievement of short-term objectives	<input checked="" type="checkbox"/>
	contribution of interventions in accordance with the objectives	-
	dissemination function	<input checked="" type="checkbox"/>
	supporting terminological researches	-
	improvement of the terminological resources	-
	training activity	<input checked="" type="checkbox"/>

Table 5.5. Final report of the systematic analyses



### 3. Corpus-based analyses

Terminological works in standardization centers tend to admit or approve the most appropriate form among existing terminological variations or propose newly coined terms. New coinage is supposed to fulfill the terminological gaps and admitted terms serve for either assisting in the consistent and standard production of scientific texts or facilitating professional communications. These implications are associated with socioterminological needs before and after the standardization function.

Following the methodology proposed in Chapter IV, this section deals with socioterminological and corpus-based analyses. On the one hand, it aims to evaluate the relevance of the terminological works in Iran to the real and pragmatic needs of a chosen domain, i.e. geophysics; and, on the other hand, it investigates the use of approved geophysics terms (by the APLL) to evaluate the impact of terminological activities of the Terminology Department. This current section also presents various engagements of the surveys in the topic addressing the use of standardized terms in Persian language and the real needs of the users.

These analyses facilitate the terminology planning in four ways:

- a) Giving a panorama of the impact of terminological works in the Academy and Terminology Department
- b) Providing terminologists and planners with empirical data to revise unsuccessful or non-implanted terms to propose new alternatives
- c) Providing a list of unprocessed terms to be used in the future standardization projects
- d) Detecting the impact of institutional activities on the implantation of terms or otherwise

For these aims, this section is organized into three distinct subsections:

**3.1. Review:** A review of the studies carried out on terminology usage, their domains, the methodology, and the results;

**3.2. Retrospective Analysis:** Conducting a corpus-based analysis in “geophysics” and observing to what extent the standardized terms at the APLL are used in technical and scientific articles written by experts.

**3.3. Prospective Analysis:** Conducting a corpus-based analysis and observing to what extent the real terminological needs of target users have been addressed at the APLL’s Geophysics Committee.

### 3.1. Review

The impact of the terminological activities at the Terminology Department has been questioned by Iranian researchers from distinct aspects. A considerable number of surveys have observed the use of standardized terms in general or in specialized contexts. These surveys have been conducted through textual analysis or preparation of questionnaire. These studies have not covered all active domains in Persian terminology; nonetheless, they provide us a panoramic picture of how outcomes of the APLL have contributed to accomplishing its objectives.

One of the noticeable characteristics of these studies is that terminological needs of target users have never been examined. Besides, the starting point of almost all textual analyses have been translated texts, and original texts written in Persian are not explored. Some of the most significant aspects of these studies are discussed as follows.

#### 3.1.1. Corpus-based studies

A great deal of research has been carried out on the identification of various factors that might affect the acceptance or rejection of standardized terms. The linguistic factors (e.g. brevity, simplicity, euphony, and ease of pronunciation) have frequently been pointed out in many cases. Nevertheless, researchers like Gandomi (2001) and Ahmadipour (2006) have also mentioned the role of familiarity and awareness as determinative variables that can affect the use of approved terms (as cited in Talebinejad, V. Dastjerdi, & Mahmoodi, 2012, p. 183).

Zarrin Ghalam (2011) has observed the standardized linguistics terms approved by the APLL by comparing their term formation methods<sup>52</sup> and the translators' tendencies towards the use of terms. He concluded that the APLL has been more successful in promoting the use of existing terms by presenting the most adequate forms, the so-called "selected terms". However, the Academy showed less success for those cases in which standardization deals with neologisms (denominative or semantic).

Although Zarrin Ghalam did a wide textual analysis, the results are not highly reliable due to the fact the author has not considered the time intervals between the publication of approved terms and the publication of translated documents. A methodological weakness resides in the fact that the author analyzed five translated books in the domain of linguistics two of which were translated in 2003 and the remaining were translated in 2008. However, she has studied all linguistics terms published from 2000 to 2008 (six volumes of term collections). Obviously, some standardized terms had the chance of being implanted during the years and some others have just been published.

In terms of formation tendencies in linguistics terms, she provides interesting results. Zarrin Ghalam (2011, p. 43) has claimed that the majority of standardized terms in linguistics are formed through the "selection method" and only a few of them are Persian neologisms. In other words, the great deal of standardization in linguistics has been carried out on choosing the most adequate forms already used by specialists or translators. These selected terms show the highest usage as well.

Similar to this debate, Hesami & Ghanbari (2012) have also pointed out the success of selected terms in genetics. Hesami is a molecular and cellular biologist who have been also working as a researcher at the APLL collaborating with the committees mainly related to his subject field; e.g. genetics, proteomics. The article "*Evaluation of Persian Academy approved genetics terms acceptance in upper graduate user population*" (Hesami & Ghanbari<sup>53</sup>, 2012), presents the study of 20 randomly-chosen genetics terms regarding

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<sup>52</sup> The formation methods consist of selection, re-semanticization, neologization

<sup>53</sup> Atefeh Ghanbari is also researcher and linguist at the APLL.

preference of usage (i.e. 101 selected upper-graduate users from genetics departments). The results demonstrate that the APLL's terms were not the first choice in many cases. Notwithstanding (and surprisingly), they have concluded that the Academy was successful in the standardization activities.

In spite of low scores for users' preference upon the APLL's terms, they summarized that scientific policies and principles are clear and unambiguous. However, in none of their results, the role of policies or principles is studied.

The presence of clear and unambiguous scientific policies and the constant and precise application of principles in word formation not only has led to the production of proper equivalents for English word, but also has paved the way for specialists in genetics and all other sciences either to be able to find equivalents for the newly loaned terms by using tested methods of word formation. (2012, p. 41)

In this article, discussions and grounding factors suffer from a well-established theoretical background. The results are randomly analyzed and later generalized to be employed in all areas. For instance, by analyzing merely a term (*self-splicing* p. 41), they concluded on some general points of view that led to linguistic factors involved in term acceptance.

But in the case of "*self-splicing*", it is promising that the quality of equivalent coining can guarantee its success and acceptability just like selected terms. But what make this coined equivalent as successful as other selected terms? Three reasons can be considered:

1- This equivalent is created by strict obeying Persian word formation principles. And besides no dated affix is used in its creating.

2- The selected term is a short and one-part word (compared to its English term that is two-part).

3-before coining the equivalent for this term, there was no Persian equivalent available for "*self-splicing*" and so the coined equivalent have not to compete with any previous prevailing equivalent.

Because of all three above reasons this equivalent is accepted without any resistance from the part of Persian users.

In *Trends in Persian medicinal terminology a progressing field of interdisciplinary research* (Naseri, Hesami Tackallou, Ghanbari, & Dalilan, 2011) the same tendencies to unjustified generalization are also visible. This study is not corpus-based, but for its similar arguments, I have decided to mention here as well. In a study based on lexical structures of approved terms, they have concluded the same phrases mentioned above.

The presence of terminology department in Persian Academy as an organization to standardize and make policies in language has been very effective for medical terminology. *The presence of clear and unambiguous scientific policies and the constant and precise application of principles in word formation not only has led to the production of proper equivalents for English word, but also it has paved the way for specialists in medical sciences to be able to find equivalents for the newly loaned terms by using those stabilized methods of word formation*<sup>54</sup> (2011, p.46).

In my opinion, these types of research and generalizations (regardless of the methodological and theoretical shortcomings) not only are not useful but can also bias the reality and typically result in unreliable conclusions. It could be noted also that critical thinking and awareness of what should- and what should not- be considered as authentic and valid research are the most important elements in scientific research.

Hazbavi (2012) has compared the borrowing mechanisms used by translators for the terminology in the domain “information technology” (IT); and, along with them, he has observed the use of APLL’s terms as an alternative option indicating the use of Persian terms. He pointed out that the most frequent mechanism used by translators is *transference* (in Newmark’s words<sup>55</sup>) which shows a tendency to use foreign terms written in Persian letters.

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<sup>54</sup> The italic shows the repeated phrases.

<sup>55</sup> [...] “transference is the process of transferring a source language word to a target language text, which includes conversion of source language letters into the letters of the target language” (Hazbavi 2012: 1055).

This comparison intended to question if the APLL's standardized forms are used by translators or not; nevertheless, does not provide any information about the variables and factors involved. In terms of the impact, it can be concluded that APLL's terms in IT do not show a great success.

Regardless of the translation procedure adopted, the study clearly showed that in most cases the Iranian translators are reluctant about using APLE<sup>56</sup> in their translations (p. 1056).

This study has developed the argumentations based on a misconception. By "borrowing mechanisms" Hazbavi meant *transcription*, *transference*, *naturalization*, and *calque*. However, it is worth noting that in many cases these mechanisms are used as well in the formation of Persian equivalents at the APLL. For instance, for the equivalents of the terms "*internet*", "*internet worm*", "*hyperlink*" (among many other examples) the Academy has used transference (*internet*) and calque (*internet worm*, *hyperlink*) mechanisms. In other words, categorizing APLL's standardized terms as if a different mechanism is used in their formation process is not accurate and biases the research outcomes to some extent.

Barzegar (2015), another researcher who has tackled the subject by observing non-linguistic factors, has studied the relation between the acceptance of approved lexical items (in general language) and variables like demographic and geographic characteristics, education, the knowledge of foreign languages, etc. In his thesis, he concluded that the public's attitude towards APLL's words is independent of the age, gender, and education level. However, it is not clear from the theoretical parts how he came up with these variables and why these variables have been presupposed as important factors in implantation.

After discarding the impact of some variables, he has identified a significant relationship between the use of terms and variables such as knowing foreign languages, the parents' education, and the residence location. He mentioned that people from Tehran are less likely to use the APLL's approved terms, however people from other cities show more positive attitude.

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<sup>56</sup> The Academy of Persian Language and Literature's Equivalents

In the end, he provided a list of concluding remarks that summarize his thesis outcomes. Some of them are selected as follows (pp. 207-209):

1. There is no relationship between participants' level of education and the acceptance of the words promoted by the APLL.
2. Participants who live in cities or towns other than Tehran use the APLL new words to a larger degree.
3. The APLL is believed to have succeeded 'little' or 'very little' in terms of word-formation and word-selection.
4. The APLL words are used to a lesser extent (very little) by the public and the participants' families compared to reporters and newsreaders.
5. The APLL experts should consider semantic transparency and eusemy as their first two priorities in spite of the fact that the APLL experts themselves stress the importance of productivity.

Alipanahi & Mahmoudi (2015) have carried out a comparison between the use of borrowings and APLL's coined terms in distinct domains of study. Results show that "the application rate of borrowed words exceeded that of the APLL coined words in the translation of the technical texts by Ph.D. students. However, in some domains like climatology and humanities, the results are the other way around. Namely, these two domains show a significant use (or preference) of the APLL's terms over the borrowings.

They concluded that "high level of familiarity with the APLL's coined words was associated with a high application rate of them" and they add that the "application rate is not only a matter of familiarity." One of the interesting aspects of this study is that they could recognize from some examples in their corpus, that the APLL has largely considered the linguistic aspects in term coinage and those "informative aspects central to information communication"<sup>57</sup> are left unstudied.

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<sup>57</sup> In my opinion, the authors refer to communicative situations and pragmatic aspects when stating *informative aspects central to information communication*.

A unique study in its kind is also carried out by Akbari (2014) who is also one of the APLL's terminologists. In her thesis, she studied the "potentiality of the application of abbreviation methods<sup>58</sup> in Persian" based on APLL's approved terms and observed some morphological aspects that can affect the acceptance or use of the abbreviated forms.

Her thesis is based on a full list of Persian abbreviated forms approved by the Academy, and an extensive comparative analysis of English terms and Persian Equivalents. Notwithstanding, discussions are based on theory and no textual empirical research is conducted to support the results regarding the implantation of terms.

Akbari enters in the debates upon "good terms" and detects the most probable elements that can affect the acceptability of Persian abbreviations as the secondary neologisms. She concluded that "language planners are not always able to apply characteristics" of *good term* to "new term formation, and that terms that enjoy only a small number" of them are "more likely to fail" (2014, p.151).

In terms of systematized activities, she adds that:

"It reveals that despite the Academy implementing an official plan to dynamize abbreviation in Persian, its results were not promising" (Akbari 2014, p.87).

### 3.1.2. Involving factors

In the reviewed articles, I have explored the variables and factors that are presented as representative elements involved in the acceptance of standardized forms. These factors are classified in Table 5.6.

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<sup>58</sup> Abbreviation: [...] "the representation that is the result of the omission of any part of the full form is an abbreviated form (International Organization for Standardization: 2011)" (Akbari, 2014, p. 51), including "processes like acronyms, blending and clipping" (Akbari, 2014, p. 52).



Table 5.6. Examples of involving factors based on the literature<sup>59</sup>

Intralinguistic factors	Non-linguistic factors
brevity	dissemination and familiarization
simplicity	educational systems
euphony	unequivocal policies
ease of pronunciation	more investigations
semantic transparency	uniformity <sup>60</sup> in word formation processes
eusemy	study on frequent formation processes
productivity	knowing foreign languages
	the parents' education

Among those non-linguistic factors, consistency in word formation processes and unequivocal policies are associated with the methodology and standardization guideline presented by the Academy (functional and organizational factors). Other factors such as dissemination and educational systems are factors that reflect the relationship between the acceptance and language/terminology planning processes (sociolinguistic factors).

### 3.1.3. Non-corpus-based studies

In non-corpus-based studies, authors have tackled the issue by analyzing and evaluating the standardization process at APLL. For the importance of these arguments and their relatedness to the evaluation in terminology, I present some of these studies in this section.

Reza Mansouri is an Iranian cosmologist who has dedicated a considerable amount of his academic activities to investigations on

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<sup>59</sup> I have presented the exact phrases used by the authors without assessing if they are applicable or not.

<sup>60</sup> In my opinion, *uniformity* can be understood here as “consistency in the use of word formation methods. An example can be the use of a similar suffix for all terms that end with –logy. However, there should be some further research to evaluate these proposed criteria.

language development and planning in the Persian language. Mansouri (1995) believes that the lack of available Persian standardized terms can result in the preference for foreign terms over potential Persian equivalents. He stresses the pace of the terminology activities and compares the huge amount of imported terms into Persian with the number of standardized terms. Yet, these claims have not been proved by any statistical data, and they have remained as individual's opinions. He proposes that Persian terminology needs technical support and innovative standardization methodology to improve terminology management systems. Although the facts are related to the beginning phases of the Academy, they still apply.

Moreover, there are some studies in morphology and semantics which have analyzed outputs of the APLL in distinct domains of study, the behavior of standardized terms in their real context of use, their formation tendencies, along with the problematic situations.

These studies are useful to detect how specialized needs vary from a domain to another. As an example, in medicine, one of the most problematic issues could be translating the abbreviations. This issue has also been studied in physics (Mansouri, 1995) regarding the use of acronyms (*laser* or *radar*) in newly coined terms, particularly those *portmanteaux*, (e.g. *lidar* or *ladar*). These surveys are conducted to detect formation difficulties and to look for possibilities to ease the acceptability of standardized terms.

Another researcher, Izadi (2003) stresses the importance of systematized standardization and believes that the rejection of standardized terms can be due to carelessness and extremes in the selection of equivalents (as cited in Barzegar 2015, p. 45).

Davari Ardekani (2003), another Iranian linguist, believes that the success of the Academy is associated with the systemic and systematic changes. Her proposals reside in:

- (1) [...] establishing a separate and independent panel under the title of "Department of Sociolinguistics" in the APLL to study issues in the Persian language scientifically and the trends in language planning including terminology better and more precisely;

(2) [...] a permanent and strong administrative interaction between the APLL and the Ministries of Science and Education because these two ministries are the centre for spreading the findings of the APLL;

(3) A codified organizational and administrative interaction with the Islamic Republic of Iran's Broadcasting (IRIB) is vitally important. (p. 36)

(as cited in Barzegar 2015, p. 48)

Naseri, Hesami –Tackallou, Ghanbari, & Dalilan (2011) [as it is mentioned earlier] have studied the formation mechanisms and tendencies in medical terms as a progressing field of interdisciplinary research. The tables and data regarding morphological aspects are good examples of the basic medical terms. Nonetheless, they are not effective in the identification of patterns since only a very limited number of terms are studied.

#### 3.1.4. Synthesis

Table 5.7 shows the full list of articles that are reviewed with a brief description of the subjects and the orientations. The main characteristics of the evaluations carried out on third Academy activities can be identified as below:

1. In many cases, *familiarization* and *real use* are considered as two important variables that have been considered through the whole analysis.
2. Evaluations do not cover all domains of studies; however, they show a panoramic view to the current situation of terminology planning in Iran.
3. An increasing tendency in terminology evaluation is visible. This tendency could be due to the considerable number of standardized terms over the last decade.
4. In recommendations for improving the acceptance and quality of terms, they emphasize the linguistic factors as effective elements to succeed in the standardization process.
5. None of them deal with periodic analyses or regular evaluations.

6. The material used in these studies as the textual corpus or textual evidence is scarce and arbitrary.
7. These studies do not deal with periodic monitoring on the progress of activities or plans.
8. These studies are not identical in terms of the methodology; however many of them have focused on translation-oriented subjects.
9. None of them are supported or funded by APLL.
10. In many cases, there is a misconception about the terms *neologism* and *loan word*. By *loan words*, they refer to the use of non-standardized foreign terms in Persian and by *neologism* they mean the new-coined terms that are standardized by the APLL<sup>61</sup>. This might be due to the concepts presented in the *Terminology Guideline* in which neology is considered as a formation method in the process of standardization.

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<sup>61</sup> It is worth noting that among standardized terms by APLL there are cases that are loan words and this misconception between neologism and loan word can bias the final results of the investigations.

Table 5.7. Full list of reviewed articles

Authors	Title	Description
Alipanahi & Mahmoudi (2015)	Vocabulary enrichment: borrowing vs. neologism	<ul style="list-style-type: none"> <li>- based on textual analysis in translations</li> <li>- addressing the rate of the use of borrowed words comparing to standardized terms</li> <li>- examining the relationship between familiarity with the neologisms coined by APLL and the application rate in technical texts translated by PhD students</li> </ul>
Barzegar (2015)	Attitude of Iranian state university students to general lexical items created by APLL	<ul style="list-style-type: none"> <li>- addressing the impact of variables such as knowing foreign languages, the parents' education, the residence location, gender, age, and etc. on the acceptance of APLL's standardized forms.</li> </ul>
Akbari (2014)	Language and terminology planning in Iran: the challenge of English abbreviated forms in Persian	<ul style="list-style-type: none"> <li>- addressing the abbreviation formation methodologies in Persian and conducting a comparison between English foreign terms and their Persian equivalents</li> </ul>
Hazbavi (2012)	Investigating Iran's success in standardization of terminologies of computer and information technology	<ul style="list-style-type: none"> <li>- measuring the use of APLL's IT terms in translated specialized documents</li> <li>- studying the most frequent borrowing mechanisms in translation of IT texts</li> </ul>
Talebinejad, V. Dastjerdi, & Mahmoodi (2012)	Barriers to technical terms in translation: borrowings or neologisms	<ul style="list-style-type: none"> <li>- measuring the frequency of use of neologisms (new terms) coined by the APLL in the translation of scientific and technical documents</li> </ul>
Yazdani Moghadam & Sedighi (2012)	A Study of the translation of neologisms in technical texts: a case of computer texts	<ul style="list-style-type: none"> <li>- detecting the most frequent translation mechanisms in the translation of neologisms</li> </ul>

Barzegar & Khemlani David (2012a)	Regional variation and Persian word-selection	- studying the relation between regional variations and acceptance or rejection of APLL's standardized words
Barzegar & Khemlani David (2012b)	The Significance of education and gender in Persian word-selection	- addressing the impact of education and gender on acceptance of APLL's standardized forms
Hesami Tackallou & Ghanbari (2012)	Evaluation of Persian academy approved genetics terms acceptance in upper graduate user population	- identifying the most frequent formation mechanisms in genetics terms
Naseri, Hesami – Tackallou, Ghanbari & Dalilan (2011)	Trends in Persian medicinal terminology a progressing field of interdisciplinary research	- addressing the term formation tendencies in medical science
Zarrin Ghalam M. (2011)	Translating neologisms: a study of the application of linguistics terms approved by the Academy of Persian Language and Literature (APLL) in translating related texts	- examining the application of approved linguistics terms by the APLL in translation

## 3.2. Retrospective analysis

It is not possible to examine the impact of the terminological works without the aid of textual analysis through the controlled corpora. Besides, the genuine questions about the use of terms and implantation cannot be addressed through rough comparisons among all domains of studies and one needs to specify either the specialized domain or the terms that are subject to use. As Quirion states it, “the subdividing of knowledge is a requirement as much for its widespread use as for practicality” (2003, p. 36).

The methodological nucleus of this study is the constitution of a *textual corpus* created of specialized texts (i.e. independent texts from scientific journals) for verifying the use of geophysics terms standardized and published by the APLL (*terminological corpus*). For this purpose, I have chosen the most convenient period for both materials according to the timeline of the thesis and deadlines.

The characteristics of specialized domains posit some distinct challenges, including the need to select appropriate data-collection methods and the availability of electronic data. Such issues must be considered not only concerning the corpus design but also to earlier attempts to compile the corpora and even domain selection. The creation of a corpus, indeed, is a very important part of any analysis and managing the obstacles and handling data are necessary to obtain the accurate result.

### 3.2.1. Selection of the domain

Geophysics benefits from having a committee at the Academy with a history of nearly sixteen years of activities. Thus, terminological activities have made adequate progress. Besides, as long as particular characteristics of domains are concerned, this domain benefits from a long terminological history in their related areas (e.g. physics, meteorology, and geology) that logically can assist and facilitate the progress of terminological works for this interdisciplinary committee.

Furthermore, although yet few, an adequate number of documents in the Persian language from various perspectives and communication scenarios (glossaries and dictionaries, scientific

articles) are available in this domain. Another criterion involved in the choice of this domain was the establishment date of the committee at APLL (2000). The periods involved in my study and designing the time distribution for each phase were important factors, and I had not a broad range of options. Therefore, those domains with a very short course of activities at the APLL had to be removed from my list. Briefly, the main factors leading me to choose this domain are as follows:

1. the lack of published research on this domain regarding implanted terms or the use of standardized terms
2. Online and free accessibility to the documents and scientific journals
3. The history of the terminological works in this domain
4. Personal experience as the Geophysics Committee's moderator for three years at the APLL
5. Familiarity with challenges in this domain due to harmonization and coordination in various councils

### 3.2.2. Objectives

The main objective of this analysis is to measure the quantity of standardized terms that are used by specialists. This analysis seeks answers to these questions (Table 5.8):

1. What has happened as result of the standardization in geophysics domain at the APLL from 2000 to 2007?
2. How many of standardized terms are used in scientific articles?
3. Does the organizational intervention contribute to the achievement of terminology development in the domain?

Table 5.8. Primary questions for retrospective analysis



### 3.2.3. Corpus description

I have compiled two corpora for this analysis:

- a) Terminological corpus; i.e. a list of processed and standardized terms by Geophysics Committee (official terminology<sup>62</sup> as terms of reference)
- b) Textual corpus; i.e. selected scientific articles in applied geophysics- mainly in sub-domains *earthquake studies*, *seismology*, *magnetometry*, *geoelectric*, and *gravimetry*.

#### 3.2.3.1. Terminological corpus

This corpus comprises a list of processed and standardized terms in Geophysics Committee (Table 5.9) during the years 2000-2007 (Vol.1: 53, Vol.2: 87, Vol.4: 160 terms). The committee has not contributed to the Volume three. In this table, *English terminological unit* (ETU) stands for the English terms (including the synonyms), *concept* stands for the conceptual units and *Standardized Persian terms* (SPT) stands for approved Persian equivalents (including the synonyms).

Collection	Concepts	ETU	SPT
<b>Volume 1 (2003-2004)</b>	51	53	53
<b>Volume 2 (2005)</b>	80	87	88
<b>Volume 4 (2007)</b>	124	160	143
<b>Total</b>	255	299	284

Table 5.9. Distribution of terms and concepts according to the publication date

The official terms are more oriented towards applied geophysics for the background and specialties of the committee's members. "Applied geophysics is a common name for the various geophysical research methods that are used to study the structure and

<sup>62</sup> [...] "recommended or standardized terminology that is approved of by government authorities" (Quirion 2003: 36).

composition of the uppermost, near-surface parts of the Earth” (*Applied Geophysics* 2013, University of Oulu<sup>63</sup>).

The terminological corpus consists of terms from the sub-domains *earthquake studies*, *seismology*, *magnetometry*, *geolectric*, and *gravimetry*<sup>64</sup>. The full list of the English source terms is arranged in the tables 5.10, 5.11 and 5.12 for the Volumes four, two and one respectively. In these tables, the color green represents the terms found in the textual corpus (described in the next section, 5.2.3.2). The complete list with the Persian equivalents (terms of reference) is presented in Appendix I.

Table 5.10. Full list of English source terms (Vol.4)

Collection of approved terms in Geophysics - Volume 4 (2007)				
acoustic log	borehole	end-on spread seismic profile	isomagnetic map	reference spheroid
acoustic well logging	borehole effect	engineering seismology	isopor line	seaquake, submarine earthquake
aerial gravimetry	borehole geophone	Eötvös balance	isoseismal line	seaquake wave
aerial magnetometry, airborne magnetometry	borehole gravimeter	Eötvös torsion balance	liquefaction	second arrival
aeromagnetic map	borehole televiewer	error of closure, misclosure, closing error	local magnitude, Richter magnitude	secular variation
airborne magnetometer	borehole-to-borehole method	fault segmentation	log	seismic hazard, earthquake hazard
air gun	Bouguer reduction, Bouguer correction	first arrival, first break	long-path multiple	seismic risk
airwave	bubble effect	geoidal height, geoid height	magnetic polarity	shadow zone
alias band	bubble pulse	geoidal separation,	magnetic polarization	short-path multiple

<sup>63</sup> [<http://www oulu fi/physics/geophysics/applied>]

<sup>64</sup> Other existing sub-domains in applied geophysics are “*forensic geophysics*, *hydrogeophysics*, and *archaeology geophysics*, and etc.” that are beyond the discourse of this terminological corpus. (What is applied geophysics, 2011-Geophysics Forum) [<http://forum.detectation.com/viewtopic.php?f=18&t=1352>] accessed Jan. 2014.

		geoid separation		
alias filter, antialias filter	bulk density	geoid undulation	magnetic pole, dip pole	slip partitioning, strain partitioning
aliasing	colatitude	geomagnetic equator	magnetotelluric method	split spread
apparent density	common-offset gather, common-range gather	geomagnetic secular variation	migrated section	split spread data acquisition
arrival time	crosshole method	gradiometer	migration aperture	stress drop
artifact, footprint	crossover distance	hidden layer	moment magnitude	terrain correction, topographic correction
aseismic	cross spread	induced magnetization	moveout, stepout	torsion balance
asperity	datum plane, reference level, reference plane	intercept time	multiple reflection	tsunami, seismic sea wave, seismic surge
astatized gravimeter, unstable gravimeter, labilized gravimeter, astatic gravimeter, pseudoastatized gravimeter	dip log, dipmeter log	interval velocity	normal moveout	undulation
aurora australis, southern lights	dip moveout	invaded zone	offset	upsweep
aurora borealis, northern lights	dip needle	isoanomaly, isanomaly, isoanomalous line, isanomalous line	peg-leg multiple	upward continuation
automatic picking	downsweep	isoanomaly curve, isanomaly curve	pilot trace	velocity pull-up
auxiliary plane, auxiliary fault plane	downward continuation	isocline	poststack migration	velocity push-down, push-down
bar magnet	earthquake engineering, seismic engineering	isodynamic	prestack migration	well log, wire line log

barrier	earthquake magnitude	isogal	primary reflection	well logging
blind zone	earthquake precursors	isogam	pull-up	zero length spring
body-wave magnitude	end-on spread	isogonic line	recurrence interval	upsweep
<b>Total number: 124 concepts</b>				

Table 5.11. Full list of English source terms (Vol.2)

<b>Collection of approved terms in Geophysics -Volume 2 (2005)</b>				
absolute gravity	depth section	induced earthquake	paleoearthquake	seismic anisotropy
aeromagnetic surveying	distortional wave	interseismic phase	paleolatitude	seismic gap
applied seismology, exploration seismology, prospecting seismology	ductile	irrotational wave	paleomagnetism	seismic section
astronomic latitude	ductility	isostasy	paleoseismicity	shear wave, S wave
body wave	earthquake prediction	isostatic	postseismic phase	sounding
Bouguer plate	earthquake swarm	latitude correction1	preseismic phase	strain
brittle	elastic	latitude correction2	pressure wave, P wave	stress
characteristic earthquake	elastic constant	longitudinal wave	primary wave	surface wave
common-depth-point, CDP	elasticity	magnetic equator	push-pull wave	tangential wave
common midpoint, CMP	focal depth	magnetic inclination	raypath	teleseism
common-source gather	free-air correction	magnetic latitude	ray tracing	time section
compressional wave	free-air gravity anomaly	magnetic local anomaly	remanent magnetization	transverse wave
coseismic phase	geocentric latitude	magnetic meridian	rotational wave	
crustal deformation cycle	geomagnetic reversal	magnetic observatory	secondary wave	
Curie depth	gravity gradient	magnetic secular change	seismic1	
declination	gravity reduction	magnetic storm, geomagnetic storm	seismic2	
density contrast	ground roll	observed gravity	seismic acquisition	
<b>Total number: 80 concepts</b>				

Table 5.12. Full list of English source terms (Vol.1)

<b>Collection of approved terms in Geophysics -Volume 1 (2003)</b>				
aftershock	foreshock	intermediate-focus earthquake	seismic exploration, seismic prospecting	streamer
cataclastic	geophone	large earthquake	seismicity	time-distance curve
centre of gravity	geophone array	lower crust	seismic trace	travel time
converted wave	gravimetry	lower mantle	seismic wave	ultra-microearthquake
core	gravity	major earthquake	seismogram	upper crust
critical distance	great earthquake	mantle	seismograph	upper mantle
critical refraction	half-life	microearthquake	seismology1	vertically oriented geophone
crust	head wave	microseism	seismology2	
deep-focus earthquake	horizontally oriented geophone	moderate earthquake	seismometer	
earthquake, seism	hydrophone	outer core	shallow-focus earthquake	
epicentre	inner core	seismic belt	small earthquake	
<b>Total number: 51 concepts</b>				

### 3.2.3.2. Textual corpus

“Once the subject area has been determined for the study, and the terms to be included have been inventoried, the corpus may be constructed” (Quirion 2003, p. 37). The corpus used in this thesis includes scientific articles in geophysics. Four principles have been taken into account for establishing the textual corpus:

1. The level of specialization of texts
2. Validity of publishers amongst specialists
3. Date of publishing
4. The sub-domains and subject of the texts

The textual corpus is exclusively based on the specialized journal articles (60 articles) written in Persian and selected corresponding to the sub-domains of the terminological corpus. The full list of the articles is presented in Appendix II. The main features of the textual corpus are:

- Use setting: academic purposes (learning, teaching, scientific production)
- Independent texts (journal articles)
- Authors and target users: specialists, senior researchers
- Journals: Iran Geophysics Journal, Journal of Earth and Space
- Publishing time: 2011 to 2012
- Sub-domains: earthquake studies, seismology, magnetometry, geoelectric, gravimetry

For compiling this corpus, I have consulted specialists of the domain (the members of the committee) to choose the most appropriate resources. The journals and the articles are recognized as the most reliable resources written and edited by the field specialists. The access to the full articles is free of charge, and the format of the documents is .pdf.

At least a four-year time interval between dissemination (publication) of the last standardized collection of terms (Vol. 4) and the publication of the articles is considered which refers to the minimum expected time that standardized forms need to be implanted. This interval for the previous collections, i.e. Vol.2 and Vol.1, will be six and eight years respectively.

#### 3.2.4. Analysis procedure

One of the main challenges in this analysis is the lack of any application for the Persian language that can perform automatic extraction and statistical analysis. Thus, I had to manage the analysis manually. The terms' definitions provided by the APLL were so helpful in recognizing either the context of the use or the terminological alternatives (variations).

Besides, as it can be seen from the terminological corpus, the relation between English terms and standardized equivalents is not bijective (one-to-one correspondence). In other words, for each English term, there is no, necessarily, one unique equivalent and the decision made on the proposed equivalents differs from one case to another. This suggests that the implantation of terms cannot always be observed merely based on terminological units and their corresponding equivalents. For instance, in Persian case, the

analysis should address the concepts and take the terminological units and equivalents into account as the potential and optional denominations.

In this regard, in this analysis, the standardized Persian terms along with the other terminological variations are considered as available options for subject field specialists to choose. Thus, the focus is on the use of any standardized Persian equivalents corresponding to a specific concept; and, the synonyms receive the same value. Indeed, to observe the behavior of specific terms and variations in their contexts some other criteria would apply which is not the purpose of this current analysis.

#### 3.2.4.1. Frequency

The frequency of use is not the focus of the analysis for two main reasons:

1. The analysis is done manually, and it was almost impossible to count all occurrences regarding absolute frequency<sup>65</sup>;
2. The accurate counting of terminological variations for relative frequency<sup>66</sup> needed an extended time and effort which was out of the framework of this thesis.

Therefore, only the use of standardized terms in journal articles is concerned, and I excluded the role of total frequency. For this reason, the accurate result of the implantation of the terms cannot be available, and in this section, the mere use of the terms is addressed. Indeed, further studies can complement the results of this retrospective study for achieving more accurate data on the implantation of terms.

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<sup>65</sup> Absolute frequency: “The total number of occurrences of a given word form in a corpus; for example, the term *T* is used 60 times (without any mention as to the alternate word forms *T'* for the same notion)” (Quirion 2003, p. 32).

<sup>66</sup> Relative frequency: “A ratio comparing the proportionate usage of a given term to that of its competing designations; it is represented by the implantation coefficient” (Quirion 2003, p. 32).

### 3.2.4.2. Time factor

The majority of the studies on the use of standardized terms in Persian consists of random observations and cannot reflect any change in the use of terms in distinct time periods. However, a comparison among various collections and examining the impact of time can provide us a broader insight.

As it is mentioned in the corpus description, the standardized terms under the study are published in different years and do not have the same chronological characteristic. It can be probable that some of them had much opportunity to be implanted because they are published earlier.

Therefore, in my analysis, the results are presented separately for each collection to observe if time factor is significant or not. This division, principally, shows if certain collection shows better results or not. An overall accounting is also provided to have an overview of the whole condition of standardized terms.

### 3.2.5. Results

Of the total of 255 concepts, 99 concepts are found in my corpus (Table 5.13). In other words, only 39 percent of the examined concepts had been addressed in the 60 journal articles. These concepts are distinguished by the color green in the tables 5.10, 5.11 and 5.12.

Table 5.13. The ratio of found concepts to examined concepts

Collection	Found concepts	Total concepts	% Found/ Total
Vol. 1	25	51	49 %
Vol. 2	36	80	45 %
Vol. 4	38	124	31 %
Total	99	255	39 %



Among all, the Volume one shows the most compatibility between the concepts of standardized terms and those in the corpus, yet few. There could be some possible reasons for this unexpected result. It is possible to interpret the low compatibility of concepts as a suggestion that work methodology in the preparation phase (discussed in the *systematic analysis*) might be unsystematic.

This unsystematic work, on the one hand, would bias the candidates towards a blind selection merely relying on individuals' knowledge and memory rather than a systematized corpus compilation. On the other hand, the methodology contributes to the collection of term candidates majority of which fall in terms *in vitro* (i.e. approved by consensus or standardized, dictionary entries, thesauri, etc.) and terms *in vivo* (spontaneous and natural units) are disregarded. In other words, although they are specialized terms used in glossaries or encyclopedic dictionaries, they may not show a frequent use in journal articles.

Another possibility could be due to the conceptual clustering as a methodology used in the preparation of the terminological records in the committees, described in Zarnikhi (2010a<sup>67</sup>). As it is evident by the structure and formation of the terms, many of not-found concepts are of the derivatives or collocations of one certain term; e.g. *alias band*, *alias filter*, *antialias filter*, *aliasing*; *geoidal height*, *geoid height*, *geoidal separation*, *geoid separation*, *geoid undulation*, *geoid*. I presume that the occurrence probability cannot be equal for all of them.

### 3.2.5.1. Terms in use

To understand the usage rate of the equivalents, only those terms that are fully used in the corpus are accounted. The result shows that of the total of 99 concepts, 68 concepts are denominated in the corpus by the equivalents similar to the standardized terms (Table 5.14).

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<sup>67</sup> “Related terms form a conceptual cluster; a group of terms share a core meaning. This common meaning connects them in a horizontal line, but at the same time, they are vertically different from each other by some nuances. The philosophy behind it is to avoid choosing an equivalent in place of another one” Zarnikhi (2010a).

Table 5.14. Percentage of similar denominations in the corpora

Volume	Concepts with similar denominations	Concepts/Found %
<b>Vol 1</b>	20	80%
<b>Vol 2</b>	31	86%
<b>Vol4</b>	17	45%
<b>Total</b>	68	69%

This result is independent of the frequency of use, and only shows the application of standardized equivalents. Table 5.15 shows this result organized by their related collection volume.

Volume 4	Volume2	Volume1
aliasing	absolute gravity	aftershock
arrival time	applied seismology, exploration seismology, prospecting seismology	core
auxiliary plane, auxiliary fault plane	astronomic latitude	crust
body-wave magnitude	body wave	earthquake, seism
downward continuation	Bouguer plate	epicentre
engineering seismology	density contrast	gravimetry
first arrival, first break	earthquake prediction	gravity
intercept time	elastic	large earthquake
magnetic polarization	elasticity	mantle
moment magnitude	focal depth	microearthquake
moveout, stepout	free-air correction	seismic belt
offset	gravity gradient	seismic exploration, seismic prospecting
primary reflection	gravity reduction	seismicity
seismic hazard, earthquake hazard	induced earthquake	seismic wave
seismic risk	magnetic local anomaly	seismogram
stress drop	observed gravity	seismograph
upward continuation	paleoseismicity	seismology2
	pressure wave, P wave	seismometer
	raypath	time-distance curve
	seismic1	travel time
	seismic2	

	seismic acquisition	
	seismic anisotropy	
	seismic gap	
	seismic section	
	shear wave, S wave	
	stress	
	strain	
	surface wave	
	teleseism	
	time section	
<b>17</b>	<b>31</b>	<b>20</b>

Table 5.15. List of similar denominations classified according to the volumes

It should also be noted that the figures show all used terms, regardless of standardization methods (i.e. *selection, re-semanticization, neologisms*; described in the *systematic analysis*). Hence, Persian terms coined by specialists and being in use earlier than the Academy's approval are also included. Due to the lack of relevant documentation, it was not possible to differentiate standardized forms coined by the Academy (neologisms) from the existing Persian ones (selected terms). Although some random documentation is available, it cannot be applied for a comprehensive comparison of all those terms.

Nevertheless, as the former terminologist at the Terminology Department and representative of the geophysics committee, I came to the conclusion that it is extremely probable that the majority of terms are standardized through the selection method. Yet, this remains as a personal claim and cannot be reflected in my overall evaluation. Regarding this case, as long as no significant competition between standardized terms and other alternative variations would be noticeable in my corpus, the use of the similar denomination can reflect the success of the standardized terms (at the selecting or diffusing level).

A striking result is the remarkable amount of similarities for the terms published in Volume one and Volume two, 80% and 86% respectively. The question that might come to mind is if this result is due to the time or the linguistic factors involved or any other characteristics that can affect their usage. To answer this question, I have examined dissimilar variations to the standardized terms that can be considered as competitors of the standardized forms.

### 3.2.5.2. Dissimilar denominations

Table 5.16 contains the data extracted from two corpora, including standardized forms from the terminological corpus (Vol. 4) and terminological variations extracted from the textual corpus. This table comprises 15 concepts and their denominative variations that showed the partial use of standardized forms, and six concepts that have shown no denominative similarities to the standardized terms.

A comparison of terminological variations and the standardized forms shows a visible tendency toward pure Persian in standardized forms and a tendency to discard English borrowed forms. In other words, the dissimilarity is due to the use of loan terms or plain Persian by the subject field specialists. Examples from the corpus are *artifact*, *borehole*, *Bouguer reduction*, *geoidal height*, *geoidal separation*, *topographic correction*, *magnetotelluric method*, etc.

There are some other instances to which purism or discarding borrowed forms cannot apply. In these cases, dissimilarity can be interpreted due to the stylistic choices. For instance, terms such as *isomagnetic map* or *induced magnetization* or *airborne magnetometry* are good representatives for this category.

Table 5.16. Dissimilar denominations in Vol. 4

English Terms	Terms used in Corpus	Standardized equivalents
acoustic log	نمودار صوتی، نگار صوتی	نگاره صوتی
aerial Magnetometry, airborne magnetometry	مغناطیس سنجی (به روش) هوابرد	مغناطیس سنجی هوایی مت. مغناطیس سنجی هوابرد
artifact, footprint	نوفه اثرانگشتی	پردازش ماند
borehole	چاه اکتشافی	چاه گمانه، چاه
Bouguer reduction, Bouguer correction	تصحیح بوگه	برگردان بوگه
datum plane, datum plane, reference level	سطح مبنا، داتوم	سطح مبنا مت. 1. سطح مرجع مت. 2. تراز مرجع
earthquake engineering, seismic engineering	مهندسی زلزله، زلزله شناسی مهندسی	مهندسی زلزله
earthquake magnitude	بزرگی زمین لرزه، بزرگای	بزرگی زمین لرزه

	زمین لرزه، بزرگی زلزله	
geoidal height, geoid height	ارتفاع ژئوئید	ارتفاع زمینوار
geoidal separation, geoid separation	جدایی ژئوئید	جدایش زمینوار
induced magnetization	مغناطیس شوندهی القایی	مغناطش القایی
isomagnetic map	نقشه هم مقدار مغناطیسی	نقشه هم مغناطیسی
local magnitude, Richter magnitude	بزرگی محلی، بزرگی محلی	بزرگی محلی مت. بزرگی در مقیاس ریشتر، بزرگی ریشتر
log	نمودار	نگاره
magnetotelluric method	روش مگنتوتلوریک، روش زمین مغناط برقی	روش زمین مغناط برقی
multiple reflection	بازتاب های چندگانه، بازتاب های تکراری	بازتاب چندباره
normal moveout	NMO، برون راند نرمال	برون راند بهنجار
slip partitioning, strain partitioning	تقسیم حرکت کلی چپ گرد مایل در عرض	افراز لغزش مت. افراز کرنش
terrain correction, topographic correction	تصحیح توپوگرافی	تصحیح زمینگان
well log, wire line log	نمودارهای چاه، داده های نگار چاه، نگار چاه، داده های چاه، اطلاعات داده های چاه، لاگ چاه	چاه نگاره مت. سیم خط نگاره
well logging	داده برداری از چاه	چاه نگاری

In theory, the Academy has stressed the moderate approach toward standardization. However, standardized forms in various committees do not show the same tendencies. Ghanatabadi, the linguist and the researcher at the Terminology Department, has pointed out an inclination toward pure Persian terms in some committees and believes that in some cases they experiment excessive new coinage while there are plain Persian terms already available (2013, p. 663). This means that, in some domains, despite existing frequent Persian equivalents, committees' members or even terminologists at the Academy tend to form new equivalents, and these equivalents are biased toward pure Persian words.

Those dissimilar denominations from other volumes also support the aforementioned specialists' preferences (i.e. stylistic choice,

borrowing, plain Persian). The standardized Persian terms for the English terms like *inner core*, *shallow-focus earthquake*, *upper mantle* (Volume1) and *remanent magnetization* (Volume2) are examples of excessive term formation and puristic approach. Whereas the equivalents of the terms, such as *seismic trace*, *seismograph* (Volume1) and *magnetic inclination*, *declination* and *aeromagnetic surveying* (Volume2), are representatives of the stylistic features. *Isostasy* (Volume2) can also be regarded as the result of unfamiliarity which ended in the use of borrowed form (Table 5.17).

Table 5.17. Dissimilar denominations in Vol.1 & Vol.2

English Terms	Terms used in Corpus	Standardized equivalents
aeromagnetic surveying	برداشت مغناطیس‌سنجی به روش هواپرد	نقشه‌برداری هوا مغناطیسی
declination	زاویه انحراف مغناطیس‌شوندگی، انحراف	انحراف، انحراف مغناطیسی
inner core	هسته درونی	درون‌هسته
isostasy	ایزوستازی	هم‌ایستایی
magnetic inclination	میل مغناطیس‌شوندگی، زاویه میل، زاویه میل مغناطیس‌شدگی، زاویه میل مغناطیس‌شوندگی	میل مغناطیسی
remanent magnetization	مغناطیس باقی‌مانده، مغناطیس‌شوندگی باقیمانده	مانده مغناطش
seismic trace	رد لرزه	ردّ لرزه
seismograph	دستگاه ثبت‌کننده امواج حاصل از زمین لرزه، لرزه‌نگار	لرزه‌نگار
shallow-focus earthquake	زمین لرزه کم عمق	زمین لرزه کم‌ژرفا
upper mantle	گوشته بالایی	روگوشته

### 3.2.6. Discussions

Quantitative analysis constitutes the primary phase of any corpus-based study. Particularly, in the retrospective study, the amount of the used terms in their real context and the choice of terms over the analyzed articles give us a panoramic view to realizing how these standardized terms could function as optimal and appropriate denominative forms chosen by specialists.

This retrospective study has assessed the use of standardized terms by their real users. It provided details about the terminological variations and a comparison among preferred denominative forms and standardized forms. Results are based on the real examples rather than theoretical generalization, and some aspects that have rarely been studied in the Persian language (if there is any) are observed through this comparison.

The results also provide a panoramic view in which we can examine several terminological issues that, while crucial, are often disregarded in other studies. To answer the questions drawn at the beginning of this section, I first discuss whether the standardized forms have met the terminological needs of their users or not. This reflects the quantity of similar denominations in use out of the total number of standardized forms. Second, in addressing the impact of interventions on standardized forms (activities ↔ outcome ↔ impact), I compare different periods of standardizations in Geophysics committee and their relevant impacts.

#### 3.2.6.1. Standardization in geophysics (2000-2007)

The Academy has standardized 284 terms for 255 concepts corresponding 299 English denominative forms. Out of this figure, the total number of similar denominations in use can form the real impact of the standardization process over the years 2000-2007, in geophysics domain. The analysis illustrates a low rate of use of standardized terms up to the year 2007. The total number of standardized terms in use is only 68 out of 255 concepts (27%). Although the proportion of similar denominations comparing to the found reference concepts shows positive results, the fact is that this figure is still little out of the total number of standardized terms.

In Figure 5.3, dissimilarities and not found concepts show the area of concern. An important point in relation to the results is how to revise those dissimilar denominations and how to “recycle” them into the process of standardization. In my corpus, those unsuccessful terms are few, and it seems that it will not be troublesome for the Academy to modify or update these terms.

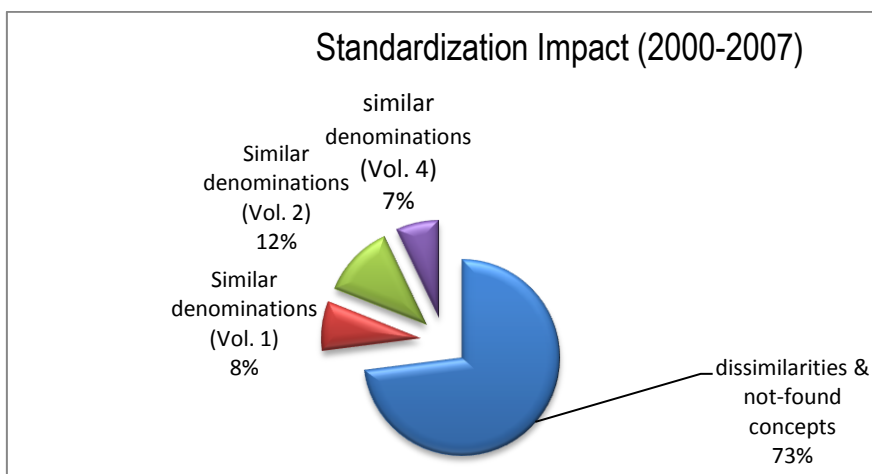


Figure 5.3. Standardization impact (2000-2007), Geophysics [Vol.1-Vol.4]

Nevertheless, for those concepts that are not found in the corpus, there must be some additional observations and analysis. Building a new corpus and focusing only on these concepts, consulting with specialists and studying some other use situations can be suggested for obtaining advanced results.

### 3.2.6.2. Interventions’ impact

As it is mentioned in the systematic analysis, and also reflected on the number of the standardized terms in different periods, the Academy has speeded up the standardization in the language of science by examining more concepts per year and expanding the councils and meetings by various means.

The first volume of the geophysics terms contains 53 terms (published in 2003-2004), while it is increased to 143 terms in Volume Four (published in 2007). It is also worth noting that despite this rise, the number of the committee’s meetings has not been increased. In other words, the committee kept having four meetings per month. These facts reveal that the pace of the



standardization comprised bigger deal of efforts and pressure in the committees and the larger amount of Terminology councils. This resulted in standardizing more derivative forms that prompted a quantitative growth.

Nevertheless, the retrospective evaluation shows that this growth has not had a positive impact. Many of those derivative forms or collocations are not, in fact, of major interest for the specialists since they are neither frequently in use nor challenging. Besides, to my mind, the interval between terminological corpus and textual corpus has not affected the result to a significant extent, since the results for volume two shows a better success than volume one (86% for Vol.2 and 80% for Vol.1).

### 3.2.7. Synthesis

The terminological corpus of my study was formed by the approved terms at the Academy during 2003 to 2007 which are the outcomes of the Terminology Department for geophysics domain in the years 2000-2007. The main aims of my study were to understand to what extent these standardized terms can be useful for the field specialists and how the Academy has contributed to removing potential terminological barriers.

According to the findings and also supported by some other standardization studies, the Academy would need some alternative approach rather than what it is currently applied for contributing to the terminology development. It is necessary to address the real needs of the users by changing the focus from mere quantitative outcomes to corpus-based activities and impacts.

### 3.3. Prospective analysis

One of the significant roles of the terminology centers is providing appropriate terminological resources due to the specialists' demand. As it is also discussed in the review, availability of appropriate and relevant Persian terms should be given the prominence in Persian terminology. For this reason, any terminological research needs to address the relevance of the terminological activities and socioterminological demands to observe if they sufficiently anticipated the users' expectations or not.

The availability of standardized Persian terms can facilitate the process of translation and provides appropriate materials for experts to utilize in their text production. In this analysis, I intend to realize how relevant terminological works at the Terminology Department were to the scientific and real needs of geophysics specialists. In this case, the analysis on standardized terms is not limited to the domain, but any availability of Persian equivalents that can account as a response to terminological demand is concerned.

#### 3.3.1. Objectives

The main objective of this analysis is to measure the proportion of standardized terms relevant to geophysics, geosciences, mathematics, physics, and surveying, among the most representative English terms used by experts, taking into account the interdisciplinary nature of the domain. This analysis intends to answer this question:

- To what extent the terminology activities at the APLL correspond with the needs and pragmatical requirements of the geophysics specialists?

#### 3.3.2. Corpus description

For this prospective evaluation, I have compiled an English textual corpus constituted of all English abstracts of the articles used in the retrospective analysis which contains around 35.168 words (60 abstracts). This corpus is used to extract the most representative English terms used by the authors during the years 2011-2012.

It is assumed that the English terms used in these journal abstracts may show the common terminological needs of the experts during the course of drafting, writing and translating. Over this process, they require Persian equivalents to replace the English terms. Thus, they might consult the standardized terms of the Academy (i.e. approved terms during the years 2003-2010) or some other terminological resources. In the case of confronting terminological gaps, these English terms may become challenging.

Identifying these gaps and recognizing the common terminological needs are considered as the relevant activities of standardization centers (here the APLL) to the existing demands. In other words, this corpus could form a good source for evaluating whether terminological needs of the geophysics domain have been anticipated in the process of planning for the activities of the Geophysics and its related committees posterior to the years 2011 and 2012.

For the purpose of this analysis, a comparison among English extracted terms and standardized English terms published by the Academy from 2003 to 2016 (which are the outcome of the activities from 1998 to 2016) is carried out.

### 3.3.3. Term extraction

The selection of terms and validation are key factors in this analysis. Any inaccurate data can bias the final result. Therefore, I have chosen an automatic extractor for building the English terms list and then the final validation of terms is managed based on a selected list of dictionaries, glossaries, and handbooks in the domain verified by the members of the geophysics committee. Further verification based on the online resources, whenever was needed, is done to build the most reliable result. This happened mostly for the polylexical units and the most recent terms that have not been found in the paper-based resources.

For the extraction, the TERMINUS application, created and developed by IULA, is used since to my knowledge is one of the reliable tools in term extraction; and, it offers various options to control and manage the corpus from extracting polylexical units to verifying term candidates according to their concordances.

### 3.3.4. Verified terms

After the extraction process, 130 English terminological units (TU) are verified among which 40 terms are monolexical, 72 terms are bilexical, and 18 terms are trilexical (Table 5.18). As it could be expected, the majority of terms are bilexical. Apart from the frequency, all these terms have appeared at least in two articles by different authors. This reduces the probability of arbitrary coinage or stylistic denominations, given that the abstracts are not written by native speakers but specialists with a good conceptual and terminological knowledge.

TU	Number	Structure
<b>monolexical units</b>	40	8 adjectives + 32 nouns
<b>bilexical units</b>	72	nouns
<b>trilexical units</b>	18	nouns

Table 5.18. Verified terms

### 3.3.5. Data presentation

For conducting a better analysis, terms are presented separately according to the number of their lexical units. Expectedly, monolexical units are more interdisciplinary, and polylexical units are less interdisciplinary. I have not made any categorization regarding related domains since the collective work is addressed here and not the property of each domain.

TU	(Extracted) ETU	SPT	SPT/ ETU%
<b>Monolexical</b>	40 terms	26 terms	65%
<b>Bilexical</b>	72 terms	21 terms	29 %
<b>Trilexical</b>	18 terms	1 term	5 %
<b>Total</b>	130 terms	48 terms	37%

Table 5.19. Standardization rate of verified terms

The results show that out of the total number of extracted English terminological units (ETU) only 48 terms are standardized Persian terms (SPT). In other words, the standardization process at the Academy from the beginning up to 2016 has contributed to the 37%

of the units identified in my corpus. It is worth noting that this figure only shows an approximation of needs and achievements for some reasons:

1. The terminological needs cannot be measured by quantitative data solely based on a term extraction. They involve a wide range of elements from non-institutional activities to individuals' knowledge of the language and the specialized contexts.
2. These texts are written by the Persian authors and are limited to the abstracts of the Persian articles. For sure, the real needs could be much further than what it is presented by these figures.
3. Among those extracted monolexical units, there are some terms that are standardized in combination with some other units. Examples are *zone*, *magnitude*, *attenuation*, *tectonic*, *geometry*, *crustal*, *magnetotelluric*, *spectral*.

However, neither from the standardized terms nor the *Terminology Guideline*, one cannot realize the rationales behind the standardization of some simple nouns and adjectives and not some others. For instance, why *seismic* is standardized separately and why it does not apply to *tectonic* or *crustal*. For this ambiguity, I left these terms as not-standardized, since I believe that solving this puzzle, in any case, can be considered as an urgent need for those domains that are affected by this inconsistency.

In terms of the synonymy, it is worth mentioning that the most frequent form is used for the classifications. For instance, for the terms *downward continuation* and *DWC* as synonyms, the most frequent form is bilingual; so, it is classified in bilingual terms list.

Furthermore, units like *time-frequency* in TERMINUS are considered as monolexical since there is no any algorithm to identify compound hyphenated forms. In these cases, I have modified the data accordingly. The following sections give a brief presentation regarding each category (i.e. monolexical, bilingual, trilingual units) with their corresponding terms list.

### 3.3.6. Discussions

In this section, discussions related to each category are supported by their associated tables. Tables are designed to give information about verified terms, i.e. terminological units (TU), availability (A) or otherwise (NA), in terms of standardization forms, absolute frequency (AF), the number of texts in which these terms appeared, i.e. representative articles (RA), and representative frequency (RF) which shows the total number of RAs.

#### 3.3.6.1. Monolexical units

Following Cabré, Estopà & Vivaldi (2000), monolexical terminological unit is “any lexical unit found between blanks that is used in a specialized meaning within a given text” (p.51). According to Daille (1994) and Jacquemin (1996) and Naulleau (1998), monolexical units have the higher degree of polysemy comparing to polilexical ones (as cited in Cabré, Estopà & Vivaldi, 2000, p. 51).

Nevertheless, this fact does not entail that monolexical units should not be addressed in terminology extraction. Indeed, it is confirmed that developing a further study on the characteristics of these units are as crucial as any study on polylexical units. The standardization outcomes of the Academy also support the idea that monolexical units have received significant attention in the standardization process.

The data show that the Academy tended to monolexical standardization in the years 1998-2016. In other words, the most standardized terms are polysemic terms and hence interdisciplinary. This result is in contrast to the preferences of the Academy described in the systematic analysis (section 2.4). Table 5.20 presents the monolexical terminological units.

No.	TU	A/NA	AF	RA	RF
1.	seismic (adj)	A	223	t2 t3 t9 t11 t15 t18 t19 t22 t23 t24 t26 t27 t29 t30 t31 t32 t35 t36 t42 t44 t47 t48 t49 t50 t51 t53 t54 t55 t56 t60	30
2.	frequency	A	181	t2 t4 t5 t8 t9 t11 t13 t15 t16 t18 t19 t22 t26	29

No.	TU	A/NA	AF	RA	RF
				t30 t34 t36 t39 t45 t46 t47 t48 t49 t51 t54 t55 t56 t58 t59 t60	
3.	signal	A	79	T1 t2 t3 t8 t9 t12 t13 t15 t21 t22 t26 t28 t30 t36 t37 t39 t43 t46 t49 t51 t55 t56	22
4.	source	A	99	t1 t3 t5 t8 t11 t12 t16 t19 t22 t26 t28 t37 t38 t40 t43 t46 t47 t51 t53 t54	20
5.	geological (adj)	NA	35	t1 t3 t6 t12 t14 t16 t23 t25 t27 t33 t34 t39 t40 t43 t45 t49 t50 t51 t52 t55	20
6.	noise	A	55	t2 t3 t8 t12 t15 t16 t21 t24 t26 t28 t32 t36 t39 t43 t51 t55 t56 t59	18
7.	wave	A	85	t2 t3 t5 t14 t19 t22 t23 t32 t35 t36 t44 t47 t48 t50 t60	15
8.	resolution <sup>68</sup>	NA	26	t3 t8 t9 t12 t13 t26 t29 t31 t34 t37 t45 t49 t52 t55 t56	15
9.	exploration	A	23	t4 t12 t16 t23 t24 t25 t28 t29 t30 t33 t40 t43 t46 t49 t55	15
10.	anomaly	A	102	t1 t4 t8 t10 t12 t16 t21 t28 t33 t35 t39 t43 t58	13
11.	estimation	A	27	t2 t3 t5 t8 t16 t18 t22 t26 t28 t49 t54 t55 t56	13
12.	fault	A	88	t2 t5 t6 t11 t27 t31 t39 t40 t44 t50 t53 t54	12
13.	amplitude	A	43	t1 t8 t15 t18 t26 t29 t37 t49 t50 t51 t56 t60	12
14.	algorithm	A	22	t2 t14 t15 t19 t20 t22 t38 t39 t42 t47 t49 t55	12
15.	gravity	A	82	t1 t8 t10 t12 t21 t33 t35 t38 t39 t41 t58	11
16.	wavelet	A	86	t8 t9 t15 t26 t30 t39 t42 t49 t55 t56 t60	11
17.	earthquake	A	77	t2 t5 t6 t11 t27 t35 t44 t47 t48 t53 t54	11
18.	crust	A	30	t22 t27 t35 t40 t43 t44 t46 t48 t50 t54 t58	11
19.	zone	NA	29	t3 t7 t20 t21 t27 t35 t40 t44 t46 t53 t54	11
20.	resistivity	A	66	t4 t7 t13 t16 t25 t34 t40 t45 t46 t52	10

<sup>68</sup> It is approved in cinema, but it is not related to this concept.

No.	TU	A/NA	AF	RA	RF
21.	profile	A	25	t3 t4 t7 t8 t12 t16 t35 t36 t40 t43	10
22.	magnitude <sup>69</sup>	NA	17	t5 t8 t11 t16 t17 t19 t23 t27	10
23.	reservoir	NA	44	t19 t18 t20 t23 t29 t32 t40 t54	9
24.	attenuation	NA	29	t2 t9 t15 t24 t32 t48 t51 t60	8
25.	seismicity	A	21	t2 t3 t6 t27 t35 t44 t48 t54	8
26.	tectonic (adj)	NA	9	t2 t6 t11 t12 t21 t27 t48 t53	8
27.	geometry	NA	23	t4 t10 t17 t27 t37 t43 t51 t52	8
28.	crustal (adj)	NA	30	t3 t11 t22 t27 t35 t44 t48	7
29.	filtering	NA	15	t10 t12 t15 t24 t26 t39 t60	7
30.	spectral (adj)	NA	25	t9 t21 t36 t42 t48 t49 t56	7
31.	offset	A	17	t1 t24 t27 t31 t32 t51	6
32.	survey	A	11	t7 t25 t34 t40 t45 t51	6
33.	waveform	NA	9	t11 t23 t27 t50 t56 t60	6
34.	<b>MT</b> , magnetotelluric (adj)	NA	47	t11 t25 t33 t40 t46	5
35.	teleseismic (adj)	NA	13	t3 t11 t22 t27 t35	5
36.	spectrum	A	26	t9 t26 t40 t49 t56	5
37.	anisotropy	A	34	t23 t50	2
38.	footprint	A	30	t34 t51	2
39.	porosity	A	25	t18 t29	2
40.	geoid (adj)	A	18	t41 t58	2

Table 5.20. Monolexical terminological units

### 3.3.6.2. Bilexical units

Bilexical units have shown much termhood<sup>70</sup> in comparison with monolexical units. Thus, they are more likely to be verified as terminological units in automatic term extraction systems. The extracted terms from my corpus also support this fact. As it can be seen, 72 units are identified and verified as bilexical terminological units (Table 5.21).

However, according to the data, at the Academy, these units have been regarded less than monolexical units. The data show that only

<sup>69</sup> It is approved in astronomy committee, which is different to this concept.

<sup>70</sup> The degree to which a stable lexical unit is related to some domain-specific concepts (Kageura and Umino, 1996, as cited in Wong, 2009).



29% of these units benefit from standardization support. That would complicate the terminological situations in two ways. First, they show considerable terminological variations (synonymy in this case), which should be taken into account for future terminology works or any revision upon the standardized forms. Second, among these variations, there are many abbreviations (nine cases) that need to be managed and standardized. For instance, *downward continuation* is standardized without its abbreviation which is *DWC*. Another example is *magnetotelluric method* which is standardized also without its abbreviation (*MT method*).

Another example that could represent the unsystematic work methodology at the Academy is the term *Moho depth* extracted from my corpus. At the Academy the terms *Mohorovicic discontinuity* (Syn. *M-discontinuity*, *Moho*) are standardized. However, the compound form of these terms is missed (*Moho depth*). One cannot understand why some terms and their compounds are standardized at the same time, and the otherwise applies to some other cases. This example gives an empirical support to the Zarnikhi's discussions (2010a) on the conceptual clusters and related terms in terminological records (Section 2.7).

No.	TU	A/NA	AF	RA	RF
1.	seismic data	NA	49	t9 t15 t18 t23 t24 t26 t29 t32 t42 t49 t51 t55 t56 t60	14
2.	real data	NA	15	t8 t9 t11 t12 t13 t21 t24 t32 t36 t45 t49 t51	12
3.	synthetic data, synthetic seismic data	NA	17	t8 t11 t12 t16 t21 t24 t34 t37 t39 t49	10
4.	shear wave, <b>S</b> wave	A	29	t2 t5 t19 t23 t36 t47 t50	7
5.	wavelet transform	NA	22	t8 t9 t26 t30 t39 t49 t55	7
6.	seismic wave	A	17	t2 t19 t36 t47 t48 t50 t60	7
7.	frequency domain	NA	9	t4 t13 t16 t30 t39 t56 t60	7
8.	electrical resistivity	A	17	t4 t7 t25 t45 t46 t52	6
9.	magnetic data	NA	12	t1 t12 t21 t28 t37 t43	6
10.	magnetic field	A	12	t12 t19 t34 t37 t43 t45	6
11.	Fourier transform	NA	8	t9 t16 t37 t49 t56 t60	6
12.	arrival time	A	7	t3 t9 t23 t27 t35 t44	6
13.	time-frequency	NA	32	t9 t26 t30 t49 t55 t60	6
14.	gravity data	NA	17	t8 t10 t21 t33 t38	5
15.	gravity anomaly	A	17	t10 t21 t33 t39 t58	5
16.	seismic attribute	NA	11	t18 t29 t30 t42 t55	5

No.	TU	A/NA	AF	RA	RF
17.	seismic trace	A	10	t9 t26 t29 t30 t60	5
18.	random noise	A	10	t8 t15 t16 t43 t56	5
19.	potential field	NA	9	t1 t10 t21 t28 t37	5
20.	forward modeling	NA	8	t11 t29 t37 t39 t45	5
21.	geological structure	NA	8	t16 t33 t34 t49 t52	5
22.	strike slip	A	6	t5 t6 t27 t44 t53	5
23.	analytic signal	NA	22	t1 t21 t37 t43	4
24.	discrete wavelet	NA	13	t8 t26 t30 t39	4
25.	spectral decomposition, time-frequency decomposition, time-frequency spectral decomposition	NA	13	t9 t42 t49 t56	4
26.	time window	NA	12	t2 t30 t42 t51	4
27.	focal mechanism	A	11	t5 t11 t27 t44	4
28.	core sample	NA	8	t18 t20 t23 t55	4
29.	regional gravity	NA	7	t10 t33 t39 t41	4
30.	synthetic model	NA	5	t12 t21 t34 t38	4
31.	seismic signal	NA	4	t9 t15 t49 t56	4
32.	magnetotelluric method, <b>MT</b> method	A	4	t25 t33 t40 t46	4
33.	Moho depth	NA	14	t3 t22 t35	3
34.	slip rate	NA	14	t6 t27 t53	3
35.	downward continuation, <b>DWC</b>	A	13	t1 t12 t58	3
36.	crustal thickness	NA	11	t3 t22 t35	3
37.	Magnetotelluric data, <b>MT</b> data	NA	10	t25 t40 t46	3
38.	inversion method, seismic inversion method	NA	9	t21 t29 t44	3
39.	structural index	NA	8	t28 t37 t43	3
40.	seismic network	NA	8	t2 t35 t50	3
41.	apparent resistivity	A	8	t4 t7 t45	3
42.	horizontal derivative	NA	8	t1 t8 t37	3
43.	<b>P</b> wave, <b>P</b> -wave	A	9	t3 t22 t35	3
44.	airborne electromagnetic, <b>AEM</b>	NA	6	t13 t34 t45	3
45.	magnetic anomaly	A	9	t12 t28 t43	3
46.	well log	A	9	t20 t29 t55	3
47.	Bouguer anomaly	A	5	t35 t39 t58	3
48.	quality factor, seismic quality factor, <b>Q</b>	NA	5	t2 t48 t60	3
49.	seismic activity	NA	5	t27 t48 t54	3
50.	neural network	NA	5	t18 t26 t29	3

No.	TU	A/NA	AF	RA	RF
51.	point source	A	5	t5 t11 t54	3
52.	geophysical methods	NA	4	t22 t33 t46	3
53.	training data	NA	4	t18 t29 t30	3
54.	teleseismic event	NA	4	t3 t22 t35	3
55.	amplitude spectrum	NA	11	t26 t56	2
56.	ground motion	NA	10	t5 t48	2
57.	seismic anisotropy	A	7	t23 t50	2
58.	moment tensor, <b>MT</b>	NA	7	t11 t27	2
59.	depth estimation	NA	6	t3 t28	2
60.	gravity map	A	6	t10 t39	2
61.	resistive layer	NA	5	t34 t40	2
62.	residual anomaly	NA	5	t10 t39	2
63.	reflection coefficient	NA	5	t26 t56	2
64.	acoustic impedance	NA	5	t18 t29	2
65.	histogram method	NA	5	t6 t53	2
66.	anisotropy parameter	NA	4	t23 t50	2
67.	resistivity distribution	NA	4	t34 t45	2
68.	offset domain	NA	3	t24 t32	2
69.	electrical conductivity	NA	3	t7 t46	2
70.	azimuthal gap, <b>Gp</b>	NA	3	t27 t44	2
71.	electric field	A	10	t16 t19	2
72.	fault system	NA	4	t6 t27	2

Table 5.21. Bilexical Terminological unit

### 3.3.6.3. Trilexical units

Among all terminological units, trilexical units have the least standardization. They also show a significant number of abbreviations; i.e. six abbreviations out of the total (33%).

There are some terms that have the standardization support for their constituting lexical units. For instance, in my opinion, terms such as *Bouguer gravity map* are not that much troublesome since they have all constituents already standardized in one way or another. The same applies to *time-frequency spectrum*. However, it does not apply to all of them.

The results also reveal a common need to standardization of geophysics' *methods*. This list provides a series of terms addressing different types of methods used in applied geophysics. Up to now, some methods are standardized but as other examples show, the

work was arbitrary, and many other methods are missed. Table 5.22 provides the full list of trilexical terminological units.

No.	TU	A/NA	AF	RA	RF
1.	finite element method, <b>FEM</b>	NA	15	t4 t7 t10 t33	4
2.	discrete wavelet transform, <b>DWT</b>	NA	7	t8 t26 t30 t39	4
3.	shear wave velocity	NA	7	t5 t23 t36 t47	4
4.	time-frequency analysis	NA	5	t9 t30 t49 t55	4
5.	analytic signal amplitude	NA	3	t1 t37	2
6.	boundary value problem	A	10	t41 t58	2
7.	empirical mode decomposition, <b>EMD</b>	NA	7	t15 t26	2
8.	matching pursuit decomposition (method), <b>MPD</b>	NA	6	t9 t49	2
9.	P recipient functions	NA	6	t3 t22	2
10.	optically stimulated luminescence, <b>OSL</b>	NA	5	t6 t53	2
11.	continuous wavelet transform, <b>CWT</b>	NA	5	t9 t49	2
12.	crustal velocity structure	NA	5	t27 t44	2
13.	shear wave splitting	NA	4	t23 t50	2
14.	real seismic data	NA	3	t15 t24	2
15.	regional gravity anomaly	NA	3	t10 t33	2
16.	secondary magnetic field	NA	3	t34 t45	2
17.	Bouguer gravity map	NA	3	t10 t39	2
18.	time-frequency spectrum	NA	6	t9 t49	2

Table 5.22. Trilexical terminological units

### 3.3.7. Synthesis

The prospective study was based on the terms extracted from the corpus and the standardized forms in need. The study covers approved terms in Geophysics Committee and some other related committees in the years 2003- 2016 which can be considered as the representative data of interdisciplinary outcomes at the Terminology Department.

The main aims of my study were to understand to what extent the terminological needs of the field specialists are addressed in the ongoing terminology activities, including coordination and

revisions. According to the findings, the Academy's activities do not seem much relevant to the real needs of the specialists to the extent that bilexical units have received less attention and trilexical units are almost missed (Figure 5.4).

This result, to some extent, reflects an inconsistency and unsystematic work regarding needs identification and terminology management. For contributing to the terminology management and planning (as they are mentioned in the objectives of the Academy), it is necessary to address the real needs of the users by concentrating on terminology management applications- or any other source available that can assist terminologists and committees in this area.

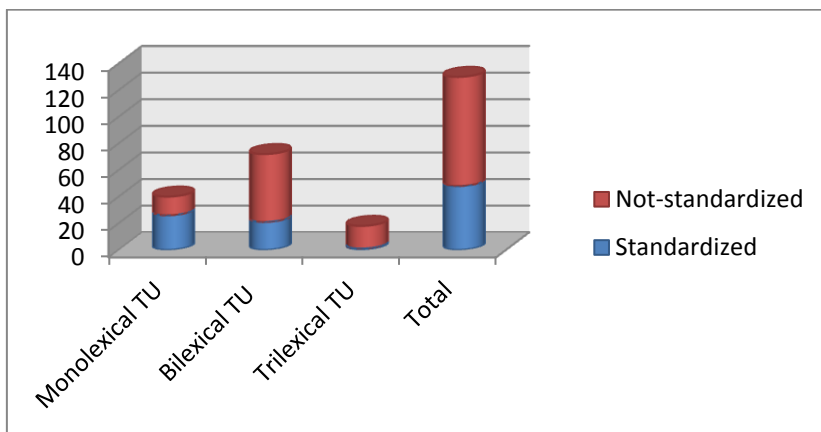


Figure 5.4. Standardization rate of terminological units (TU)

Maybe a few decades ago the terminology management was not regarded that much crucial and there was no urgent need. But, nowadays, with the vast amount of information and data, given the growing pace of data production, it seems more challenging to continue with traditional compilation models.

#### 4. Concluding remarks

TP in Iran is understood as activities associated with standardization of terms, including the policies and methodology that are supported by the government for replacing foreign terms by Persian equivalents. In this sense, terminological activities in Iran are prescriptive, and the standardization proposals should be approved and legalized by the high council of the Academy of Persian Language and Literature and the president of the time.

Terminological works at Iranian academies have been oriented towards the study of word formation resources in either classic Persian or modern Persian, to develop and modernize the language based on its own linguistic resources. This orientation from the earliest time was often accompanied by legalization and promotion of the new coined or selected words.

The Persian language is able and apt to be used in all domains (general and specialized). It is developed relatively to function as the language of science, and it can be used in all communicative circumstances. Indeed, this status is due to the endeavors of all Iranian scholars and literature cycles over the centuries, and academies of science and language during the recent decades. The scientific language in Iran is adequately understandable for all Persian speakers, and it conforms to the standard form of Persian. The emergence of new concepts and the use of foreign terms (mainly English words) are inevitable. However, Persian has shown a high productivity thus far.

Currently, standardization activities in Iran are regulated and continuous; nevertheless, these activities undergo a series of limitations due to the terminological resources or intrinsic characteristics of the language. For instance, the alphabetical difference between Persian and Romance languages does not let Persian linguists benefit from Western advances in language-based programs or applications. There are some adaptations and localizations in general language, but in specialized contexts, the efforts are in the primary phases. Some of the shortages that would affect the TP in Iran are as follows:

- There is no technical and specialized corpus.
- There is no any term base to offer contextual and terminological data.
- There is no any localized application or program to facilitate term extraction adapted to the characteristics and linguistic needs of the Persian.
- Technical translation activities do not experience planned and institutional strategies.

These facts indicate that terminological resources are quite scarce. The only source of consultation is the collection of approved terms at the Academy, accessible via its web page, or via <http://www.vajehyab.com/>, or hard copies providing information about the original terms, synonymy, Persian standardized forms and their definitions.

Despite these limitations, the Academy makes great effort to reduce the use of foreign terms by proposing and publishing standardized forms that assist authors and translators in the production and transmission of the knowledge. Based on the evaluation conducted on three different levels, i.e. systemic, systematic and socioterminological levels, the following results are obtained:

#### 4.1. Systemic level

1. Terminological activities in Iran are affected by the sociopolitical changes to the extent that any political change (from changing the governments or the presidents in the same government) would influence the activities. This influence would range from changes in resource allocation, policies, the head of the APLL to the associate members of the Academy or terminology guidelines.

2. Terminological activities in Iran have always been subordinated to the language plans and policies. Recently, the activities are getting more organized and managed to be subordinated to the development plans by drawing the horizons and long-term objectives.

3. The first and the second results mentioned above suggest a major concern towards the sociocultural needs in TP that is, in the earlier

steps, associated with the fulfilling the sociolinguistic-related needs and accountability of the organization in charge; and, at the advanced levels, it involves sustainability and generative approaches.

These results are predicated on the current situation of the activities, given that some recently made decision have not yet obtained the outcomes and are in the primary phases.

## 4.2. Systematic level

1. Institutional terminological activities in Iran have met the basic needs of work methodology. The activities are supported by the formulation of policies and guidelines. The existence of monitoring and coordinating sectors, as well as criteria for the standardization process, are good elements that can be considered as a good basis for the development of the terminological activities.

2. Regarding the short-term objectives, dissemination of terms and training activities, given the existing limits, the Academy is functioning well. However, it seems that further efforts are required to develop the contribution of interventions according to the objectives by supporting terminological research and improving the resources.

3. The current system has no particular mechanism for problem-solving and resource management. These shortcomings have brought about some challenging situations that affect not only the quality of standardized terms, but also the implantation of these terms.

4. Over the recent years, the number of standardized terms at the Academy has increased dramatically. During the first ten years of the activities, more than 10 000 terms have been approved and published (from 1997 to 2007); while, only during four years, from 2012 to 2015, around 17 000 terms are approved and presented. This dramatic rise in the number of standardized terms, mainly during the last decade, on the one hand, implies an expansion in the organization of the department in terms of the personnel, committees, resources, etc.; and on the other hand, indicates an



increasing terminological demand due to the rapid pace of technological evolutions.

5. These particular terminological situations and the quantity of processed terms call for well-established guidelines and a systematized managing system to overcome the limitations and provide a satisfactory result.

### 4.3. Socioterminological level

1. The existing empirical approaches towards assessing the APLL's standardized terms do not benefit from a systematized methodology. The arbitrary attempts cannot account for the further improvements regarding systematic changes or criteria modifications.

2. In the framework of periodical assessment, much more systematic studies are required to form a basis for the development of institutional and terminological activities. The future studies need to be supported by the much reliable evidence and standard methodological protocols.

3. The results, based on the activities of the Geophysics committee in the years 2000-2006 (retrospective study), show that the purism and discarding loan terms had a negative effect on the final use of the standardized terms. This suggests that in the future works, it is better to select or propose terms that are formed more in plain Persian.

4. The results, based on the evaluation of the planned activities at the Geophysics committee (prospective study), show that identification of real needs is given the least attention. This resulted in the disregarding biliteral and triliteral terminological units that are, indeed, among the most challenging units for the specialists.

### 4.4. Holistic reflections

A comparison of different layers and their mechanisms shows that the guidelines and policies, to some extent, have a symbolic function in TP activities in Iran. Paradoxical decision makings in

the theory and the practice, the objectives that have never been realized, the lack of policies for borrowings and the focus on the production quantity are instances that confirm the presence of some dysfunctions in the institutional work.

According to the socioterminological analyses, the low level of satisfaction of the real users can be interpreted as a suggestion that the relation between the Academy and its sociocultural environment needs to be recovered. The constant negative reports and the non-responsive attitude of the Terminology Department for years have created major challenges that need to be overcome.

In the current situation, the intrasystemic factors had a significant role in the use of the approved terms. However, some planned strategies are also required to improve the intersystemic relations as such the relationship between specialists and the Academy implies.

## **CHAPTER VI. FINAL CONCLUSION AND FURTHER RESEARCH**

This study principally aimed at designing and proposing a holistic analytical framework to evaluate TP activities. For this purpose, foremost, it was necessary to verify the needs of such holistic approach. Afterward, recognition of elements and indicators has been considered essential for developing the analytical model.

On this path, the current attempts in TP evaluation on the one hand, and the relations among various levels of TP and the influence they may have on the final results, on the other hand have been addressed through an extensive review of all relevant topics to TP. These topics are presented in the earlier chapters, ranging from the super-ordinate topics such as planning and terminology to substantial aspects of TP such as modeling, policy formulation, and the evaluation function.

The theoretical background of the current thesis reflects the complex nature of TP. The practice and theorization in TP have a considerable long-standing tradition, and the historical account has been necessary to position the discussions on evaluation in full perspective. The sources of the arguments have ranged from classical terminology to modern perspectives, including the contributions from sociolinguistic and socioterminological issues.

The literature reviewed in the thesis was presented in three main blocks. The first one was devoted to the perception and conception of TP which continued with identifying relevant and involving factors. The second part included the presentation of models and stages. The third part, in particular, observed the arguments on evaluation, its implications and the analytical stages that have been addressed thus far.

The main achievement of this thesis is manifesting the needs and possibility of developing a holistic analytical model that can analyze the performance of TP in a given context. In the proposed model, all data used as input are defined and explained due to their role in analytical interpretations. The methodology used in this thesis can help practitioners and planners to uncover implicit

information that assists in improving and amending current activities without changing the model in practice. In other words, the evaluation methodology can be applied to all models to solve a variety of practical problems based on sociolinguistic, socioterminological and functional information collected from different levels of TP process.

In Chapter V, the TP situation in Iran and its implications was analyzed given the proposed model. The study started with an analysis of sociolinguistic and historical aspects that characterize the TP in the Iranian context. To be able to evaluate the whole TP performance, institutional activities and the application of terminological proposals (i.e. final products) in their real context were surveyed as well.

The thesis is an exploratory and explanatory research. It is exploratory because it provides significant insight into TP process in general and the Persian TP in particular by means of qualitative approach. It is explanatory because it presents some quantitative information as well; and, it has tried to find interpretations of the observed phenomena to form an integrated and holistic approach. This characteristic, on the one hand, is useful for decision-making in the observed subject field, and on the other hand, it gives a generalization of the TP activities based on evaluation criteria (i.e. relevance, efficiency, effectiveness, and impact) in the Iranian context.

The thesis has been structured around two hypotheses to explain the necessity of a holistic analytical framework for conducting TP evaluations as well as to observe the performance of planning systems, emphasizing the importance of identification of users' needs. The first hypothesis suggested that analytical systems in TP need to benefit from not only a wide external view to the terminological activities and their context but also an insight into the mechanisms underlying the institutional activities. The equilibrium between contextual and institutional aspects in the analytical procedures provides a significant amount of information either to interpret the interactions of distinct levels or to solve the potential problems emerging from different levels.

The second hypothesis is supported by empirical evidence of the Persian case study that shows the importance of users' needs identification in the success of terminology activities. This hypothesis has been addressed previously in the literature by means of exploring the communicative requirements of subject fields; however, at the empirical level, little research has been conducted to support the theory.

Due to the organization of the thesis according to which each section is followed by the synthesis and its proper conclusion, in this chapter, I focus on the general reflections. For this purpose, the following section is dedicated to the answering the research questions put forward in Chapter I.

## 1. Research questions and the results

The research questions have been classified into two categories. The first category was devoted to the questions for designing the analytical model proposal. The questions in the second category are related to the empirical research and the Persian case. Hereinbelow, the final conclusions are presented due to these categories; i.e. general conclusions on the analytical model, and general conclusions on the empirical research.

### 1.1. General conclusions on the analytical model

The analytical approach presented in this thesis is innovative in that it is based on interdisciplinary theoretical concepts from sociolinguistics, socioterminology, social development, planning theories and performance management. It is the first attempt to design an analytical framework in TP for developing a decision support tool. The proposed framework has the potential to combine different types of perspective to account for various scenarios. The analytical framework shows some reflections on the research questions that are presented as follows.

a) The main elements associated with a holistic evaluation in TP have been identified as *objectives* of the evaluation, the *criteria*, their associated *key questions*, the credible and defensible *source* and *methods*, the *standards* and the *evidence* to support the final report and evaluation. These elements are identified as the most

important elements in any type of evaluation under the framework of social development.

b) The role and the objective of evaluation in TP models can be diverse. Different scenarios require correspondingly different objectives. However, generally speaking, the main purposes of evaluation in TP are to contribute to the improvement of interventions and quality of terminological works or policies, the effectiveness of decision-making and TP implementation as well as to assist in accountability by reporting on the terminological achievements.

c) The main success indicators of TP systems are identified as *integration* and *dynamicity*. Integration implies the coordination and constant interaction and interplay among various levels to guarantee the relevance of the institutional activities to the sociolinguistic context on the one hand and socioterminological needs on the other hand. While, dynamicity is predicated on the periodic research to obtain information and data about the impact of the activities; and, it can be realized only by employing this information for the ongoing updates. Furthermore, sustainable TP systems are only achievable by means of integration and dynamicity as the fundamental characteristics.

d) Implantation evaluation is associated with other TP elements by manifesting the impact of terminology activities. The impact, as the long-term achievement of institutional operations and the coordination of sub-systems, not only reflects some linguistic aspects of terms (i.e. descriptions of term-formation methodologies, tendencies, frequencies and grammatical aspect) but also it represents the extent of coordination and integration in a certain system. It is required, therefore, for a TP system to manage the implantation results systematically and to support internal and external research attempts to obtain a wide knowledge about various subject fields.

e) Although implantation evaluation is necessary for any TP system, it is not sufficient for updating the terminological resources and improving the terminological activities. The methodology and the evidence show that a series of analysis is required for a TP system to have the adequate and sufficient practical, theoretical and

analytical information for improving and amending the activities. These analyses can be ranged from retrospective and prospective studies (based on corpus studies) to the functional evaluation and sociolinguistic research.

## 1.2. General conclusions on the empirical research

The empirical study represented the functioning of the TP in Iranian context and the characterization of its institutional performance and its terminological impacts as well as sociolinguistic expediencies. The application of the proposed framework to the Iranian terminology confirms that the analytical approach requires large amounts of data that have to be collected from multiple sources.

Given the peculiarity of the Iranian terminology context (shortcomings regarding specialized corpora, the lack of methodological consistency in terminological research and time limits for assessing the impact of recently launched activities) it has been difficult to obtain all necessary information on the behavior of terminological units. Nevertheless, the results have shown a plenty of sufficiencies to respond the research questions in terms of systemic and systematic activities.

As the main purpose of evaluation systems implies, the results of the case study should account for the improvements of operations and activities in different levels. In this regard, the empirical part of this thesis showed adequate reflections to be accounted for further contributions to TP improvements in Iran. These reflections are summarized as follows.

a) The foremost and the most crucial step in the improvement of Persian TP is the preparation of specialized corpora based on the institutional and academic documents. Developing specialized corpora in the Persian language not only improves the accessibility to reliable terminological data but also is the fundamental element of implantation studies and monitoring function that assists in analyzing terminological units' behavior.

The establishment of specialized corpora is also required to achieve the objectives of the terminological works in the APLL among

which the Terminology Department has addressed managing terminological resources.

At the second level, the results suggest that the Terminology Guideline should be revised concerning interdisciplinary needs and terminology consistency. The current document not only is inconsistent with the use of terms but also shows a certain degree of disagreements among presented topics, in theory and practice.

b) The evaluation results showed that the standardization process in the APLL merely relies on ad-hoc terminology work and arbitrary use of subject-field specialists' knowledge. The improvement of implantation of Persian standardized terms requires an integrated work and systematized interventions in which the socioterminological needs are given the primacy. This systematization should be predicated on the identification of socioterminological needs and a terminology management system that can support decision-making.

c) As it has already mentioned, identification of specialists' needs has been recognized as one of the most relevant actions to the success of TP systems. The same applies to Persian terminology. The outcome and the impact of Persian TP show a significant relation to the professional and socioprofessional needs. In Persian terminology, the evaluation of terms usage in geophysics domain reflects that terminological needs had not been addressed sufficiently and systematically.

It is worth mentioning that the institutional decision making broadly influences the terminological standardization. This intervention should take into account two main factors: i.e. political factors and socioterminological factors.

Regarding policies, any decision making needs to follow language policies of the country or the region to achieve a coherent and integrated TP. Those public authoritative bodies that are also responsible for language policies and language planning programs (e.g. Iran) have the opportunity to manifest an adequate degree of relevance between language policies and terminology policies. Whereas, this issue may become more challenging for private sectors or individual agents. In terms of socioterminological needs,



it is admitted that TP systems, ideally, should be dynamic and adaptive systems (Zarnikhi 2014). These two main characteristics suggest that mere prescriptions based on purely political and linguistic aspects cannot gain much success.

## 2. Further research recommendation

The holistic approach to TP evaluation presented in this thesis makes it possible to improve the quality of TP processes by gathering information from different dimensions. The results from Persian terminology show that analyses at different levels are interconnected to form an integrated evaluation system. However, the model makes it also possible to conduct each analysis separately and independently as long as the integration of the analytical model is reflected in the final interpretations. In other words, the limits of each analysis, its implications, and the proper criterion need to be addressed in connection with other criteria.

This analytical model can also be used in combination with monitoring systems embedded in the TP models to benefit from dynamic data collection methods. Besides, the model is flexible to further development of criteria or the selection of standards and methods accordingly. Notwithstanding, a multi-criteria setting is recommended to identify the functions and dysfunctions of TP systems based on different perceptions.

Some lines of research for the further studies in the context of Iranian terminology are proposed as follows:

1. Developing implantation studies based on the systematic and standard protocols in the Persian context
2. Developing the studies and research to identify the real terminological needs of the active committees at the APLL
3. Conducting periodical assessments for comparing the achievements of the Terminology Department over the different phases of the activities
4. Studying terminologists' profile at the Academy and their contribution to the effectiveness of the activities

5. Conducting surveys on the level of satisfaction of the committees' members (specialists engaged in the terminological activities) and collecting data about their specific needs in relation to their contributions in the standardization process
6. Conducting research on the requirements of a terminology management system in Iran and its technological and scientific implications
7. Studies on the specialists' profile in various subject fields and their contribution to the terminology development in Iran
8. Analyzing the impact of the recently launched terminological activities associated with dissemination, development plans, and policies

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## Appendix I- List of approved terms (Geophysics Committee-Vol. 1, Vol. 2 & Vol. 4)

Persian Equivalents	English Terms	Definition	Vol.
گرانیگاه	centre of gravity	نقطه ثابتی در هر جسم که برآیند نیروی ربایش گرانشی بر آن وارد شود * مصوب فرهنگستان اول	1
موج تبدیلی	converted wave	نوعی موج لرزه‌ای که بخشی از مسیر انتشار را به صورت موج P و بخش دیگر را به صورت موج S می‌پیماید	1
هسته 1	core 3	[ژئوفیزیک] بخش مرکزی زمین [انجوم] بخش مرکزی ستاره یا سیاره یا هر جرم آسمانی مانند آن	1
فاصله بحرانی	critical distance	فاصله‌ای از چشمه که در آنجا زمان‌های رسیدن موج بازتابی و موج شکستگی با هم برابر باشند	1
شکست بحرانی	critical refraction	شکست موج در مرز دو لایه هنگامی که زاویه فرود برابر زاویه بحرانی باشد	1
پوسته 3	crust	بخش بیرونی کره زمین	1
زمین‌لرزه ژرف	deep-focus earthquake	زمین‌لرزه‌ای با عمق کانونی 300 تا 700 کیلومتر	1
زمین‌لرزه	earthquake, seism	حرکت ناگهانی پوسته زمین به سبب آزاد شدن انرژی جمع شده در امتداد گسل‌ها یا فعالیت‌های آتشفشان‌ها مت. زلزله	1
رومرکز	epicentre	تصویر قائم کانون زمین‌لرزه بر سطح زمین	1
لرزه‌یاب	geophone	وسیله‌ای برای دریافت موج‌های لرزه‌ای در خشکی و زمین‌های باتلاقی که بیشتر در اکتشاف لرزه‌ای به کار می‌رود	1
آرایه لرزه‌یاب	geophone array	تعدادی لرزه‌یاب که به صورت خطی یا سطحی در ایستگاه ثبت لرزه چیده شوند	1
گرانی‌سنجی	gravimetry	اندازه‌گیری گرانی یا شتاب گرانی	1
گرانی	gravity	ربایش گرانشی در سطح هر سیاره یا جرم آسمانی دیگر * مصوب فرهنگستان اول	1
گران‌زمین‌لرزه	great earthquake	زمین‌لرزه‌ای با بزرگی بیش از 8	1
نیم‌عمر	half-life	زمان لازم برای از بین رفتن نیمی از اتم‌های یک ماده پرتوزا در فرایند واپاشی	1
سرموج	head wave	موجی که با زاویه بحرانی وارد لایه‌ای با سرعت زیاد شود و با همان زاویه نیز به محیط اول برگردد	1
لرزه‌یاب افقی	horizontally oriented geophone	نوعی لرزه‌یاب که بخش نوسان‌کننده آن فقط در راستای افقی جابه‌جا شود	1
آبلرزه‌یاب	hydrophone	وسیله‌ای برای دریافت موج‌های لرزه‌ای در آب که بیشتر در اکتشافات لرزه‌ای دریایی به کار می‌رود	1
درون‌هسته	inner core	بخش درونی هسته زمین	1
نیم‌ژرف‌زمین‌لرزه	intermediate-focus earthquake	زمین‌لرزه‌ای با عمق کانونی 70 تا 300 کیلومتر	1
زمین‌لرزه بزرگ	large earthquake	زمین‌لرزه‌ای همراه با شکست تمام پهنای یک زون لرزه‌زا	1
زیرپوسته 1	lower crust	بخشی از پوسته زمین، زیر ناپوستگی کنراد	1
زیرگوشته	lower mantle	بخشی از گوشته زمین، از عمق 700 تا 2900 کیلومتر	1

Persian Equivalents	English Terms	Definition	Vol.
کلان‌زمین‌لرزه	major earthquake	زمین‌لرزه‌ای با بزرگی برابر یا بزرگ‌تر از 7	1
گوشته	mantle	بخشی از زمین بین پوسته و هسته	1
خردزمین‌لرزه	microearthquake	زمین‌لرزه‌ای با بزرگی برابر یا بزرگ‌تر از 1 و کوچک‌تر از 3	1
خردلرزه	microseism	اصطلاحی برای حرکت‌های کوچک زمین که منشأ زمین‌لرزه‌ای نداشته باشد	1
زمین‌لرزه متوسط	moderate earthquake	زمین‌لرزه‌ای با بزرگی برابر یا بزرگ‌تر از 5 و کوچک‌تر از 7	1
برون‌هسته	outer core	بخش بیرونی هسته زمین	1
	seism → earthquake		1
کمربند زلزله	seismic belt	زون زمین‌لرزه‌ای با طول زیاد	1
اکتشاف لرزه‌ای	seismic exploration	به‌کارگیری روش‌های لرزه‌ای برای مطالعه ساختارهای زمین‌شناختی زیرسطحی و تعیین موقعیت ذخایر نفت و گاز و دیگر کانی‌ها مت. کاوش لرزه‌ای seismic prospecting	1
زلزله‌خیزی	seismicity	پراکنندگی زمانی و مکانی زمین‌لرزه‌ها	1
کاوش لرزه‌ای	seismic prospecting	← اکتشاف لرزه‌ای	1
رد لرزه	seismic trace	نمودار حرکت‌های زمین برحسب زمان که با لرزه‌نگار ثبت شود	1
موج لرزه‌ای	seismic wave	اصطلاح عمومی برای موج‌های کشسانی ناشی از زمین‌لرزه‌ها یا چشمه‌های لرزه‌ای مصنوعی که در زمین انتشار می‌یابند	1
لرزه‌نگاشت	seismogram	نمودارهای حاصل از ثبت لرزش‌های زمین	1
لرزه‌نگار	seismograph	دستگاهی برای دریافت و ثبت لرزش‌های زمین	1
زلزله‌شناسی	seismology 1	علم مطالعه زمین‌لرزه‌ها و ساختار درونی زمین با بهره‌گیری از امواج لرزه‌ای	1
لرزه‌شناسی	seismology 2	علم مطالعه انتشار موج‌های کشسانی در زمین و پدیده‌های مربوط به آنها	1
لرزه‌سنج	seismometer	دستگاهی که حرکت‌های زمین با آن آشکار و سنجیده شود	1
زمین‌لرزه کم‌زرفا	shallow-focus earthquake	زمین‌لرزه‌ای با عمق کانونی کمتر از 70 کیلومتر	1
زمین‌لرزه کوچک	small earthquake	زمین‌لرزه‌ای همراه با شکست بخشی از پهنای یک زون لرزه‌زا	1
کیشانه	streamer	وسيله‌ای دریایی که سنج‌افزارهای ژئوفیزیکی در آن تعبیه و با کشتی کشیده شود	1
منحنی زمان - مسافت	time-distance curve	نمودار زمان سیر برحسب فاصله از چشمه	1
زمان سیر	travel time 1	مدت‌زمان لازم برای رسیدن موج لرزه‌ای از چشمه به لرزه‌سنج	1
ریززمین‌لرزه	ultra-microearthquake	زمین‌لرزه‌ای با بزرگی کوچک‌تر از 1	1
روپوسته	upper crust	بخشی از پوسته زمین بر روی ناپیوستگی کنراد	1
روگوشته	upper mantle	بخشی از گوشته زمین در عمق کمتر از حدود 700 کیلومتر	1



Persian Equivalents	English Terms	Definition	Vol.
لرزه‌یاب قائم	vertically oriented geophone	نوعی لرزه‌یاب که بخش نوسان‌کننده آن تنها در راستای قائم جابه‌جا شود	1
زلزله		← زمین‌لرزه	1
پس‌لرزه	aftershock	زمین‌لرزه کوچک پس از زمین‌لرزه بزرگ	1
پیش‌لرزه	foreshock	لرزشی پیش از زمین‌لرزه بزرگ	1
تنش‌آوری	cataclastic	مربوط به سنگی که بر اثر تنش مکانیکی شدید در جریان دگرگونی دینامیکی، در عمق پوسته به وجود آید	1
گرانی مطلق	absolute gravity	زیایش گرانشی واقعی روی سطح زمین یا هر سیاره دیگر	2
نقشه‌برداری هومغناطیسی	aeromagnetic surveying	اندازه‌گیری‌های مغناطیسی با هواپرد	2
لرزه‌شناسی کاربردی	applied seismology	← لرزه‌شناسی اکتشافی	2
عرض نجومی	astronomic latitude	زاویه میان امتداد قائم و صفحه استوای آسمان	2
موج حجمی	body wave	نوعی موج لرزه‌ای که در داخل زمین منتشر می‌شود	2
صفحه بوگه	Bouguer plate	لایه فرضی نامتناهی با ضخامتی برابر ارتفاع ایستگاه اندازه‌گیری از سطح مرجع، معمولاً سطح دریاهای آزاد	2
شکننده	brittle	[ژئوفیزیک] ویژگی ماده‌ای که بدون تغییر شکل موم‌سان بشکند [علوم و فناوری غذا] ویژگی ماده غذایی‌ای که بر اثر فشار به‌آسانی می‌شکند	2
	CDP → common-depth-point		2
زمین‌لرزه سرشتی	characteristic earthquake	زمین‌لرزه‌هایی که در یک زون گسلی با بزرگی‌های تقریباً یکسان و مشخصه‌های مشابه روی دهد	2
	CMP → common midpoint		2
هم‌ژرفانقطه	common-depth-point, CDP	دارای نقطه بازتاب مشترک	2
هم‌میان نقطه	common midpoint, CMP	دارای نقطه‌ای مشترک در فاصله میان دو چشمه و گیرنده لرزه‌ای متناظر	2
گردآورد هم‌چشمه	common-source gather	نمایش رده‌های لرزه‌ای که چشمه آنها یکسان باشد	2
موج تراکمی	compressional wave	همان موج P است که با توجه به ایجاد انبساط و انقباض در محیط به این نام نیز خوانده می‌شود	2
مرحله هم‌لرزه‌ای	coseismic phase	مرحله‌ای از فرایند کامل دگرشکلی پوسته زمین، در هنگام وقوع زمین‌لرزه اصلی	2

Persian Equivalents	English Terms	Definition	Vol.
چرخه دگرشکلی پوسته	crustal deformation cycle	فرایند کامل دگرشکلی پوسته زمین	2
عمق کوری	Curie depth	عمقی در زمین (30 تا 40 کیلومتر از سطح) که در آن افزایش دما موجب می شود مواد خاصیت مغناطیسی را از دست بدهند	2
انحراف I	declination I	زاویه افقی میان راستای شمال مغناطیسی و شمال جغرافیایی در هر نقطه مت. انحراف مغناطیسی 2	2
تباين چگالی	density contrast	اختلاف چگالی هر محل با محیط اطراف	2
مقطع عمقی	depth section	مقطع لرزه‌ای که مقیاس قائم آن عمق است	2
موج پیچشی	distortional wave	همان موج S است که با توجه به تغییر شکل ایجاد شده در محیط بدون تغییر حجم به این نام نیز خوانده می شود	2
شکل پذیر	ductile	ویژگی ماده‌ای که به تغییر شکل مومسان تن دهد، بی آنکه بشکند	2
شکل پذیری	ductility	معیار تن دهی ماده به تغییر شکل مومسان، بی آنکه بشکند	2
پیش بینی زمین لرزه	earthquake prediction	تخمین زمان و مکان و بزرگی زمین لرزه آینده مت. پیش بینی زلزله	2
خوشه زمین لرزه	earthquake swarm	مجموعه‌ای از زمین لرزه‌های کوچک در گستره زمانی و مکانی محدود، بدون زمین لرزه اصلی قابل تشخیص	2
کشسان	elastic	ویژگی ماده‌ای که پس از حذف نیروهای وارد بر آن به شکل و اندازه اول برگردد	2
ثابت کشسانی	elastic constant	هریک از ضریب‌های قانون هوک که بیانگر مؤلفه‌های کرنش به صورت تابعی خطی از مؤلفه‌های تنش است	2
کشسانی	elasticity	قابلیت بازگشت ماده به شکل و اندازه اول، پس از حذف نیروهای وارد بر آن	2
لرزه شناسی اکتشافی	exploration seismology	به کارگیری روش‌های لرزه نگاری در اکتشاف و کاوش و فعالیت‌های مهندسی مت. لرزه شناسی کاربردی applied seismology مت. لرزه شناسی کاوشی prospecting seismology	2

Persian Equivalents	English Terms	Definition	Vol.
زرفای کانون	focal depth	فاصله قائم کانون زمین‌لرزه از سطح زمین مت. عمق کانون	2
تصحیح هوای آزاد	free-air correction	تصحیح ارتفاعی گرانی نقاط اندازه‌گیری‌شده در سطح زمین، درحالی‌که نقطه در هوای آزاد، بدون در نظر گرفتن جرم در زیر آن، فرض شود	2
بی‌هنجاری گرانی هوای آزاد	free-air gravity anomaly	اختلاف میان گرانی اندازه‌گیری‌شده و گرانی نظری در هر ایستگاه پس از اعمال تصحیح هوای آزاد	2
عرض زمین‌مرکزی	geocentric latitude	زاویه میان صفحه استوا و خطی که از مرکز زمین می‌گذرد	2
وارونگی زمین‌مغناطیس	geomagnetic reversal	تغییر میدان مغناطیسی زمین از قطبایی شمال به قطبایی وارون	2
	geomagnetic storm → magnetic storm		2
گرادیان گرانی	gravity gradient	مشتق جزئی شتاب گرانی نسبت به فاصله در راستای خاص	2
برگردان گرانی	gravity reduction	اعمال تصحیح‌های هوای آزاد و بوگه و هم‌ایستایی و غیره بر روی اندازه‌گیری‌های گرانی	2
زمین‌غلت	ground roll	نوعی موج لرزه‌ای سطحی با سرعت و بسامد کم و دامنه بلند	2
زمین‌لرزه القایی	induced earthquake	زمین‌لرزه‌ای که از فعالیت‌های انسان، مانند تزریق مایعات در اعماق زمین، ساخت سد و انجام انفجارهای هسته‌ای زیرزمینی ناشی شود	2
مرحله میان‌لرزه‌ای	interseismic phase	مرحله‌ای از فرایند کامل دگرشکلی پوسته زمین، در فاصله زمانی میان دو زمین‌لرزه	2
موج ناچرخشی	irrotational wave	همان موج P است که با توجه به صفر بودن تاو بردار جابه‌جایی ذرات به این نام نیز خوانده می‌شود	2
هم‌ایستایی	isostasy	شرایط توازن تقریبی میان سنگ‌کره و سست‌کره برای جبران اثر گرانشی جرم‌های بالای زمینوار و کمبود چگالی در آب‌های اقیانوس	2
هم‌ایستا	isostatic	ویژگی شرایط توازن تقریبی میان بخش‌های مختلف پوسته زمین	2

Persian Equivalents	English Terms	Definition	Vol.
تصحیح عرض جغرافیایی	latitude correction	1. تصحیح شمالی- جنوبی که بر شدت میدان مغناطیسی اندازه‌گیری شده اِعمال می‌شود تا میدان نرمال زمین حذف شود 2. تصحیح داده‌های گرانی با عرض جغرافیایی مت. تصحیح عرض	2
موج طولی	longitudinal wave	همان موج P است که با توجه به هم‌راستا بودن ارتعاش ذرات و انتشار موج به این نام نیز خوانده می‌شود	2
استوای مغناطیسی	magnetic equator	مکان هندسی نقاطی روی سطح زمین با میل مغناطیسی صفر	2
میل مغناطیسی	magnetic inclination	زاویه میان مؤلفه افقی و راستای میدان مغناطیسی کل	2
عرض مغناطیسی	magnetic latitude	فاصله زاویه‌ای شمالی یا جنوبی از استوای مغناطیسی	2
بی‌هنجاری محلی مغناطیسی	magnetic local anomaly	انحراف میدان مغناطیسی مکانی معین از میدان میانگین اطراف	2
نصف‌النهار مغناطیسی	magnetic meridian	خطی که در هر مکان بر راستای میدان مغناطیسی زمین منطبق باشد	2
رصدخانه مغناطیسی	magnetic observatory	ایستگاه ژئوفیزیکی مجهز به دستگاه‌های مغناطیس‌سنج برای اندازه‌گیری و بررسی میدان مغناطیسی زمین	2
تغییر درازمدت مغناطیسی	magnetic secular change	تغییر تدریجی مقدار مؤلفه مغناطیسی در طول سال‌ها	2
توفان مغناطیسی	magnetic storm, geomagnetic storm	تغییر قابل توجه میدان مغناطیسی زمین و کاهش مؤلفه افقی میدان که بر اثر برخورد سیلی از ذرات باردار خورشیدی به وجود می‌آید	2
گرانی مشاهده‌ای	observed gravity	گرانی حاصل از اندازه‌گیری‌های مطلق یا نسبی	2
دیرین‌زمین‌لرزه	paleoearthquake	زمین‌لرزه پیش‌از تاریخ	2
دیرینه‌عرض مغناطیسی	paleolatitude	عرض مغناطیسی ناحیه‌ای معین بر روی سطح زمین، در گذشته‌های زمین‌شناختی مت. دیرینه‌عرض	2
دیرینه‌مغناطیس	paleomagnetism	مطالعه مانده‌مغناطش طبیعی مواد زمین برای تعیین شدت و راستای میدان مغناطیسی، در گذشته‌های زمین‌شناختی	2
دیرین‌زلزله‌خیزی	paleoseismicity	مطالعه زمان و وقوع و بزرگی و فراوانی زمین‌لرزه‌های پیش‌از تاریخ	2

Persian Equivalents	English Terms	Definition	Vol.
مرحله پس‌لرزه‌ای	postseismic phase	مرحله‌ای از فرایند کامل دگرشکلی پوسته زمین، اندک‌زمانی پس از وقوع زمین‌لرزه اصلی	2
مرحله پیش‌لرزه‌ای	preseismic phase	مرحله‌ای از فرایند کامل دگرشکلی پوسته زمین، اندک‌زمانی پیش از وقوع زمین‌لرزه اصلی	2
موج فشاری	pressure wave	همان موج P است که با توجه به نوع تنش‌های به‌وجودآورنده آن به این نام نیز خوانده می‌شود	2
موج اولیه	primary wave	همان موج P است که زودتر از سایر موج‌های لرزه‌ای به گیرنده‌های لرزه‌ای می‌رسد	2
لرزه‌شناسی کاوشی	prospecting seismology	← لرزه‌شناسی اکتشافی	2
موج کش‌واکشی	push-pull wave	همان موج P است که با توجه به نوع تغییر شکل محیط به این نام نیز خوانده می‌شود	2
Pموج	P wave	نوعی موج لرزه‌ای حجمی که در آن راستای ارتعاش ذرات با راستای انتشار آن یکی است	2
مسیر پرتو	raypath	خطی که در همه جا بر جبهه موج عمود باشد	2
ردیابی پرتو	ray tracing	تعیین مسیر انتشار پرتو	2
مانده مغناطش	remanent magnetization	خاصیت مغناطیسی باقی‌مانده در سنگ از زمان سنگی شدن	2
موج چرخشی	rotational wave	همان موج S است که با توجه به غیرصفر بودن تاو بردار جابه‌جایی ذرات به این نام نیز خوانده می‌شود	2
موج دوم	secondary wave	همان موج S است که به خاطر کندتر بودن سرعت انتشار، بعد از موج P به گیرنده‌های لرزه‌ای می‌رسد	2
زمین‌لرزه‌ای	seismic 1	مربوط به ارتعاش زمین ناشی از وقوع زمین‌لرزه	2
لرزه‌ای	seismic 2	مربوط به امواج کشسان حاصل از چشمه‌های مصنوعی لرزه	2
داده‌برداری لرزه‌ای	seismic acquisition	گردآوری داده‌های لرزه‌ای	2
ناهمسان‌گردی لرزه‌ای	seismic anisotropy	تغییر سرعت امواج لرزه‌ای در نتیجه تغییر راستای انتشار و تغییر جهت قطبیدگی	2

Persian Equivalents	English Terms	Definition	Vol.
کاف لرزه‌ای	seismic gap	قطعه‌ای از یک گسل فعال که در دورهٔ فعالیت گسل، کلان‌زمین لرزه‌ای ایجاد نکرده باشد	2
مقطع لرزه‌ای	seismic section	نمایش داده‌های لرزه‌ای در راستای یک خط	2
موج برشی	shear wave	همان موج S است که با توجه به نوع کرنش‌های به‌وجودآورندهٔ آن به این نام نیز خوانده می‌شود	2
عمق‌یابی	sounding 1	اندازه‌گیری عمق دریاها و دریاچه‌ها و رودخانه‌ها با وسایل مختلف	2
کرنش	strain 2	تغییر ابعاد یا شکل جسم بر اثر تنش	2
تنش 1	stress 2	نیروی وارد بر واحد سطح در نقطه‌ای داخل جسم	2
موج سطحی	surface wave	نوعی موج لرزه‌ای که در سطح زمین منتشر می‌شود	2
Sموج	S wave	نوعی موج لرزه‌ای حجمی که در آن راستای ارتعاش ذرات بر راستای انتشار عمود است	2
موج مماسی	tangential wave	همان موج S است که با توجه به نوع تنش‌های به‌وجودآورندهٔ آن به این نام نیز خوانده می‌شود	2
دورلرزه	teleseism	زمین‌لرزه‌ای به فاصلهٔ رومرکزی 30 تا 80 درجه از ایستگاه لرزه‌نگاری	2
مقطع زمانی	time section	مقطع لرزه‌ای که مقیاس قائم آن زمان رسیده است	2
موج عرضی	transverse wave	همان موج S است که با توجه به عمود بودن راستای ارتعاش ذرات به راستای انتشار موج به این نام نیز خوانده می‌شود	2
انحراف مغناطیسی 2		← انحراف 1	2
پیش‌بینی زلزله		← پیش‌بینی زمین‌لرزه	2
تصحیح عرض		← تصحیح عرض جغرافیایی	2
دیرینه‌عرض		← دیرینه‌عرض مغناطیسی	2
عمق کانون		← ژرفای کانون	2

Persian Equivalents	English Terms	Definition	Vol.
نگاره صوتی	acoustic log	اصطلاحی عمومی برای نگاره‌هایی که از طریق انتشار امواج آکوستیکی تهیه می‌شوند	4
چاه‌نگاری آکوستیکی	acoustic well logging	اندازه‌گیری پیوسته سرعت انتشار موج با فرستادن گمانه، شامل آشکارساز و چشمه، به داخل چاه	4
گرانی‌سنجی هوایی	aerial gravimetry	اندازه‌گیری گرانی از داخل هواگرد	4
مغناطیس‌سنجی هوایی	aerial magnetometry	اندازه‌گیری زمین‌مغناطیسی از داخل هواگرد مت. مغناطیس‌سنجی هوایرد airborne magnetometry	4
نقشه هومغناطیسی	aeromagnetic map	نقشه‌ای که بر مبنای داده‌های مغناطیسی هوایرد تهیه می‌شود	4
مغناطیس‌سنج هواایرد	airborne magnetometer	نوعی دستگاه هواایرد برای اندازه‌گیری میدان مغناطیسی زمین	4
مغناطیس‌سنجی هواایرد	airborne magnetometry	← مغناطیس‌سنجی هوایی	4
تفنگ هوا	air gun	وسيله‌ای برای تخلیه هوای بسیار فشرده به درون آب	4
هواموج	airwave	بخشی از انرژی لرزه‌ای که با سرعت صوت در هوا منتشر می‌شود	4
نوار دگرنام	alias band	مؤلفه‌هایی از نشانک/ سیگنال که محتوای بسامد اولیه آنها خارج از پهنای نوار نایکوئیست ( nyquist bandwidth) است، ولی بر اثر نمونه‌برداری بر روی نوار گذر (pass band) افتاده است	4
صافی دگرنام	alias filter, antialias filter	نوعی صافی که قبل از نمونه‌برداری به کار می‌رود تا بسامدهای ناخواسته‌ای که در نتیجه نمونه‌برداری امکان دگرنامی دارند حذف شوند	4
دگرنامی	aliasing	بروز خطا در بسامدهای پایین طیف دامنه یک تابع گسسته بر اثر نمونه‌برداری نامناسب	4
	antialias filter → alias filter		4
چگالی ظاهری	apparent density	← چگالی کپه‌ای	4
زمان رسید	arrival time 1	1. لحظه رسیدن موج لرزه‌ای به ایستگاه لرزه‌نگاری 2. بازه زمانی رسیدن موج لرزه‌ای از چشمه به گیرنده	4
پردازش‌ماند	artifact 2, footprint 1	اثر اتفاقی و ناخواسته ناشی از داده‌برداری یا داده‌پردازی	4
بی‌لرزه	aseismic	رویداد یا فرایندی زمین‌ساختی که زمین‌لرزه به همراه ندارد	4

Persian Equivalents	English Terms	Definition	Vol.
تنشگاه	asperity	هر زون پرتنش در صفحه گسل	4
	astatic gravimeter → astatized gravimeter		4
گرانی سنج ناپایدارنما	astatized gravimeter, unstable gravimeter, labilized gravimeter, astatic gravimeter, pseudoastatized gravimeter	گرانی سنجی که در آن نیروی گرانی با نیروی بازدارنده، نزدیک به حالت تعادل ناپایدار است	4
شفق جنوبگان	aurora australis	شفق قطبی در عرض‌های جغرافیایی جنوبی مت. نورهای جنوبی southern lights	4
شفق شمالگان	aurora borealis	شفق قطبی در عرض‌های جغرافیایی شمالی مت. نورهای شمالی northern lights	4
گزینش خودکار	automatic picking	تعیین زمان رویداد لرزه‌ای به‌طور خودکار در امتداد مقطع لرزه‌ای یا از درون حجمی از داده‌های لرزه‌ای	4
	auxiliary fault plane → auxiliary plane		4
صفحه کمکی	auxiliary plane, auxiliary fault plane	صفحه‌ای مجازی عمود بر صفحه گسل در حل سازوکار کانونی	4
آهن‌ربای میله‌ای	bar magnet	میله‌ای از فولاد سخت به‌شدت مغناطیده که خاصیت مغناطیسی خود را حفظ می‌کند	4
سد جنبش	barrier 3	هر بخشی از گسل که مقاومت فوق‌العاده دارد و مانع گسترش گسیختگی شود مت. سد	4
زون کور	blind zone	لایه‌ای که موج شکست مرزی آن اولین رسید نیست	4
بزرگی موج حجمی	body-wave magnitude	بزرگی زمین‌لرزه بر پایه لگاریتم نسبت اندازه دامنه موج P به دوره آن	4
چاه گمانه	borehole	نوعی چاه حفر شده با مته برای اندازه‌گیری و نمونه‌برداری و اکتشاف مت. چاه	4
اثر چاه	borehole effect	آشفتگی ایجاد شده در چاه‌نگاره به سبب اندازه و تأثیر چاه و زون تاخته	4
چاه‌لرزه‌یاب	borehole geophone	لرزه‌یابی که می‌تواند شرایط دما و فشار داخل چاه گمانه را تحمل کند	4



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چاه‌گرانی‌سنج	borehole gravimeter	گرانی‌سنج مجهز به سامانه قرائت از دور برای اندازه‌گیری گرانی در داخل چاه	4
دوربین درون‌چاهی	borehole televiewer	نوعی روبشگر (scanner) فراصوتی برای تصویربرداری از دیواره چاه، با استفاده از امواج صوتی بازتابی	4
روش چاه‌به‌چاه	borehole-to-borehole method	روشی برای مطالعه محدوده میان دو یا چند چاه که با ایجاد امواج P یا S در یک چاه و دریافت آنها در چاه دیگر صورت می‌گیرد	4
	Bouguer correction → Bouguer reduction		4
برگردان بوگه	Bouguer reduction, Bouguer correction	تصحیح در داده‌های گرانی به‌نحوی که در آن ارتفاع ایستگاه و لایه سنگی میان ایستگاه و سطح دریا در نظر گرفته شود	4
اثر حباب	bubble effect	تکرار اولین رسیده‌ها و دیگر رویدادهای حاصل از چشمه لرزه‌ای بر اثر تپ‌های حباب	4
تپ حباب	bubble pulse	زمبش‌های پیاپی حباب حاصل از چشمه لرزه‌ای در آب مت. پالس حباب	4
چگالی کپهای	bulk density	وزن واحد حجم جسم که فضاهای خالی را نیز در بر می‌گیرد مت. چگالی ظاهری apparent density	4
	closing error → error of closure		4
متمم عرض جغرافیایی	colatitude	نود درجه منهای عرض جغرافیایی	4
گردآورد هم‌دورآفت	common-offset gather, common-range gather	مجموعه‌ای از ردهای لرزه که در فاصله یکسانی از چشمه ثبت شده‌اند	4
	common range gather → common-offset gather		4
روش بین‌چاهی	crosshole method	روشی برای اندازه‌گیری سرعت موج P و S از طریق ثبت زمان سیر موج از چشمه در یک چاه تا گیرنده یا گیرنده‌های نصب‌شده در چاه یا چاه‌های دیگر	4
فاصله هم‌گذری	crossover distance	فاصله‌ای از چشمه که در آن، موج شکست مرزی لایه عمیق به موج مستقیم یا به موج شکست مرزی لایه سطحی‌تر می‌رسد و از آن پیشی می‌گیرد	4
گسترش چلیپایی	cross spread	1. گسترشی که با امتداد پیمایش، زاویه‌ای بزرگ، غالباً 90 درجه، می‌سازد 2. گسترشی به شکل چلیپا	4
سطح مبنا	datum plane	صفحه افقی یا سطح یا ترازوی که مرجع ارتفاع هر نقطه از زمین است مت. سطح مرجع reference plane 1	4

Persian Equivalents	English Terms	Definition	Vol.
		تراز مرجع 2 reference level	
شیب‌نگاره	dip log, dipmeter log	چاه‌نگاره‌ای که سمت و بزرگی شیب سازندها (formation dip) براساس آن تعیین می‌شود	4
	dipmeter log → dip log		4
برون‌راند شیب	dip moveout	تغییر در زمان رسید موج بازتابی بر اثر شیب سطح بازتابنده	4
سوزن مغناطیسی	dip needle	نوعی مغناطیس سنخ قدیمی با سوزنی مغناطیده که آزادانه در سطح قائم می‌چرخد	4
	dip pole → magnetic pole		4
فروروش	downsweep	رویشی که در آن بسامد با زمان کاهش می‌یابد	4
ادامه فروسو	downward continuation	محاسبه میدان پتانسیل در تراز پایین‌تر از تراز که میدان در آن اندازه‌گیری شده است	4
مهندسی زلزله	earthquake engineering, seismic engineering	علمی کاربردی که اثر جنبش‌های ناشی از زمین‌لرزه را بر سازه‌های ساخت بشر بررسی می‌کند	4
	earthquake hazard → seismic hazard		4
بزرگی زمین‌لرزه	earthquake magnitude	میزان قدرت زمین‌لرزه یا انرژی کرنشی آزادشده با آن، بر پایه مشاهدات لرزه‌نگاشتی	4
پیش‌نشانگرهای زمین‌لرزه	earthquake precursors	پدیده‌هایی که پیش از وقوع زمین‌لرزه رخ می‌دهند	4
یک‌سوگسترش	end-on spread	گسترشی از آرایه یا گروه لرزه‌یاب‌ها با فاصله منظم که چشمه در یک انتهای آن قرار دارد	4
پروفیل لرزه‌ای یک‌سوگسترش	end-on spread seismic profile	نوعی آرایش لرزه‌ای برای داده‌برداری یک‌سوگسترش	4
زلزله‌شناسی مهندسی	engineering seismology	علمی کاربردی که مؤلفه‌های مهندسی جنبشی ناشی از زمین‌لرزه را بر پایه زلزله‌شناسی و زمین‌شناسی مطالعه و ارزیابی می‌کند	4
ترازوی اوتوش	Eötvös balance	← ترازوی پیچشی	4
ترازوی پیچشی اوتوش	Eötvös torsion balance	← ترازوی پیچشی	4
خطای بست	error of closure, misclosure, closing error	میزان انحراف حاصل از مجموعه‌ای از اندازه‌گیری‌های هر کمیت نسبت به مقدار حقیقی یا نظری آن	4

Persian Equivalents	English Terms	Definition	Vol.
قطعه‌بندی گسل	fault segmentation	تقسیم زون گسل به قطعه‌های کوچک‌تر بر پایه تاریخچه گسیخت (rupture) هر قطعه	4
اولین رسید	first arrival	اولین نشانک/ سیگنال رسیده از چشمه لرزه‌ای مت. اولین شکن first break	4
اولین شکن	first break	← اولین رسید	4
	footprint 1 → artifact 2		4
ارتفاع زمینوار	geoidal height/ geoid height	فاصله عمودی زمینوار از بیضوی مرجع	4
جدایش زمینوار	geoidal separation/ geoid separation	فاصله بیضوی مرجع و زمینوار	4
	geoid height → geoidal height		4
	geoid separation → geoidal separation		4
موجواری زمینوار	geoid undulation	ارتفاع زمینوار از بیضوی مرجع موجواری undulation	4
استوای زمین مغناطیسی	geomagnetic equator	دایره عظیمه‌ای بر روی زمین، به فاصله 90 درجه از قطب‌های مغناطیسی	4
تغییرات سده‌ای زمین مغناطیس	geomagnetic secular variation	← تغییرات سده‌ای	4
گرادیان‌سنج	gradiometer	وسيله‌ای برای اندازه‌گیری مؤلفه‌های گرادیان میدان پتانسیل	4
لایه پنهان	hidden layer	لایه‌ای که موج شکست مرزی ندارد	4
مغناطش القایی	induced magnetization	مؤلفه‌ای از مغناطش سنگ، متناسب و همسو با میدان مغناطیسی محیط	4
زمان برخوردگاه	intercept time	زمان به‌دست‌آمده از برخورد محور زمان با خط برازشی به داده‌های امواج شکست مرزی در نمودار زمان - مسافت	4
سرعت بازه‌ای	interval velocity	سرعت متوسط پرتو در فاصله بین دو بازتاب در داخل زمین	4
زون تاخته	invaded zone	بخشی از دیواره چاه گمانه که مایع حفاری در آن نفوذ کرده و جانشین شاره سازند شده است	4
	isanomalous line → isonomaly/ isanomaly		4
	isanomaly →		4

Persian Equivalents	English Terms	Definition	Vol.
	isoanomaly		
	isanomaly curve → isoanomaly curve		4
	isoanomalous line/ isanomalous line → isoanomaly/ isoanomaly		4
خط هم‌بی‌هنجاری	isoanomaly/ isanomaly, isoanomalous line/ isanomalous line	خطی که نقاط دارای بی‌هنجاری‌های ژئوفیزیکی یکسان را به هم وصل می‌کند مت. هم‌بی‌هنجاری	4
خم هم‌بی‌هنجاری	isoanomaly curve/ isanomaly curve	خمی متشکل از نقاطی با بی‌هنجاری یکسان	4
خط هم‌میل	isocline 1	خطی با میل مغناطیسی یکسان مت. هم‌میل	4
خط هم‌دینامیک، هم‌دینامیک	isodynamic	← خط هم‌شدت	4
خط هم‌گرانی	isogal	پرنبدی با مقادیر گرانی برابر مت. هم‌گرانی	4
خط هم‌شدت	isogam	خطی که نقاط با شدت مغناطیسی یکسان را به هم وصل می‌کند مت. هم‌شدت خط هم‌دینامیک، هم‌دینامیک isodynamic	4
خط هم‌انحراف	isogonic line	خطی که نقاط با انحراف مغناطیسی یکسان را به هم وصل می‌کند مت. هم‌انحراف	4
نقشه هم‌مغناطیسی	isomagnetic map	نقشه نشان‌دهنده مؤلفه‌های میدان مغناطیسی زمین	4
خط هم‌تغییر	isopor line	خطی که تغییرات درازمدت، مانند تغییرات خطوط هم‌انحراف یا هم‌میل، بر روی آن یکسان است	4
خط هم‌لرزه	isoseismal line	پرنبدی که نواحی هم‌شدت زمین‌لرزه را از یکدیگر جدا می‌کند	4
	labilized gravimeter → astatized gravimeter		4
روان‌گرایی	liquefaction	تغییر حالت رسوب‌های سیر شده از آب، از جامد به مایع، بر اثر تکان‌های شدید زمین	4

Persian Equivalents	English Terms	Definition	Vol.
بزرگی محلی	local magnitude	بزرگی زمین‌لرزه بر پایهٔ لگاریتم بیشینهٔ دامنهٔ امواج درونی ثبت‌شده با لرزه‌نگار معیار در فاصلهٔ 100 کیلومتری رومرکز زمین‌لرزه مت. بزرگی در مقیاس ریشتر، بزرگی ریشتر Richter magnitude	4
نگاره 2	log 3	نگاشت حاصل از اندازه‌گیری یا مشاهدات داخل چاه گمانه	4
چندبارهٔ بلندمسیر	long-path multiple	بازتاب چندباره‌ای که به سبب طولانی بودن مسیر بازتاب، به‌صورت رویدادهای مجزا مشاهده می‌شود	4
قطبایی مغناطیسی	magnetic polarity	دارا بودن دو قطب مخالف در اجسام مغناطیسی	4
قطبش مغناطیسی	magnetic polarization	قطب‌دار شدن برخی مولکول‌ها یا ساختارهای بلوری در میدان مغناطیسی به سبب ماهیت نامتقارن آنها	4
قطب مغناطیسی	magnetic pole, dip pole	هریک از دو نقطه بر روی سطح زمین که در آنجا نصف‌النهارهای مغناطیسی هم‌گرا هستند	4
روش زمین‌مغناطی‌برقی	magnetotelluric method	روشی الکترومغناطیسی برای اندازه‌گیری میدان‌های مغناطیسی و الکتریکی طبیعی زمین	4
مقطع کوچیده	migrated section	مقطعی لرزه‌ای که در آن بازتاب‌ها و پراش‌ها به مکان‌های درست خود منتقل شده‌اند	4
دریچهٔ کوچ	migration aperture	گستره‌ای مکانی که از داده‌های لرزه‌ای آن در کوچ استفاده می‌شود	4
	misclosure → error of closure		4
بزرگی گشتاوری	moment magnitude	بزرگی زمین‌لرزه بر پایهٔ گشتاور لرزه‌ای، با فرض ثابت بودن آفت تنش	4
برون‌راند	moveout, stepout	اختلاف زمان رسید موج به لرزه‌یاب‌های واقع در فاصله‌های مختلف از چشمه	4
بازتاب چندباره	multiple reflection	انرژی یا موج لرزه‌ای که بیش از یک بار بازتاب شده است	4
برون‌راند بهنجار	normal moveout	اختلاف زمان‌های رسید موج بازتابی به هر لرزه‌یاب با بازتاب عمودی	4
نورهای شمالی	northern lights	← شفق شمالگان	4
دورآفت	offset 2	فاصلهٔ چشمه از لرزه‌یاب یا مرکز گروهی از لرزه‌یاب‌ها	4

Persian Equivalents	English Terms	Definition	Vol.
چندباره چوب‌پایی	peg-leg multiple	بازتاب چندباره‌ای که مسیر انتشار آن به سبب بازتاب‌های بی‌درپی در لایه‌های نازک، متقارن نیست	4
رد راهنما	pilot trace	رد لرزه‌ای که دیگر ردهای لرزه نسبت به آن تنظیم می‌شود	4
کوچ پس‌برانباشت	poststack migration	جابه‌جایی اجزای داده‌های لرزه‌ای بر روی مقطعی که در آن چشمه و گیرنده بر هم منطبق‌اند	4
کوچ پیش‌برانباشت	prestack migration	فرایند جمع بستن دامنه انرژی لرزه‌ای روی سطح زمان سیر و نسبت دادن آن به رأس سطح، یعنی نقطه‌ای با کوتاه‌ترین زمان سیر	4
بازتاب اولیه	primary reflection	انرژی یا موج لرزه‌ای که تنها یک بار بازتاب شده است	4
	pseudoastatized gravimeter → astatized gravimeter		4
فراراند	pull-up 2	← فراراند سرعتی	4
	pull-up 2 → velocity pull-up		4
	push-down → velocity push-down		4
بازه بازگشت	recurrence interval	میانگین دوره زمانی وقوع زمین‌لرزه‌های اصلی بر روی یک گسل یا در گستره‌ای معین	4
تراز مرجع	reference level	← سطح مبنا	4
سطح مرجع	reference plane 2	← سطح مبنا	4
گره‌وار مرجع	reference spheroid	بیضوی دواری برای تقریب‌زنی زمینوار	4
بزرگی در مقیاس ریشتر، بزرگی ریشتر	Richter magnitude	← بزرگی محلی	4
دریالرزه	seaquake, submarine earthquake	زمین‌لرزه‌ای که در زیر اقیانوس روی می‌دهد	4
دریالرزه‌موج	seaquake wave	← سونامی	4
دومین رسید	second arrival	قطار موجی که پس از اولین رسید ثبت می‌شود	4
تغییرات سده‌ای	secular variation	تغییرات چندصدساله در میدان مغناطیسی مت. تغییرات سده‌ای زمین‌مغناطیس geomagnetic variation secular	4
	seismic engineering → earthquake engineering		4

Persian Equivalents	English Terms	Definition	Vol.
خطر زمین‌لرزه	seismic hazard, earthquake hazard	برآورد احتمال جنبش زمین با مؤلفه‌هایی معین بر اثر زمین‌لرزه در یک مکان	4
خطرپذیری زمین‌لرزه‌ای	seismic risk	برآورد احتمال وقوع زمین‌لرزه و خسارت‌های عمده ناشی از آن	4
	seismic sea wave → tsunami		4
	seismic surge → tsunami		4
زون سایه	shadow zone	ناحیه‌ای در فاصله تقریبی 100 تا 140 درجه از رومرکز زمین‌لرزه که در آن موج P به سبب عبور از محیط کم‌سرعت دریافت نمی‌شود	4
چندباره کوتاه‌مسیر	short-path multiple	بازتاب چندباره‌ای که به سبب کوتاهی مسیر بازتاب، به صورت دنباله موج اصلی ظاهر می‌شود	4
افراز لغزش	slip partitioning	شکل‌گیری گسل‌های شیب‌لغز و امتدادلغز به موازات هم در ناحیه‌ای با هم‌گرایی مایل مت. افراز کرنش strain partitioning	4
نورهای جنوبی	southern lights	← شفق جنوبگان	4
دوسوگسترش	split spread	نوعی آرایش لرزه‌ای که در آن چشمه در وسط گسترش لرزه‌یاب‌هاست	4
داده‌برداری دوسوگسترش	split spread data acquisition	داده‌برداری لرزه‌ای با قرار دادن چشمه در وسط پروفیل لرزه‌ای	4
	stepout → moveout		4
افراز کرنش	strain partitioning	← افراز لغزش	4
افت تنش	stress drop	اختلاف تنش‌های برشی وارد بر صفحه گسل، پیش از زمین‌لرزه و پس از آن	4
	submarine earthquake → seaquake		4
تصحیح زمینگان	terrain correction, topographic correction	تصحیح داده‌های گرانی به سبب نابرابری ارتفاع ایستگاه با مناطق اطراف	4
	topographic correction → terrain correction		4

Persian Equivalents	English Terms	Definition	Vol.
ترازوی پیچشی	torsion balance	دستگاهی برای اندازه‌گیری مشتق‌های دوم پتانسیل مت. ترازوی پیچشی اوتوش Eötvös torsion balance Eötvös balance ترازوی اوتوش	4
سونامی	tsunami, seismic sea wave, seismic surge	موج دریایی گرانشی ناشی از آشفته‌گی‌های بزرگ‌مقیاس و کوتاه‌مدت کف دریا، حاصل از زمین‌لرزه‌های کم‌عمق و فوران‌های آتشفشانی و زمین‌لغزش‌های کف اقیانوس مت. دریالرزه موج seaquake wave	4
موجوارگی	undulation	← موجوارگی زمینوار	4
	unstable gravimeter → astatized gravimeter		4
فراروبش	upsweep	روبشی که در آن بسامد با زمان افزایش می‌یابد	4
ادامه فراسو	upward continuation	محاسبه میدان پتانسیل در ترازوی بالاتر از ترازوی که میدان در آن اندازه‌گیری شده است	4
فراراند سرعتی	velocity pull-up	جابه‌جایی ظاهری و روبه‌بالای رویدادهای بازتابی به سبب وجود مناطقی با سرعت زیاد در لایه‌های سطحی‌تر مت. فراراند 2 pull-up	4
فروراند سرعتی	velocity push-down, push-down	جابه‌جایی ظاهری و روبه‌پایین رویدادهای بازتابی به سبب وجود مناطقی با سرعت کم در لایه‌های سطحی‌تر	4
چاه‌نگاره	well log	نگاشت حاصل از اندازه‌گیری یک یا چند کمیت فیزیکی در داخل چاه به‌صورت تابعی از عمق مت. سیم‌خط‌نگاره wire line log	4
چاه‌نگاری	well logging	ثبت و تحلیل مشخصات سازندی (formation) که چاه در آن حفر شده است	4
سیم‌خط‌نگاره	wire line log	← چاه‌نگاره	4
فتر صفر	zero length spring	فتری که در نبود نیروهای خارجی طول مؤثرش صفر باشد	4
هم‌دینامیک		← ← خط هم‌شدت	4
بزرگی ریشتر		← بزرگی محلی	4



Persian Equivalent	English Terms	Definition	Vol.
پالس حباب		← تپ حباب	4
چاه		← چاه گمانه	4
هم انحراف		← خط هم انحراف	4
هم بی هنجاری		← خط هم بی هنجاری	4
هم شدت		← خط هم شدت	4
هم گرانی		← خط هم گرانی	4
هم میل		← خط هم میل	4
سد		← سد جنبش	4
فروراند		← فروراند سرعتی	4



## Appendix II- List of articles

No.	Title	Pub.Year	Source	Keywords
1.	A normalized statistics method in edge detection of potential field anomalies	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.4 p.46-56	Edge detection, gravity, magnetic, normalized standard deviation, Sar-Cheshme
2.	Estimation of the quality factor of shear waves and Coda waves in the Hormuzgan region of southern Iran	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.4 p.111-131	Coda normalization method, Hormuzgan region, shear and Coda waves, single back-scattering method, quality factor
3.	Variation of the Moho depth in some Iranian seismotectonic zones using P receiver functions	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.4 p.132-152	P-Receiver function, Moho depth, Alborz zone, Sanandaj-Sirjan metamorphic zone
4.	3D Modeling of resistivity and IP data for rectangle array using Finite Element Method	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.4 p.153-172	Induced polarization, electrical resistivity, finite element method, rectangle Array, modelling, COMSOL script, Cole-Cole model, percent frequency effect
5.	Simulation of strong ground motion for the 2004 Firozabad Kojoor earthquake in northern Iran	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.1-13	Simulation, stochastic finite fault, empirical Green's function, Firozabad Kojoor earthquake
6.	Determination of the slip rate in the Shesh-Taraz river on the Doruneh fault using histogram and minimum age OSL methods	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.14-29	Doruneh Fault, Shesh-Taraz River, Optical Simulated Luminescence (OSL), slip rate
7.	Identifying excavation damaged zones using 2D electrical resistivity tomography modeling	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.42-54	Electrical resistivity tomography (ERT), Finite element method (FEM), Poisson equation
8.	The use of two-dimensional discrete wavelet transform in the boundary estimation of gravity sources	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.55-66	Gravity data, two-dimensional wavelet transform, edge detection

No.	Title	Pub.Year	Source	Keywords
9.	Single-frequency seismic attribute obtained from continuous-wavelet transform and matching pursuit methods	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.83-93	Time-frequency resolution, time-frequency continuous wavelet transform, matching pursuit, time-frequency spectrum, non-stationary signal, low-frequency shadow
10.	Interpretation of gravity data using the finite element method in the Chabahar Plain	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.94-101	Finite element method; regional-residual separation, Chabahar; depth of Moho
11.	Focal mechanisms of moderate earthquakes with complex sources	2012 (accepted year: 2011)	Iran geophysics journal Vol.5, N.3 p.111-134	Focal mechanism, complex earthquakes, moment tensor, Fin earthquake
12.	Interpretation of the magnetic anomaly of Zanjan's Morvarid mine using the normalized full gradient method	2011 (accepted year: 2011)	Iran geophysics journal Vol.5, N.2 p.1-15	Synthetic models, magnetic data, 2D-NFG, 3D-NFG, Zanjan's Morvarid mine
13.	Study of the effects of the variables changes on the inversion of airborne electromagnetic data in frequency domain	2011 (accepted year: 2011)	Iran geophysics journal Vol.5, N.2 p.38-50	Airborne electromagnetic, trade-off parameter, Occam's inversion, nonuniqueness
14.	Investigating the influence of blasting operations at the surge tanks and storage facilities on the underground structures of Gotvand Olya dam	2011 (accepted year: 2011)	Iran geophysics journal Vol.5, N.2 p.51-60	Blasting, ground vibration, peak particle velocity, genetic algorithm
15.	Random noise suppression in seismic data by empirical mode decomposition	2011 (accepted year: 2011)	Iran geophysics journal Vol.5, N.2 p.61-68	Random noise suppression, empirical mode decomposition, intrinsic mode function, interval thresholding
16.	Determination of depth and the half-width of an inclined plate self-potential anomaly using a second moving average window curves method	2011 (accepted year: 2011)	Iran geophysics journal Vol.5, N.2 p.86-96	Self-potential, second -moving average, window curves, inclined plate, depth and the half-width
17.	The change of curvature as an invariant measure for studying height deformation	2011 (accepted year: 2011)	Iran geophysics journal Vol.5, N.2 p.116-129	Datum, geodetic control networks, invariant, subsidence

No.	Title	Pub.Year	Source	Keywords
	in geodetic control networks			
18.	Prediction of reservoir porosity distribution from seismic attributes using NEFPROX neuro-fuzzy model in the Gorgan Basin	2011 (accepted year: 2010)	Iran geophysics journal Vol.5, N.1 p.1-15	Porosity, NEFPROX neuro-fuzzy model, seismic attributes, Gorgan Basin
19.	An algorithm for the modeling and interpretation of Seismoelectric data	2011 (accepted year: 2010)	Iran geophysics journal Vol.5, N.1 p.51-61	Electric field, pseudospectral time domain, poroelastic media, seismoelectric coupling, pore pressure
20.	Analysis of fractures using fuzzy logic method	2011 (accepted year: 2010)	Iran geophysics journal Vol.5, N.1 p.62-72	Fuzzy logic, fracture detection, well logs, fracture index, image logs, core samples
21.	2D modeling of gravity data with the compact inversion method and density variation as a stopping criterion	2011 (accepted year: 2010)	Iran geophysics journal Vol.5, N.1 p.92-108	Compact inversion modeling, synthetic models, gravity data, Dehloran bitumen
22.	Variations of the Moho depth and Vp/Vs ratio beneath East Iran (Birjand) using P receiver function method	2011 (accepted year: 2010)	Iran geophysics journal Vol.5, N.1 p.124-138	P receiver functions, teleseismic, crust, Eastern Iran, Vp/Vs ratio
23.	Estimation of anisotropy parameter $\gamma$ in Kangan and Dalan Formations by DSI in a well at South Pars field	2011 (accepted year: 2010)	Iran geophysics journal Vol.5, N.1 p.139-150	Anisotropy, Dipole shear sonic imager, $\gamma$ parameter, Shear waves slowness, Kangan and Dalan Formations
24.	Multiple suppression in CMP data using parabolic Radon transform	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.1 p.69-82	Parabolic Radon transform, multiple attenuation, coherent noise, seismic data processing
25.	1D and 2D interpretation of the Magnetotelluric (MT) data of northeast Gorgan plain	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.1 p.139-152	Dashli-Boroon, Conductivity, Iodine, Magnetotelluric, 1D and 2D inversion, Resistivity
26.	Seismic wavelet estimation	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.1 p.153-168	Seismic source wavelet, Discrete wavelet transform, Empirical mode decomposition, Time-frequency peak

No.	Title	Pub.Year	Source	Keywords
				filtering
27.	Investigation of seismicity of the Astaneh Fault in the East Alborz	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.1-16	Astaneh Fault, Micro-earthquake, crustal velocity model, Local Networks, East Alborz
28.	Depth Estimation of Ground Magnetic Anomalies using Standard Euler Deconvolution in the Reshm area, Semnan	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.33-43	Anomaly, geomagnetic method, Euler, Structural index, Window Size, Reshm area
29.	Application of seismic inversion and multi attribute analysis to prediction of porosity distribution in an oil field in SW of Iran	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.45-55	Porosity, Acoustic impedance, Seismic inversion, Neural network, RBFN
30.	Seismic texture recognition in time-frequency domain	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.71-81	wavelet transform, seismic interpretation, texture analysis, SVM classification
31.	Derivation of the complete (3d) displacement field using interferometric Synthetic Aperture Radar (SAR) technique; Case Study on the Bam fault	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.83-96	Synthetic Aperture Radar (SAR) ,Differential Interferometry, Azimuth Offset, Co seismic, Pre seismic, Ascending, Descending
32.	Aliasing in $\tau$ -p domain and attenuation of aliased linear noise in this domain	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.97-110	$\tau$ -p transform, FK filter, Aliasing, Interpolation
33.	A study of the capability of the finite element method in gravity anomalies separation of oil traps	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.2 p.111-125	Gravity data, anomaly separation, Dehno area, oil trap, finite element
34.	Recovering 1D conductivity from AEM data using Occam inversion	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.3 p.47-58	Airborne electromagnetic, Nonlinear forward problem, Jacobian matrix, Occam's inversion
35.	Crustal velocity structure beneath Tehran based on teleseismic and mining	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.3	Velocity structure, Tehran, Receiver function, 1D inversion

No.	Title	Pub.Year	Source	Keywords
	explosion data recorded by Tehran City Seismic Network (TCSN)		p.59-69	
36.	A revised spatial autocorrelation method to study shear wave velocity	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.3 p.71-85	Shear wave velocity structure, SPAC coefficient, Seismic ambient vibrations, Rayleigh waves, Inversion, Tehran
37.	Combination of analytic signal and Euler Deconvolution methods for interpretation of 2-D magnetic data	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.3 p.87-99	Analytic signal, Euler Deconvolution, Structural index, Horizontal and vertical derivatives of field
38.	3D gravity inversion using a selection of constraints including minimum distance, smoothness and compactness	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.3 p.101-113	Gravity, 3D Inversion, Lagrangian formulation, Depth Weighting
39.	Separation of the gravity anomaly using discrete wavelet analysis and comparing to other classical methods	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.4 p.17-35	Regional gravity, Residual gravity, Wavelet transform, Separation, Polynomial fitting
40.	Application of Magnetotelluric method in exploration of geothermal reservoirs with an example from Iceland	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.4 p.93-106	Brennisteinsfjoll, Epidote-Chlorite, geothermal, Hengill, Iceland, inversion, magnetotellurics, resistivity, smectite-zeolite
41.	A methodology for mean gravity value computation based on harmonic splines and their application to boundary value problem	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.4 p.107-124	Mean gravity value, harmonic splines, boundary value problem, orthometric height, geoid
42.	Using PCA and RDA feature reduction techniques for ranking seismic attributes	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.37, N.4 p.217-227	Regularized discriminate analysis, Principal Component Analysis, forward selection algorithm, backward selection algorithm, rank, optimal method, covariance matrix
43.	Interpretation of magnetic anomalies using analytic signal derivatives	2011 (accepted year: 2011)	Iran geophysics journal Vol.6, N.1 p.69-83	Analytic signal, location parameters, Bishop, Jalal-Abad

<b>No.</b>	<b>Title</b>	<b>Pub.Year</b>	<b>Source</b>	<b>Keywords</b>
44.	Instrumental Seismology of the Eastern part of the Moshfa Fault	2011 (accepted year: 2011)	Iran geophysics journal Vol.6, N.1 p.128-146	Moshfa fault, microearthquake, crustal velocity structure, focal mechanism
45.	Approximate interpretation of Airborne Electromagnetic data using a halfspace model	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.1-12	Airborne Electromagnetic, Forward modeling, Half-space model, Apparent resistivity
46.	Magnetotelluric and Radiomagnetotelluric investigations, an example on Midsommar Island in Sweden	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.13-21	Electrical conductivity, Electrical resistivity, Magnetotelluric, Midsommar Island, Radiomagnetotelluric
47.	Seismic waves scattering in three-dimensional homogeneous media using time-domain boundary element method	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.23-40	Boundary Element Method, Elastodynamic kernels, Time domain, homogeneous media, Topography
48.	Determination of Lg Coda Q from local earthquakes in the Central Alborz, Iran	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.101-112	Quality factor, Lg phase, Crustal waveguide, Alborz, Spectral stacking ratio
49.	Study of efficiency of seismic time-frequency spectral decomposition by matching pursuit for detecting thin layers	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.113-131	Seismic interpretation, Time-frequency representation, Matching pursuit decomposition, Thin layer, Tuning thickness
50.	Seismic wave anisotropy in the upper crust of the Bam area in the southcentral Iran	2012 (accepted year: 2012)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.133-144	Bam, Local Seismic Network, Anisotropy, Shear wave splitting, Sg shear phase
51.	Calculation of footprint noise result of 3D seismic survey design for AHWAZ oil field	2012 (accepted year: 2010)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.1 p.145-160	acquisition footprint, fold variation, variation of offset and azimuth distribution, patch geometry, variation of amplitude pattern
52.	Study of a landslide using 1D and 2D resistivity surveys in northern Iran-Rudbar region	2012 (accepted year: 2012)	Journal of the Earth & Space Physics (Institute of Geophysics) Vol. 38, No. 1, P. 11-20 [p.268-277]	Geoelectric, Resistivity imaging, CRP, Dipole- dipole, Landslide



<b>No.</b>	<b>Title</b>	<b>Pub.Year</b>	<b>Source</b>	<b>Keywords</b>
53.	Applying optically stimulated luminescence to determine the slip-rate of part of the Har-Us-Nuur Fault	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.2 p.1-14	Har-Us-Nuur fault, Mangolia, Optically Stimulated Luminescence (OSL), Slip rate
54.	Fractal distribution of induced seismicity in Masjed Soleyman dam site (South West of Iran)	2012 (accepted year: 2012)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.2 p.15-27	B-value, Fractal dimension, Induced earthquake, Masjed Soleyman dam, Seismicity
55.	Improving seismic facies analysis using WTMMMLA attributes, self-organizing maps and K-mean clustering	2012 (accepted year: 2012)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.2 p.45-56	Signal processing, Seismic facies analysis, Time-frequency analysis, Seismic pattern recognition, Self organizing maps
56.	Improving thickness estimation for thin layers in quefrequency domain	2012 (accepted year: 2012)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.2 p.91-105	Thin layer, Spectral decomposition, Cepstral decomposition, Quefrequency domain
57.	Mixed-phase seismic wavelet estimation by analyzing the zeros of autocorrelation function in Z-domain	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.3 p.63-72	Autocorrelation function, Wavelet estimation, Mixed phase, Z transform, Deconvolution
58.	Formulation of Stokes-Helmert boundary value problem using no topography space	2012 (accepted year: 2012)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.3 p.147-159	Stokes-Helmert, Precise geoid determination, Downward continuation, Bouguer, No topography space
59.	Separation of the gravity anomaly using discrete wavelet analysis and comparing to other classical methods	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.4 p.17-35	Regional gravity, Residual gravity, Wavelet transform, Separation, Polynomial fitting
60.	Absorption effect removal of the earth using nonstationary linear filters	2012 (accepted year: 2011)	Journal of the Earth and Space Physics (Institute of Geophysics) Vol.38, N.4 p.79-92	attenuation, nonstationary linear filter, Q factor, pseudodifferential operator