

## **e-Pedalion: The Transformation of a Christian Cultural Heritage Text into a Textual Database of Orthodox Canon Law**

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**Abstract:** Despite the great value of canonical texts in the life of the Eastern Orthodox Churches, there have been few memorable works of their digital processing and promotion. The first Orthodox Greek Canonical texts appeared two millennia ago and are the sources of Canon Law. These texts as cultural heritage objects deserve more publicity, which can be supported by new technologies. Within this context, this article summarizes the design of a textual database called e-Pedalion. The Pedalion (or Rudder) is a recognized, official, and in-use Collection of Canons of the Orthodox Church. The main goal of the project is to show how the information about this printed book, i.e., its intangible aspects – content and the metadata that accompany it – is digitally transformed into a relational database. In particular, the design process consists of two tasks: a) requirement analysis and b) conceptual database design. The first task mainly answers the questions “what is the purpose of the system and what is its intended functionality?”. The second task aims at capturing the entities of the database with their attributes, as well as the relationships between the entities. Ultimately, this capture leads to the logical database design. The proposed database will provide a powerful digital methodological research tool to the scholars of Canon Law and further support the application of Semantic Web technologies and AI to its study.

**Keywords:** *Canon Law—Database—Metadata—Religious Script—Pedalion (Rudder).*

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### **Introduction**

In the Eastern Orthodox Churches, Church Law, that is, Canon Law is a body of Canons (also called Holy Canons), which ensures the ecclesio-canonical taxis (or order) of the Church. This body of Canons (or in other words the canonical texts) is of interest, on the one hand, to legal research, and in particular ecclesiastical criminal law, and on the other hand, to theological research, which deals with a variety of issues, such as dogmatic and theological issues, issues of organization and self-government of the Church.

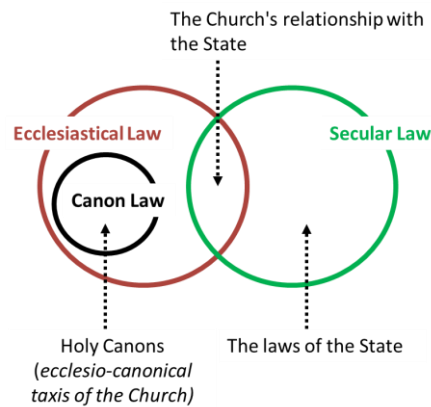


Fig. 1. A schematic representation of the relationship between canon and secular law (© Authors).

The Canon Law is a domestic law that concerns exclusively the organization of the Church, and not the State – although when the Canon Law was formed it was influenced by the Byzantine-Roman Empire, which was founded on Roman Law (Heith-Stade, 2011). This means that Canon Law does not have a common point of contact with Secular Law (the laws of the State). As Patsavos (2003, pp. 1–2) characteristically says “Contrary to what some have believed, the Church’s law differs essentially from secular law. Its difference lies mainly in the premise that the original source of canon law is found in the will of God to establish His Church on earth”. The law field that deals with the State-Church relations is the Ecclesiastical law, which is a set of rules of law that govern, inter alia, the Church’s relationship with the State. Ecclesiastical law is, therefore, a broader field that contains the Canon law, that is, Canon Law is essentially a subclass of Ecclesiastical Law (Figure 1).

Although about 2 millennia have passed since the appearance of the first Greek Orthodox Christian canonical texts, there is a lack of direction toward their systematic presentation using new technologies. One of the few relevant efforts that have been made is the digitization of the printed canonical collections and their free availability on the Web. For example, in the context of digital canonical law, two related efforts can be mentioned. The first effort concerns the Greek database Βαλασαμών (Balsamon) (Legal Service of the Holy Synod of the Church of Greece., 2010)<sup>1</sup>, which contains texts (Holy Canons, jurisprudence, legislation, opinions, etc.) for Orthodox Canon and Ecclesiastical Law. This database supports rather limited search criteria (e.g. keyword, decision number, content category, year, court). The second concerns the online thematic mapping of the Canonical Territory of the Russian Orthodox Church, which is derived from the content of the Canons (Ponomariov, 2019). But these canonical texts, for the Orthodox Church, have a special value because they are both the main sources of Orthodox Canon Law (or in a broader term, Ecclesiastical Law) and also determine its identity over the centuries. The most famous collection of Orthodox Greek Canonical Texts is the *Rudder (Pedalion)* – in Greek, Πηδάλιον – which is available in Greek and English (Agapius the Monk & Nicodemus the Hagiorite, 1957). This book, written by Agapius the Monk and St. Nicodemus the Hagiorite, presents in a systematic way the Canons of the Eastern Orthodox Church. It should be noted that this was written in the monastic community of Mount Athos on the Mount Athos Peninsula. The Greek original work was first published in 1800 A.D. in Leipzig of Saxony.

<sup>1</sup> <http://www.valsamon.com>

Obviously, the Pedalion is a religious item of world cultural heritage because it concerns all the Orthodox Christian people worldwide. This has historical, cultural, legal, and religious value. After all, religious heritage represents a large piece of the broader cultural heritage. Indeed, in recent years, religious heritage has been at the heart of scientific and technological research, as new projects are emerging that protect and promote it through digital technology. Cultural heritage preservation, as well as the diffusion of it to the audience (general or specialist), are two main goals of the consequent efforts. Zhou et al. (2012) have listed various technologies for effective protection such as AI, multimedia, broadband networks, virtual reality, and databases.

Based on the above, this article presents the transformation of the Pedalion into a textual database of Orthodox Canon Law. In this way, the transition from the unstructured information of this text collection to the corresponding structured data of an information system will be achieved. In practice, this religious script is annotated with semantic information (metadata) which are organized and correlated with each other based on their significance and logical relations. This best practice, on the one hand, presents a unified view of the semantic content of the Canons, and on the other hand, emphasizes their connected nature.

Regarding the contribution of our work, we envision that the proposed database will be the main digital methodological research tool of the scholars of Canon Law, which is missing – to the extent of our knowledge – to this day, and which will lead the field of Canon Law to the new digital age.

## The Pedalion

According to the authors of the Pedalion, this canonical collection seeks: a) to interpret and explain the Canons in everyday speech so that they are accessible and understandable even by the simplest person, and b) to compile in one book all the authentic Canons and their approved interpretations, as they had been formulated by various famous canonists (persons specializing in Canon Law).

The Pedalion based on its content can be divided into five broad sections: 1) First pages-Prolegomena about Canons, 2) Presentation of Canons (Main Body), 3) Concise and Accurate Instructions Concerning Marriages, 4) Forms of Some Letters 5) Table of contents and topics. The second section, which will be transformed into a textual database, contains four types of Canons: Apostolic Canons, Ecumenical Synodical Canons, Local Synodical Canons, and Patristic Canons.

At the Pedalion, each Canon follows a specific structure with the following mandatory or optional sections:

- (1) *Number of Canon*. The number of a Canon, which can be displayed in various numeral systems, such as Arabic or Greek, or Roman numerals, depending on the language of the text.
- (2) *Canon prototype*. Text with the original phrasing of the Canon in Greek.
- (3) *Concordant Canons*. Systematic citation of concordant Canons without explanation, that is Canons with the same or similar content.
- (4) *Interpretation of Canon*. Text that includes the interpretation of the Canon according to the genuine and approved interpreters (canonists) of the Orthodox Church (like John Zonaras, Theodore Balsamon, and Alexios Aristenos).
- (5) *Concord of Canon*. Short presentation of the concord of the Canon to achieve the examination of the Canons as a whole and not individually.

(6) *Footnote*. Text that contains comments that philologically enrich the text or provide further information on a specific topic of interest.

A brief description of this organizational structure of the Canons, as well as relevant comments on the existence of each section, are shown in Table 1.

Figure 2 shows a selected snapshot of a page of the Pedalion, in which the different sections (Table 1) that make up the structure of each Canon can be seen numbered.

### Methodology

The methodology applied for the development of the textual database follows the basic international principles for the development of relational databases (Harrington, 2016; Ramakrishnan and Gehrke, 2000). In other words, the relational data model is used to organize the database data, which consists of two components: (a) tables with their attributes and records and b) the relations of the tables that are implemented through their common features (foreign keys).

Table 1. Canons organizational structure (© Authors).

No.	Section	Section description	Section existence
1	Number of Canon	Number of Canon	Always
2	Canon prototype	Prototype text of Canon	Sometimes
3	Concordant Canons	Systematic citation of concordant Canons	Sometimes
4	Interpretation of Canon	Interpretation of Canon	Almost always
5	Concord of Canon	Brief presentation of the concord of the Canon	Sometimes
6	Footnote	Enrichment of text with literary notes or interpretive clarifications	Sometimes

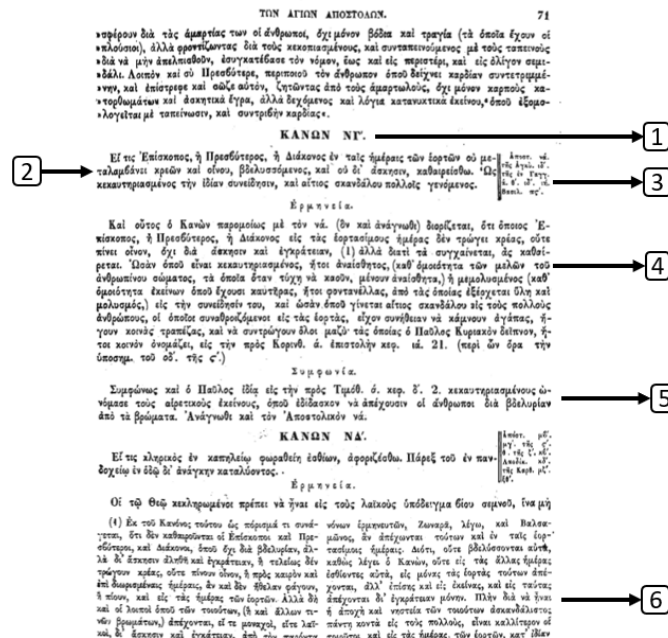


Fig. 2. The content structure of Pedalion (© Public Domain<sup>2</sup>).

<sup>2</sup> See: <https://anemi.lib.uoc.gr/metadata/3/0/a/metadata-39-0000123.tkl>

Its basic advantages are that searching data is done through queries, which allow multiple combinations of search criteria and representation of the data (Atzeni and De Antonellis, 1993), while also avoiding data redundancy. As part of the database design, a metadata standard was developed that incorporates different types of metadata (descriptive, structural, semantic, administrative) for the multilevel annotation of canonical resources. The proposed *OrthoCCL Metadata Standard* (Orthodox Christian Canon Law Metadata Standard) (Sarakatsianou and Koloniari, 2022) adopts elements of the Dublin Core metadata standard. The OrthoCCL Metadata Standard includes 23 elements and 61 element refinements that help describe various levels of recording (collection level, source level, canon level, content level), as well as identify different types of information (e.g. subject information, bibliographic information, copyright information, array information, etc.). Essentially, semantic enrichment is achieved on the basis of three broad areas of description: content, context, and structure (Baca, 2016). Specifically, enrichment concerns: (a) information relating to the semantic content of the Canons (b) information relating to the circumstances in which the Canons were created (c) information relating to the structure of the Canons.

This article summarizes the design of the database, based on which, at a later time, the corresponding database will be created in a web-based environment, so that the data of Orthodox Canon Law become accessible to the audience and provide enriched search capabilities through the exploitation of the derived metadata.

## Database design

### Requirement Analysis

The creation of the e-Pedalion database is intended to provide the necessary information about resources of Orthodox Christian Canon Law. These resources are distinguished into *Collections*, *Sources*, *Canons* and *textual data* (see Table 2).

Table 2. Description of resources (© Authors).

Resource	Description
Collection	The collection (printed book) containing Canons (e.g. the Rudder)
Source	The source of origin of the rules (e.g. First Ecumenical Council)
Canon	The Canon of a specific Collection of Canons (e.g. the first Canon of the first Ecumenical Council as it appears in the Rudder collection)
Textual data	The content of the collection (e.g. prototype text or footnote of Canon)

Continuing with the requirement analysis the stakeholders, i.e., the potential users of the textual database and their expectations and intended use of the database is determined.

In view of the multifaceted interest produced by Canon Law, the following potential user groups are identified:

- lawyers interested in defending in an ecclesiastical court a person who has committed some canonical offence.
- judges interested in imposing an appropriate punishment on a person based on the canonical offence committed.
- canonists and theologians who are interested in meeting their current needs for their scientific research.

- non-scientists (ordinary citizens) who want to come into contact with church canons mainly out of personal religious interest.

Taking into account the information needs of potential users of the proposed text database, some indicative processes that can be carried out through it are listed:

- search of collection based on various criteria (collection title, publisher, language, edition, contributor, etc.)
- search of source based on various criteria (source title, created, source type, chronological order, etc.)
- search of canon based on various criteria (canon title, canon type, canon genre, Arabic numerals in English, etc.)
- search of textual data based on various criteria (keywords, text section, page, etc.)
- advanced search

Finally, the textual database should meet the following main specifications:

- incorporates textual data from the Pedalion, the official Collection of Canons of Orthodox Christian Canon Law. However, its design envisages its future expansion, i.e. the import of other data from other relevant Collections.
- provides textual data in two languages, Greek (original) and English, based on the respective Collections available in these languages.
- has as a basic data description language, Greek, however, its design provides for multilingual data description support.

## Database Design

For the correct design of the database, a standard top-down procedure is followed, starting from a conceptual database model that is then transformed into a corresponding relational database model (Ramakrishnan and Gehrke, 2000).

The conceptual model is derived based on the requirement analysis, and after the study of the structure of the primary data source, that is, the Pedalion, and in particular, the way in which a collection of Canon Law is formed and the way the Canons are presented within it. Firstly, each distinct data resource is represented by a separate entity, and the attributes that describe it are identified. Then, the relationships between the entities are captured. Thus, the conceptual model centers around the Canon of a Collection associating it with the other entities such as the Collection it is included in, the Source it belongs to, and so on. Figure 3 shows the basic database entities and the relationships among them.

Figure 4 shows the relationships of the three major database entities, namely Sources, Collection, and Canons. Here, there is a specific pattern of correlation of canonical resources, which is governed by the following condition: a Source contains specific Canons but also a Collection contains Canons from different Sources. This condition should be taken into account when designing the database, so that the database can be extended, in the future, by incorporating data from other collections of canonical texts besides the Pedalion.

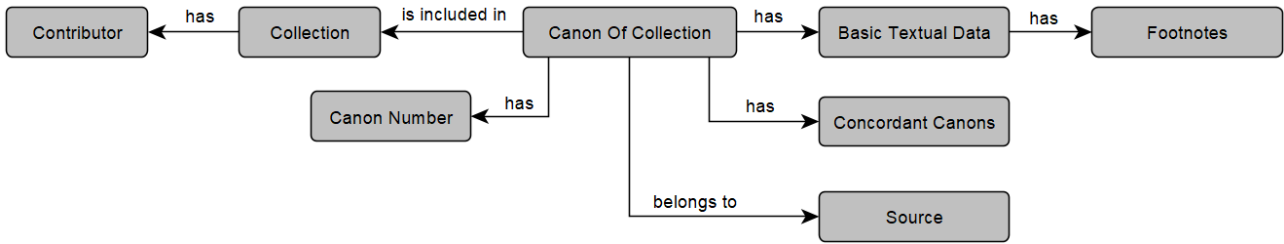


Fig. 3. Relationships of basic entities (© Authors).

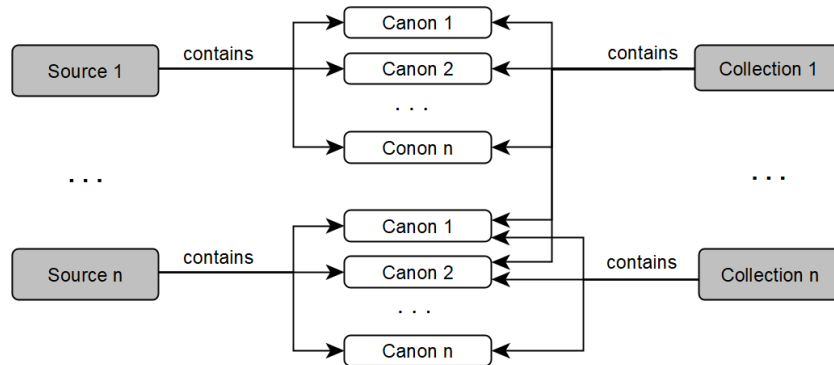


Fig. 4. Relationships of three major entities (© Authors).

The central entity of the e-Pedalion textual database is CanonOfCollection, which is linked to four other key entities, CollectionOfCanons, SourceOfCanons, BasicTextualData, and Footnote. These key entities are in turn related to other peripheral entities.

To transform the conceptual model to a relational model, entities are mapped to relation tables and entity relationships are distinguished into one-to-many and many-to-many so as to derive the corresponding foreign keys and additional tables when needed. Figure 5 shows the logical design, i.e., the relational schema, of the database.

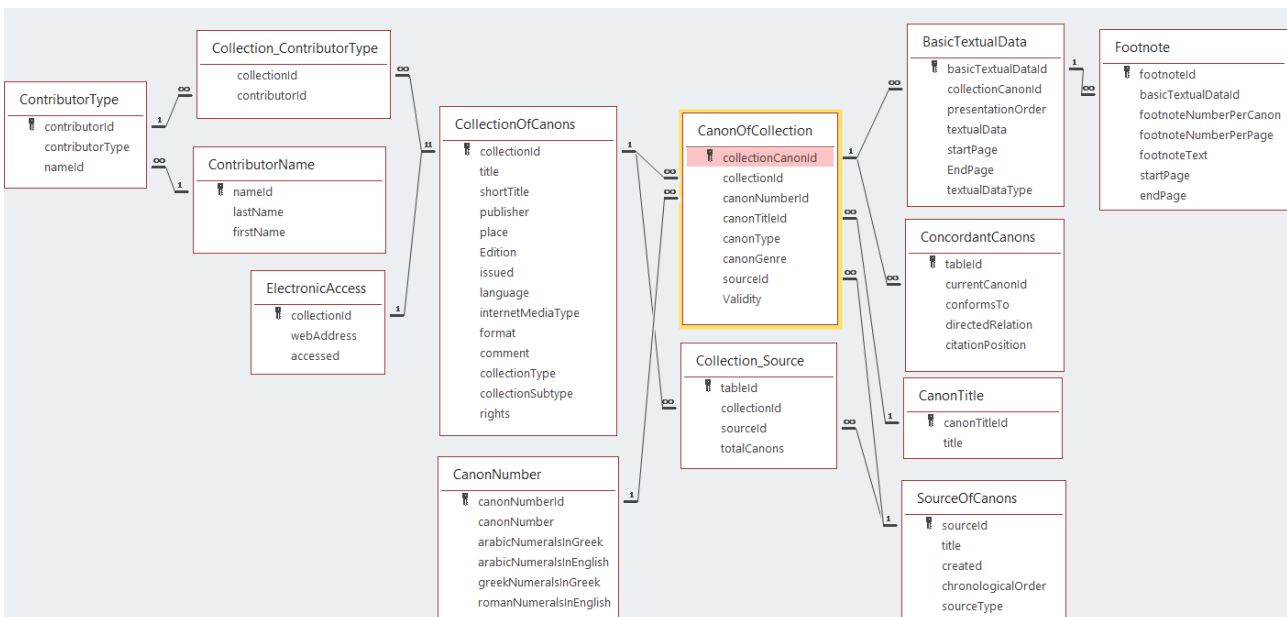


Fig. 5. Logical database design (© Authors).

## Conclusion

The Pedalion is a Christian cultural heritage text, which contains canonical orders (called Canons) which are the sources of Orthodox Canon Law. These Canons rule the whole life of the Orthodox Christian Church, and at the same time determine its religious identity. It is, therefore, an item of interest to both the scientific and the general audience. On the Web, one can find several digital items of the Pedalion in the form of images or texts. Nevertheless, the unstructured information of the texts cannot satisfy the various information needs of the readers, as a result of which tasks such as finding, identifying, grouping, and presenting resources based on specific criteria. The rich semantic data contained in this text can be used in decision-making in canonical research (or more generally in the government of the Orthodox Church) whether it is done by humans or machine-based agents. It is safe to say that the semantic enrichment of existing canonical data is a data exploitation effort, which is an important step in the adoption of Semantic Web technologies in the field of Canon Law and not only.

In this context, an attempt was made to transform the Pedalion into a bilingual textual database, which, on the one hand, will support the information needs of its users in various ways, and on the other hand, will allow a deeper understanding of the texts. The next steps of this project are the development of the proposed database through a database management system (DBMS), its pilot use and evaluation, as well as its free availability on the Web. The online content of this vertical application could be, in a second phase, the background in order for Semantic Web technologies (e.g. ontologies, semantic graph databases) (Cardoso, 2007) to help AI systems (e.g. knowledge system, deduction system) understand the content of the Canons and to perform case-based reasoning. In particular, an interesting and very relevant perspective is the use of knowledge graphs. A knowledge graph (Fensel et al., 2020; Hogan et al., 2021) is a knowledge representation and reasoning technology that combines features from three data management technologies, graphs, databases, and knowledge databases. Organizing the derived ontological entities into a knowledge graph can promote further interlinking and interpreting of the data while also supporting semantic queries. Ultimately, this project could be characterized as an innovative initiative in the field of Orthodox Canon Law and the Orthodox Church in general.

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## Conflict of Interests Disclosure

Authors have no conflict of interest to declare.

## Author Contributions

**Conceptualization, Data curation, Investigation, Software, Visualization, Writing – original draft:** Sarakatsianou Dimitra

**Funding acquisition, Project Administration, Supervision, Validation, Writing – review & editing:** Koloniari Georgia

**Methodology:** Sarakatsianou Dimitra, Koloniari Georgia

**Resources:** Koloniari Georgia, Sarakatsianou Dimitra

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