

THE PROCESS OF GENERATION A KNOWLEDGE GRAPH FOR THAI LAW

BACKGROUND OF THE INVENTION

(a) Technical Field of the Invention

5 Manufacturing companies operate under a complex regulatory framework that covers a wide range of issues, including equipment maintenance, safety protocols, raw material handling, logistics, chemicals management, permits, labor regulations, and more. These regulations are scattered across multiple legal documents, from the overarching law Act to detailed ministerial announcements and recommended practices.

10 Compliance with these regulations is a significant challenge for companies. They must manually track the validity and renewal of permits, monitor changes in reporting requirements, and ensure that all processes involving government or regulatory bodies are correctly followed. Failure to comply with these regulations can result in severe financial penalties.

15 One of the most challenging aspects of compliance is tracking changes in equipment safety practices, report frequency, maintenance standards, and certified standards. These aspects are spread across various legal documents that are updated regularly, but there is no centralized, "equipment-centric" view to track all of these changes. Companies are forced to invest considerable human effort to connect the dots between different documents, making it difficult to maintain compliance and increasing the risk of oversight.

20 While digital transformation initiatives, such as paperless operations, have simplified certain aspects of compliance management, they remain complex and time-consuming. Existing digital tools often focus on workflow management, requiring substantial human effort to read, interpret, correlate, and make decisions based on legal documents and updates.

25 Generative AI presents a breakthrough opportunity in this domain, particularly due to its natural language processing (NLP) capabilities. However, relying on Generative AI alone is insufficient for handling legal documents. Vector databases that use Retrieval-Augmented Generation (RAG) techniques are prone to hallucinations—errors that can be catastrophic in legal contexts. This is where a Knowledge Graph (KG) becomes essential. A KG can accurately map the relationships between different legal documents and their contents, providing a
30 structured, context-aware foundation for AI-driven legal process management.

Current methods for managing legal documents and compliance in manufacturing industries typically involve basic workflow applications. These tools assist companies in

tracking tasks and deadlines related to compliance but fall short in several key areas. They do not inherently understand the legal content, leaving the burden of interpretation and decision-making on human users.

Additionally, these solutions lack the capability to dynamically link various legal requirements across different documents. For example, they cannot automatically correlate a change in a ministerial announcement with its impact on related permits, safety protocols, or equipment standards. This limitation forces companies to invest significant time and effort in manual cross-referencing and interpretation, leading to inefficiencies and the risk of non-compliance.

Even more advanced technologies, such as vector databases using RAG techniques, struggle with the complexity and precision required for legal applications. These databases often produce inaccurate or incomplete results due to their reliance on probabilistic models, which can result in the aforementioned hallucinations. The lack of a structured, context-aware data model in these solutions makes them unsuitable for the rigorous demands of legal compliance.

(b) Description of Prior Art

The previously disclosed work, such as US Patent No. 20120158633A1, reveals a method for constructing a knowledge graph, which involves various steps like gathering, preparing, and storing large amounts of data. Alternatively, US Patent No. 11468342B2 discloses a method for building a knowledge graph that involves a data processing device with a computer processor, including steps to receive data from a data source, identify facts in the data, and generate triples for each fact, where the triple identifies the subject, predicate, and object, and completes a knowledge graph with nodes and edges representing the triples. After reviewing these steps, it can be concluded that they do not match the steps of the current invention.

To address these challenges, a new process was needed to develop a more effective and accurate Knowledge Graph specifically designed for the Thai Law universe in Thailand. The KG provides a comprehensive set of relationships between every individual item in the relevant legal documents. For example, it captures specific orders that require certain items in attachments to have permits for importation, links these items to the relevant attachments, and tracks changes in these attachments over time. It also connects these items to the permit request process, applicable fees, maintenance standards, and other related legal requirements.

This holistic approach ensures that every piece of information is interconnected within the KG, allowing the Generative AI to retrieve highly accurate, contextually linked answers to user queries. This innovation not only streamlines the legal compliance process for manufacturing companies but also significantly reduces the risk of errors and non-compliance by providing precise, actionable insights and the present invention introduces a novel Large Language Model (LLM)-powered system designed to process, interpret, and extract structured legal knowledge from unstructured Thai legal texts. This invention specifically focuses on multi-agent LLM processing, ensuring efficient legal text segmentation, entity recognition, legal term extraction, relationship mapping, and automated ingestion into a Knowledge Graph (KG) framework. The system provides a scalable and AI-driven approach to legal knowledge representation, compliance automation, and advanced legal research.

Unlike conventional Natural Language Processing (NLP) approaches, which rely on pre-defined rule-based extraction or static machine learning classifiers, this invention leverages multi-agent LLM coordination to dynamically interpret, contextualize, and structure Thai legal content. This ensures adaptability to evolving legislative frameworks, multi-jurisdictional legal systems, and AI-powered semantic legal retrieval.

SUMMARY OF THE INVENTION

The invention is a novel process for developing a Knowledge Graph (KG) specifically designed to map and integrate the complex legal landscape of Thai Law in Thailand. This process involves a series of standard yet meticulously executed steps, including data gathering, data cleansing, text extraction from both machine-readable and non-readable Thai sources, chunking, embedding, and ingestion into a Graph Data Model.

What sets this process apart is the deep integration of legal domain expertise with advanced data modeling techniques. The process begins with a comprehensive understanding of all relevant legal datasets, which informs the design of a specialized Ontology tailored to the intricacies of Thai legal documents. This Ontology captures critical elements such as effective dates, legal context, actionable items, prohibitions, penalties, and more, ensuring that the KG accurately reflects the legal framework.

Unique to this process is the combined use of deep data modeling expertise and specialized knowledge of the Thai legal domain, particularly in the interpretation of Thai text.

This dual expertise allows for the precise categorization, definition, and design of the legal Ontology, ensuring that the KG is both comprehensive and contextually accurate.

The primary benefit of this invention is its pioneering application in the Thai legal context. To date, there is no existing Knowledge Graph that comprehensively covers Thai legal documents, particularly in the domain of Thai Law. This KG represents a significant breakthrough in Legal Tech for Thailand, providing a powerful tool for legal compliance, interpretation, and decision-making. By offering a structured, context-aware foundation, this KG enhances the capabilities of Generative AI systems, enabling accurate and reliable natural language processing of legal queries.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the process diagram for generation a knowledge graph for Thai law according to this invention.

Figure 2 shows the data cleansing process according to this invention.

Figure 3 shows the step of combination generative AI and OCR (Optical Character

Recognition) tools for text extraction in the text extraction step.

Figure 4 shows the data chunking and embedding processes according to this invention.

Figure 5 shows the graph data model ingestion process according to this invention.

Figure 6 shows the integration interface process according to this invention.

Figure 7 shows an example diagram for tracking the compliance with equipment safety

standards.

Figure 8 shows an example diagram for tracking license renewal and validity.

Figure 9 shows an example diagram for managing the transportation of chemical materials.

Figure 10 shows an example diagram for reporting annual regulatory compliance.

Figure 11 shows an example diagram for legal audits and risk assessments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The inventions to be disclosed herein are described in detail with reference to the illustrations. However, this invention may be provided in different aspects and ought not to be limited to the disclosed figure. The figure has been made so that this disclosure is absolutely clear that those who are skilled in the art can fully understand in the figure. However, thickness and scale of the figure may be exaggerated for clarity.

Thai law, according to this invention, includes regulations, orders, or decrees established by the state, includes relevant regulatory guidelines and (regulation(s) and related document(s))

The process of generation a knowledge graph for Thai law (100) according to this invention, as shown in Figure 1, includes the following steps:

5 **1. Data Gathering (102):** The first step in developing the Knowledge Graph (KG) involves gathering data from a variety of sources (101). The primary data sources include Government Gazette, Government Agency Websites, Legal Repositories, History Archives, and Ministerial Records. These sources provide the legal documents necessary to map the Thai Law universe in Thailand.

10 Given the complexity and scope of the Thai Law domain, the process involves collecting data from multiple different sources. These sources encompass both contemporary legal documents and historical records, some of which are difficult to access or may exist only in paper format. The team employs a combination of automated data scraping tools and manual data collection methods to ensure comprehensive coverage.

15 **2. Data Cleansing (103) as shown in figure 2,** Once the data is gathered (102), it undergoes a rigorous cleansing process to ensure accuracy and consistency. This step is particularly critical given the varied formats and conditions of the legal documents, which include both machine-readable files and scanned paper documents.

The data cleansing process involves:

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 - **Standardization (201):** Converting all text to a uniform format, correcting any OCR errors in scanned documents, and ensuring consistency in terminology and references.
 - **De-duplication (202):** Identifying and removing duplicate entries, particularly in historical records where multiple versions of the same document might exist.
 - **Normalization (203):** Aligning different versions of laws and regulations to a

25 common standard, ensuring that the most current and relevant versions are prioritized.

30 **3. Text Extraction (104):** The next step involves extracting text from the gathered legal documents. This includes handling both machine-readable formats and non-readable sources, such as scanned paper documents. The process uses a combination of Generative AI and OCR (Optical Character Recognition) tools for text extraction and custom algorithms designed to handle the nuances of Thai legal language.

Challenges in this step include dealing with poor-quality scans, outdated language or terminology, and the need to accurately capture the structure of legal documents, such as

clauses, sub-clauses, and attachments. The team addresses these challenges by leveraging advanced OCR tools, coupled with manual verification to ensure the accuracy of extracted text.

The combination of generative AI and OCR (Optical Character Recognition) tools for text extraction as shown in figure 3

- 5 Document Ingestion Agent step (701)
 - Extracts raw text from legal documents (e.g., Act, Royal Decree) in PDF, HTML, or OCR-processed formats.
 - Cleans and standardizes text for downstream processing.
 - Segments legal texts into logical units (e.g., Sections, Clause, Paragraphs).
 - 10 • Generates concise summaries using LLM-driven prompt engineering.
- Named Entity Recognition (NER) & Legal Term Extraction Agent Step (702)
 - Identifies and classifies named entities such as government agencies, ministries, corporate entities, individuals.
 - Extracts legally significant terms (e.g., “penalty,” “license,” “fee”) using
 - 15 **LLM-based** entity extraction or fine-tuned models.
 - Standardizes legal terms by mapping predefined taxonomies within the KG.
- Relationship Extraction Agent Step (703)
 - Identifies cross-references between legal provisions (e.g., amendments, citations, regulatory dependencies).
 - 20 • Maps extracted sections to relevant legal topics, ensuring contextual semantic connectivity.
 - Converts legal text chunks and extracted entities/terms into embedding vectors for AI-driven legal search.
 - Utilizes semantic representation techniques (e.g., Transformer-based
 - 25 embeddings) for enhanced retrieval accuracy.
- Knowledge Graph Population Agent Step (704)
 - Transforms extracted structured data (documents, sections, topics, terms, citations, amendments, etc.) into graph nodes and relationships.
 - Automates insertion and update operations within a graph database (e.g.,
 - 30 Neo4j, TigerGraph).
 - Stores embedding vectors for AI-powered semantic search and retrieval.
- Orchestrator Step (705)
 - Coordinates the sequential execution of all LLM agents.

- Manages data dependencies, error handling, and workflow optimization to ensure efficient processing at scale.

4. Chunking and Embedding (105) as shown in figure 3, Once the text is extracted, it is chunked into smaller, manageable pieces that can be embedded into the Graph Data Model.

5 This process involves:

- **Segmentation (301):** Breaking down documents into logical sections, such as individual clauses, definitions, and procedural steps.
- **Embedding (302):** Each chunk is then embedded using NLP embedding techniques, ensuring that the contextual meaning of the text is preserved during the ingestion into the Graph Data Model.

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5. Ontology Design (107): A critical aspect of the process is the design of the legal Ontology, which provides the structure for how legal concepts are represented and related within the Knowledge Graph (KG). This involves several key components:

Legal Content Extraction (108)

15 The first step in ontology design is to extract relevant legal content from various sources such as legal documents, government agency databases, and ministry records. This ensures that all critical legal information, such as obligations, compliance requirements, and penalties, is captured and structured for use in the knowledge graph. This step combines both automated and manual methods to extract the necessary data and ensure contextual accuracy.

20 Concept Definition and Class Development (109)

The first step in ontology design is to define the key legal concepts, which are organized into Classes. A Class in this context represents a broad category of legal entities or concepts, such as "Permits," "Safety Standards," "Penalties," or "Inspection Requirements." Each Class encapsulates a set of similar entities that share common characteristics.

25 **Example:** For instance, the Class "Permit" might include various types of permits required under Factory Law, each with specific legal obligations and associated conditions. The Class "Safety Standards" might include various safety protocols that manufacturing equipment must adhere to.

30 Property Definition (110) and Relationship Development (111)

Once Classes are defined, Properties are established to describe the attributes and characteristics of each Class. Properties define the specific data points or aspects of a Class

that are relevant to the legal framework. Relationships, on the other hand, define how different Classes are interconnected within the legal ontology.

- **Properties:** For example, the Class "Permit" might have Properties such as "Effective Date," "Expiration Date," "Issuing Authority," and "Associated Fees." These Properties provide detailed information about each permit.
- **Relationships:** Relationships connect different Classes, showing how they interact within the legal framework. For instance, a Relationship might connect "Permit" to "Penalty" to indicate the consequences of failing to renew a permit. Another Relationship might link "Safety Standard" to "Inspection Requirement" to show the mandatory inspections that must be conducted to comply with safety regulations.
- **Example:** In the legal ontology, a Relationship might be established between the Class "Chemical Material" and "Transportation Permit," indicating that the transportation of certain chemicals requires specific permits. This Relationship could further link to the Class "Penalty" to show the legal consequences of non-compliance.

15 **Hierarchy Development (112)**

After defining Classes, Properties, and Relationships, the next step is to develop a hierarchical structure that organizes these elements according to the legal framework. This hierarchy reflects the legal dependencies and precedence of various laws and regulations, ensuring that the KG accurately represents the complexities of Law.

- **Example:** Within the hierarchy, general laws might be positioned at a higher level, with specific regulations and ministerial announcements branching off as more detailed, context-specific requirements. For example, "General Safety Standards" might sit at a higher level, with specific standards for "Electrical Safety" and "Chemical Safety" nested beneath it.

25 **Contextualization and Special Cases (113)**

Contextualization involves incorporating additional information that defines the circumstances under which certain laws apply, enhancing the relevance and accuracy of the KG. This includes modeling special cases or exceptions within the ontology, where different rules or interpretations may apply.

- **Example:** For instance, the Class "Labor Regulation" might have different Properties and Relationships depending on the size of the manufacturing plant or the type of labor being employed. The ontology would capture these contextual nuances, ensuring that the KG provides accurate legal guidance even in complex scenarios.

Graph Data Model Design (114)

This step focuses on designing and structuring the graph data model, which is used to connect relationships between various legal entities such as regulations, licenses, and penalties. The graph data model differs from ontology in that it emphasizes storing and linking data in a graph format to ensure that all legal entities and their relationships are accurately represented and can be queried efficiently.

6. Graph Data Model Ingestion (115) as shown in figure 4, The cleaned, extracted, and embedded data is then ingested into the Graph Data Model. The model is designed to capture the relationships between various legal entities, such as regulations, permits, safety standards, and penalties.

The ingestion process involves:

- **Node Creation (401):** Defining each legal document or section as a node within the graph.
- **Relationship Mapping (402):** Establishing connections between nodes based on the legal context, such as linking a permit requirement to its associated penalties or procedural steps.
- **Version Control (403):** Incorporating historical versions of legal documents to track changes over time and their implications.

7. Integration Interface (117) as shown in figure 5, Although the primary focus of the patent is the KG itself, the integration with Generative AI is a key component of the overall system.

The KG is integrated with Generative AI systems through standard techniques such as:

- **LLM Integration (501):** Leveraging large language models to interpret and query the KG.
- **Semantic Search (502):** Using semantic search techniques to perform similarity searches within the KG, allowing for precise and context-aware query results.
- **API Development (503):** Creating APIs that enable seamless interaction between the KG and other AI tools, ensuring that the KG can be effectively used in real-time legal queries.

Use Cases and Applications

Example 1

Use Case 1: Compliance Tracking for Equipment Safety Standards as shown in figure 6

- **Scenario:** A manufacturing company needs to ensure that its equipment complies with updated safety standards as mandated by Thai Factory Law. These standards are spread across various legal documents, including regulations, ministerial announcements, and safety protocols.
- 5 • **Application of the Knowledge Graph:** The Knowledge Graph (KG) developed using the patented process allows the company to create an "equipment-centric" view. By querying the KG, the company can instantly access all relevant legal requirements for specific equipment, track changes in safety standards, and ensure compliance. The KG links each piece of equipment to its relevant legal obligations, including mandatory
10 inspections, maintenance schedules, and reporting requirements.
- **Benefits:** This application reduces the manual effort required to track and interpret legal documents, minimizes the risk of non-compliance, and ensures that the company adheres to the latest safety standards. The ability to query the KG using natural language through Generative AI further simplifies the process.

15 **Example 2**

Use Case 2: Permit Renewal and Validity Monitoring as shown in figure 7

- **Scenario:** A manufacturing company must manage the renewal and validity of multiple permits related to its operations, such as import permits for hazardous materials and environmental permits for emissions.
- 20 • **Application of the Knowledge Graph:** The KG provides a centralized system for monitoring permit validity and renewal timelines. By integrating the KG with the company's operational systems, the company can receive automated alerts when a permit is nearing expiration or when new legal requirements affect the renewal process. The KG's structure allows it to link permits with associated legal documents, fees, and
25 renewal procedures.
- **Benefits:** This application streamlines the permit management process, reduces the likelihood of lapses in permit validity, and ensures that the company remains compliant with all legal requirements. The KG's integration with Generative AI also allows for predictive analysis, such as identifying potential delays in the renewal process based on
30 historical data.

Example 3

Use Case 3: Managing Chemical Material Transportation as shown in figure 8

- **Scenario:** A company is required to transport hazardous chemicals, which are subject to strict regulations under Thai Factory Law. The regulations dictate specific routes, safety measures, and documentation requirements for the transport of these materials.
- 5 • **Application of the Knowledge Graph:** The KG allows the company to input details about the chemical materials and transportation routes, and instantly retrieves all relevant legal requirements, including safety protocols, required permits, and documentation procedures. The KG also tracks updates to these regulations, ensuring that the company's transportation practices are always in compliance.
- 10 • **Benefits:** This use case minimizes the risk of non-compliance during the transportation of hazardous materials, reduces the time spent researching legal requirements, and ensures that all necessary safety measures are adhered to. KG's ability to handle complex queries related to transportation routes and materials adds significant value.

Example 4

Use Case 4: Annual Compliance Reporting as shown in figure 9

- 15 • **Scenario:** At the end of each year, a manufacturing company is required to submit comprehensive reports on various aspects of its operations, such as safety standards, environmental impact, and labor practices, to government authorities.
- 20 • **Application of the Knowledge Graph:** The KG simplifies the process of generating these reports by organizing and linking all relevant legal obligations and reporting requirements. The company can generate a report template based on the KG, which automatically pulls in the necessary information and ensures that all required data is included.
- 25 • **Benefits:** This application reduces the time and effort needed to compile annual reports, ensures that reports are complete and compliant with current laws, and allows for easy updates if legal requirements change. The integration with Generative AI can also assist in drafting report sections based on the data stored in the KG

Example 5

Use Case 5: Legal Audit and Risk Assessment as shown in figure 10

- 30 • **Scenario:** A company undergoes a legal audit to assess its compliance with Thai Factory Law. The audit requires a thorough review of the company's adherence to various regulations and identification of potential legal risks.

- **Application of the Knowledge Graph:** The KG is used to conduct a comprehensive audit by cross-referencing the company's operational data with the legal requirements stored in the KG. The KG highlights areas of non-compliance, suggests corrective actions, and provides a risk assessment based on the company's adherence to legal obligations.
- **Benefits:** This application provides a thorough and accurate audit process, identifies potential legal risks before they escalate, and offers actionable insights for improving compliance. The KG's ability to analyze complex legal relationships and dependencies ensures a detailed and reliable audit.

Any change made to this invention may be vividly understood and can be done by a person skilled in the field. The change may be within the scope and intent of this invention as shown in the claim attached.

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CLAIMS

1. Method for generation a Knowledge Graph for Thai Law (100) consists of the following steps:

5 The Data Gathering (102) is responsible for gathering data from various sources (101) and sending it to the data cleansing step (103), which ensures the data is accurate and consistent. The organized data is then forwarded to the text extraction step (104), which extracts text from the collected legal documents, including handling both machine-readable and non-readable sources. The extracted data is then sent to the data chunking (105) and embedding (106) steps, which break the data into manageable pieces that can be embedded into the graph data model. Afterward, the data moves to the ontology design step (107), the graph data model design step (114), and the graph data model ingestion step (115), which inputs the data into the graph data model to create the knowledge graph. Finally, the data is forwarded to the integration step (117), which integrates the knowledge graph with the generative AI system.

15 **Characterized in that** the text extraction step (104) operates by combination of generative AI and OCR (Optical Character Recognition) tools for text extraction, which comprising Document Ingestion Agent step (701), Named Entity Recognition (NER) & Legal Term Extraction Agent step (702), Relationship Extraction Agent step (703), Knowledge Graph Population Agent step (704) and Orchestrator step (705) or

20 The ontology design step (107) is that it creates the structure for representing and linking legal concepts within the knowledge graph (KG). The process includes the legal content extraction (108), definition of concepts and class development (109), specification of properties and relationship development (110), hierarchy development (112), and contextualization and special cases (113). All these components are integrated together.

2. The process of generation a knowledge graph for Thai law according to claims 1 wherein

25 Document Ingestion Agent step (701) in the text extraction step (104) performs extracts raw text from legal documents, Cleans and standardizes text for downstream processing, Segments legal texts into logical units and generates concise summaries using LLM-driven prompt engineering.
3. The process of generation a knowledge graph for Thai law according to claims 1 wherein

30 Named Entity Recognition (NER) & Legal Term Extraction Agent step (702) in the text extraction step (104) performs identifies and classifies named entities, extracts legally

significant terms using LLM-based entity extraction or fine-tuned models, standardizes legal terms by mapping to predefined taxonomies within the KG

4. The process of generation a knowledge graph for Thai law according to claims 1 wherein Relationship Extraction Agent step (703) in the text extraction step (104) performs identifies cross-references between legal provisions, maps extracted sections to relevant legal topics to ensuring contextual semantic connectivity, converts legal text chunks and extracted entities/terms into embedding vectors for legal search and utilizes semantic representation techniques.
5. The process of generation a knowledge graph for Thai law according to claims 1 wherein Knowledge Graph Population Agent step (704) in the text extraction step (104) performs transforms extracted structured data into graph nodes and relationships and automates insertion and update operations within a graph database and stores embedding vectors for semantic search and retrieval.
6. The process of generation a knowledge graph for Thai law according to claims 1 wherein Orchestrator step (705) in the text extraction step (104) performs coordinates the sequential execution of all LLM agents and manages data dependencies, error handling, and workflow optimization to ensure efficient processing at scale.
7. The process of generation a knowledge graph for Thai law according to claims 1 wherein the data collection step includes gathering information from the Royal Gazette, government agency websites, legal databases, historical archives, ministry records, as well as sources related to contemporary legal documents, historical records, and paper-based documents.
8. The process of generation a knowledge graph for Thai law according to any claims 1 to 7 wherein the data cleansing step (103) is further comprised of the following steps:

The standardization step (201) involves converting all text into a uniform format, correcting errors from OCR (Optical Character Recognition) in scanned documents, and ensuring consistency in terminology and references.

The deduplication step (202) involves identifying and removing duplicate entries, especially in historical records, where multiple versions of the same document may exist.

The normalization step (203) involves standardizing different versions of laws and regulations, ensuring that the most current and relevant version is prioritized.

9. The process of generation a knowledge graph for Thai law according to anyone of claims 1 to 8 wherein the text extraction step (104) is further enhanced with a combination of generative AI and OCR (Optical Character Recognition) tools for text extraction, as well as algorithms specifically designed to handle the nuances of Thai legal language.

5 10. The process of generation a knowledge graph for Thai law according to anyone of claims 1 to 9 wherein the data chunking step (105) and data embedding step (106) are further comprising of the following steps:

The segmentation step (301) involves dividing the documents into logical sections, such as clauses, definitions, and process steps.

10 The embedding step (302) involves embedding each section of data using NLP (Natural Language Processing) embedding techniques to ensure that the contextual meaning of the text is preserved when imported into the graph data model.

11. The process of generation a knowledge graph for Thai law according to anyone of claims 1 to 10 wherein the graph data model ingestion step (115) is further comprising of the following steps:

15 The node creation step (401) involves defining each legal document or section as a node within the graph.

The relationship mapping step (402) involves creating connections between the nodes based on legal context, such as linking license requirements with penalties or relevant procedural steps.

20 The version control step (403) involves integrating historical versions of legal documents to track changes over time and the impact of those changes.

12. The process of generation a knowledge graph for Thai law according to claims 1 wherein the legal content extraction step (108) in the ontology design step (107) involves extracting relevant legal content from various sources. This process combines both automated and manual methods to extract the necessary data and ensure contextual accuracy.

13. The process of generation a knowledge graph for Thai law according to claims 1 wherein the definition of concepts and class development step (109) in the ontology design step (107) involves defining key legal concepts, which are organized into classes. In this context, a class represents a broad category of legal entities or concepts, with each class encompassing a set of similar entities that share common characteristics.

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14. The process of generation a knowledge graph for Thai law according to claims 1 wherein the definition of properties (110) and relationship development (111) in the ontology design step (107) involves defining properties to describe the characteristics of each class. Properties define specific data points or aspects of a class that are relevant to the legal framework.
- 5 Relationships define how different classes are linked within legal ontology.
15. The process of generation a knowledge graph for Thai law according to claims 1 wherein the hierarchy development step (112) in the ontology design step (107) involves creating a hierarchical structure that organizes these elements according to the legal framework. This hierarchy reflects the legal dependencies and the prioritization of laws and regulations.
- 10 16. The process of generation a knowledge graph for Thai law according to claims 1 wherein the integration step (117) is further comprising of the following steps:
- The Large Language Models (LLMs) integration step (501) involves using large language models to interpret and query the knowledge graph.
- The semantic search step (502) involves utilizing semantic search techniques to find
- 15 similarities within the knowledge graph, enabling more accurate search results.
- The API development step (503) involves creating APIs that facilitate smooth interactions between the knowledge graph and other tools.
17. The process of generation a knowledge graph for Thai law according to claims 1 wherein the non-machine-readable sources in the text extraction step (104) include scanned paper
- 20 documents.