Proceedings of the 3rd International Conference on International Law and Legal Policy
DOI: 10.54254/2753-7048/55/20240070

A Study on the U.S. White House Executive Order on Artificial Intelligence from the Perspective of Systemic-Functional Grammar

Hongyu Zhang[1,a,*]

[1]*Department of Foreign Language, University of Electronic Science and Technology of China, Chengdu, China*
a. Zhanghongyu202404@163.com
**corresponding author*

Abstract: In November 2023, the White House of the United States introduced relevant laws and regulations about AI. The regulation of artificial intelligence is the inevitable result of social development and the inevitable trend of technological development. Other counties' domestic regulation of artificial intelligence-related laws and regulations has not yet been carried out. This paper analyzes American AI executive order from keywords, transitivity, modality, and cohesion by using Systemic Functional Grammar theory. Understanding the important contents and characteristics of the U.S. executive order on artificial intelligence can provide a reference for the formulation of other countries' artificial intelligence-related administrative regulations and laws, which finally promote the development of international artificial intelligence law.

Keywords: Artificial Intelligence, Systemic-Functional Grammar, Executive Order, Corpora

1. Introduction

ChatGPT is the U.S. artificial intelligence research laboratory OpenAI's new launch of a kind of artificial intelligence technology-driven natural language processing tool, ChatGPT is not only a Chatbot, but also to write emails, video scripts, copywriting, translation, code, and other tasks. AI technology will infringe on the rights of some people, such as Sora based on the Internet material to automatically produce videos may infringe on intellectual property rights, technology fraud ... The development of AI has attracted the attention of many countries, and in November 2023, the U.S. White House introduced relevant laws and regulations on AI, and in March 2024, the EU countries passed the Artificial Intelligence Act to formally reach an agreement.

1.1. Research objectives

The United States has carried out binding control on the development of AI. Therefore, I first analyze the AI administrative regulations issued by the U.S. White House, analyze its top 50 keywords compared with the corpus, and analyze the text through the three aspects of the transitivity, modality, and cohesion, and discuss in detail the focus of the text and textual features.

DOI: 10.54254/2753-7048/55/20240070

1.2. Research significance

This paper has two important aspects. From each country's safety aspect, learning from the U.S. AI laws and regulations in the text of the content of concern and the characteristics of the text of the executive order, the early introduction of AI laws and regulations suitable for each country's national conditions will help to safeguard the intellectual property rights of individuals, to protect the achievements of innovation of individuals and companies, and to promote the benign development of society. From the international aspect, learning from the focus of the U.S. AI executive order, countries have introduced relevant laws and regulations that are conducive to the enactment of national AI bills and combat international crimes using AI.

2. Theoretical Framework

The reason why Halliday's SFG is chosen as the analytic tool of this present study is the fact that SFG can provide a multifunctional representation of social reality[1]. Halliday views that the language itself and what humans need it for as well as its functions are all closely related. Halliday develops a theory of the meta functions of language in his famous book Introduction to Functional Grammar (1985), which are classified into three functions: ideational function, interpersonal function and textual function[2].

Ideational function is the expression of emotions and ideas about the real world. Conceptual function is mainly realized through the transitivity system, and there are six major processes in the transitivity system, which are divided into material process, mental process, verbal process, relational process, behavioral process and existential process.

The interpersonal function of language is realized by mood and modality. Fairclough notes that modality is concerned with the objectivity of the speaker or writer, which is an important component of interpersonal metafunctioning. In the study of legal text regulations, the coercive effectual content of the text is explored. This study uses modal auxiliary verbs as an analytical tool to explore the coercive force of AI executive orders in the United States. Modal auxiliary verbs are usually used to indicate high or low levels of pressure on others to carry out orders or certainty about the validity of propositions[2].

Textual cohesion is mainly expressed by grammatical means, such as reference, ellipsis, substitution, and conjunction, as well as lexical means, such as recurrence and collocation, to show structural cohesion. This paper focuses on the analysis of conjunction in grammatical means and reiteration in lexical means.

3. Data Analysis and Methodology

To study the research focus and textual features of the U.S. government's AI executive order (USAI), keyword analysis is an important tool in corpus linguistics that can be used to analyze texts. Using the keyword list, we can directly observe which words have a particular high frequency in the selected corpus, the lexical features of the text, and the focus of attention for further qualitative analysis[3].

3.1. Keywords

In addition, the keyword KWIC generated by the corpus software will also be checked.In lexical analysis, the concordance function is very useful because it provides us with a tool to study the keywords and it can also be collocated in context. The concordance function helps us to look up a word or phrase and then list the examples and their context of use[4].

DOI: 10.54254/2753-7048/55/20240070

Table 1: Retrieval of the Keyword List and Grammatical Category of USAI.

NO.	Keywords	NO.	Keywords	NO.	Keywords	NO.	Keywords
1	and	13	federal	25	president	38	privacy
2	ai	14	director	26	subsection	39	foreign
3	secretary	15	date	27	technologies	40	term
4	use	16	section	28	through	41	research
5	order	17	united	29	consultation	42	commerce
6	appropriate	18	related	30	agency	43	consistent
7	including	19	development	31	potential	44	address
8	security	20	risks	32	support	45	civil
9	other	21	government	33	technology	46	talent
10	within	22	guidance	34	practices	47	coordination
11	agencies	23	critical	35	infrastructure	48	actions
12	days	24	develop	36	programs	49	assistant
				37	homeland	50	executive

From table 1 we know that these 50 keywords can be divided into three categories: the first one is about the agencies and people involved in the executive order (secretary, agency, government, president, assistant, united states...), initiatives to limit AI (actions, guidance, research, practices, infrastructure, support), and related executive order requirements (order, days, date, section, subsection, term); the second category deals with AI itself (AI, talent, technologies, programs), AI safety issues (use, security, development, risks, critical, develop, potential, foreign, civil); the third category is about textual cohesion (consistent, coordination, and, within, including)[5].

For the first and third categories, they are easily understood. For the second category, it illustrates the characteristics of AI and its potential problems. In order to figure out what are potential problems, I use Antconc to search “foreign” and “civil”s’ collocations[6].

Table 2: Retrieval of the Collocation of “Foreign”.

Collocate	Rank	Collocate	Rank
person	1	states	7
reseller	2	account	8
iaas	3	verify	9
united	4	transacts	10
resellers	5	actors	11
identity	6		

Table 3: Retrieval of the Collocation of “Civil”.

Collocate	Rank	Collocate	Rank
rights	1	society	8
liberties	2	division	9
civil	3	organizations	10
offices	4	violations	11
equity	5	strengthening	12
academia	7		

DOI: 10.54254/2753-7048/55/20240070

From the above two tables, we can learn that in the U.S. White House's executive order on AI, the concerns about AI include both domestic and foreign aspects. Domestic: civil rights, civil liberties, civil equality, civil society, civil divisions, national violation. Foreign: foreign accounts, foreign resellers, foreign malicious cyber actors, foreign resellers of United States IaaS Products.

3.2. Transitivity

The ideational function is present in all language use and is a meaning latent, i.e., it conveys new information to the hearer. The ideational function consists mainly of transitivity and morphology. The statistics of the six processes of the text are helpful in discovering its characteristics.

Table 4: Transitivity's Six Possesses.

Process	Number	Percentage
Material Process	175	40.6%
Relational Process	250	58%
Verbal Process	0	0
Mental Process	4	0.93%
Existential Process	2	0.47%
Behavioral Process	0	0
Total Number	431	100%

As shown in the table above, among the six major processes material process (40.6%), relational process (58%), mental process (0.93%), existential process (0.47%), verbal process, and behavioral process (0). This shows that material and relational processes are the most dominant in the text of the US AI executive order. .

The following will briefly analyze the realization of verbs, participants, and environments in the type of material processes. As well as the realization of relational processes.

3.2.1. Material processes

Material processes, which involve specific actions and behaviors that are often the most important elements in legal texts, refer to the process of doing something.

Example2: the Director of NSF shall take the following steps: Within 90 days of the date of this order, in coordination with the heads of agencies that the Director of NSF deems appropriate, **launch** a pilot program implementing the National AI Research Resource (NAIRR), consistent with past recommendations of the NAIRR Task Force.

Analysis: In this sentence, "the Director of NSF" is a participant, and "a pilot program implementing the National AI Research Resource (NAIRR)" is the goal, using the verb "**launch**" to express the action. This material process shows the requirements of the US executive order for "the Director of NSF". The subjects, behaviors and objectives of the regulations are clearly defined.

The material process involves specific actions, and administrative orders or legal texts contain restrictions on certain behaviors, as well as stipulate the rights and obligations of relevant people, organizations, and institutions, which are expressed using the material process.

3.2.2. Relational processes

The relational process is the process of expressing the relationship between things, used to describe the types and characteristics of things, there are two different types: attribute and identifying. Attribute refers to the attributes that an entity has, and the two participants are carrier and attribute;

DOI: 10.54254/2753-7048/55/20240070

identifying refers to the unity of an entity with other entities, and the two participants are identifier and identified.

Example1: The Secretary of Labor shall, within 180 days of the date of this order and in consultation with other agencies and with outside entities, **including** labor unions and workers, as the Secretary of Labor deems appropriate, develop and publish principles and best practices for employers that could be used to mitigate AI's potential harms to employees' well-being and maximize its potential benefits.

Analysis: the example 1 is intensive of attribute type. In example 1, the carrier is "outside entities" and the attribute is "labor unions and workers". This sentence specifies the subjects of The Secretary of Labor's cooperation.

Example2: The term "dual-use foundation model" means an AI model that **is** trained on broad data; generally uses self-supervision; contains at least tens of billions of parameters; **is** applicable across a wide range of contexts; and that exhibits, or could **be** easily modified to exhibit, high levels of performance at tasks that pose a serious risk to security, national economic security, national public health or safety, or any combination of those matters.

Analysis: example 1 is intensive in identifying the type. In example 2, the identified is an "AI model" and the identifiers are "trained on broad data; generally uses self-supervision; contains at least tens of billions of parameters" , "applicable across a wide range of contexts" and "to exhibit, high levels of performance at tasks that pose a serious risk to security, national economic security, national public health or safety, or any combination of those matters".

This sentence is structured in types of relational processes to fully identify the term "dual-use foundation mode". In this relational processes, the sentence uses five clauses to amply identify and explain a term in order to make it more understandable and regulate artificial intelligence clearly.

3.2.3. Summary

By describing material processes, the occurrence, execution, and results of legal actions and events can be clearly expressed, and legal meanings can be expressed more objectively and thus better understood by readers. Describing the relational process, the executive order defines some new concepts and elaborates the relationship between different things and behaviors, so that readers can understand the content of the law more clearly and sort out the relationship between them.

3.3. Modality

Mood and modality are important parts of interpersonal functions, through which the speaker's identity, status, attitude and his/her inference of things are expressed. Modality is used to express the speaker's attitude towards a certain behavior or state, and there are many ways to express modality in the language. Modal verbs are important tools for expressing semantic meaning in legal English and are used to express specific semantic functions.

Table 5: The proportions of Modal Verbs in All Values in USAI.

Value	Modal Verbs	USAI	Tatal
Low	Might	0	
	May	34	
	Could	18	
	Can	14	22.23%
Median	Will	22	
	Would	3	
	Should	8	11.12%

DOI: 10.54254/2753-7048/55/20240070

Table 5: (continued)

High	Need	1	
	Shall	186	
	Must be	11	66.67%

Statistically, in the text of the AI executive order in the United States, low-value modal verbs account for (22.23%), medium-value modal verbs account for (11.12%), and high-value modal verbs account for the most (66.67%). It can be seen that high-value modal verbs are the most used modal verbs, conveying mainly rights and obligations, emphasizing legal effects, often dominated by pronouns or third-person nouns, and conveying different interpersonal functions in different contexts.

According to statistics, "must" is used relatively rarely in the text, and its interpersonal function is to express an obligatory behavioral requirement. The reason why shall is used most frequently is that in the common law system, "shall" is often used to stipulate obligations and responsibilities, while must express legal requirements and mandatory provisions. The U.S. White House executive order on artificial intelligence is an executive order, not a real legal provision, so this feature is also an important feature of administrative regulations.

3.4. Cohesion

Halliday categorizes articulation means into lexical cohesion and grammatical cohesion. Statistically analyzed, the text of the U.S. AI executive orders all adopt lexical cohesion and grammatical cohesion in large quantities. This paper analyzes the cohesion of the corpus through its connections and collocations[7].

Table 6: Connective word.

Category	US AI Text	Number	Category
Additive	And, or, also, otherwise	1256	Additive
Adversative	But, except	6	Adversative
Casual	Due to, because of, in order to	0	Casual
Temporal	When, before, after, until	22	Temporal
Continuative	in accordance with, in consultation with, consistent with	105	Continuative
Clarifying	Such as, following	43	Clarifying

Table 7: Ordering of word frequencies.

Type	Rank	Freq	Type	Rank	Freq
the	1	1250	in	6	360
of	2	1125	for	7	270
and	3	1047	a	8	255
to	4	710	as	9	210
ai	5	443	with	10	209

The word frequency statistics of the text can be found that only “AI” is a real word in the top ten of the word frequency. Then we search the collocation with “AI” and analyze its cohesion characteristics.

DOI: 10.54254/2753-7048/55/20240070

Table 8: Collocation of "AI".

Collocate	Rank	Collocate	Rank	Collocate	Rank
generative	1	secretary	7	states	13
related	2	order	8	uses	14
this	3	in	9	emerging	15
talent	4	capabilities	10	director	16
use	5	responsible	11	systems	17
date	6	and	12	is	18

After filtering the data and eliminating the useless data, the above table shows that there are 12 kinds of collocations with "AI", among which the highest frequency of collocations with "and" is 302, and the lowest frequency of collocations with "uses" is 13. The frequent recurrence of collocations emphasizes the cohesion and coherence of the text.

As can be seen from the figure and tables above, the U.S. AI executive order texts use a variety of means of cohesion, with relatively more use of conjunctions between sentences, and the means of coherence throughout the entire text of the law, so that the audience can better understand the logical relationship of the text and the conditions of application.

4. Conclusion

By analyzing the first 50 keywords of the corpus, I found that the text focuses on the agencies and personnel involved in the executive order; initiatives to limit AI; executive order requirements ; AI itself ; safety issues of AI. The concerns about AI include both domestic and foreign aspects. Domestic: civil rights, civil liberties, civil equality, civil society, civil divisions, national violation. Foreign: foreign accounts, foreign resellers, foreign malicious cyber actors, foreign resellers of United States IaaS Products. These are concerns that other countries and the international community can learn from keeping an eye on the domestic security aspects of the AI security issues therein and being wary of international crime using artificial intelligence. Using Halliday's Systematic Functional Grammar to analyze the text's transitivity, mood, and cohesion, it is found that U.S. executive order texts mainly has four features: objectivity, seriousness, formality and logicality.

References

[1] *Halliday, M. (2003). On Language and Linguistics (edited by Jonathan Webster) [M]. London:Continuum, 29.*
[2] *Halliday, M. (2004). Introduction to Functional Grammar [M]. New York:Oxford. University Press Inc, 15, 30, 128, 147, 149, 170, 356.*
[3] *The White House (Ed.) (2023). Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. The White House.*
[4] *Jiajing Ai. A corpus-based lexical comparison study of United Nations human rights treaties and British domestic law [D]. East China University of Political Science and Law, 2022.*
[5] *Liuyin Wu. Critical discourse analysis of news reports on the Belt and Road Initiative in Chinese and American newspapers[D]. Zhejiang University, 2018.*
[6] *Bochao Zhang. Analysis of the content and revelation of U.S. generative artificial intelligence regulatory provisions[J]. Shanghai Informatization, 2024, (01):50-52.*
[7] *Shuqi Ye. Research on Translation of Academic Writings under the Guidance of Discourse Cohesion Theory[D]. East China University of Political Science and Law, 2023.*