TECHNISCHE HOCHSCHULE LÜBECK

Bachelor thesis

Statistical distribution of content management systems in the public sector in Estonia

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Task description:

With an interest on the usage of open source products, the thesis analyses the distribution of content-management-systems of public institutions in Estonia. Based on former publications related to Germany (see https://cmscensus.eu/about) an additional european country will be processed. With a certain concern on non-detectable CMS, additional detecting tools and methods to whatcms.org are part of the research. The database consists of lists of URLs/domain names for the categories of public institutions to be examined.

TECHNISCHE HOCHSCHULE LÜBECK

Department of
Electrical Engineering and Computer Science
Dean's Office - Board of Examiners

Statement on the bachelor thesis

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Yunao Lyu
Signature

Statistical distribution of content management systems in the public sector in Estonia

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A thesis submitted in fulfillment of the requirement to the degree
Bachelor of Science (B.Sc.)

2023

Declaration of Authorship

I, Student Yunao LYU, declare that this thesis titled, “Statistical distribution of content management systems in the public sector in Estonia” and the work presented in it are my own. I confirm that:

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- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
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Date: 04.06.2023.

"Imagination is more important than knowledge.
Knowledge is limited. Imagination encircles the world."

Albert Einstein

TECHNICAL UNIVERSITY OF APPLIED SCIENCES LÜBECK

Abstract

Department of Electrical Engineering and Computer Science

Bachelor of Science (B.Sc.)

Statistical distribution of content management systems in the public sector in Estonia

by Student Yunao LYU

The focus of this paper is to investigate the adoption and distribution of open-source content management systems (CMS) in public institutions in Estonia. Drawing inspiration from a previous study conducted in Germany, which can be found at https://cmscensus.eu/about, the study expanded its scope to include another European country. The research also incorporates another vital aspect: addressing the challenge of identifying undetectable CMS, thereby introducing the reason why undetected CMSs appear. A comprehensive database containing lists of URLs and domain names related to the various public institutions surveyed was used for the analysis.

The task for this work is:

1. Understand the fundamental concepts and structure of CMS also the market distribution of various CMS platforms.
2. Find an efficient database to obtain a comprehensive list of public sectors in Estonia.

3. Identify the factors contributing to the occurrence of undetected CMS.
4. Analyze and conclude the data obtained from the analysis of CMS distribution in various public sectors within Estonia.

Acknowledgements

I want to express my heartfelt gratitude to everyone who has contributed directly or indirectly to the completion of this research and the writing of this paper.

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Furthermore, I extend my gratitude to my family, friends, and all those who have supported me emotionally and intellectually. Your unwavering belief in my abilities and your constant encouragement has motivated me during these three months.

This work is dedicated to all of you, and I offer my deepest gratitude.

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LIST OF ABBREVIATIONS

CMS	**C**ontent **M**anagement **S**ystem
SPARQL	**S**PARQL **P**rotocol **A**nd **R**DF **Q**uery **L**anguage
RDF	**R**esource **D**escription **F**ramework
URL	**U**niform **R**esource **L**ocator
HTML	**H**yper **T**ext **M**arkup **L**anguage
XML	E**X**tensible **M**arkup **L**nguage
CSV	**C**omma **S**eparated **V**alues
JSON	**J**ava **S**cript **O**bject **N**otation

Dedicated to my someone,
who you really appreciate to have in your life.

1 INTRODUCTION

1.1 Motivation

A content management system (CMS) refers to a type of software application that facilitates the creation, editing, and publication of content on web pages by individuals or organizations. CMS tools enable users to interact with a website by adding and modifying text, as well as incorporating various multimedia elements such as graphics, photos, videos, audio files, maps, and program code, within a collaborative authoring environment. By utilizing CMS technology, businesses can streamline their content management process and effectively manage their website or blog, leading to greater efficiency and productivity.

The presented chart from BuiltWith, n.d. has been obtained from builtwith.com, which has collected data from 61,127 content management system detections in Estonia. The most recent update of this data is from April 24, 2023. Based on this data, it is evident that WordPress is the most commonly used CMS in Estonia, accounting for 65.52% of the market share. This raises questions about why WordPress is the preferred choice for most websites in Estonia. Additionally, it would be valuable to explore the statistical distribution of CMS usage in the various public sectors of Estonia.

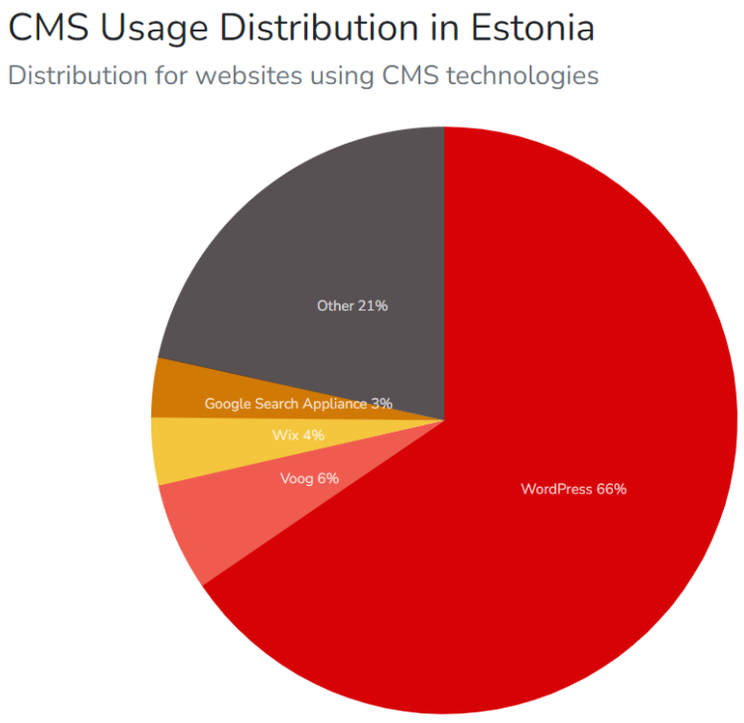

FIGURE 1.1: Usage of CMS in Estonia from BuiltWith, n.d.

1.2 Goal

This thesis presents a statistical analysis of the distribution of content management systems utilized in Estonia's public sector, encompassing education, government, and other public sectors. The methods employed to obtain this data and the associated techniques will be outlined in this paper. The data for each department will be presented in the form of pie charts or tables within the thesis, and the results will be permanently published on the CMScensus.eu website. The primary objective is to assist decision-makers in gaining a greater understanding of technology solutions specifically tailored to certain markets, such as municipal websites. Furthermore, it aims to support CMS product owners in their concrete development efforts. The intention is also to foster specialized communities, such as the TYPO3 Academic User Group, that address the development and financing of industry-specific software components in a sustainable and cost-sharing manner.

1.3 Organization

The following sections of this document are organized as follows. Chapter 2 will provide an overview of CMS, including its definition, composition, and structure. It will also introduce some well-known CMSs, such as Typo3 and WordPress, and present the distribution of CMS in Germany. In Chapter 3, the data acquisition process will be explained, including the use of CMS detection tools and obtaining a list of official websites for public sectors. Chapter 4 will delve into the specific data regarding various public sectors. Chapter 5 will summarize the work conducted and suggest future avenues of research. The Appendix will contain a list of SPARQL codes.

2

CMS AND CMS IN GERMANY

– This chapter explains CMS and CMS distribution in Germany.

2.1 CMS

The use of CMS is beneficial for organizations or companies to efficiently manage their official websites. However, it is important to understand what is CMS and what is their working principle. Additionally, statistical data about the distribution of CMS in the public sector of Estonia can provide valuable insights including different CMSs' market sharing, which can give a more direct view to the decision-maker. This chapter will provide an introduction to CMS, including its structure and the concept of content management (CM). Furthermore, an example research study on the distribution of CMS in German universities will be presented to illustrate the type of information that can be gleaned from such data.

In this chapter, the concept of CMS will be introduced, including content management and the structure of a CMS.

2.1.1 CM

Content management (CM) refers to the process of creating, organizing, managing, and publishing digital content such as text, images, videos, and audio files. This is done through the use of a specialized software tool that is known as CMS. The goal of CM is to ensure that content is created and presented in a consistent, organized, and effective manner that meets the needs of both the content creators and the intended audience. Effective CM allows for efficient content creation, reduces the likelihood of errors, and facilitates easy updating and repurposing of content. It is an essential aspect of website and online platform management.

2.1.2 Structure

The structure of a CMS is typically divided into two parts: the front-end and the back-end.

The front-end of a CMS refers to the part of the system that is visible to the end-users, including website visitors and content creators. This is typically a graphical user interface (GUI) that allows users to create and manage website content without having any programming knowledge.

The back-end of a CMS refers to the part of the system that is not visible to end-users. This includes the database and the server-side code that powers the CMS. The back-end allows developers to customize and extend the functionality of the CMS, such as by creating new content types, adding custom fields, and integrating with other systems.

This is a diagram of TYPO3 Documentation Team, 2023 that illustrates the various layers of the TYPO3 system. It can be inferred from this diagram that the TYPO3 system has multiple layers, with the backend and frontend user interfaces positioned on top of the application layer, which in turn depends on the infrastructure layer consisting of the web server, database, and PHP. To run TYPO3, all components of the infrastructure layer are prerequisites. The TYPO3 Core is primarily composed of the API (Application Programming Interface) that defines

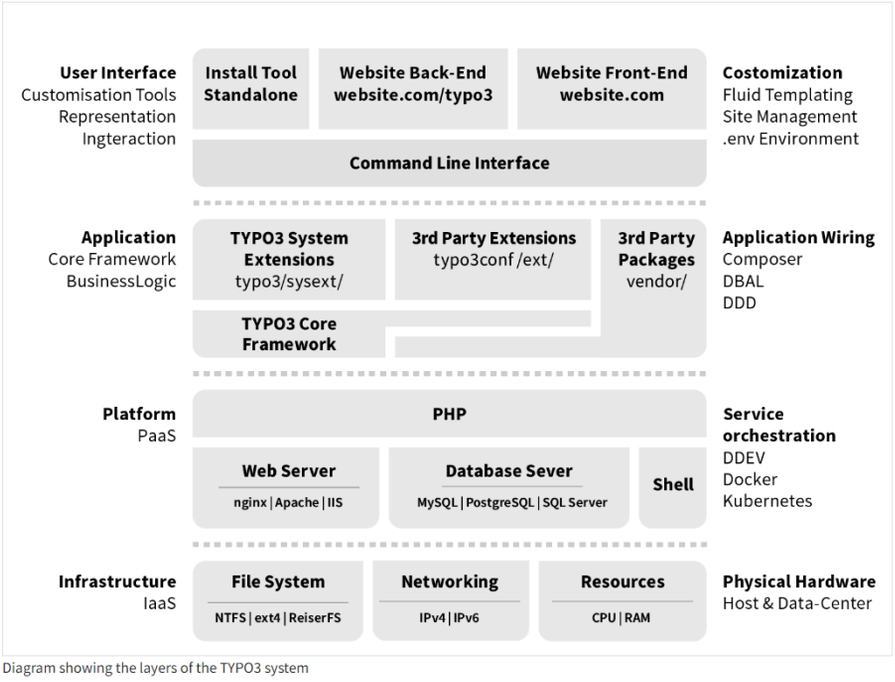

FIGURE 2.1: Structure of TYPO3 layer system

a framework for managing the project content. The API includes fundamental features like content storage, user permissions and access, content editing, and file management, all of which are delivered through system extensions that use the API. All content is stored in a database that TYPO3 accesses via the API. Extensions are clearly defined code additions, such as plugins, backend modules, application logic, skins, and third-party apps. Notably, everything in TYPO3 CMS is an extension, even the most basic functions, which are packaged as a system extension called "core".

2.2 CMS in Germany

Conducting a statistical survey on the CMS utilized in the public sector of a country can provide insights into the predominant CMS in a particular industry. This chapter aims to present the statistical distribution of CMS in Germany, including an overview of the general status and a specific sector, namely universities.

2.2.1 General status and specific CMS

2.2.1.1 General status

	1	2	3	4	5
Schulen	WordPress	Joomla!	TYPO3 CMS	Jimdo	Drupal
Hochschulen	TYPO3 CMS	WordPress	Drupal	Contao	Joomla!
Einrichtungen Bund	TYPO3 CMS	Government Site Builder	CoreMedia CMS	Adobe Experience Manager	WordPress
Städte	TYPO3 CMS	WordPress	iKISS	Joomla!	Contao
Krankenkassen	TYPO3 CMS	WordPress	Contao	Adobe Experience Manager	Drupal
Sportvereine	WordPress	Joomla!	TYPO3 CMS	Jimdo	1&1 IONOS Website Builder
Krankenhäuser	TYPO3 CMS	WordPress	Contao	Joomla!	Weblication
Rehabilitation	TYPO3 CMS	WordPress	Government Site Builder	Joomla!	Contao
Forschung	TYPO3 CMS	WordPress	Drupal	Adobe Experience Manager	Joomla!

FIGURE 2.2: CMS usage by public sectors in Germany according to Kölbel, 2022

According to the table provided by literature Kölbel, 2022, TYPO3 is the most commonly used CMS in various sectors in Germany, including universities, cities, hospitals, federal government agencies, and research departments. Following TYPO3, other CMSs such as WordPress, Joomla!, and Drupal are also popular in Germany. This chapter will introduce these CMS and their distribution briefly.

2.2.1.2 Some specific CMSs

TYPO3: According to Wikipedia contributors, 2023c. TYPO3 is a free web content management system that is open-source and written in PHP. It is licensed under the GNU General Public License and can operate on various web servers such as Nginx, Apache, or IIS, and on many operating systems including Linux, Windows, FreeBSD, macOS, and OS/2. The system is considered highly flexible as code and content are independent of one another, allowing it to be expanded with new features without programming. TYPO3 is designed to support the publication of content in multiple languages with its built-in localization system.

The system is also classified as an enterprise-grade content management system, providing advanced features such as workflow, editorial workplace, advanced front-end editing, scalability, and maturity. TYPO3 is similar to other popular content management systems, such as Drupal, WordPress, and Joomla!, and is most widely used in Europe, with German-speaking countries having a larger market share.

In Germany, TYPO3 has a strong presence and is widely used in the country's web development industry. This popularity can be attributed to the platform's advanced features and the support of a large community of developers who regularly contribute to its development. Additionally, TYPO3 is often preferred by larger companies and organizations due to its enterprise-level capabilities, such as multilingual support, advanced permissions and user management, and a wide range of customization options.

As of 2021, according to the latest statistics from *Content Management System Usage Statistics* n.d. TYPO3 has a global market share of approximately 0.2% among all websites and 1.7% among websites that use a content management system. While TYPO3's market share is relatively small compared to other popular CMS platforms like WordPress, Joomla!, and Drupal, it is widely used in certain regions and industries, particularly in Europe and German-speaking countries.

WordPress: WordPress is a free and open-source CMS that is written in PHP and uses a MySQL database according to Wikipedia contributors, 2023d. It is known for its user-friendly interface and a vast library of plugins and themes, which allows users to create and customize their websites easily. WordPress is widely used for blogs, small business websites, and e-commerce sites. According to the latest statistics from *Content Management System Usage Statistics* n.d., as of April 2023, WordPress has a 41.3% market share of all websites on the internet, which is more than any other CMS. This means that almost half of all websites on the internet are powered by WordPress. In addition, WordPress has a dominant position in the CMS market, with a market share of over 64% among all CMS users. It is followed by Joomla!, which has a market share of 4.1%, and Drupal, which has a market share of 2.6%.

Joomla!: According to Wikipedia contributors, 2023b. Joomla! is another free

and open-source CMS that is also written in PHP and uses a MySQL database. It is designed for creating more complex websites and applications, such as online forums, e-commerce websites, and social networks. Joomla! offers more advanced features and flexibility than WordPress, but it also has a steeper learning curve. According to the latest data from *Content Management System Usage Statistics* n.d., Joomla! has a market share of around 2.5% among all websites on the internet, which is the third most popular CMS after WordPress and Shopify. Joomla! has a strong presence in some countries such as Italy and the Netherlands, where it has a market share of over 5%. It is also used by various organizations and institutions, including the United Nations, Harvard University, and the Linux Foundation. Additionally, Joomla! has a large community of developers and users who contribute to the development of the platform and offer support to others.

Drupal: Based on Wikipedia contributors, 2023a. Drupal is a free and open-source CMS that is written in PHP and uses a MySQL database. It is known for its powerful and flexible features, which make it suitable for building large and complex websites, such as government and educational institutions, as well as enterprise-level applications. Drupal offers a high level of security and scalability, but it also requires more technical expertise to use compared to WordPress and Joomla! According to *Content Management System Usage Statistics* n.d., which provides website technology market share statistics, Drupal is the third most popular CMS after WordPress and Joomla! As of September 2021, Drupal holds a 4.4% market share among all content management systems. Drupal's popularity is mainly driven by its powerful features, security, and extensibility, which make it an ideal choice for large and complex websites.

2.2.1.3 Open-source CMS

An additional crucial aspect concerning the attainment of the statistical distribution of content management systems (CMSs) in a particular region pertains to the utilization of open-source CMSs.The advent of open-source CMSs has brought about a transformative impact on the field of web development. These

CMSs have revolutionized the process by providing businesses, particularly startups, with a simplified means to construct websites without the need for expensive custom web design services. One key factor contributing to their extensive adoption is their open-source nature. By granting developers access to both the front-end and back-end framework of the CMS, as well as its underlying code, a collaborative community of supporters has emerged, actively contributing to its growth and advancement.
So why wordpress is so popular is worldwide? Here is evident in the vast libraries of free themes and plugins that we find with the top 3 content management systems by market share:

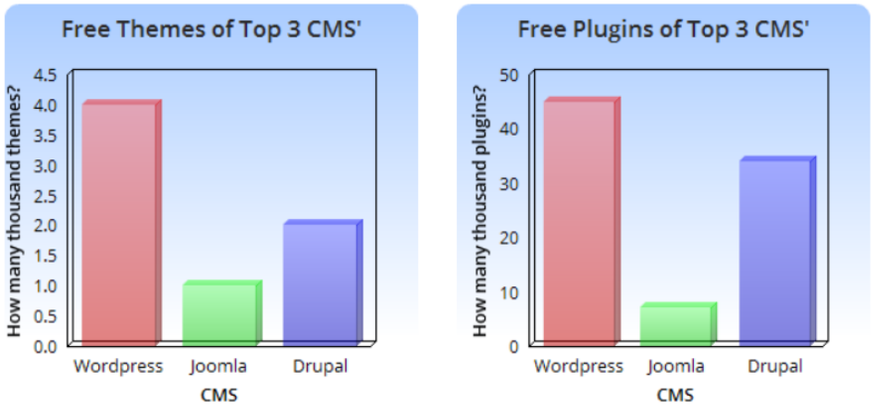

FIGURE 2.3: Number of Themes and Plugins of WordPress, Joomla and Drupal from OpenSourceCMS, n.d.

Themes and plugins serve essential functions in website management, providing a wide range of capabilities and features. Themes offer the ability to effortlessly modify the visual aspects of a website. By implementing a theme, website administrators utilizing a content management system (CMS) can instantly personalize the appearance, layout, and structure of their site without the need to directly manipulate HTML5 or CSS code. Themes typically come with their own set of options, enabling users to easily modify elements such as logos, primary and secondary colors, fonts, and more. Additionally, plugins play a significant role in augmenting website functionality by introducing new features that were previously unavailable. These plugins serve as valuable extensions to the core functionality of the CMS, providing enhanced content management capabilities and interfaces for both administrators and users. They serve as supplementary

components that contribute to the overall enrichment and expanded capabilities of the CMS platform.
It is remarkable that WordPress, as a platform, offers an impressive array of resources with over 40,000 free themes and 45,000 free plugins. These extensive collections are not developed solely by the WordPress team, but rather by a dedicated community of contributors, exemplifying the strength and effectiveness of open-source software development. This particular characteristic contributes significantly to the success and wide adoption of WordPress in the market.

#	**CMS**	**Market Share**
1	WordPress	59.7%
2	Joomla	6.7%
3	Drupal	4.7%
4	Magento	2.3%
5	Blogger	1.9%
6	Shopify	1.7%
7	Bitrix	1.5%
8	TYPO3	1.5%
9	Squarespace	1.4%
10	PrestaShop	1.3%
11	DreamWeaver	1%
12	OpenCart	0.8%
13	Wix	0.8%

TABLE 2.1: Market Share of Popular CMS from OpenSourceCMS, n.d.

2.2.2 Universities in Germany

After examining the overall distribution of content management systems (CMS) in Germany, this chapter will focus on one particular public sector: universities. The following pie chart provides a clear representation of the distribution of CMS used in German universities.

Based on the pie chart, it is evident that TYPO3 is the dominant CMS utilized by German universities, constituting around 54.22% (225 out of 415). Undetected CMS accounts for approximately 12.77%, while WordPress and Drupal

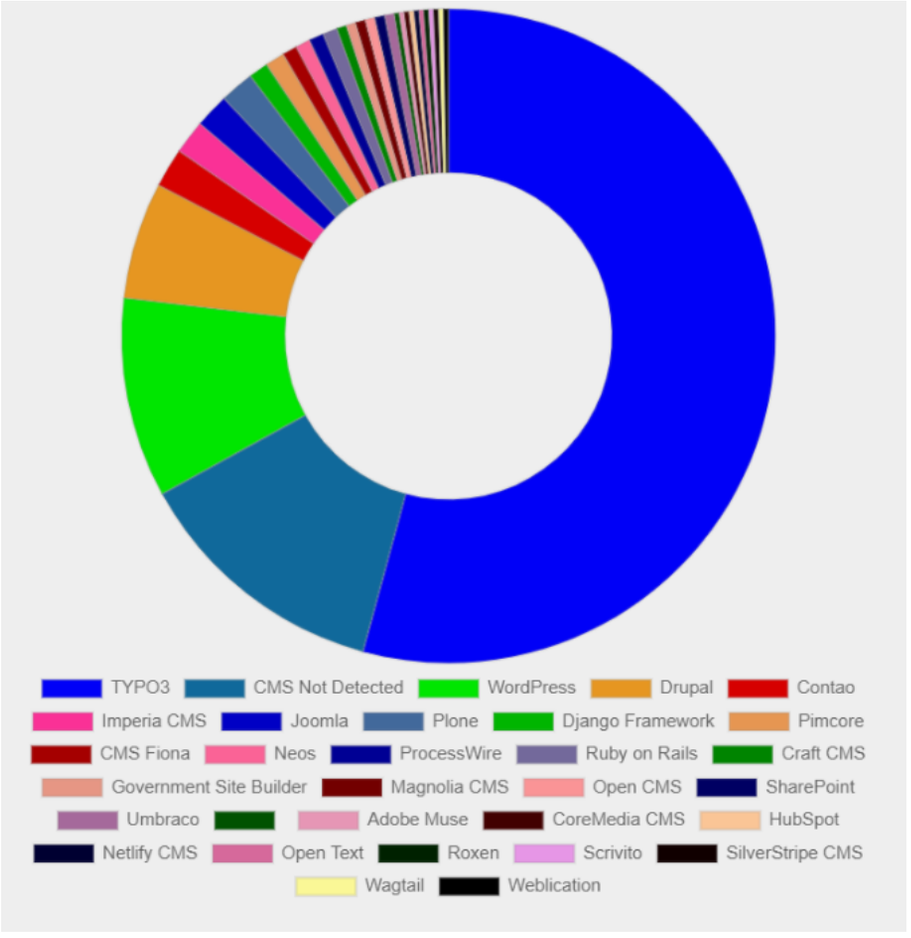

FIGURE 2.4: CMS distribution of universities in Germany from CMS Census, n.d.

account for 9.88% and 5.78%, respectively. The remaining universities use various other CMS, including Contao and Imperia CMS, which account for a very small proportion.

use packagecharter

3 DATA COLLECTING

The initial step involves obtaining a list of public sector websites in Estonia. Subsequently, detection tools are utilized to determine the CMS platforms utilized by these websites. This chapter focuses on the data collection aspect and outlines the methods utilized for obtaining the list of websites and the detection tools used for identifying the respective CMS platforms.

3.1 Tools and method

In the case of larger countries like Germany, obtaining a comprehensive list of institutions such as universities may be relatively straightforward. However, this is not always the case for smaller countries like Estonia, which is the subject of this research. Official statistics departments may not always provide complete lists of institutions or public sectors. Therefore, for this research, only the education system in Estonia was able to provide a complete list of schools in Estonia. Manually searching for individual units of specific sectors in Estonia would be almost impossible. Hence, there is a need for a more efficient method to obtain a list of public sectors. This chapter introduces the Wikidata service and SPARQL, which enables querying of the Wikidata database and retrieval of relevant data.

3.1.1 Detecting tools

In order to identify the technologies utilized in website creation and to analyze the technical implementation of a page, online tools can be employed, in addition to manual code inspection. There are a number of CMS detectors available, many of which are free, that evaluate the URL and analyze the technology used. This study made use of "whatcms.org" as the provider for evaluations, meaning that the majority of detection results were obtained from this source.

3.1.2 SPARQL

SPARQL (SPARQL Protocol and RDF Query Language) is a query language used to retrieve data from RDF (Resource Description Framework) databases. RDF is a data model for representing data on the web and is widely used in the semantic web. SPARQL is used to query data in RDF databases, such as the data found in RDF triples. SPARQL queries are similar to SQL queries in that they are used to retrieve data from a database. However, while SQL is designed for relational databases, SPARQL is designed for RDF databases. SPARQL allows users to query the RDF data using a variety of criteria, such as the subject, predicate, and object of a triple and can return results in various formats such as JSON, XML or CSV.

3.1.3 Wikidata Query Service

Wikidata is a free and open knowledge graph that can be queried using the SPARQL query language. It provides structured data about a wide range of topics, from people and places to events and concepts.

To query Wikidata using SPARQL, you can use the Wikidata Query Service, which is a web-based interface for executing SPARQL queries against the Wikidata endpoint. Here is an example SPARQL query that retrieves the List of Universities in Germany:

```
1 SELECT ?itemLabel ?item ?website
2 WHERE {
```

```
3    {
4      ?item wdt:P31 wd:Q3918;
5        wdt:P17 wd:Q183.
6    }
7    UNION
8    {
9      ?item wdt:P31 wd:Q189004;
10       wdt:P17 wd:Q183.
11   }
12   UNION
13   {
14     ?item wdt:P31 wd:Q1365560;
15       wdt:P17 wd:Q183.
16   }
17   OPTIONAL { ?item wdt:P856 ?website. }
18   SERVICE wikibase:label { bd:serviceParam wikibase:language "
        en,de,fr,es,no,pt,et,nb,sv". }
19 }
```

LISTING 3.1: Example SPARQL query

In this query, the SELECT clause specifies the variables we want to retrieve (?itemLabel ?item ?website). The WHERE clause specifies the conditions that must be met in order for a result to be included in the output. In this case, we are looking for items that have an "instance of" (P31) property with a value of "University" (Q3981), a "country" (P17) property with a value of "Germany" (Q183), and code below UNION the result of “College” (Q189004) and “University of applied science” (Q1365560). Then OPTIONAL means getting the URL of the “official website” (wdt: P856) if it is available. The SERVICE clause specifies that we want the labels for the variables in English and if there is no English name for the labels it will provide a German label then French and so on. The wikidata query service refers to the graph below and the results of this query can be displayed in various formats, such as a table, JSON, or CSV. You can also customize the output by modifying the query or using visualization tools to create charts and graphs based on the results.

3.1.4 Comparison between several methods

This chapter aims to present and compare various methods for obtaining lists of different public sectors. Three methods are explored: the first involves using wikidata and SPARQL to retrieve the list, the second involves obtaining the official list from the respective official websites or from Statistics Estonia, and the third involves using ChatGPT. Three different pie charts of CMS of schools and hospitals in Estonia will be provided to display the results obtained from two of each method, which will then be compared in the comparison chapter.

3.1.4.1 wikidata and official list

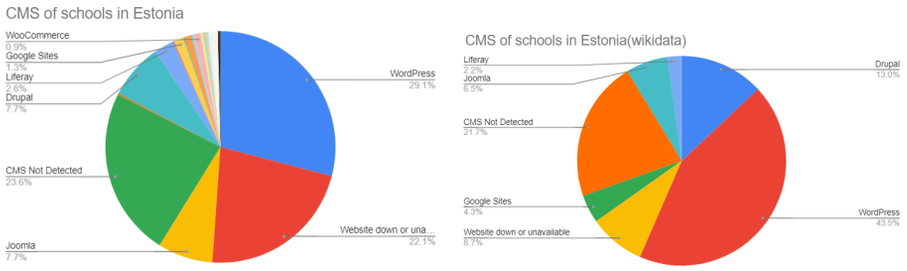

FIGURE 3.1: pie chart of wikidata and official detecting result

To begin with, utilizing wikidata and SPARQL to obtain the list can be inconvenient for users who are not proficient in using the SPARQL language. However, the benefit of this method is that the results obtained from the wikidata list have been observed to be similar to the results from Estonian Education System when compared. WordPress is the most widely used CMS for school websites, with some schools opting for CMSs such as Drupal and Joomla. Nevertheless, there is a significant difference in the percentage of websites that are inaccessible or unavailable between the two datasets, with Estonian Education System having a considerably higher percentage of 22.1%. This suggests that the approach used in this research, which involves the use of wikidata, provides an advantage in terms of timeliness and efficiency.

3.1.4.2 wikidata and chatgpt list

3.1.4.3 wikidata and official list

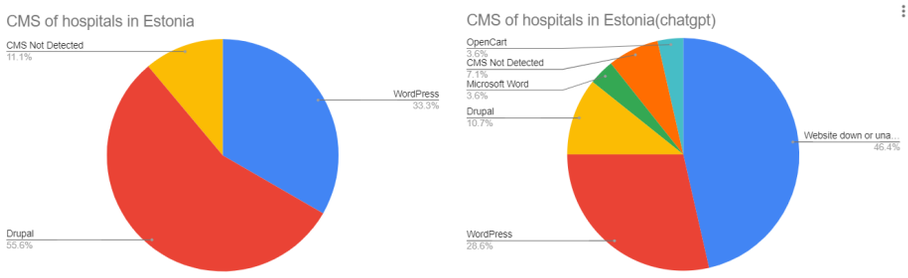

FIGURE 3.2: pie chart of wikidata and official detecting result

Upon examining the results obtained from both wikidata and chatgpt regarding the distribution of CMS used by hospitals in Estonia, it becomes evident that a large proportion of the websites provided by chatgpt are inaccessible or offline, accounting for 46.4%. Upon closer examination, it was discovered that some of these websites were fabricated, implying that chatgpt may occasionally supply users with incorrect or misleading URLs. For instance, https://www.tph.ee/ was offered by chatgpt as the website for Tallinna Pelgulinna Haigla, even though it is not the hospital's official website. Chatgpt only detected the capitalized words "Tallinna Pelgulinna Haigla" and provided this website as a result. As a result, it can be concluded that chatgpt is not an effective tool for obtaining a list of official websites, as its accuracy is lacking.

3.2 Undetected CMS

In this chapter, the thesis will present undetected CMS and provide an explanation for the reasons why they appear. The undetected CMS is not the primary focus of this thesis, this chapter will briefly introduce this topic.

3.2.1 Detecting principle

So for the first step: detecting tools. The detecting tools used in this thesis is The initial stage of this thesis is the detection of tools. To accomplish this, the thesis will utilize whatcms.org, an exceedingly robust website that offers a service for identifying the CMS employed by a given website. With this tool, users can input the website's URL, and the site's code will be analyzed to determine the CMS being used. Typically whatcms.org employs a multitude of methods to ascertain the technologies used by a website. Upon fetching a webpage, the website searches for residual artifacts left behind by the underlying systems. Specifically, in HTML, it scrutinizes <meta name="generator"> tags and common image paths, and inspects for custom headers and session names.

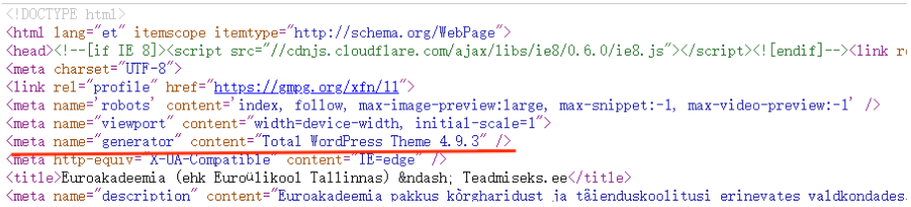

FIGURE 3.3: source code of website

3.2.2 Undetected reason

3.2.2.1 Detecting list

In simpler terms, whatcms.org is capable of examining the source code of a website and identifying the particular type of CMS being used. The website has a detection list that includes 1,326 technologies and 1,089 CMSs that can be called the detecting list of whatcms.org. However, some CMSs used by certain websites are not included in the detection list, resulting in undetected CMSs. For instance, www.emu.ee is the official website of the Estonian university Eesti Maaülikool and it is detected as undetected CMS. After checking the source code of the website. It reveals that it employs a CMS known as Greativ 2023.2.1 (build 3097), which is not among the CMSs included in whatcms.org's detection list.

```
<meta property="og:locale" content='et_EE' />
<link rel="canonical" href="https://www.emu.ee/" />
<meta name="keywords" content="ülikool,maaülikool,maaylikool,kõrgkool,kõrgharidus" />
<meta name="description" content="Eesti Maaülikool" />
<meta property="og:title" content='Eesti Maaülikool' >
<meta property="og:type" content='website' >
<meta property="og:image" content='https://www.emu.ee/ui/images/logo/default.png' >
<meta property="fb:admins" content='229647717715806' >
<meta property="og:description" content='Eesti Maaülikool' >
<meta property="og:url" content='https://www.emu.ee/' >
<meta name="generator" content="Greativ 2023.2.1 (build 3097)" />
```

FIGURE 3.4: source code of a website using Greativ

3.2.2.2 Different source code format

There are also cases where whatcms.org cannot detect a CMS even if it is included in its detecting list. This could happen because the website is using an old version of the CMS, which may not have the same artifacts as the current version. For example, the official website of the German city of Greven, www.greven.net, was detected as an undetected CMS by whatcms.org. However, upon checking the source code, it was found that the website uses a CMS called IES, which is included in whatcms.org's detecting list. The reason for the undetected result is that www.greven.net is using an old version of IES that may not have the same artifacts as the current version, making it harder to detect.

```
<!DOCTYPE html>
<!--[if IE]><![endif]-->
<!--[if lte IE 9 ]><html lang="de" itemscope="itemscope" class="no-js no-mediaqueries"><![endif]-->
<!--[if (gt IE 9)|!(IE)]><!--><html lang="de" itemscope="itemscope" class="no-js"><!--<![endif]-->
<head>

  <!--title>Startseite | Startseite | Stadt Greven</title-->
  <title>Stadt Greven - Startseite</title>
  <meta http-equiv="content-type" content="text/html; charset=UTF-8" />
  <meta name="generator" content="Sitepark Information Enterprise Server - IES Generator v1.49.1" />
  <meta name="viewport" content="width=device-width, initial-scale=1, minimum-scale=1, user-scalable=yes" />
  <meta name="geo.region" content="DE-NW" />
  <meta name="geo.placename" content="Stadt Greven" />
  <meta name="google-site-verification" content="dqgsNHfE8gk4sgEYp4pgA6zmpHa6oyXMG61X1PsBEro" />
```

FIGURE 3.5: source code of website using IES

3.2.2.3 Not using CMS

Another common reason why whatcms.org may not be able to detect a CMS on a website is that the website is not using any CMS at all. Additionally, some CMSs may not leave behind identifiable artifacts in the source code that whatcms.org can detect, such as the <meta name="generator" content="Total WordPress

Theme 4.9.3" /> tag. In these cases, the detection result will also be listed as undetected CMS.

4 DATA ANALYSIS

This section of the paper will provide a partial presentation of the research data, which is categorized into several main parts of public sectors and all the official data is from Statistics Estonia, n.d. The data will be presented in the form of tables, pie charts, and histograms. SPARQL code will be provided in the appendix as well. The remaining data will be made available on the website for further analysis.

4.1 Education

4.1.1 University

University	Number	Proportion
Official number	54	
Wikidata list	46	79.31%
Having official website	27	58.70%
No official website	20	43.48%

TABLE 4.1: table of university

After reviewing the data presented in the table, it can be inferred that a substantial proportion of universities in Estonia, approximately 44.7%, lack an official

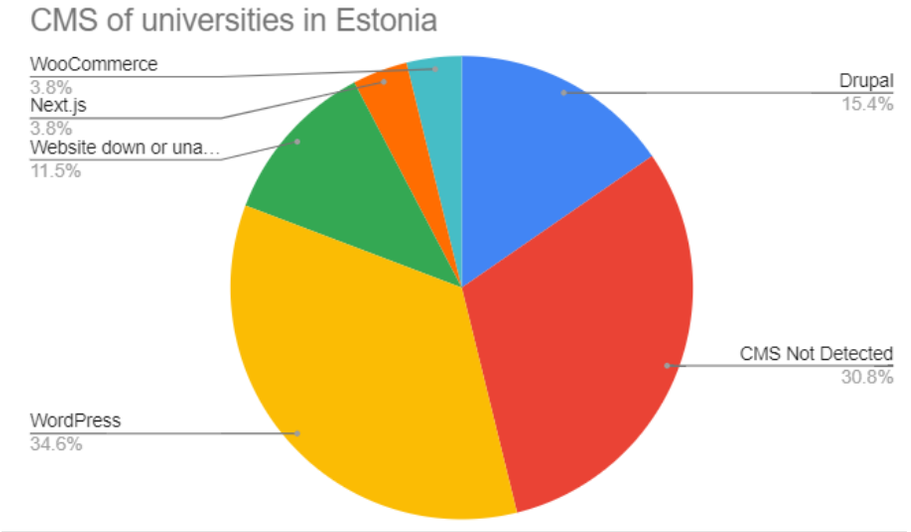

FIGURE 4.1: pie chart of university CMSs

website. The pie chart analysis revealed that WordPress and undetected CMS platforms are the most commonly used CMS, representing 34.6% and 30.8% of the total, respectively. Drupal was detected as the CMS platform for website management in 15.4% of universities in Estonia. However, it is worth noting that a significant portion of the websites (11.5%) were not accessible for analysis, and a considerable number of CMS platforms (30.8%) were not detected.

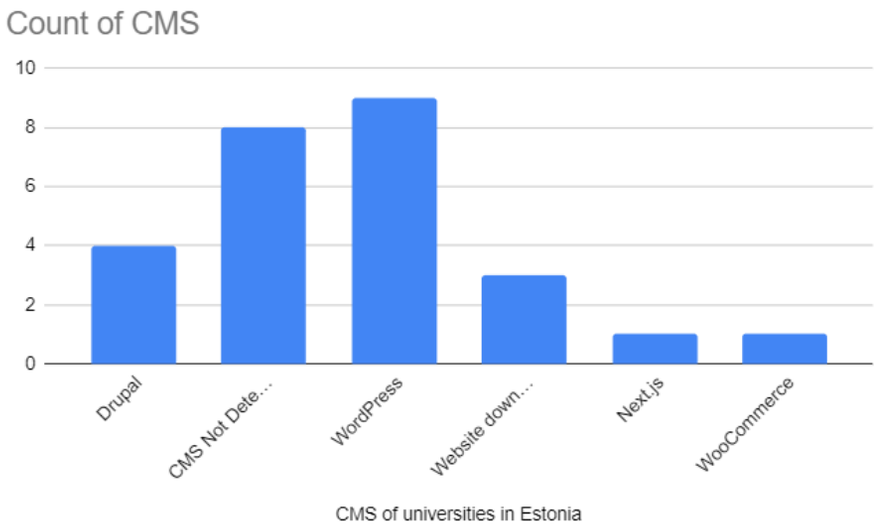

FIGURE 4.2: Count of CMSs

It is easy to see that WordPress is the most common CMS for Estonian universities. The results also indicate that Drupal is used as the CMS platform for website management in 15.4% of universities in Estonia. However, it is noteworthy that a significant proportion of websites (11.5%) were not available and not detected CMS(30.8%).

4.1.2 School

School	Number	Proportion
Official number	558	
Having official website	531	95.16%
No official website	27	4.83%

TABLE 4.2: table of school

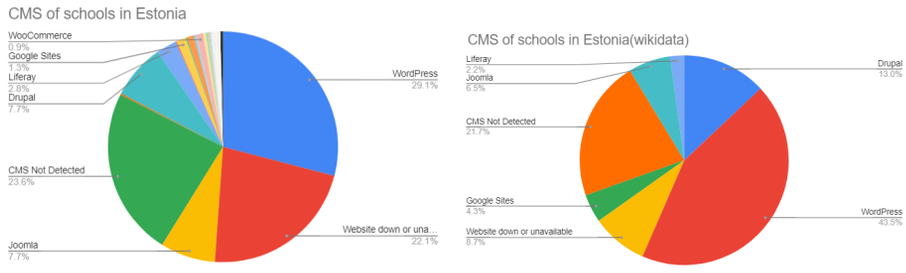

FIGURE 4.3: pie chart of school CMSs left-official list right-wikidata list

Based on the tabulated data, it is evident that a considerable majority of educational institutions in Estonia, approximately 29.1%, employ WordPress as their chosen content management system (CMS) for their official website. A significant proportion of websites, around 22.1%, were not accessible, and roughly 23.6% did not employ any CMS. A minority of schools, specifically 7.7%, utilized Drupal as their official website CMS. Furthermore, 2.8% of websites utilized Liferay, while Google Sites were used by 1.3% of schools as their CMS. Other CMS platforms like Impresspages CMS, Weebly, Wix, etc., accounted for roughly 9.8% each.

According to the data. It's clear that there is high usage of WordPress indicates its popularity among schools, possibly due to its user-friendly interface and extensive plugin options. However, the large proportion of inaccessible websites

highlights the need for better website maintenance and accessibility practices among educational institutions. The low usage of CMS platforms like Drupal, Liferay, and Google Sites suggests that they are not as popular among schools as WordPress. The data on other CMS platforms like Impresspages CMS, Weebly, and Wix indicates their limited usage among educational institutions.

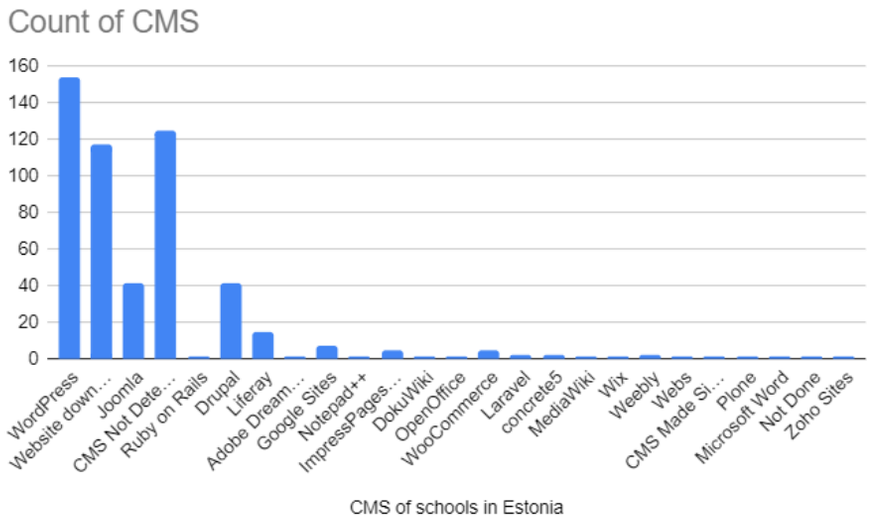

FIGURE 4.4: Count of CMSs

4.2 Government

Government	Number	Proportion
Official number	196	
Wikidata list	178	90.81%
Having official website	39	21.91%
No official website	139	78.08%

TABLE 4.3: table of government

Based on the data provided by the Statistical Office of Estonia, there are a total of 196 government sectors in Estonia. However, from the Wikidata database, only 178 records are available, out of which only 39 have an official website, accounting for 21.91% of the total. The pie chart analysis indicates that Drupal is the most popular CMS used by Estonia government sectors, accounting for 56.4% of the 39 recorded official websites. Undetected CMS occupies 23.1% of

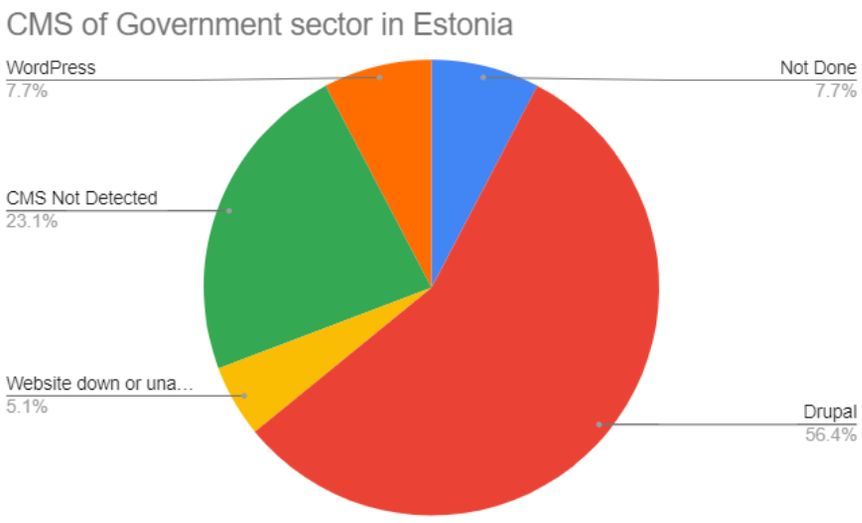

FIGURE 4.5: pie chart of government CMSs

the websites, and 7.7% of the websites were either not completed or not available during the analysis. Additionally, 5.1% of the websites were found to be unavailable or down. The remaining 7.7% of the government sectors use WordPress as their official website CMS.

There is no doubt that government sectors predominantly opt for Drupal as their primary CMS solution. When compared to WordPress, Drupal offers heightened security measures and places a strong emphasis on data protection, which holds utmost significance for government entities that handle sensitive information. The comprehensive security architecture and extensive access controls inherent in Drupal render it the preferred choice for ensuring the confidentiality and integrity of government data. Moreover, Drupal has established itself as a reputable CMS within the government sector, boasting a substantial user base and enjoying extensive community support. This advantageous position allows government agencies to leverage a plethora of resources, documentation, and specialized expertise tailored explicitly to their unique requirements. Additionally, government websites often necessitate advanced customization options and the capability to manage large volumes of information, both of which Drupal adeptly provides through its comprehensive suite of tools and functionalities.

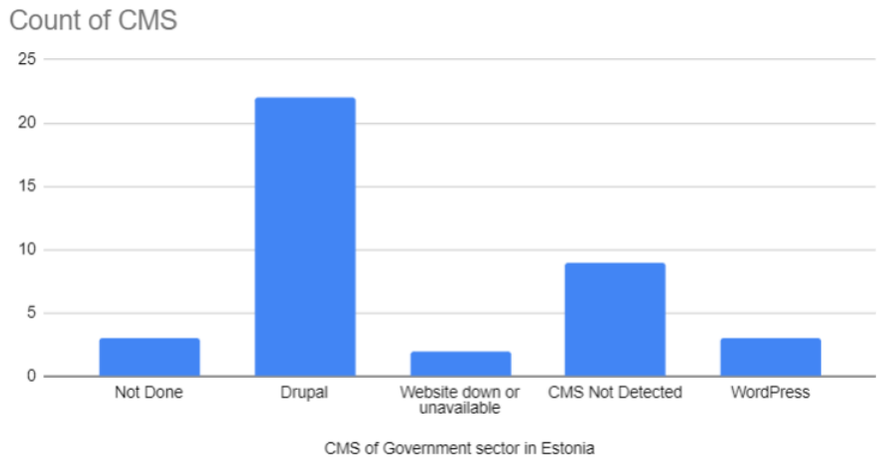

FIGURE 4.6: Count of CMSs

4.3 Health

4.3.1 Hospital

Hospital	Number	Proportion
Official number	35	
Wikidata list	30	85.71%
Having official website	9	30.00%
No official website	21	70.00%

TABLE 4.4: table of hospital

The data clearly indicates that the majority of hospitals, representing 70% of the data in the wikidata list, do not have an official website. Among the remaining 30% of hospitals, it was observed that 33.3% of them use WordPress as their content management system, while 55.6% use Drupal as their CMS. Furthermore, 11.1% of hospitals could not be detected to have a CMS in use.
Similarly, in the context of hospitals, Drupal outshines WordPress in terms of popularity. The underlying reason for this preference aligns with the government sector's choice—Drupal's superior security features. This heightened level of security offered by Drupal aligns well with the specific requirements of hospitals, where safeguarding sensitive patient data and maintaining the privacy of medical records is of paramount importance. By prioritizing robust security measures, Drupal emerges as a suitable CMS solution that meets the stringent

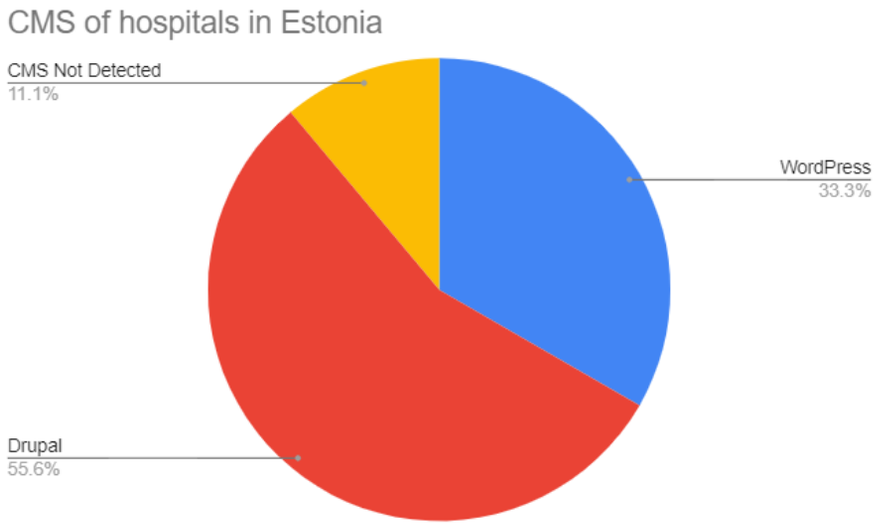

FIGURE 4.7: pie chart of hospital CMSs

security needs of hospitals, ensuring the protection and confidentiality of critical healthcare information. Consequently, hospitals opt for Drupal as their CMS of choice to align with their security-focused requirements, fostering a secure digital environment for managing patient data and facilitating efficient healthcare delivery.

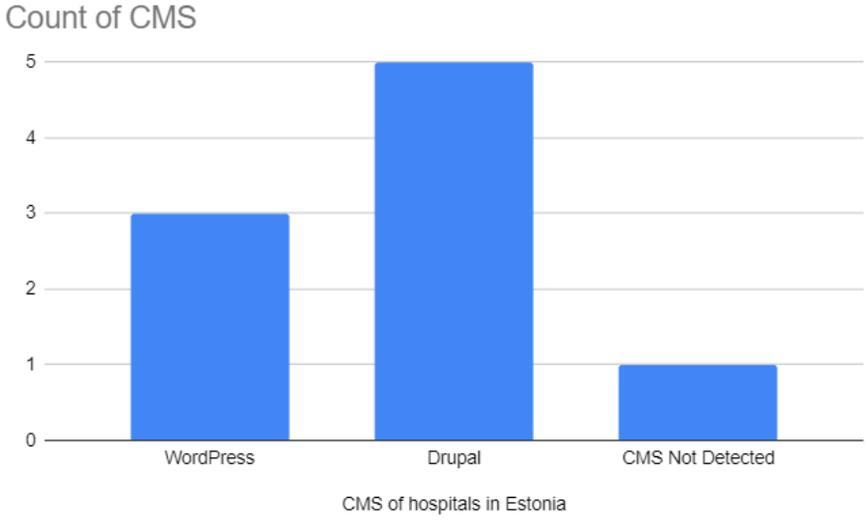

FIGURE 4.8: Count of CMSs

4.4 Sport

4.4.1 Football club

Football club	Number	Proportion
Official number	267	
Wikidata list	202	75.66%
Having official website	50	24.75%
No official website	152	75.24%

TABLE 4.5: table of Football club

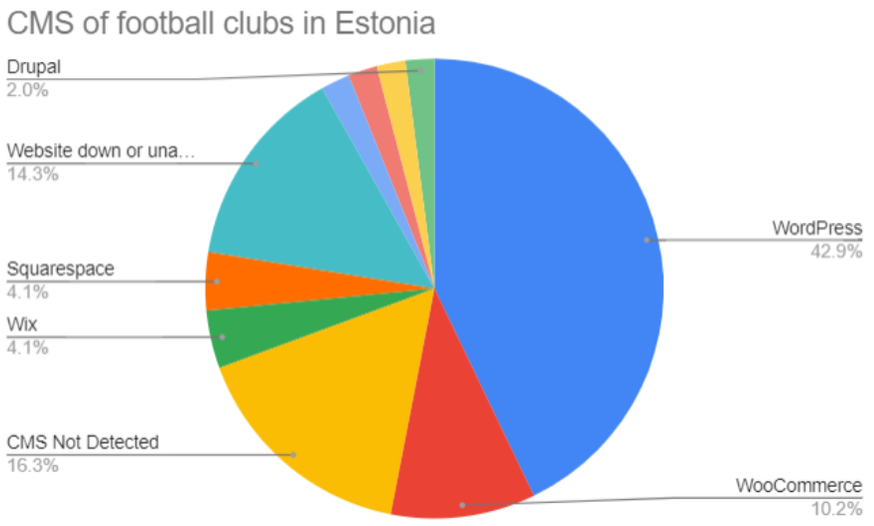

FIGURE 4.9: pie chart of football club CMSs

According to the data collected, it can be observed that wikidata covers 75.66% of football clubs in Estonia, out of which only 24.75% have official websites. In contrast, 75.24% either do not have an official website or wikidata does not have information about it. Based on the pie chart, it can be seen that WordPress is the most widely used CMS for football clubs in Estonia, accounting for 42.9% of the websites, followed by WooCommerce which is used by 10.2% of the clubs. 16.3% of the websites have been detected as undetected CMS and 14.3% of the websites were found to be either down or unavailable. The remaining 16.3% of the websites use CMS such as Drupal, Squarespace, Wix, and others.

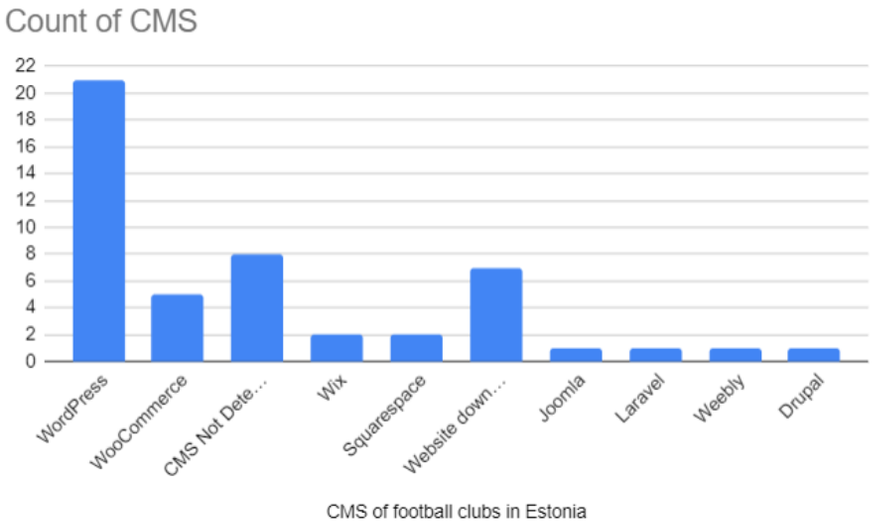

FIGURE 4.10: Count of CMSs

4.5 City

City	Number	Proportion
Official number	79	
Wikidata list	82	100%
Having official website	45	54.88%
No official website	37	45.12%

TABLE 4.6: table of city

The table clearly shows that Wikidata contains information about all registered cities in Estonia, and around 54.88% of these cities have their official website. The detecting result is also evident from the pie chart, indicating that almost all cities use Liferay as their CMS, accounting for 82.2% of the total. Only 2.2% of the cities opt for Joomla, while 6.7% of the websites are detected as having undetected CMS. The remaining websites comprise some that use CMS such as WordPress, Drupal, and some websites that are currently unavailable.
Undoubtedly, Liferay enjoys significant popularity among the websites of cities in Estonia, surpassing the utilization of other content management systems (CMSs). The predominant selection of Liferay by most cities can be attributed to its heightened emphasis on security and scalability, rendering it highly capable of managing intricate and extensive websites. The robust security measures

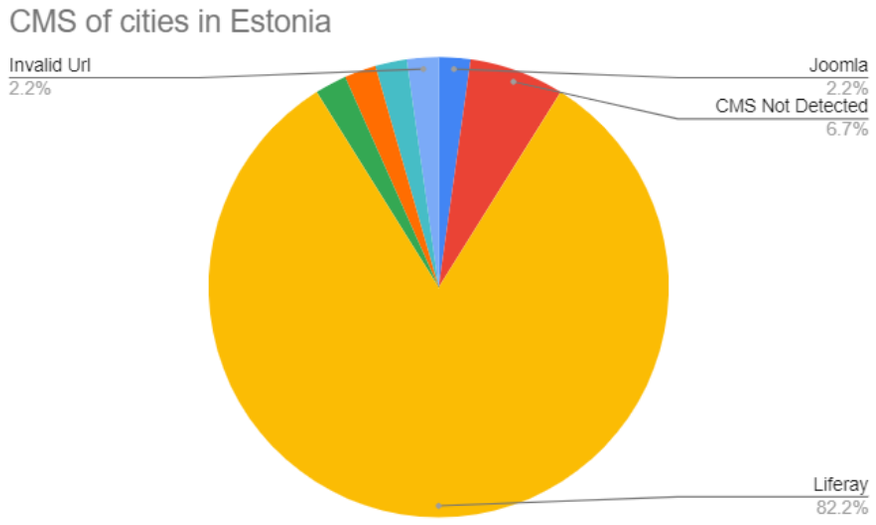

FIGURE 4.11: pie chart of city CMSs

and scalable nature of Liferay make it an attractive choice for cities in Estonia seeking to effectively administer their online platforms.

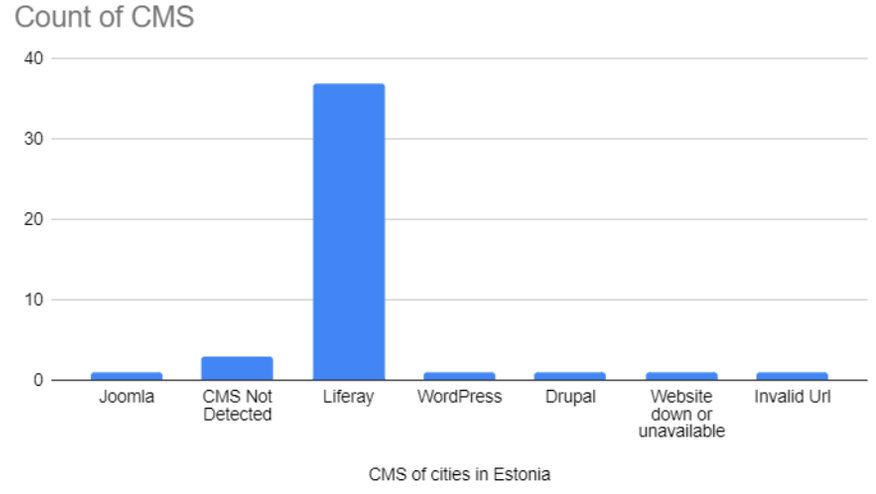

FIGURE 4.12: Count of CMSs

City	Number	Proportion
Official number	528	
Wikidata list	110	20.83%
Having official website	18	16.36%
No official website	92	83.64%

TABLE 4.7: table of transport company and building

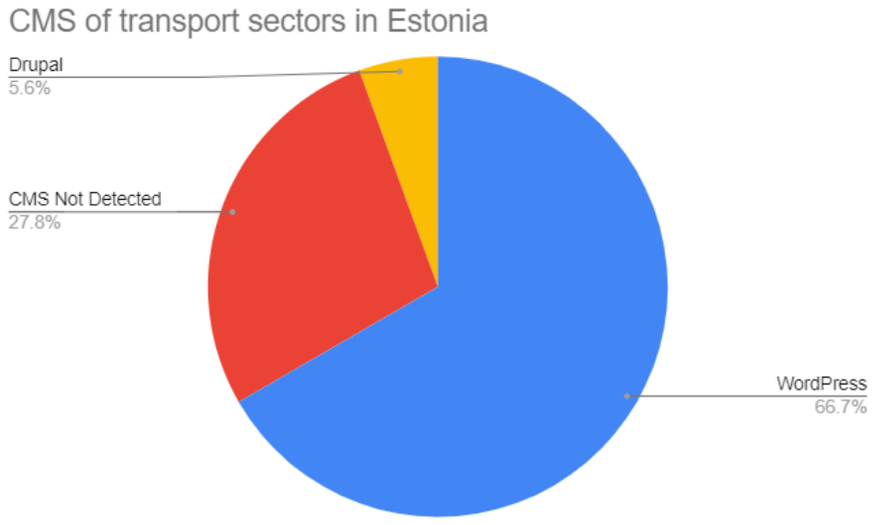

FIGURE 4.13: pie chart of transport company and building CMSs

4.6 Transport

4.6.1 Transport company and building

Based on the presented table, it is evident that Wikidata includes only a small percentage (20.83%) of transport sectors in Estonia. This is due to the fact that most of the transport companies in Estonia are privately owned and not recorded in Wikidata. Out of the 110 transport sectors listed, which include official transport companies, airports, and ports, only 18 have official websites. Among these, 66.7% of the sectors prefer to use WordPress as their CMS, while only 5.6% use Drupal. The remaining 27.8% are detected as undetected CMS.

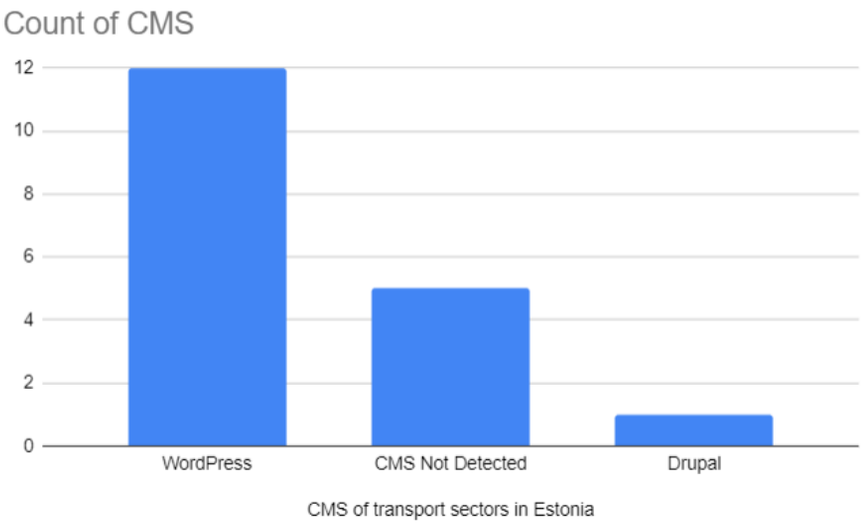

FIGURE 4.14: Count of CMSs

4.7 Art and Culture

4.7.1 Culture building

City	Number	Proportion
Official number	265	
Wikidata list	277	100%
Having official website	80	28.88%
No official website	197	71.12%

TABLE 4.8: table of museum,theatre and concert hall

Based on the table, it is evident that all the cultural buildings in Estonia, such as museums, theatres, and concert halls, are included in the Wikidata database. Out of these, only 28.88% of the culture buildings have an official website. Among the culture sectors that have a website, 47.5% use WordPress as their CMS. A significant proportion of the websites (21.3%) are detected as having an undetected CMS. Additionally, some culture buildings (12.5%) have chosen to use WooCommerce as their CMS. A small percentage of the culture sectors (7.5%) use Drupal as their CMS. Finally, the remaining 11.2% include websites with CMS like Next.js or some that are unavailable.

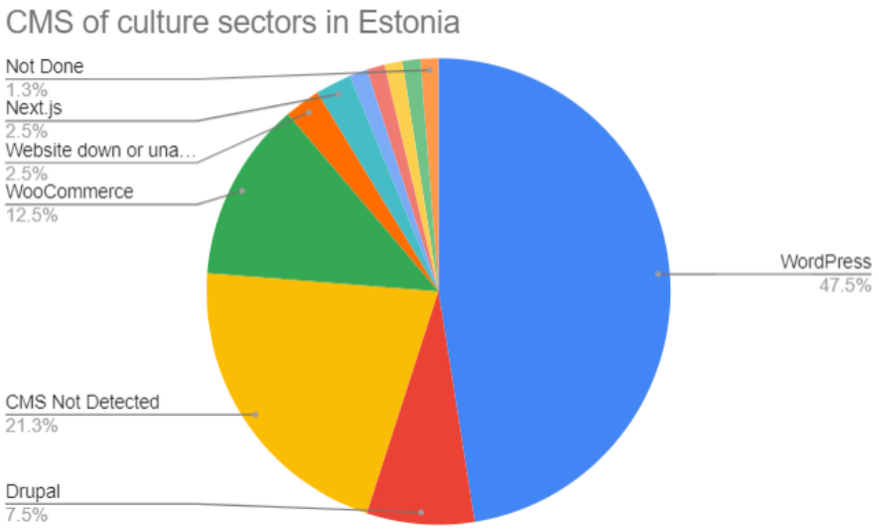

FIGURE 4.15: pie chart of museum,theatre and concert hall CMSs

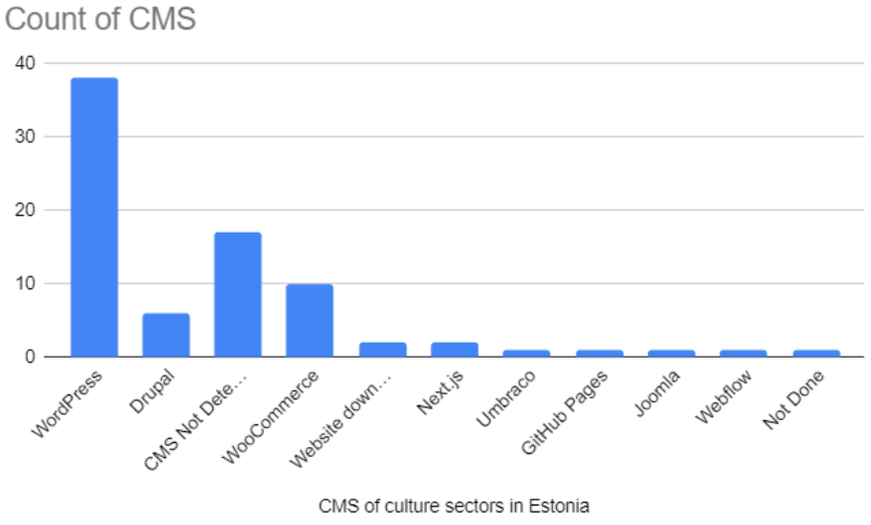

FIGURE 4.16: Count of CMSs

5 CONCLUSION

Upon data collection and CMS detection analysis of various public sectors in Estonia, such as universities, schools, and cities, the following table was generated:

CMS	**1**	**2**	**3**	**4**	**5**
University	WordPress	Drupal	Next.js	WooCommerce	
School	WordPress	Drupal	Joomla	Liferay	Google Sites
Government	Drupal	WordPress			
Hospital	Drupal	WordPress			
Football club	WordPress	WooCommerce	Wix	Squarespace	Drupal
Transport	WordPress	Drupal			
City	Liferay	Joomla	Drupal	WordPress	
Culture	WordPress	WooCommerce	Drupal	Next.js	Umbraco

TABLE 5.1: table of Usage amount of public sectors

The data suggest that WordPress is the preferred CMS across various sectors in Estonia. This could be due to its cost-effectiveness, efficiency, and user-friendliness. In contrast, the sectors like government sectors and hospitals in Estonia may have more resources to invest in a more professional CMS, as evidenced by the popularity of Drupal in this sector. After comparing WordPress and Drupal. One major difference is that Drupal is typically considered more powerful and customizable than WordPress. Drupal has a more flexible architecture, allowing for greater control over the website's functionality and content

structure. And when it comes to security, Drupal has a large community of developers constantly working to identify and fix vulnerabilities. And Drupal is often considered more secure due to its built-in security features and more robust permission management system. It appears that Drupal is indeed a more suitable choice for government sectors in Estonia.

There is another thing that can be paid attention to for this table is that a majority of cities in Estonia have opted to use Liferay as their CMS. Liferay is an open-source CMS that was initially released in 2000 and is written in Java. Compared to WordPress, Liferay is regarded as a more intricate and advanced CMS that targets enterprise-level users seeking advanced features and customization options. In contrast, WordPress is designed to be more user-friendly and geared towards small to medium-sized businesses and individuals. Liferay is highly scalable and can manage large, complex websites with numerous pages and users, while WordPress can also scale but may encounter difficulties with the demands of very large sites. Liferay is widely regarded as more secure due to its focus on enterprise-level security standards. Furthermore, Liferay provides extensive customization options that enable it to be highly adaptable to the unique requirements of different organizations. However, it should be noted that Liferay's community of users and developers is relatively smaller than that of WordPress.

In conclusion, WordPress emerges as the preferred choice for the majority of public sectors in Estonia due to its user-friendly nature and accessibility. Being an open-source platform, WordPress enables users to enhance its capabilities according to their specific needs, adding to its appeal, which means the user group themselves can make WordPress more powerful and competitive. However, in certain sectors such as government and cities, where there may be greater availability of skilled website developers and resources, the preference tends to shift towards CMS options that prioritize security and cater to more specialized requirements.

6 FUTURE WORK

6.1 About this project

In this chapter, we will discuss the thesis and its future work, which concerns the field of CMS and its statistical distribution in the public sector of Estonia or some other areas. The thesis compares this distribution with that of Germany, where the number of websites is significantly higher. However, the larger number of websites in Germany does not necessarily make research on this topic easier. In fact, it is more challenging to obtain an official list of Estonian websites because the available lists are not as comprehensive as those available for German universities and their official websites. The data collection method employed in this thesis is the Wikidata query service, which is deemed to be the best choice because of its efficiency and convenience. Nonetheless, there is a challenge in obtaining complete lists in Wikidata since all classifications of the public sector must be identified, and the number of official websites on Wikidata is relatively small. One possible explanation for this is that Estonia is a smaller country than Germany, which may have led to less information being available on Wikidata. To further advance research in the field of CMS in Estonia's public sector, several avenues can be explored. One possibility is to expand the scope of the research to include other Baltic countries or countries in the region. Another possibility is to explore different data collection methods that could

provide more comprehensive and accurate information. For example, using different databases or data collecting methods like using data from Google Map.

6.2 About undetected CMS

This thesis also addresses the issue of undetected CMS. A review of the statistical distribution of CMS in Germany on cmscensus.eu reveals that undetected CMS is also a problem in Germany. If this issue of undetected CMS can be resolved or further classified into more specific categories, then the result of CMS detection will be more accurate and clear. One possible way to solve the problem of undetected CMS in the thesis could be to expand the scope of the data collection method to include other sources besides Wikidata. For example, the researchers could manually search for websites of public institutions in Estonia that may not be listed in Wikidata. This would involve a more labor-intensive process, but it could potentially yield a more comprehensive list of websites. Another approach could be to improve the classification system used for CMS detection or find some more powerful detecting tools. By refining the categories used to classify different types of CMS, it may be possible to more accurately detect and identify previously undetected systems. Additionally, the researchers could consider collaborating with experts in the field of CMS detection to gain insights and expertise on improving the accuracy of the detection method. This could involve working with specialists in machine learning or data analysis to develop more sophisticated algorithms for detecting CMS.

7 APPENDIX

7.1 SPARQL code

7.1.1 University

```
SELECT ?itemLabel ?item ?website WHERE {
  {
    ?item wdt:P31 wd:Q3918;
      wdt:P17 wd:Q191.
  }
  UNION
  {
    ?item wdt:P31 wd:Q162633;
      wdt:P17 wd:Q191.
  }
  UNION
  {
    ?item wdt:P31 wd:Q17028020;
      wdt:P17 wd:Q191.
  }
   UNION
  {
```

```
37      ?item wdt:P31 wd:Q1664720;
38        wdt:P17 wd:Q191.
39    }
40     UNION
41    {
42      ?item wdt:P31 wd:Q189004;
43        wdt:P17 wd:Q191.
44    }
45     UNION
46    {
47      ?item wdt:P31 wd:Q917182;
48        wdt:P17 wd:Q191.
49    }
50     UNION
51    {
52      ?item wdt:P31 wd:Q902104;
53        wdt:P17 wd:Q191.
54    }
55    UNION
56    {
57      ?item wdt:P31 wd:Q2385804;
58        wdt:P17 wd:Q191.
59    }
60    OPTIONAL { ?item wdt:P856 ?website. }
61     SERVICE wikibase:label { bd:serviceParam wikibase:language "
          en,de,fr,es,no,pt,et,nb,sv". }
62  }
```

LISTING 7.1: SPARQL code of University

7.1.2 School

```
63  SELECT ?itemLabel ?item ?website WHERE {
64    {
65      ?item wdt:P31 wd:Q159334;
66        wdt:P17 wd:Q191.
67    }
```

```
68    UNION
69    {
70      ?item wdt:P31 wd:Q12373090;
71        wdt:P17 wd:Q191.
72    }
73    UNION
74    {
75      ?item wdt:P31 wd:Q3914;
76        wdt:P17 wd:Q191.
77    }
78    UNION
79    {
80      ?item wdt:P31 wd:Q28935764;
81        wdt:P17 wd:Q191.
82    }
83    OPTIONAL { ?item wdt:P856 ?website. }
84    SERVICE wikibase:label { bd:serviceParam wikibase:language "
         en,de,fr,es,no,pt,et,nb,sv". }
85  }
```

LISTING 7.2: SPARQL code of schools

7.1.3 Government

```
86  SELECT ?itemLabel ?item ?website WHERE {
87    {
88      ?item wdt:P31 wd:Q294217;
89        wdt:P17 wd:Q191.
90    }
91    UNION
92    {
93      ?item wdt:P31 wd:Q1320217;
94        wdt:P17 wd:Q191.
95    }
96    UNION
97    {
98      ?item wdt:P31 wd:Q46022688;
```

```
99        wdt:P17 wd:Q191.
100     }
101     UNION
102     {
103       ?item wdt:P31 wd:Q15911314;
104         wdt:P17 wd:Q191.
105     }
106     UNION
107     {
108       ?item wdt:P31 wd:Q327333;
109         wdt:P17 wd:Q191.
110     }
111     UNION
112     {
113       ?item wdt:P31 wd:Q17456916;
114         wdt:P17 wd:Q191.
115     }
116     UNION
117     {
118       ?item wdt:P31 wd:Q895914;
119         wdt:P17 wd:Q191.
120     }
121     UNION
122     {
123       ?item wdt:P31 wd:Q7188;
124         wdt:P17 wd:Q191.
125     }
126     OPTIONAL { ?item wdt:P856 ?website. }
127     SERVICE wikibase:label { bd:serviceParam wikibase:language "
          en,de,fr,es,no,pt,et,nb,sv". }
128 }
```

LISTING 7.3: SPARQL code of government sectors

7.1.4 Hospital

```
129 SELECT ?itemLabel ?item ?website WHERE {
```

```
130   {
131     ?item wdt:P31 wd:Q16917;
132       wdt:P17 wd:Q191.
133   }
134   UNION
135   {
136     ?item wdt:P31 wd:Q4287745;
137       wdt:P17 wd:Q191.
138   }
139   UNION
140   {
141     ?item wdt:P31 wd:Q89371670;
142       wdt:P17 wd:Q191.
143   }
144   UNION
145   {
146     ?item wdt:P31 wd:Q10729872;
147       wdt:P17 wd:Q191.
148   }
149   UNION
150   {
151     ?item wdt:P31 wd:Q4284971;
152       wdt:P17 wd:Q191.
153   }
154   UNION
155   {
156     ?item wdt:P31 wd:Q2980337;
157       wdt:P17 wd:Q191.
158   }
159   UNION
160   {
161     ?item wdt:P31 wd:Q7309759;
162       wdt:P17 wd:Q191.
163   }
164   UNION
165   {
166     ?item wdt:P31 wd:Q644264;
```

```
167         wdt:P17 wd:Q191.
168     }
169     UNION
170     {
171       ?item wdt:P31 wd:Q210999;
172         wdt:P17 wd:Q191.
173     }
174     OPTIONAL { ?item wdt:P856 ?website. }
175     SERVICE wikibase:label { bd:serviceParam wikibase:language "
          en,de,fr,es,no,pt,et,nb,sv". }
176 }
```

LISTING 7.4: SPARQL code of hospitals

7.1.5 Football Club

```
177 SELECT ?itemLabel ?item ?website WHERE {
178     {
179       ?item wdt:P31 wd:Q476028;
180         wdt:P17 wd:Q191.
181     }
182     UNION
183     {
184       ?item wdt:P31 wd:Q17270000;
185         wdt:P17 wd:Q191.
186     }
187     OPTIONAL { ?item wdt:P856 ?website. }
188     SERVICE wikibase:label { bd:serviceParam wikibase:language "
          en,de,fr,es,no,pt,et,nb,sv". }
189 }
```

LISTING 7.5: SPARQL code of football clubs

7.1.6 City

```
190 SELECT ?item ?itemLabel ?website WHERE {
```

```
191   {
192     ?item wdt:P31 wd:Q28122896;
193       wdt:P17 wd:Q191.
194   }
195   UNION
196   {
197     ?item wdt:P31 wd:Q6256;
198       wdt:P17 wd:Q191.
199   }
200   UNION
201   {
202     ?item wdt:P31 wd:Q15284;
203       wdt:P17 wd:Q191.
204   }
205   UNION
206   {
207     ?item wdt:P31 wd:Q3957;
208       wdt:P17 wd:Q191.
209   }
210   UNION
211   {
212     ?item wdt:P31 wd:Q50809253;
213       wdt:P17 wd:Q191.
214   }
215   OPTIONAL { ?item wdt:P856 ?website. }
216   SERVICE wikibase:label { bd:serviceParam wikibase:language "
        en,de,fr,es,no,pt,et,nb,sv". }
217 }
```

LISTING 7.6: SPARQL code of cities

7.1.7 Transport

```
218 SELECT ?item ?itemLabel ?website WHERE {
219   {
220     ?item wdt:P31 wd:Q1248784;
221       wdt:P17 wd:Q191.
```

```
222   }
223   UNION
224   {
225     ?item wdt:P31 wd:Q44782;
226       wdt:P17 wd:Q191.
227   }
228   UNION
229   {
230     ?item wdt:P31 wd:Q740752;
231       wdt:P17 wd:Q191.
232   }
233   OPTIONAL { ?item wdt:P856 ?website. }
234   SERVICE wikibase:label { bd:serviceParam wikibase:language "
        en,de,fr,es,no,pt,et,nb,sv". }
235 }
```

LISTING 7.7: SPARQL code of transport sectors

7.1.8 Culture

```
236 SELECT ?item ?itemLabel ?website WHERE {
237   {
238     ?item wdt:P31 wd:Q33506;
239       wdt:P17 wd:Q191.
240   }
241   UNION
242   {
243     ?item wdt:P31 wd:Q24354;
244       wdt:P17 wd:Q191.
245   }
246   UNION
247   {
248     ?item wdt:P31 wd:Q1060829;
249       wdt:P17 wd:Q191.
250   }
251   UNION
252   {
```

```
253       ?item wdt:P31 wd:Q10547643;
254         wdt:P17 wd:Q191.
255     }
256     UNION
257     {
258       ?item wdt:P31 wd:Q112688641;
259         wdt:P17 wd:Q191.
260     }
261     UNION
262     {
263       ?item wdt:P31 wd:Q207694;
264         wdt:P17 wd:Q191.
265     }
266     UNION
267     {
268       ?item wdt:P31 wd:Q16735822;
269         wdt:P17 wd:Q191.
270     }
271     UNION
272     {
273       ?item wdt:P31 wd:Q1970365;
274         wdt:P17 wd:Q191.
275     }
276     UNION
277     {
278       ?item wdt:P31 wd:Q2398990;
279         wdt:P17 wd:Q191.
280     }
281     OPTIONAL { ?item wdt:P856 ?website. }
282     SERVICE wikibase:label { bd:serviceParam wikibase:language "
          en,de,fr,es,no,pt,et,nb,sv". }
283 }
```

LISTING 7.8: SPARQL code of culture buildings

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