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SoCaTel

A multi-stakeholder co-creation platform for better access to Long-Term Care services

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Data Sources Classification and Access Means

By CyRIC

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EXECUTIVE SUMMARY

This deliverable presents the SoCaTel platform's final set of Data Sources that has been identified and classified according to the SoCaTel requirements in the work done in Task 4.1.

The list of incorporated services, datasets and media feeds identified in each pilot site as presented in D4.1. have been examined, filtered and imported into SoCaTel's knowledge base. This deliverable presents the barriers that were identified during this process as well as the final list of data sources that have been included. Moreover, we outline several techniques and data sources that could be potentially used to enrich platform capabilities and user experience.

This deliverable also further presents the final social care and welfare data model that will be published in open data and that will constitute a major contribution to the semantic web community.

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Glossary

Abbreviation	Expression
SOCATEL	A multi-stakeholder co-creation platform for better access to Long-Term Care services
KB	Knowledge Base
QE	Query Expansion
LOD	Linked Open Data
LSI	Latent Semantic Indexing

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1 INTRODUCTION

The SoCaTel co-creation platform enables individuals to collectively improve the delivery of long-term care services. The SoCaTel knowledge base (KB) is a crucial part of the platform that facilitates the listing of readily available care services, and material relevant to long-term care such as statistics, events and more. The information stored in the KB is collected from external data sources. After processing, relevant insights are pushed to the co-creation platform user interface for presentation to the end-users in a user-friendly way.

Most of the datasets from external data sources that have been incorporated into the SoCaTel co-creation platform have been presented in *D4.1 - Data Standardization and Semantic Interoperability*. All data stored in the SoCaTel KB are accessible via the mechanisms documented in previous deliverables under WP4. Data are anonymized and secured according to the principles and methodology presented in *D2.2 - "Data privacy protection requirements"*.

Section 2 presents the major barriers that we identified during the process of classifying the sources that are relevant to the project's context, as well as the methodology we followed in order to assemble the final list of data sources that has been included into the SoCaTel KB. Moreover, we present a sample of new data sources as well as software techniques that could be potentially used to enrich platform capabilities and user experience.

Section 3 presents the final semantic data model that was altered throughout the entire project development cycle. We document all the changes needed to accommodate new introduced requirements. We further present required model refinements. Last there is a dedicated subsection that outlines the final social care and welfare data model that will be published in open data and that will constitute as a major contribution to the semantic web community.

Lastly, Section 4 summarises the present deliverable providing a set of heads-up for future exploration.

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2 DATA SOURCES

This section outlines the methodology used to classify the data sources detailed in *"D4.1 Data Standardization and Semantic Interoperability"* to build the final list of Data Sources being utilized by the SoCaTel platform. We detail the restrictions that we faced during this process and we present a summary of data sources that have been identified and included in the final list of data sources.

The Data Sources provided by the pilot sites have undergone a filtering process to select the most appropriate ones according to the SoCaTel business requirements and the context of the project. The methodology used is documented in Section 2.2.

Moreover, this Section presents the final list of imported data sources as well as the list of research and statistical data sources and Linked Open Data (LOD) that have been included to expand the information in the KB.

Additionally, we outline a sample set of additional open data sources that can be potentially leveraged under SoCaTel scope for future enhancements of the platform's KB. The collected experience over the two years working on SoCaTel allows us to retrospect and to propose new methodologies for further data processing and additional data sources based on the business needs and functional requirements, thus potentially impacting the business targets and the functionality of the KB.

2.1 INTRODUCTION

Chapter 3 of *D4.1 – Data Standardization and Semantic Interoperability* lists the data sources identified by the pilot sites. These Data Sources were meant to be imported into the KB and consequently be accessible by the SoCaTel portal. Making the Data Sources available to the Portal, helps the stakeholders participating within the co-creation groups to be aware of information that would help them transition to the ideation phase in a more resourceful manner. Data Sources provide an informative layer to the stakeholders by enhancing their knowledge on available resources relevant to the topic and the context of specific co-creation groups.

However, the process is not trivial mainly due to the lack of unified protocols and procedures for data source publishing, and sometimes it is impractical to

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incorporate every available source of information. In the following paragraphs we outline the major restrictions we identified during this process.

2.1.1 SOCIAL MEDIA RESTRICTIONS

Social media are considered one of the most effective tools of communication in our days, and their use is not limited only on socialization [1]. Furthermore, considering the number of individual users (not to mention multiple accounts) social media contain without a doubt a vast amount of raw data. Nevertheless, due the reasons specified further in this section, the retrieval process and analysis of social media data is challenging. The major challenges we identified can be categorized as follows:

1. **Platform Limitations**
   - Both Facebook and Twitter (used for data acquisition) limit the number of API requests available per specific amount of time. This limits the amount of data that can be gathered per day.
   - Facebook data collection policies introduced in 2018 prohibit the data acquisition from public pages and groups without a special approval from Facebook [2].

2. **"Internet Language" Barrier:**
   - Multiple different dialects and abbreviations used only through the social media platforms, known as slang, do not follow specific rules, thus limiting significantly the performance of traditional language processing algorithms that work amazingly on standard text [3].

3. **Lack of Structured Data:**
   - Since the data collected are parts of conversations and are not naturally meant to present information in a structured manner, the context of the information must be extracted using Natural Language Processing (NLP) techniques. However, NLP techniques require clean texts in order to be efficient but due to the previous barrier, this task is much more complex, especially the cleaning process to get qualitative results. Also, many times the information from conversations is hidden in their context and not in word definitions.
   - Moreover, gathering information regarding a service offering from an organisation is not as trivial. A very limited number of organizations list their offered services in their social media accounts (Facebook or Twitter), while the ones that list them do not necessarily follow a specific protocol or a common structured way.

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4. **Small Data Pools:**
    - According to D4.1, the harvested and analysed social media data were meant to improve user experience and co-creation group discussions by providing statistics and trending health-related issues. When it comes to Twitter, the social media sources discussing these subjects are very limited. This may improve in the future as currently there is limited usage of Twitter in the pilot countries. Specifically, data from https://gs.statcounter.com (the publicly available data source with the largest sample size) show that in the pilot countries the percentages of Twitter users among social media users are:
        i. Finland – 12.43%
        ii. Spain – 5.98%
        iii. Ireland – 3.81%
        iv. Hungary – 2.24%
    - The scenery worsens when it comes to Healthcare in Twitter. Most of the largest healthcare Twitter pages are pharmaceutical but still, their followers are very few. For example, the largest Irish healthcare page in Twitter[1] has less than 9000 followers. As a result, the amount of data available through Twitter is limited.

2.1.2 General Data Source Restrictions

In the following paragraphs we present the challenges we faced in general that apply to all type of data sources. These challenges were identified from examining data sources given from local partners and are mostly regarding services that act on a national level.

1. **Language Barrier:**
    - Firstly, one common problem diagnosed, is the limited availability of tools and libraries that process multilingual content. Specifically, the sources that were provided from most of the pilot countries were exclusively in their native language. Most of the tools, dictionaries, libraries and frameworks for language manipulation and processing (NLP in general) that reside as open source are limited to English language. Moreover, due to the use of semantically annotated words, the translation and context of a word needs to connect with its context in other languages. When for example the word 'food' is used as a search, then there needs to be a connection with the Spanish word 'comida' to facilitate retrieval of Spanish results that may interest the user. However, this type of semantic

[1] https://www.socialbakers.com/statistics/twitter/profiles/detail/374964231-hrbireland

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annotation between languages is extremely difficult especially for developers who do not understand both languages.

2. **Service-oriented Format of the Data Sources:**
   - The SoCaTel platform Data Handlers presented in "*D3.2: SoCaTel Platform Concrete Architecture Design*" handle the following types of data sources:
     i. Social Media sites (Facebook, Twitter)
     ii. Statistical and Research Data
     iii. Governmental Open Data
     iv. Linked Open Data (LOD)
     v. Raw Data

   Development of specialized web crawlers was considered not viable. That is mainly because different organization websites follow different structures, and consequently multiple crawlers should be developed to enable processing in an automatic and reproducible way of acquiring data. Therefore, websites of organisations offering various services had to be processed manually.

2.2 Data Sources Screening Methodology

The methodology that was followed to process the list of the data sources detailed in D4.1 is presented in *Table 1 - Classification Process.* Imported entries are used by the Recommendation Engine to provide relevant recommendations and are accessible to end-users via the SoCaTel dashboard.

Data Sources Classification Process
1. Identification of the relationship between the Organisation Information and the Service Database schema. Table 2 presents the details of the database schema. 2. Identify the distinct organisations that pilot sites listed within D4.1. As a result, a large table summarizing all the provided services and organisations was constructed. 3. Manually process the table and transform it to JSON format. Then, import it to the KB using the developed data handler. The data handler takes as input this large JSON, semantically annotates the data entries and stores them as RDF entries in the GraphDB.

Table 1 - Classification Process

The full list of imported Pilot Site Services can be found in subsection 2.3 - Imported Data Sources. During the manual process of Step 3 the Data Sources referring to dead website links or lacking proper explanation of their offered services, goals and/or description have been excluded. Moreover, we did not adopt any website crawling methodology to automatically scrape and harvest

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websites content. Doing so requires specialised website crawlers demanding human annotators to filter out the important harvested information. Hence, development of specialized crawlers would not minimize the required human efforts. Overall, we listed and imported into the KB all the relevant services along with their respective goal and description. Particularly, *we imported all long-term care related services*, i.e. a variety of services that specialise on helping with needs of people with chronic illnesses or disabilities who cannot care for themselves for long periods [4], *and all data sources that provide statistics, trending issues or extra information* regarding topics that are being discussed. It is noted that the SoCaTel KB is a component that can continues evolving by enriching it with new data sources.

Moreover, as many of the data sources do not list or maintain social media (Twitter/Facebook) accounts, we could not use the Social Media Handlers (D4.2) to further enrich these data sources with more information and insights. Lastly, we grouped the Data Sources by organisation. Thus, each organisation encapsulates all offered services to be used by the Recommendation Engine to provide accurate and meaningful recommendations of services and organisations based on metadata of co-creation groups (Item-to-Item Collaborative Recommendation) and on what is being discussed and expressed within a co-creation group (Content-based recommendations).

Organisation and Service Database schema relationship
1. Identification of each individual Organisation that the D4.1 provided. According to the Database Schema, that was presented in D3.2 and D3.3 the Organisation Database schema consists of specific fields that uniquely describe an Organisation. 2. A provided Service, known as Service Database schema, is a 1-N relationship between the Service and the Organisation providing multiple N services. Thus, each listed service stored in the database schema has an association with a single organisation. 3. Each Service has its own set of distinguishable fields along with respective hashtags, Twitter Feed screen name, Facebook Page Id, Description, etc.

Table 2 - Organisations and Services Database Schema Relationship

Table 3 below depicts an example of an organisation registered to the KB semantic repository and the services it provides. It corresponds to the Health Service Executive Irish organisation that is specialized in providing social care services to elder people, people with disabilities, etc. The services provided by the HSE organisation are also stored in the KB with the association explained in *Table 2 - Organisations and Services Database Schema Relationship.*

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Health Service Executive (HSE) – Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Health Service Executive (HSE)	Ireland	HSElive	HSElive	https://www.hse.ie/eng/
Offered Services				
Service Code	Service Name + Goal		Description	
IE-1	Home Support Services		The HSE Home Support Service aims to assist and support people to remain at home and support informal carers: ● getting in and out of bed ● dressing and undressing ● personal care such as showering and shaving ● help at mealtime and/or with essential domestic duties. Aged 65 or over ● Need support to continue living at home or to return home following a hospital stay ● Not a 24hr care ● Assessed on care needs and not on income level ● Free service	
IE-2	Nursing Homes Support Scheme - Fair Deal The HSE Nursing Homes Support Scheme aims to provide financial support to help pay for the cost of care in a nursing home through the Fair Deal scheme.		Payment depends on income and assets ● Short-term care such as respite, convalescent or day-care not covered ● Extra fees charged by the nursing home for services like hairdressing, therapies or activities ● When the person has assets including land and property, they can delay paying for their care until after their death using these assets to secure the costs.	
IE-3	Older People Services where you live A website listing older people services provided in any given local health office, that they can access through their GP or Public Health Nurse.		Payment depends on income and assets ● Short-term care such as respite, convalescent or day-care not covered ● Extra fees charged by the nursing home for services like hairdressing, therapies or activities ● When the person has assets including land and property, they can delay paying for their care until after their death using these assets to secure the costs.	
IE-6	Find your nearest hospital health centre, GP and more Health Atlas helps you to find essential health services on a map, General Practitioners, GPs, Family Doctors, Pharmacists, Dentists, Hospitals. It also provides contact phone numbers.			

Table 3 - Health Service Executive (HSE) - Irish Organisation/Service Provider

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2.3 IMPORTED DATA SOURCES

The following subsections provide the list of the Data Sources that have been successfully imported to the KB per pilot site.

2.3.1 SPANISH DATA SOURCES

Ajuntament de Vilanova i la Geltrú – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Ajuntament de Vilanova i la Geltrú	Spain, Catalonia	ajuntamentvng	ajuntamentvng	https://www.vilanova.cat/
Offered Services				
Service Code	Service Name + Goal		Description	
SP-7	Servei d'ajuda a domicili SAD - Home Care The service provides home care support by professional carers.		Home care service helps LTC recipients and older adults with lack of personal autonomy to get a home support to do common daily activities: to have a shower, cooking, mobilisation, dressing and take a walk. • More than 65 years old. • Disabled people or lack of personal autonomy. • More than 80 years old living alone or with other old person. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.	
SP-8	Servei d'àpats a domicili - Home food delivery service To provide a healthy food menu at home to older adults and people recovering from accident or operation.		Home food delivery service provides a weekly food menu for older adults that cannot cook at their own homes. It takes into consideration dietary restrictions, if case. • More than 65 years old. • Disabled people or lack of personal autonomy or difficulties to cook at home. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.	
SP-12	Grups d'ajuda mútua - Caregivers support groups Family caregivers' group is adressed to family carers to share their experiences, needs and concerns about to take care of LTC adults drived by one nurse and one social worker		Several family care support groups are organized along the year in the city of Vilanova i la Geltrú. • Free of charge. • Previous evaluation of Social Work and/or Health Primary Services needed.	

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SP-14	Servei de primera acollida social - Social first attention To inform about public and private services for LTC recipients. It provides also information about personal autonomy incomes and benefits.	• Free of charge. • Public service of the Vilanova i la Geltrú municipality open to all citizens.
SP-18	Servei de menjador - Daily Lunch Service To provide a healthy daily lunch menu in a shared place for older adults or LTC that cannot cook at home	Public lunch service for people who wants to have lunch in a shared place and cannot cook at home. • More than 65 years old or with several difficulties to follow a healthy diet or cannot cook at home. • Disabled people or lack of personal authonomy. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.
SP-19	Prèstec material ortopèdic i ajuts tècnics - Orthopedical material and technical support loan Temporary technical support and orthopedical material loan to disabled people and low incomes.	Material can be loaned are shower chairs, walkers, wheelchairs, shower tables and crutches. • Disabled people or lack of personal autonomy. • Previous evaluation of Social Work and/or Social Services needed. • Free of charge.
SP-20	Servei de dutxa - Shower service To provide a shower place for people that cannot have a shower at home.	It provides soap, towels, razor and comb. • Disabled people or lack of personal authonomy. • Free of charge.

Table 4 - Ajuntament de Vilanova i la Geltrú – Spanish Organisation/Service Provider

Cruz Roja – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Cruz Roja	Catalonia	CruzRojaEsp	CruzRoja.es	https://www.cruzroja.es/principal/web/teleasistencia/teleasistencia-en-casa
Offered Services				
Service Code	Service Name + Goal		Description	
SP-4	Telecare at home - Red Cross Service		This service consists of a terminal and a push button that connects you, from any room in the house in which you are, with our professionals	

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		24 hours a day, 365 days a day, facilitating a response and immediate intervention in case of any need or eventuality. • Private service by pay no more than 30 € by month.
SP-5	Cuídate + is a service that encourages self-care thanks to the proactive monitoring of health (tension, weight ...) in a simple way to promote physical, mental and emotional well-being. It also includes a system that analyses the life model according to the daily routines (time in the room, in the bathroom, outside the home ...) proactively detecting dangerous situations that may occur.	This service operates through an application that we install on your own mobile phone and that connects you both inside and outside the home with our professionals 24 hours a day, 365 days a day, facilitating a response and immediate intervention in case of any need or eventuality. The application consists of a button that you only have to press if necessary. It also includes geographic location if necessary. Private service by pay: no more than 45 € by month.
SP-6	Telecare mobility - Red Cross Service Mobile telecare is a service that accompanies people inside and outside the home and feel calm and safe.	As simple as pressing a button we help you in whatever you need, whether it is for emergency, solitude or just to talk, we are by your side 24 hours a day, 365 days so that you think only about the things that really matter. Private service by pay: no more than 17 € by month.
SP-9	LoPe	LoPe (people locator) is a support and help service for family members and caregivers of people with cognitive impairment that allows, thanks to a warning program, to obtain movement information and geographically locate the person who carries it. Private service by pay.

Table 5 - Cruz Roja – Spanish Organisation/Service Provider

Diputació de Barcelona – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Diputació de Barcelona	Barcelona, Spain	benestardiba	DiputaciodeBarcelona	https://www.diba.cat/es/web/respir
Offered Services				
Service Code	Service Name + Goal		Description	
SP-3	Arrenjament d'habitatges - Housing adapt The objective of the adapting home program is to reform bathrooms, kitchens or other home spaces to live in an adapted environment and to		Before undertaking reforms, experts recommend carrying out a personalized pre-study that considers the needs of the resident. For example, daily activities, people in the environment and possible medical diagnosis. • More than 65 years old. • Disabled people or lack of personal autonomy. • Insufficient or low incomes.	

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	promote personal autonomy and the quality of life.	• More than 80 years old living alone or with other old person. • Previous evaluation of Social Work and/or Social Services needed.
SP-11	Servei Respir - Caregiver relax service Respir provides a temporally nursing home slot to support family caregivers who have people over 65 with a lack personal autonomy	Service is available all year, but families must fill a form and wait their turn. Temporary nursing home requests are allocated based on the technical evaluation of the applications and the availability of free slots. • More than 65 years old. • Disabled people or lack of personal autonomy. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.

Table 6 - Diputació de Barcelona – Spanish Organisation/Service Provider

Fundació Amics de la Gent Gran – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Fundació Amics de la Gent Gran	Catalonia, Spain	amicsgentgran	amicsdelagentgran	https://amicsdelagentgran.org/es
Offered Services				
Service Code	Service Name + Goal		Description	
IE-5	Amics de la Gent Gran - Friends of the Elderly Volunteers, who visit older adults at home 1 or 2 days per week to reduce isolation and loneliness.		Amics de la Gent Gran brings friendship and emotional companionship. Annual journal about its loneliness observatory. Other activities: Volunteers' training program and Social awareness program. • Free and confidential service. • Previous evaluation of Social Work and/or Social Services needed.	

Table 7 - Fundació Amics de la Gent Gran – Spanish Organisation/Service Provider

Generalitat de Catalunya – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Generalitat de Catalunya	Catalonia, Spain	aferssocialscat	treballiaferssocialscat	http://treballiaferssocials.gencat.cat/ca/ambits_tematics/gent_gran/residencies_centres_de_dia_i_habitatges_tutelats/centres_de_dia/
Offered Services				
Service Code	Service Name + Goal		Description	
SP-15	Servei de Centre de dia per a la gent gran - Older adults Day Center		This residential reception service is aimed at persons of sixty-five years old and above who are dependent, who need organization,	

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		supervision and assistance in daily life activities. It constitutes an alternative to the residential internment of the elderly and can be a service of a temporary or permanent nature. Day centre is a day care service that complements the care of the family environment, with the aim of promoting the recovery and maintenance of personal and social autonomy, maintaining the person in their personal surroundings and relative in the best conditions and provide support to families in the care of dependent elderly people. • More than 65 years old. • Disabled people or lack of personal autonomy. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.
SP-16	Residència assistida - Assisted Nursery Home Service	The professional team that works there is multidisciplinary and consists of nurses, auxiliaries of gerontology, physiotherapists, occupational therapists, experts in social education, psychology and medicine. There is also a responsible director and a responsible sanitary ware. Residential, permanent or temporary support services, and global assistance, aimed at elderly people who do not have a enough degree of autonomy to carry out activities of daily living, who need constant supervision • More than 65 years old. • Disabled people or lack of personal autonomy. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.
SP-17	Llar residència - Nursery Home	Residential, permanent intended for elderly people with a sufficient degree of autonomy for daily life activities, which require a certain level of organization and personal support. The main objective is to provide a substitute environment for the home. The functions that this service fulfils are: accommodation, maintenance, reception, coexistence and personal support • More than 65 years old. • Previous evaluation of Social Work and/or Social Services needed. • Required to pay a contribution in some cases.

Table 8 - Generalitat de Catalunya – Spanish Organisation/Service Provider

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Imserso - Instituto de Mayores y Servicios Sociales – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Imserso - Instituto de Mayores y Servicios Sociales	Spain	Imserso	imserso	http://www.imserso.es/imserso_01/autonomia_personal_dependencia/saad/app/index.htm
Offered Services				
Service Code	Service Name + Goal		Description	
SP-13	App de dependencia - LTC application.		Application that includes more than 60 videos and advices about care, services and benefits and information about application forms.	

Table 9 - Imserso - Instituto de Mayores y Servicios Sociales – Spanish Organisation/Service Provider

Ministry of Health – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Ministry of Health	Spain	sanidad gob	MinSanidad	https://www.mscbs.gob.es/

Table 10 - Ministry of Health – Spanish Organisation/Service Provider

Securitas Direct, CaixaBank – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Securitas Direct, CaixaBank	Spain		familysenior	http://proteccionsenior.com/es/comercial/index.html
Offered Services				
Service Code	Service Name + Goal		Description	
SP-10	Protección Senior The service is a device to locate people outside home and allows to communicate with a emergency central in case of incidents.		Senior Protection consists of two elements: a central unit and a wristwatch. The central unit is portable to move it, according to your needs, to the specific room and has an SOS button to communicate with the Central in case of incidents. The watch is placed on the wrist to protect you both inside and outside the home and can get wet, so you will not have to take it off under any circumstances. By pressing the SOS button on the watch for at least two seconds, an SOS emergency warning is automatically sent to the control panel. Private service by pay no more than 45 € by month.	

Table 11 - Securitas Direct, CaixaBank – Spanish Organisation/Service Provider

Tunstall Televida / Diputació de Barcelona – Spanish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Tunstall Televida / Diputació de Barcelona	Barcelona, Spain	benestarrdiba	DiputaciodeBarcelona	https://www.diba.cat/es/web/benestar/teleassistencia

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Offered Services		
Service Code	Service Name + Goal	Description
SP-1	Servei Local de Teleassistència - Telecare service	The objective of Telecare Service is to improve elderly people's living standards by providing users with telematic and face-to-face care. With this care, the program tries to reduce the problems caused by any delays in providing help when there is a health emergency. Each telecare user has a device at home that directly calls the telecare provider's headquarters at the press of a button. Telecare professionals answer any calls, evaluate the situation and arrange a response. The service has a team of mobile units available that can be sent to the user's house to evaluate the situation or even solve the emergency, if it is not very serious. The telecare worker calls emergency services if he or she detects that the problem is serious or if this is considered necessary after the mobile unit's evaluation. • More than 80 years old. • Chronic disease patients. • Living alone or lack of social/family network. • Mobility difficulties nor fall. • Required to pay a contribution in some cases.

Table 12 - Tunstall Televida / Diputació de Barcelona – Spanish Organisation/Service Provider

2.3.2 IRISH DATA SOURCES

Age and Opportunity – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Age & Opportunity	Ireland	Age_Opp	AgeandOpportunity	https://ageandopportunity.ie
Offered Services				
Service Code	Service Name + Goal		Description	
IE-10	Retirement Plans		Provide elders with activities and engagements	

Table 13 - Age and Opportunity – Irish Organisation/Service Provider

Age Action – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Age Action	Ireland	AgeAction	AgeActionIreland	https://www.ageaction.ie/
Offered Services				
Service Code	Service Name + Goal		Description	
IE-7	Aging in Developing Countries		Helps ageing and older people in developing countries overcome challenges they face	

Table 14 - Age Action –Irish Organisation/Service Provider

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

Alone Ireland – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Alone Ireland	Ireland	ALONE_IRELAND	AloneIreland	https://alone.ie/
Offered Services				
Service Code	Service Name + Goal		Description	
IE-F4	ALONE Ireland		ALONE helps older people in need to age at home. They work with those who have difficulties with loneliness, ill health, poverty, poor housing or homelessness. Their feed reports testimonies from successful events and support options to the elderly facing loneliness.	

Table 15 - Alone Ireland – Irish Organisation/Service Provider

Care Folk – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Care Folk	Ireland	carefolkteam		https://carefolk.com/
Offered Services				
Service Code	Service Name + Goal		Description	
IE-F3	Care Folk Service		Award winning digital toolbox & community designed to make caregiving easier. Secure, and easy to use. It is their mission to help & support caregivers. Relevant to link to new reports on the home care situation and testimonials.	

Table 16 - Care Folk – Irish Organisation/Service Provider

Department of Finance – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Department of Finance	Ireland	welfare_ie		http://m.welfare.ie/en/Pages/home.aspx
Offered Services				
Service Code	Service Name + Goal		Description	
IE-F2	Twitter Feed		Official Twitter account of the Department of Employment Affairs and Social Protection, who gathers relevant initiatives for improving government services and access to digital platforms.	

Table 17 - Department of Finance – Irish Organisation/Service Provider

Enable Ireland – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Enable Ireland	Ireland	EnableIreland	actionondisability	www.enableireland.ie

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

Offered Services		
Service Code	Service Name + Goal	Description
IE-8	Service Centres	Organise activities for children and adults with disabilities Children Ages: 0-6 Adult Ages: 18+
IE-9	Parent's Guidance	Give guidance to parents for better support of their children. Parents of children with disabilities

Table 18 - Enable Ireland – Irish Organisation/Service Provider

Friends of the Elderly– Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Friends of the Elderly	Ireland	Friendof Elderly	friendsoftheelderly	https://friendsoftheelderly.ie/about/
Offered Services				
Service Code	Service Name + Goal		Description	
IE-5	Bringing friendship and companionship		Friends of the Elderly works hard to provide a wide range of social programmes for older people who would benefit from a friendly chat or a social outing.	

Table 19 - Friends of the Elderly– Irish Organisation/Service Provider

Kare Social Services – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Kare Social Services	Ireland	KareSocial	KARE-Social-Services-331224117071892	http://www.karesocialservices.ie
Offered Services				
Service Code	Service Name + Goal		Description	
IE-4	Meals on Wheels		Provide home help, meals on wheels and citizens information	

Table 20 - Kare Social Services – Irish Organisation/Service Provider

My Home Care Ireland – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
My Home Care Ireland	Ireland	myhomecare_ie	myhomecare	https://myhomecare.ie
Offered Services				
Service Code	Service Name + Goal		Description	
IE-F6.1	Twitter Feed		Promoting independent living within a safe comfortable environment. They tweet about healthcare, support for carers and issues affecting those who require care.	
IE-F6.2	Facebook Feed		Promoting independent living within a safe comfortable environment. They tweet about healthcare, support for carers and issues affecting those who require care.	

Table 21 - My Home Care Ireland – Irish Organisation/Service Provider

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

The Alzheimer society of Ireland – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
The Alzheimer society of Ireland	Ireland	alzheimersocirl	TheAlzheimerSocietyofIreland	https://alzheimer.ie
Offered Services				
Service Code	Service Name + Goal		Description	
IE-11	Dementia Adviser		Provide highly responsive and individualised information and signposting service. Alzheimer and Dementia patients	
IE-12	Social Club		Social club for people with dementia. Alzheimer and Dementia patients Carers and Family members	
IE-13	Alzheimer Café		Place for people with dementia and relatives to meet and exchange ideas and learnings. Dementia Patients and their families and friends	
IE-14	Day Care Services		Dementia patients. Day care centres provide dementia specific, person centred care to meet the needs of the person with dementia.	
IE-15	Respite Care		Dementia patients. Respite centre offers stimulation and activity to the person with dementia in a safe and friendly environment	
IE-16	Home Care Services		Dementia patients. Offer home care service for dementia patients	
IE-17	Family Carer Training		Alzheimer and Dementia friends and Family. Training family carers to look after a loved one with dementia.	
IE-18	Support Group		Alzheimer and Dementia friends and Family. Support groups for families affected by dementia around Ireland	
IE-19	Cognitive Stimulation Therapy		Alzheimer and Dementia friends and Family. Evidence-based group intervention for people with mild to moderate dementia.	
IE-20	Community Dementia Support Nurse		Alzheimer and Dementia friends and Family. Provide dedicated local point of contact to support people with dementia and their families to live well at home	
IE-21	Resource Centre		Alzheimer's and Dementia's carers. Information and resources for past/present carers of people with dementia / Alzheimer's	
IE-22	Reminiscence Walking Trail		Alzheimer and Dementia patients. A reminiscence walking trail with vintage memorabilia, designed for people with dementia	

Table 22 - The Alzheimer Society of Ireland – Irish Organisation/Service Provider

Third Age Ireland – Irish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Third Age Ireland	Ireland	thirdageireland	thirdageireland	http://www.thirdageireland.ie/

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

Offered Services		
Service Code	Service Name + Goal	Description
IE-F5	Third Age Ireland	Third Age Ireland is a national voluntary organisation based in Ireland which both values older people's contribution to society and helps to meet their needs through innovative programmes. Their feed provides useful infographics on facts and options people have regarding long term care issues.

Table 23 - Third Age Ireland – Irish Organisation/Service Provider

2.3.3 HUNGARIAN DATA SOURCES

John Calvin Reformed Elderly Home – Hungarian Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
John Calvin Reformed Elderly Home / Kálvin János Református Idősek Otthona	Hungary			http://kalvinotthon.hu/
Offered Services				
Service Code	Service Name + Goal		Description	
HU-3	Elderly Care Home		• full service • regular medical care and care • nursing, physiotherapy, mental hygiene, patient transport • Laundry • 3x meal • care tasks • group programs, excursions, events, exhibitions visiting	

Table 24 - John Calvin Reformed Elderly Home / Kálvin János Református Idősek Otthona – Hungarian Organisation/Service Provider

Municipality of Metropolitan Municipality Kamaraerdei Elderly – Hungarian Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Municipality of Metropolitan Municipality Kamaraerdei Elderly Home	Hungary			http://www.kamerdo.hu/index.php

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

Offered Services		
Service Code	Service Name + Goal	Description
HU-1	Elderly Care Home	The Elderly Home aims to assist and support people to remain at home and support informal carers: Care-nursing (dress-washing, regular cleaning, own kitchen - catering, home care specialist, screening tests, physiotherapist, physiotherapist, 24-hour nurse) Leisure services: excursions, presentations, celebrations, events, classical music program, library, crafts Other services: hairdresser, pedicurist-manicurist, dental technician - for a fee

Table 25 - Municipality of Metropolitan Municipality Kamaraerdei Elderly – Hungarian Organisation/Service Provider

Social Home of Ruzsa– Hungarian Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Social Home of Ruzsa	Hungary			http://nolak.hu/
Offered Services				
Service Code	Service Name + Goal		Description	
HU-5	Website		• Complete care • 24-hour monitoring • Medical care • Mental health care and employment. • Disabled access areas • Buffet • Hairdressing salon	

Table 26 - Social Home of Ruzsa– Hungarian Organisation/Service Provider

Social Home of Ruzsa– Hungarian Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Elderly Care Home	Hungary			http://www.szterzsebetotthon.hu/
Offered Services				
Service Code	Service Name + Goal		Description	

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

HU-2	Website	The Home aims to help the inhabitants to live a tolerable life in a physical and spiritual sense. Provided services: • Cleaning, maintenance as needed, renovation • Washing, ironing and repair of clothing, other textiles • physical activities - joint gymnastics, individual physiotherapy, walking, intellectual and • entertaining activities - watching TV, listening to music, presentations, reading, quiz, • card and board games, handicrafts, cultural activities - celebrations, theater, concert • tours, exhibitions, excursions • 24-hour nurse service. • Regular medical supervision. • Daily 24-hour service, professional care, and care for skilled workers • Provision of health and medical care: regular medical supervision ensures the • continuous monitoring of the health status of the persons provided and, if necessary, • the organization of specialist medical and hospital care. • Three meals a day are provided. Diet as needed •

Table 27 - Social Home of Ruzsa– Hungarian Organisation/Service Provider

Urban Human Service and Social Services Nursing Home – Hungarian Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Urban Human Service and Social Services Nursing Home / Városi Humánsegítő és Szociális Szolgálat Idősek Otthona	Hungary			http://human.mezoberony.hu/IdosekOtthona

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Grant Agreement Nº 769975.

Offered Services		
Service Code	Service Name + Goal	Description
HU-4	Website	• three meals a day • regular medical care • care - care • Providing medicine and medical aids • the possibility of practicing religion • Useful and cultured spending of leisure time • Mental care • advocacy

Table 28 - Urban Human Service and Social Services Nursing Home – Hungarian Organisation/Service Provider

2.3.4 FINNISH DATA SOURCES

Kotitori – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Kotitori	Finland		Kotitori	https://www.tampereenkotitori.fi
Offered Services				
Service Code	Service Name + Goal		Description	
	Equipment: Laitetori		An elderly person can borrow or rent digital or other equipment that makes it easier for them to live at home.	
	Household: Koti- ja ympäristöpalvelut		The elderly person 's home and living environment will remain tidy and safe with cleaning and maintenance services.	
	Home Care: Kotihoidon palvelut		A nurse, doctor or therapist may visit the elderly home if needed, e.g. wound care sampling, rehabilitation, health or drug monitoring.	
	Social and Wellness. Koti- ja juhlapalvelu Docella		An elderly person can take care of their personal well-being by ordering, for example, a home for a barber, hairdresser, masseuse or paediatrician. He may also engage in health activities with a counsellor or companion.	
	Administration, Accessibility: Escorting and helping with handling different things, Saatto- ja asiointiapu. Lähelläsi Koti- ja tukipalvelut		Elderly person has access to assistant (e.g. bank, post office, laboratory, health care)	

Table 29 - Kotitori – Finish Organisation/Service Provider

The City of Tampere – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
The City of Tampere	Finland			https://www.tampere.fi

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Offered Services		
Service Code	Service Name + Goal	Description
	Activities: Luotsitoiminta	People who need/want help with going to museums or concerts or doing sports. Elderly person has free access and assistance in entering cultural/sports events.
	Digitalisation: ATK-tukipalvelut, it-tuki. ICT support.	An elderly person is able to use digital services, such as appointments, banking, email, social media.
	Mobility: Pali-palveluliikenne, service bus lines	Persons who have difficulty in using public transport. People who have difficulties in using public transport. Elderly Person Accessing Door-to-door Services with Pali Bus at Public Transportation Fee.
	Administration: Ikäihmisten palvelut. Services for the elderly.	Residents of Tampere and Orivesi. People in need of home care. All services for the elderly can be found on the city website.
	Service centres: Palvelukeskukset (6 omaa ja 6 sopimussuhteista). 12 service centers.	Service Centers are open to all older people in Tampere. In the Service Center you can participate in diverse recreational activities and groups and meet other people. There is a lunch restaurant and café in every Service Center.
	Local squares: Lähitorit (6)	Nearby marketplaces are meeting points for all ages and low-threshold service points. Nearby markets provide a wealth of information, support and activities for everyday life. Get advice and service on everyday issues at the local market, attend group activities, events or just come and meet someone you know.

Table 30 - The City of Tampere – Finish Organisation/Service Provider

Ikifit Oy – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Ikifit Oy	Tampere, Finland		ToiminimiLauraToropainen	http://www.ikifit.fi/
Offered Services				
Service Code	Service Name + Goal		Description	
	Administration, Accessibility: Escorting and helping with handling different things, Saatto- ja asiointiapu		A concierge or similar person leaves to accompany the customer by service bus, regular bus, taxi or the employee's own car. Either so that the customer is exported. to the place and picked up from there, or with the attendant at all times.	

Table 31 - Ikifit Oy – Finish Organisation/Service Provider

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Hoiva- ja Talkkaripalvelut Rajaveräjä – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Hoiva- ja Talkkaripalvelut Rajaveräjä	Tampere, Orivesi, Finland		ToiminimiLauraToropainen	https://www.kauppalehti.fi/yritykset/yritys/hoiva-+ja+talkkaripalvelut+rajaveraja/27133997
Offered Services				
Service Code	Service Name + Goal		Description	
	Accessibility: Kauppa-asiointi		Accompanying aid for hobbies and things like shopping, doctor, club activities, excursions, agencies, etc.	

Table 32 - Hoiva- ja Talkkaripalvelut Rajaveräjä – Finish Organisation/Service Provider

JaruKo Oy – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
JaruKo Oy	Finland		OyJaruKo	www.jaruko.fi
Offered Services				
Service Code	Service Name + Goal		Description	
	Activities: Saatto- ja asiointiapu harrasteisiin, Escorting to outside activities and hobbies		Saatto- ja asiointiapua tarvitsevat henkilöt, People who need help with going out (walking, culture, some hobby)	

Table 33 - JaruKo Oy – Finish Organisation/Service Provider

Apukolmio oy– Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Apukolmio oy	Tampere, Finland		Apukolmio Oy - Vireät Kotipalvelut	www.apukolmio.fi
Offered Services				
Service Code	Service Name + Goal		Description	
	Digitalisation: Digilaitteiden asennus, Installing digital devices		An elderly person can use digital devices once they have been installed in their home, e.g. smartphone, computer, television, security systems etc.	

Table 34 - Apukolmio oy– Finish Organisation/Service Provider

Menumat Oy – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Menumat Oy	Tampere, Orivesi, Finland			
Offered Services				
Service Code	Service Name + Goal		Description	
	Food: Ateriapalvelut: Aterioiden kuljetuspalvelut, ruuan valmistus kotona. Food delivery, preparing food at home.		An elderly person can get ready-made meals or groceries delivered at home, which he or she prepares with an assistant.	

Table 35 - Menumat Oy – Finish Organisation/Service Provider

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Lääkärikeskus Medical – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
Lääkärikeskus Medical	Tampere, Orivesi, Finland			www.laakarikeskusmedical.fi
Offered Services				
Service Code	Service Name + Goal		Description	
	Health:Terveyteen liittyviä palveluita		If necessary, a nurse, doctor or therapist may visit the home of a self-paying elderly person, for example wound care, sampling, rehabilitation, health or drug monitoring.	

Table 36 - Lääkärikeskus Medical – Finish Organisation/Service Provider

ATK Seniorit Mukanetti ry – Finish Organisation/Service Provider				
Organisation	Territorial Scope	Twitter	Facebook	Website
ATK Seniorit Mukanetti ry	Tampere, Finland			http://www.mukanetti.net/
Offered Services				
Service Code	Service Name + Goal		Description	
	Communication: Digiohjaus		Mukanetti is an association that provides senior citizens with basic skills in using computers, tablets, and mobile phones by providing training and guidance at various helpdesks. Come and see how we can guide you. We're here to help! Guidance provided by peer instructors at all of our guidance points is free and does not require membership of the association.	

Table 37 - ATK Seniorit Mukanetti ry – Finish Organisation/Service Provider

2.4 Research and Statistical Data

This section provides an overview to what has been imported to the KB in terms of Research and Statistical Data. In detail we have followed the similar categorisation and filtering technique with the Organisations/Services Data Sources that was previously described.

All Research and Statistical Data that led to dead links or HTML pages that must be parsed with specialized HTML scrappers were filtered out.

All imported Research and Statistical Data within the KB are presented in *Appendix 6.1 - Research and Statistical Data*.

2.5 Linked Open Data

The focus of the LOD that has been already ingested into the KB has been to discover new links between the different data sources and entities in the KB. In

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particular, the imported LOD aimed to expand the information in the KB in two directions:

- Linguistic data: retrieving synonyms and translations of themes, keywords, topics, etc. in the KB. This allows us to retrieve broader recommendations that are not explicitly linked to a particular keyword or topic.
- Location data: retrieving information about the locations of the services, organisations, etc. of the platform. This information includes data such as country, population and area and helps us compare services implemented in different locations with similar characteristics.

The LOD sources consulted to retrieve this information are summarized in Appendix 6.2. In the future, more data sources can be added in order to implement a full-fledged LOD crawling process that will retrieve additional related information into the KB.

2.6 Potential Future Enhancements

2.6.1 Additional Data Sources

SoCaTel KB is an entity that continuously evolves. We envision incorporating additional open or closed data sources to enrich the available organizations and services as well as the addition of new ones.

Moreover, new data could be potentially generated by the platform itself and used to improve recommendations. For instance, analytics derived from user behaviours are valuable to moderators and admins of the platform. With many discussions taking place in parallel in multiple co-creation groups, automatic smart notifications to alert a moderator that a discussion is stale or needs to move to a new phase could be a helpful indication. Furthermore, additional dynamic analysis of user behaviours could allow the moderator to proactively address a trend instead of reacting to an issue.

2.6.1.1 Open Data Sources

Open data are a constant source of new information, as they are being rapidly published every day. Table 38 lists a sample of additional open data sources that could be imported in the SoCaTel KB. This sample consists of resource aggregation datasets for France. This sample could be potentially used to improve recommendations provided to end users and/or to present information for multiple countries. For instance, these data can be referenced in the ideation phase of co-creation groups to:

- Understand public spending on specific health sub-sectors.

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- Find and enlist professionals that would help create a new service, within a municipality/district.
- Discover whether a country imports necessary medicines that will be handed out in newly created services.

Source	Name	Description	URL
Open platform of French public data	Public Drug Database (official database)	Data and reference documents on medicines marketed or having been marketed during the last two years in France.	https://www.data.gouv.fr/fr/datasets/base-de-donnees-publique-des-medicaments-base-officielle/
	List of health and social institutions	Information on health, social, medico-social, and vocational training institutions in these sectors registered with the "Fichier national des établissements sanitaires et sociaux" in France.	https://www.data.gouv.fr/fr/datasets/finess-extraction-du-fichier-des-etablissements/#_
	Dates and places of blood donations	Location and schedules of blood donation collections.	https://www.data.gouv.fr/fr/datasets/dates-et-lieux-des-collectes-de-don-du-sang/
	Health Directory	Contact details of health professionals practicing on a liberal basis and those of the care establishments, as well as the acts practiced.	https://www.data.gouv.fr/fr/datasets/annuaire-sante-de-la-cnam/
	Financing of healthcare expenditure by Social Security	Cover by the Social Security of the various use of care and medical goods	https://www.data.gouv.fr/fr/datasets/financement-de-la-depense-de-soins-par-la-securite-sociale/#_
	Medicines reimbursed by Public Health Insurance	Information on drugs reimbursed by all health insurance plans is presented annually for the years 2012 to 2014 and monthly since the year 2015.	https://www.data.gouv.fr/fr/datasets/medicaments-rembourses-par-lassurance-maladie/
	Geolocated address database	Daily extract and update files of all OpenStreetMap data on metropolitan France.	https://www.data.gouv.fr/fr/datasets/donnees-openstreetmap-integrales-de-france-metropolitaine/
	Diagnosis of access means and time to urgent care by municipality	-	https://www.data.gouv.fr/fr/datasets/diagnostic-dacces-aux-soins-urgents-par-commune/

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	Database of public facilities	The permanent equipment base (BPE) is a statistical source that provides the level of equipment and services provided to the population in a territory.	https://www.data.gouv.fr/fr/datasets/base-permanente-des-equipements-1/#_
	SIRENE database of companies and their establishments (SIREN, SIRET)	Database of all companies and associations geolocated	https://www.data.gouv.fr/fr/datasets/base-sirene-des-entreprises-et-de-leurs-etablissements-siren-siret/
Geoservices IGN	GeoPortal of geographical data	Georeferenced and immediately usable geographical data to know the territory, locate information and update other databases.	https://geoservices.ign.fr/
Meteo France	Weather forecast data	-	https://donneespubliques.meteofrance.fr/

Table 38 - Example of Additional Open Data Sources

2.6.1.2 Community Generated Content

The immediate SoCaTel community can be described by co-creation group participators. It is expected for a group to create new content, in their search of improving local delivery of care, and it is imperative that our platform can digest this in improving service discovery. To guide automatic compilation of new insights into datasets and populating them to the KB, a series of templates can be released to streamline the harvesting process. Apart from custom-made datasets that co-creation groups might release, established, local service providers can be encouraged to register their social media and services. This will organically grow our KB, as it adheres to our data harvesting methodologies.

Open data providers such as CORE[2] are candidates to approach in enlarging our community pool. Direct partnership with such entities can aid in mutual improvement of each other's platforms. CORE delivers Open Access publications in journals and institutional repositories in a machine-readable format down to their raw format. These publications span a variety of fields and cover a wide range of descriptive information [5]. By developing further relationship with such a partner, we can provide to co-creation groups:

- Recommendations of open access publications relevant to the group's topic
- Contact details of researchers and experts on specific topics

[2] https://core.ac.uk/

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- Information on Commercial/governmental partners collaborating with academia

For the dissemination of ideas and new services established through co-creation groups, the project would benefit from partners such as DialogHealth[3]. Dialog Health developed an outstanding knowledge on Health and Social Care Systems around the world. They combine it with organizational expertise to create turnkey study tours for international healthcare professionals. In elderly care, their activity has led to multiple studies that exposed the variety, technologies and best practices surrounding services in the sector. A potential collaboration will allow co-creation groups to educate up-and-coming professionals in newly developed/under development healthcare services in their sub-fields of interest. Consequently, both networks can grow in tandem, to foster innovation in an international level.

2.6.2 ADDITIONAL DATA PROCESSING TECHNIQUES

In this section, we outline unvisited techniques that could be potentially adopted to derive additional insights from existing or new data sources, thus impacting the functionality of the platform from both technical and business perspectives. The techniques and data sources discussed here can either stem from independent, un-utilised datasets or from datasets derived from existing data sources, through data processing techniques not previously visited.

2.6.2.1 Latent Topic Extraction Improvements

In D4.3, the concept of latent topic extraction was introduced, utilised towards metadata enhancement of the platform content. There is future opportunity to further explore topic extraction, with similar and potentially more advanced methodologies. The benefits lie not only in maximising topic modelling accuracies, but also in discovering topics not previously considered that can lead to discovery of new data sources. Ensemble learning strategies pose the most valid direction and are discussed in this section.

Authors in [6] examine the drawbacks of relying on the stochastic element that characterises standard methodologies, such as the Latent Semantic Indexing (LSI) previously visited. Alleviating from this, ensemble modelling combines a set of “base” topic models to produce a single model. The general idea in achieving

[3] https://www.dialog-health.com/services

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this can be described by a two-step process. Firstly, a diverse set of base topic models is generated to yield a series of topic vectors. Secondly a secondary model is trained on the combined vectors, to capture the variance between the base topic models. The resulting matrix holds weights for all terms of each generated base model topics.

Ensemble modelling comes with implementation and execution hindrances. Computational expenses accompanying its optimisation phase, due to local minima pitfalls that might persist in base models, make this venture preventive in limited data volume scenarios. However, it could be examined relatively quick since the PredictionIO [4] framework upon which the SoCaTel Recommender System is built can support the implementation through a customised algorithm template. Similar ensemble model implementations in PredictionIO can help guide the incorporation process of its variants.

2.6.2.2 Artificial Intelligence

The KB stores and delivers rich textual content, entailing user interactions and topic exploration through co-creation groups. Co-creation group discussions generate massive amounts of textual content, often difficult to parse through for new-comers or users that have been inactive for some time in the group. As recommendation engine is an important platform's component, we could examine whether Artificial Intelligence techniques can help these users save time from going through all the new content by providing a summary. Specifically, adopting neural summarization solutions could help in providing explainable co-creation group recommendations to users.

Summarising content spanning thousands of posts, from which part of can be irrelevant to the original group's subject, is cumbersome. In combatting this, query-based summarisation is a method that can be re-purposed for the SoCaTel platform. The study in [7] introduces the query-based summarisation approach. Their addressed problem lies with thread summarisation, given a query term. Using said query term, they can select the most relevant posts from the thread, concatenate them to form a shorter version of the document and then summarise it. Considering our case, the query terms can utilise profile metadata to target specific group content before attempting summarisation. Presenting the summary to the user whose metadata we used to compile this, will give them more

[4] http://predictionio.apache.org/

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confidence in participating in a co-creation group. This can be especially interesting to users, as it can appeal to them in written language, giving them valuable insight into the current state of the group's discussion. Over time, this methodology will compile a new data source, linking queries and groups with a time-evolving textual description, which can be used in learning text representations (for both academic and commercial use). Despite the apparent potential, developing and implementing such a solution will require significant computational power and considerable amounts of relevant training data (due to domain adaptation difficulties [8]) to name the least.

2.6.3 TOWARDS REUSABILITY OF THE SOCATEL PLATFORM

The final remark that we address here envisions the SoCaTel platform in content plug-and-play scenarios. Service discovery as a use case can be repurposed in many contexts, which encourages reuse of the platform in various thematic settings, as a future business direction. The key lies in stimulating interest to external parties throughout a community, in communities of any size or type. This is imperative to establish constructive dialogue and foster ideas, evaluated at a highly professional level, hence our strong belief of pursuing a future roll-out in other domains.

Given the incorporation of appropriate data sources, SoCaTel platform could be adopted as an example in the provision of charity services. Specifically, most citizens able to contribute to charity services do not have direct exposure of how to do so. Citizens lack information and directions on these as resources are scattered online, thus making aggregation and dissemination cumbersome. Discovery of existing services, through the developed harvesting process developed, and the idea of co-creation groups to nurture ideas around existing and absent services can be of great use.

City planning and development is another example. Governments and/or public services could utilise SoCaTel platform to better integrate citizens, developers and development agencies from planning to project completion stage; i.e. facilitate the development of new services though co-creation groups and relevant services discovery.

From a technical point of view, we summarise key takeaways as follows: (a) ensemble modelling is a practical extension to base latent topic extraction techniques currently in place; (b) by providing further insights to users behind

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recommendation listings through neural summarisation, we could increase user confidence in following our suggestions.

From a business point of view, the proposed technical directions still feature open-source data sources and solutions, thus minimizing the financial requirements. Added benefits include minimisation of time spent by technical experts to improve potentially poor recommendation quality. The ensemble modelling approach, especially, is applicable for a wide range of usage scenarios. Thus, it can act as a regularisation layer to reduce output instability, inherent in most machine learning settings. Evidently, ensemble models have been the highlight of Kaggle [5] competitions, often deciding the winner among many elaborate machine learning solutions. Additionally, new collaborations with partners that can provide rich content during co-creation group activity, such as CORE, or partners that can exponentially grow our professional network and stakeholder participation, such as DialogHealth, will considerably boost SoCaTel's service discovery potential. Finally, repurposing our platform for alternative public services is a possible route architectural wise.

[5] https://www.kaggle.com/

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3 UNIFIED SEMANTIC DATA MODEL

This section presents the final semantic data model that was altered throughout the entire project development cycle. A detailed explanation is given on how it was changed to accommodate new introduced requirements. Additional models that were necessary to refined and completed are also presented in this chapter. Lastly, there is a dedicated subsection that outlines the final social care and welfare data model that will be published in open data and that will constitute as a major contribution to the semantic web community.

At the heart of the SoCaTel KB lies the unified semantic data model that is used to integrate data coming from all the identified and classified external sources. The objective of this semantic data model, implemented in the form of an OWL ontology, is to homogenize the models of the external sources, making it easier and more efficient to utilize the information they contain by other modules of the KB.

In deliverables D4.1 and D4.3, the detailed design of the unified data model was presented. At that point, the focus of the model was on the integration of the data coming from the external data sources, and thus the central concept in the model was *socatel:ExternalSource*, which was then specialized into different types of sources (e.g. open data source, social media source, etc.). While each specialized type of the concept had its own attribute to represent its data, this concept centralized all the information relevant to the KB modules about the different types of sources, such as the language, themes and location of the source.

This in turn allowed for the exploitation of the external sources in a more straightforward manner, independently of the type of source. For instance, the data analytics and recommendation engines can retrieve social media posts, open data sets, and research and statistical data related to a specific topic using a single algorithm or mechanism, instead of having to include three different implementations for each type of source separately.

Since then, this unified semantic data model has been extended to include data generated from the platform, as well as the data incoming from external data sources. The motivation behind this extension was to expand the scope of data integrated in the semantic model to include platform-generated data, such as information about registered organisation and the services they offer, or registered users, their interests and the co-creation group of which they are members.

Representing the platform data in the same semantic model as the data coming from external sources also allows us to discover hidden links between the two

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types of data, which can be then exploited by the different modules of the KB. Furthermore, given that the platform data needs to be transformed into semantic format, the same type of enrichment applied to external sources can be applied to this data through the transformation pipelines. This enrichment includes, for instance, discovering synonyms of themes / topics / keywords coming from the platform, or automatically retrieving additional information about the location of an organisation / service / user.

In order to accommodate this additional platform-generated data, the unified semantic model (i.e. the SoCaTel ontology) was revised and extended. *Figure 1 - Revised SoCaTel Semantic Data Model* below shows the new revised version of the SoCaTel ontology. The main changes that were done in comparison to the model presented in D4.3 can be summarized as follows:

- The central concept *socatel:ExternalSource* was renamed to *socatel:Source*, in order to indicate the fact that not all of the data in the KB is coming from external sources.
- Several sub-concepts of *socatel:Source* were created, each representing different data types incoming from the platform:
  - *socatel:User* to represent users of the platform,
  - *socatel:Group* to represent co-creation groups of the platform,
  - *socatel:Organisation* to represent organisations registered on the platform,
  - *socatel:Service* to represent services offered by the registered organisations.
- These new sub-concepts were also link to each other hrough new relations:
  - *socatel:memberOf* links a user to the groups of which he / she is a member,
  - *socatel:implements* links an organisation to the services that it implements.

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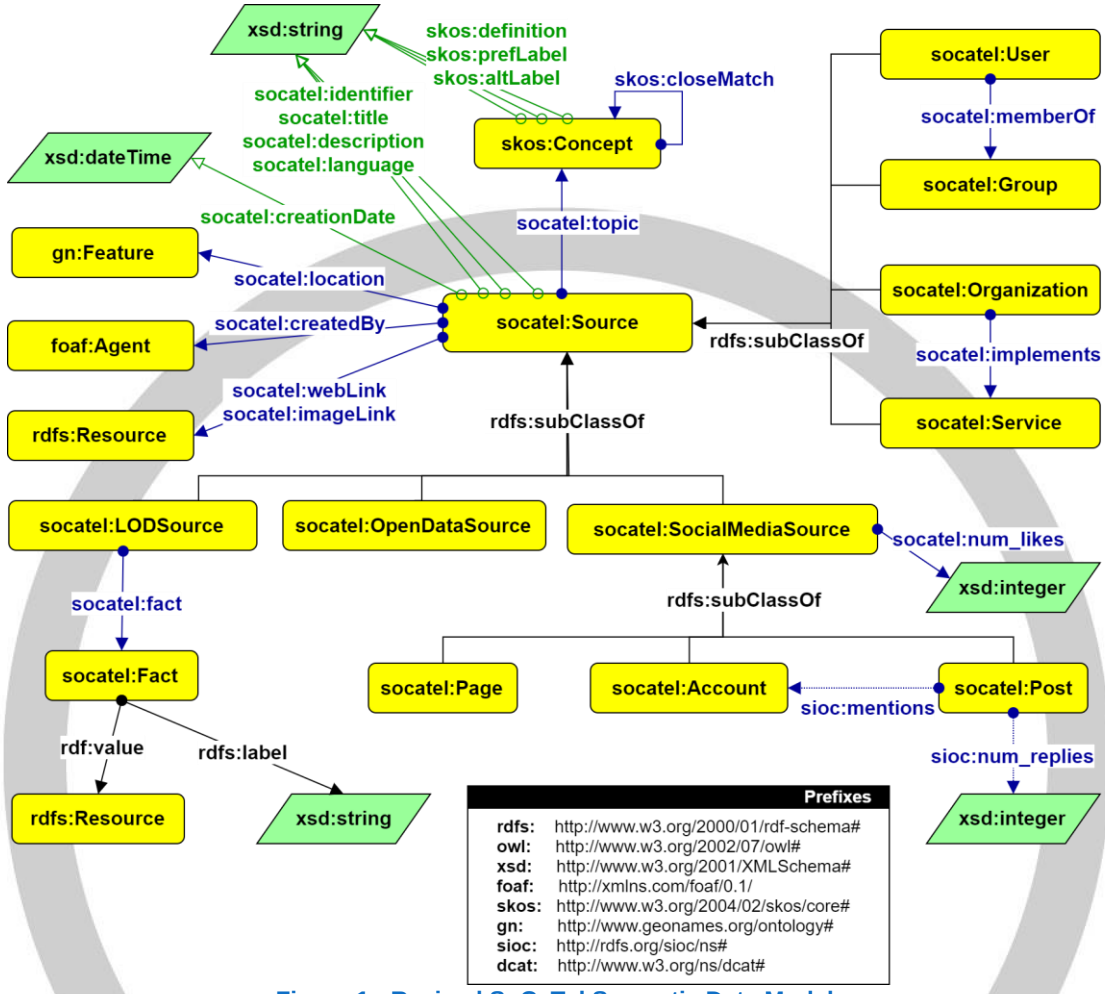

Figure 1 - Revised SoCaTel Semantic Data Model

Once the platform-generated data is represented using this unified semantic model, it can be used to generate analytics and recommendations side-by-side with data from external sources. For instance, aside from social media posts and open data sets, the recommendation engine can now recommend co-creation groups and services related to a particular topic. This opens the door for a whole new class of recommendations based on platform data, where the KB can even generate suggestions to users of other users that have similar interests or have interacted with similar co-creation groups.

Evidently, including this platform-generated data into the semantic data model of the KB requires us to make the corresponding modifications to the semantic pre-processing layer, which oversees transforming the incoming data into a semantic format. Thus, each new type of source from the platform (e.g. user, organisation, etc.) will have its corresponding semantic transformation pipeline, which will be responsible for transforming the data into semantic format, as well as enriching the data using the LOD Handler. These new pipelines have been implemented

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using the same technologies as the rest of the semantic pre-processing layer, as discussed in detail in deliverable D3.4.

Note that this new unified data model is solely used by the KB and is meant to complement (and not replace) the platform's operational repository, which remains as the main data repository of the portal-side of the platform.

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4 CONCLUSIONS

The present document is a technical deliverable of the SoCaTel project (D4.6) concluding the WP4 work for the design and development of the SoCaTel Software Platform.

The document focuses on the Data Sources selection methodology and the final list of data sources included in the SoCaTel's KB. It also outlines several additional data sources and software techniques that could be potentially adopted to improve the overall performance and reliability of the platform and its reusability in other domains and sites. Moreover, certain challenges faced during the data sources selection procedure are presented. Specifically, the challenges identified are: (a) finite amount of data can be retrieved since social networks are limiting the daily number of requests for data retrieval; (b) available tools do not easily handle content in "internet language"; (c) lack of standardized protocols to publish available services makes the gathering process difficult and time consuming; and (d) service-care related services and organizations show limited presence in social media.

Lastly, we present the Final Semantic Data Models developed under WP4. As a major contribution to the semantic web community, these Data Models will be made publicly available in open data portals.

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6 APPENDICES

6.1 RESEARCH AND STATISTICAL DATA

Imported Research and Statistical Data					
Source ID	**Dataset Name**	**Data Source**	**Added Value**	**File Format**	**Licence**
IE-S1	Registered Pharmacies per county and Dublin area	Ireland's Open Data portal	Identification of potential gaps in the area coverage and opportunities to use local pharmacies as part of innovative services	PDF	Creative Commons Attribution 4.0
IE-S2	CD801 - Persons with a Disability as a Percentage of All Population by Age Group, CensusYear, Statistic and Sex	Ireland's Open Data portal	Population per age group, sex, and variations from previous census years can indicate potential trends towards aging that can motivate the establishment of a specific service.	json-stat/CSV	Creative Commons Attribution 4.0
IE-S3	CD817 - Population Aged 15 Years and Over with a Disability (Number) by Social Class, Age at which Full Time Education Ceased, CensusYear and Sex	Ireland's Open Data portal	Population with a disability by social class, age and education, and variations from previous census years can indicate potential traits towards which population is affected by disability and can help focus the reach of a given service.	json-stat/CSV	Creative Commons Attribution 4.0

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IE-S4	CD868 - Carers Usually Resident and Present in the State (Number) by Religion, Regular Unpaid Help, CensusYear and Sex	Ireland's Open Data portal	Population of carers by number of unpaid hours completed per week, useful to inform the number of carers in the area and the amount of help being provided overall, valuable to justify the need for better services to assist or replace the carers.	json-stat/CSV	Creative Commons Attribution 4.0
IE-S5	CD864 - Carers in Private Households in Permanent Housing Units (Number) by Computer and Internet Access, CensusYear and Age Group	Ireland's Open Data portal	Population of carers by age group and by level of free access to computing equipment, useful to inform the number of carers in the area and their ability to use a digital system or application to enhance their situation or service they provide to the elderly.	json-stat/CSV	Creative Commons Attribution 4.0
IE-S6	CD884 - Population (Number) by General Health, Social Class, CensusYear, Sex and Age Group	Ireland's Open Data portal	Population by age group and quality of health, useful to assess the overall state of the population and those really affected by chronic illnesses.	json-stat/CSV	Creative Commons Attribution 4.0

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IE-S7	Disability, Carers and Voluntary Activities	Ireland's Open Data portal	The number of persons with disabilities and their carers in communal establishments or private houses, classified by sex, age group, single year of age, marital status, type of disability, number of disability types, region and other geographic areas, principal economic status, socio economic group, social class, employment status, occupational group, nature of occupancy, nationality, birthplace, age when fulltime education ceased, level of education and qualifications, means of travel to work, school or college, status in family nucleus.	TSV/GeoSpatial	Creative Commons Attribution 4.0
IE-S8	Tips for healthy living	HSE	Common health issues for old and young, and some useful tips to help keep on the go.	Text	
IE-S9	Information for carers and relatives	HSE	Information for carers and relatives, such as supports and training for carers, carers allowance, community welfare services.	Text	
SP-S3	People with disabilities and care needs. Working with people with disabilities	INE – *Instituto Nacional de Estadística* (National Institute for Statistics)	Identification of people with disabilities and care needs.	JSON	Creative Commons Attribution 4.0

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SP-S5	Catalonia Health Survey (2011-2016)	Department of Health - (Catalan Regional Government)	Information about health status, lifestyles and health services use	PDF	Creative Commons Attribution 3.0
HU-S1	Survey about general practitioners and elderly care	Semmelweis University, Faculty of Public Health, Institute of Mental Health, Budapest	Research about long-term care systems, their sustainability, and the difficulties of aging societies.	PDF	
HU-S2	Central Statistics Office / Központi Statisztikai Hivatal	Population by age group	Data on the number of Hungarian populations by age groups	XLS	
HU-S3	Yearbook of Welfare Statistics	Central Statistics Office / Központi Statisztikai Hivatal	· Age distribution of persons in care · Assistance for people over 65 years of age · Distribution of social homes	PDF	
FI-S1	Public health centres in Tampere	City of Tampere's open data portal	Identification of potential gaps in the coverage of ageing population with public health centres	CSV, WFS, GeoJSON, ShapeFile	Creative Commons Attribution 4.0

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FI-S2	Statistics on elderly care and a comparison between the six largest cities	City of Tampere's open data portal	Identification whether Tampere represents the general situation in Finland in respect to the ageing population	XLS	Creative Commons Attribution 4.0
FI-S3	Statistical information on welfare and health in Finland	Sotkanet	Over 2000 indicators on health, welfare and functioning of the service-system in Finland. Also, a lot of international comparisons are available.	REST	Creative Commons Attribution 4.0

Table 39 - Imported Research and Statistical Data

6.2 LINKED OPEN DATA SOURCES

Imported and Planned Linked Open Data Sources				
ID	**Name**	**URL**	**SPARQL Endpoint**	**Description**
LOD-1	FactForge	http://factforge.net/	http://factforge.net/repositories/ff-news	FactForge.net is a knowledge graph of Linked Open Data (LOD) and news articles about people, organizations and locations. It includes more than 1 billion facts from popular datasets such as DBpedia, Geonames, Wordnet, the Panama Papers, etc., as well as ontologies such as the Financial Industry Business Ontology (FIBO). FactForge serves as a convenient RDF repository, tuned for efficient querying of several central LOD datasets. Some aspects of these datasets have been cleaned up and complemented to allow for more efficient use,

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LOD-2	WordNet	https://wordnet.princeton.edu/	-	WordNet® is a large lexical database of English. Nouns, verbs, adjectives and adverbs are grouped into sets of cognitive synonyms (synsets), each expressing a distinct concept. Synsets are interlinked by means of conceptual-semantic and lexical relations. The resulting network of meaningfully related words and concepts can be navigated with the browser. WordNet is also freely and publicly available for download. WordNet's structure makes it a useful tool for computational linguistics and natural language processing.
LOD-3	DBpedia	https://wiki.dbpedia.org	http://dbpedia.org/sparql	DBpedia is a project aiming to extract structured content from the information created in the Wikipedia project. This information is made available on the Web. DBpedia allows users to semantically query relationships and properties of Wikipedia resources, including links to other related datasets. Tim Berners-Lee described DBpedia as one of the most important parts of the decentralized Linked Data effort.
LOD-4	Wikidata	https://www.wikidata.org/wiki/Wikidata:Main_Page	https://query.wikidata.org/	Wikidata is a free and open knowledge base that can be read and edited by both humans and machines. Wikidata acts as central storage for the structured data of its Wikimedia sister projects including Wikipedia, Wikivoyage, Wiktionary, Wikisource, and others. Wikidata also provides support to many other sites and services beyond just Wikimedia projects! The content of Wikidata is available under a free license, exported using standard formats, and can be interlinked to other open data sets on the linked data web.

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LOD-5	Google Knowledge Graph	https://developers.google.com/knowledge-graph	https://developers.google.com/knowledge-graph	The Knowledge Graph has millions of entries that describe real-world entities like people, places, and things. These entities form the nodes of the graph. The graph is created by Google in order to improve their search engine and is commonly used to return results to users of the engine, particularly when the results
LOD-6	WorldBank	https://data.worldbank.org/	https://datacatalog.worldbank.org/	WorldBank provides a list of datasets that contains several world developments indicators, financial data and projects. For example, they provide data about the efficiency of public spending in Education, health and infrastructure.
LOD-7	EuroStat	https://ec.europa.eu/eurostat/data/database	http://data.europa.eu/euodp/en/linked-data	EuroStat is the data portal of the European Commission that provides the statistical data for most of the domains (economy, population, transport, energy, science, etc.). Some data are available through the Open Data Portal and other datasets are downloadable in semantic format (SDMX).

Table 40 - Imported Linked Open Data Sources

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