



Collaborative Project

GeoKnow - Making the Web an Exploratory Place for Geospatial Knowledge

Project Number: 318159

Start Date of Project: 2012/12/01

Duration: 36 months

Deliverable 7.2.1 Exploitation Plan

Dissemination Level	Public
Due Date of Deliverable	M12, 30/11/2013
Actual Submission Date	M12, 29/11/2013
Work Package	WP7
Task	T7.2
Type	Report
Approval Status	Approved
Version	1.0
Number of Pages	28
Filename	D7.2.1_Exploitation_plan.pdf

Abstract: This report provides a detailed description of exploitable results of the GeoKnow project and activities of all partners for their continuous promotion and valorisation beyond the runtime of the project. The analysis of two surveys confirms importance and timeliness of GeoKnow objectives and provides additional input on possible distribution channels.

The information in this document reflects only the author's views and the European Community is not liable for any use that may be made of the information contained therein. The information in this document is provided "as is" without guarantee or warranty of any kind, express or implied, including but not limited to the fitness of the information for a particular purpose. The user thereof uses the information at his/her sole risk and liability.



Project funded by the European Commission within the Seventh Framework Programme (2007 - 2013)

History

Version	Date	Reason	Revised by
0.1	12/11/2013	Initial structure of this deliverable	Christiane Lemke
0.11	15/11/2013	Revised statement for Athena	Spiros Athanasiou
0.2	16/11/2013	Added list of exploitable results	Christiane Lemke
0.21	17/11/2013	Revised statement for InfAI	Jens Lehmann
0.22	17/11/2013	Revised statement for OpenLink	Hugh Williams
0.3	17/11/2013	Added survey analysis and introduction	Christiane Lemke
0.8	18/11/2013	Added summaries and future work	Christiane Lemke
0.81	19/11/2013	Revised statement for Brox	Robert Isele
0.82	19/11/2013	Revised statement for IMP	Valentina Janev
0.9	19/11/2013	Proofread and ready for review	Andreas Both
0.95	20/11/2013	Peer-Review	Daniel Hladky
0.99	27/11/2013	Integrated Review Comments	Christiane Lemke
1.0	28/11/2013	Final version	Christiane Lemke

Author List

Organization	Name	Contact Information
Unister	Christiane Lemke	christiane.lemke@unister.de
Unister	Andreas Both	andreas.both@unister.de

Executive Summary¹

The GeoKnow exploitation plan serves as a concept for the promotion and valorisation of the knowledge, services, components and technologies developed in the scope of this project. It provides a description of general exploitable results and individual exploitation statements by the consortium members of the GeoKnow project. Although the majority of the software results will be available as open source, this document will point out aspects that have the potential to be licensed commercially.

Exploitation is recognised as the key enabler for the success of the project by all consortium members, hence all the partners are committed to the exploitation of the results. It is the principle of all exploitation activities to use research results for the internal development and support of new products and services wherever possible. These products and services will lead to a competitive advantage of the participating organisations and will substantially contribute to the benefit of the targeted users. The two use case scenarios of GeoKnow will serve as the validation point throughout the project.

¹Parts of this page also appeared in the GeoKnow proposal.

Table of Contents

1	Introduction	4
2	Surveys	5
2.1	S1: Requirements engineering survey	5
2.2	S2: Exploitation plan survey	5
2.3	Survey Distribution	6
2.4	Participants of the surveys	7
2.5	User scenarios	9
2.6	Desired delivery	13
2.7	Summary	14
3	Exploitable GeoKnow results	15
4	Exploitation statements of individual consortium partners	22
4.1	InfAI: Institute for Applied Computer Science, University of Leipzig	22
4.2	Athena: Institute for the Management of Information Systems, Greece	22
4.3	OpenLink Software Ltd., UK	23
4.3.1	Virtuoso Universal Server	23
4.3.2	Consultancy and Training	23
4.4	Ontos AG, Switzerland	24
4.4.1	GeoKnow generator Text Mining extension	24
4.4.2	OntoQUAD	24
4.5	Unister GmbH, Germany	24
4.5.1	A novel recommendation engine	25
4.5.2	Motive-based search	25
4.6	Brox-IT Solutions, Germany	25
4.7	IMP: Institute Mihailo Pupin, Serbia	25
4.7.1	Excellence building and Knowledge Transfer	26
4.7.2	Extended product range	26
4.8	Summary	26
5	Future work and road to the exploitation reports	28

1 Introduction

This report develops an exploitation plan for the GeoKnow project, aiming at maximising the achievements of the project in and beyond its runtime.

As described in the GeoKnow proposal, the integrated exploitation approach of the GeoKnow project will be supported by the following activities, some of which have already started:

- An initial market and research analysis of current state-of-the-art and practice with respect to geospatial knowledge integration as well as further monitoring of the market throughout the project. This has been started with the initial market and research overview provided in D2.1.1.
- Transferring research results into products and services of the application partners (Unister, Brox). This is an ongoing activity.
- Continuous analysis of transfer opportunities, flexible adjustment of the project if necessary for best possible outcome.
- Continuous evaluation of research results against user requirements.
- Continuous investigation of possible economic benefits and impact of research results.
- Individual exploitation plans of the consortium partners will serve as input to their product and solution management, enabling them to develop business cases for development decisions.

This exploitation plan is structured as follows: Based on recent surveys, objectives and intended distribution channels of the GeoKnow project are reinforced and updated in section 2. Section 3 will list and describe results that can be exploited including the intended target groups. Individual exploitation plans follow in section 4. The report finishes by an outlook on future exploitation and monitoring activities in section 5.

2 Surveys

In order to stay as close to our potential users' needs as possible, results of two questionnaires provided input to this report. They will be described in more detail in the following sections.

2.1 S1: Requirements engineering survey

The requirements engineering questionnaire, from here on referred to as S1, was originally designed for the initial common requirements specification. It consisted of 21 questions and was online for 25 days in April 2013. Of 122 partly incomplete results altogether, 39 were used to support the collection of functional and non-functional requirements in addition to the requirements given by the two commercial use cases in the GeoKnow project. However, the survey results also include other aspects that are relevant to the exploitation of the results, such as information about potential target groups, which will be used for this report. More details about the setup and questions of the survey are described in deliverable D1.1.1.

2.2 S2: Exploitation plan survey

The exploitation plan questionnaire, from here on referred to as S2, was designed specifically for this deliverable to help identifying market sectors and exploitable results. It was created using the same LimeSurvey software Q1 did and it was active on the GeoKnow server from 22nd of October to 18th of November 2013. Three amazon vouchers of 50 Euro each were offered in a prize draw for the participants. There were 41 complete answers and 52 incomplete ones.

Three groups of questions were presented to survey participants:

- "Information about your organisation": Three questions about the organisation or company of the user.
- "Data sets, stores and visualisation": Six questions identifying tools used for geospatial applications.
- "User scenarios": Four questions trying to describe the scenario geospatial data is used in.
- "Finalisation - prize draw": A simple text field optionally allowing to provide an email address for the prize draw.

These 14 questions are presented in Table 1.

Group	No.	Question	Type
G-1	Q1	Which type of organisation do you represent?	Single Choice
	Q2	Which domain does your organisation belong to?	Nominal, Multiple choice
	Q3	Please classify users of your geospatial applications.	Nominal, Multiple Choice
G-2	Q4	Which sources of geospatial data are you using?	Nominal, Multiple choice
	Q5	What are the major shortcomings of geospatial data sets you are using?	Nominal, Multiple choice
	Q6	Which stores do you use for working with geospatial data?	Nominal, Multiple choice
	Q7	Are there any others that you would like to use? What prevents you from using them?	Free text, Open
	Q8	Which visualisation tools do you use for geospatial data?	Nominal, Multiple Choice
	Q9	Are there any shortcomings in your visualisation tools? Which additional features would you welcome?	Free text, Open
G-3	Q10	How is spatial data used in your work?	Nominal, Multiple choice
	Q11	Do you plan to use data in other ways in the future? If yes, how?	Free text, Open
	Q12	Presuming you would be interested in acquiring help for your geospatial applications, how would you like to be supported?	Nominal, Multiple choice
	Q13	Regarding geospatial aspects, which of the following would benefit your work most?	Nominal, Multiple choice
G-4	Q14	If you would like to take part in the prize draw for a 50 Euro amazon voucher, please enter your email address below.	Free text, Open

Table 1: Survey questions by group

2.3 Survey Distribution

For the distribution of this survey we tried to target geospatial data users world wide using mailing lists and social networks depicted in Table 2. The selection of these channels aimed to target people that work with geospatial data in different specialised areas, but also within the semantic web community.

Channel	Detail
Mailing list	discuss@lists.osgeo.org public-lod@w3.org semantic-web@w3.org linked-geo-data@googlegroups.com
Forums	openstreetmap.org
Facebook	geoknow
LinkedIn Groups	geoknow
Twitter	@geoknow @SoerenAuer

Table 2: Survey distribution channels

2.4 Participants of the surveys

The first questions of both surveys tried to get a clearer picture about the participant answering the questions. Both of the surveys asked for information about the domain the participant works on. Outcomes of both surveys agree on the fact that the majority of responses came from the areas of information technology and academia, however, most of the other domains are represented as well. A domain that appeared twice in the free text “Other” field was “earth sciences”.

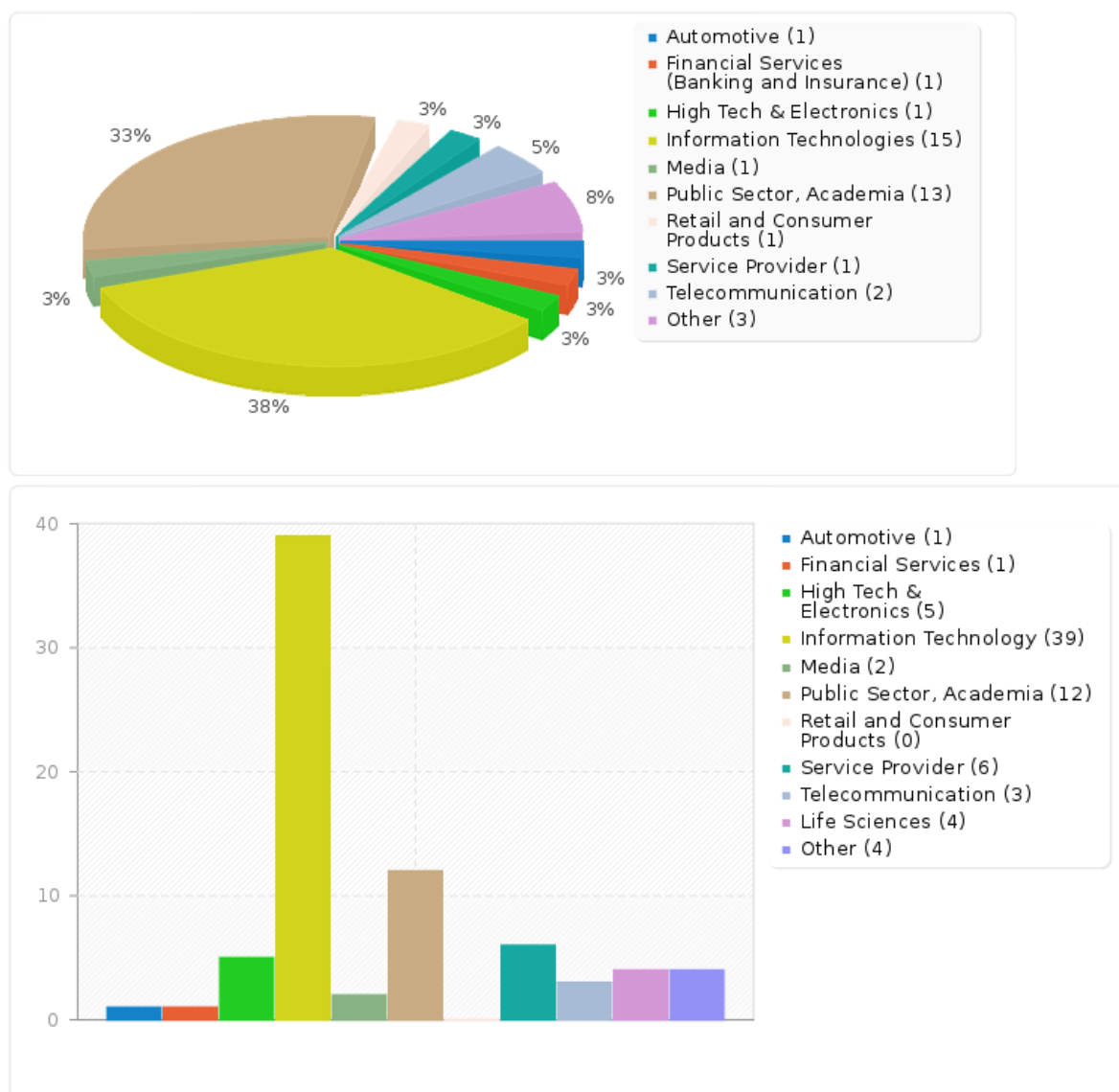


Figure 1: Domains participants work in, top: S1, bottom: S2

The question about the type of organisation the participants work in also shows that academic users filled out most of the questionnaires. B2B and B2C users are an equally strong group. In the free text field, there were three entries related to government, two entries stating “government” directly, another “B2B and B2G”.

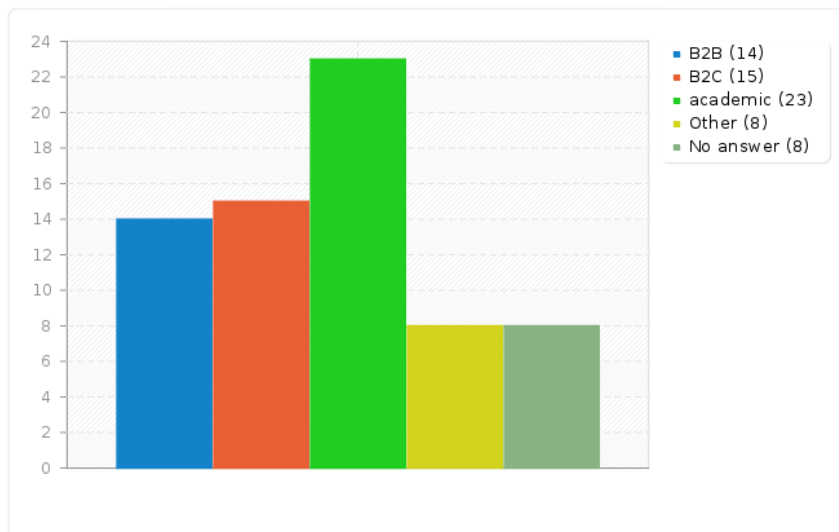


Figure 2: Type of organisation participants work in (S2)

For the question “please classify users of your geospatial application”, 3 options were given: (a) novice users (mass market), no specific market segment, (b) expert users (niche market) with specialised needs and characteristics, (c) diverse users in different segments. The answers show that all types of potential users need to be expected and accommodated for.

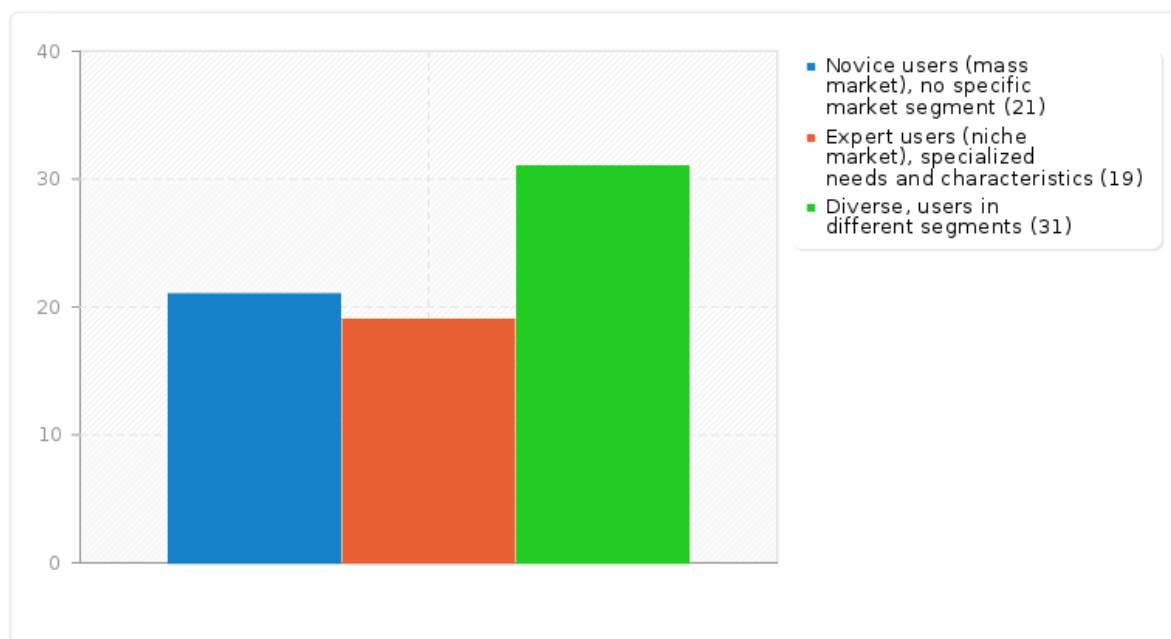


Figure 3: Users of geospatial applications (S2)

2.5 User scenarios

Three questions collect lists of tools and stores participants use. This will help identifying further communities for dissemination of exploitable results and possibly indicate which technologies/standards should be integrated as well. Following each of these questions, the possibility to enter which shortcomings are observed, which will give us an indication about which GeoKnow results would be welcomed most.

Q4 asked about sources of geospatial data in use. The free text answers revealed that our given multiple choice list was nowhere near extensive, additional sources mentioned include OpenHistoricalMap, NaturalEarthData, GeoCommons, ATKIS, DeCover, barbules.fr, fvl.fr, Panoramio, Foursquare, Google+, Google Maps, Facebook Places, Qype as well as more general answers like public governmental sources, customer's data, third sector and earth sciences data.

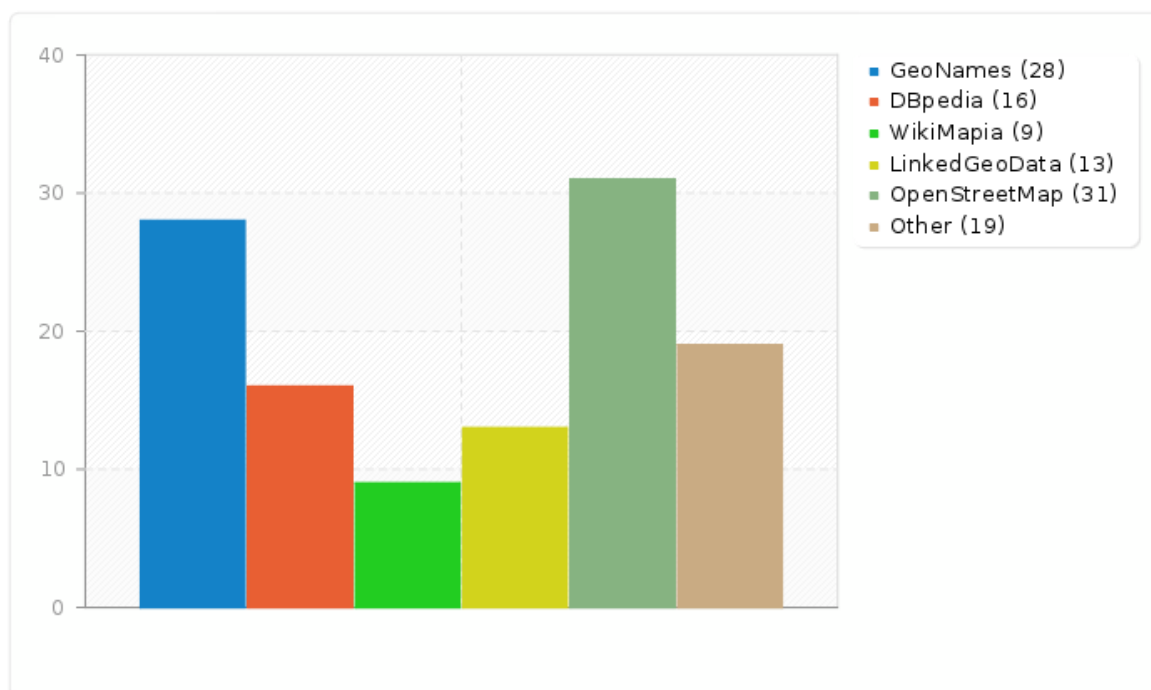


Figure 4: Data sources used (S2)

Regarding shortcomings of the data sources, all of the options we gave were almost equally an issue, with “erroneous data” and “missing resources” being the two most frequently chosen. Free text answers add missing or poor semantics, missing metadata and different projections. All of these issues are tackled within GeoKnow and will be picked up on in the list of exploitable results later in this report.

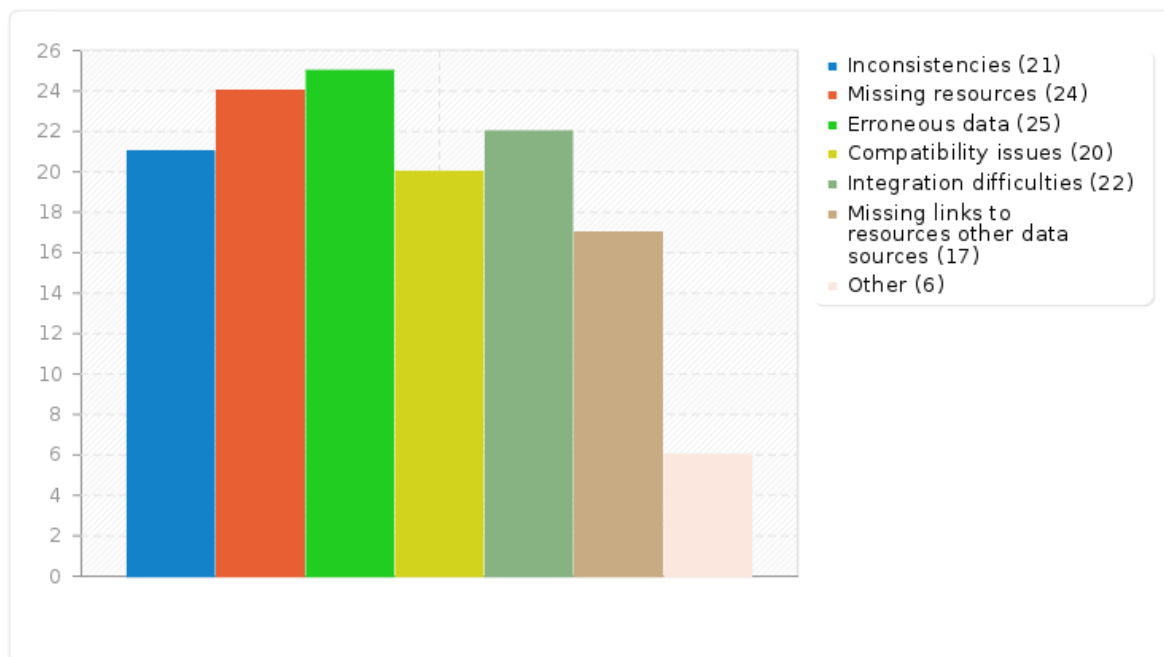


Figure 5: Shortcomings of data sources (S2)

Question Q6 asked about data stores used for working with geospatial data. Relational database systems are used most, with PostGIS being the most popular one, while Oracle was mentioned as well. Fulltext indexes with geospatial capabilities like ElasticSearch and Solr were ranked second. Fewer users clicked “Triple stores”, other solutions and hybrid solutions. Q7 followed in asking about stores that people would like to use but are not using yet, and what prevents them from it. In the free text field, users typed “lack of temporal data attached to them”, “triple stores, if they had more geospatial features” and “compatibility issues”. Again, all these aspects are addressed in the GeoKnow project.

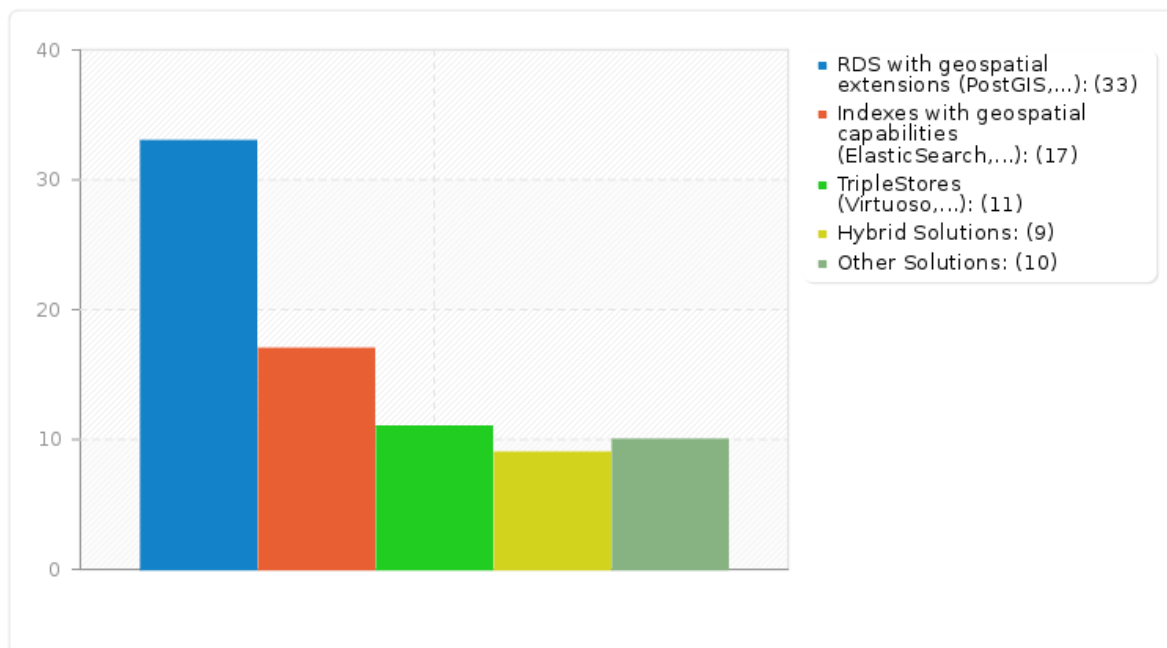


Figure 6: Data stores with geospatial capabilities (S2)

Question Q8 proceeded to ask for information on visualisation tools used for geospatial data. GoogleMaps and OpenStreetMap are among the most popular, new options provided in the free text field were OpenHistoricalMap, OpenJump, Desktop GIS, ArcGIS, QGIS, GRASS, GeoExt, Leaflet, Saga, neatline, sightsmap, geoportail and OpenLayers. Q9 then asked about features that would be welcome in existing visualisation tools. Things mentioned were the lack of a time slider for temporal data, better ease of use, provenance information on displayed data, visual spatial analysis and better performance for displaying many objects. With the enlargement of the GeoKnow consortium, a task was added dealing with spatiotemporal analysis was added. The GeoKnow visualisation component will address the other issues mentioned. While displaying provenance information of displayed data was not explicitly planned, it will be added to the features of one of the releases.

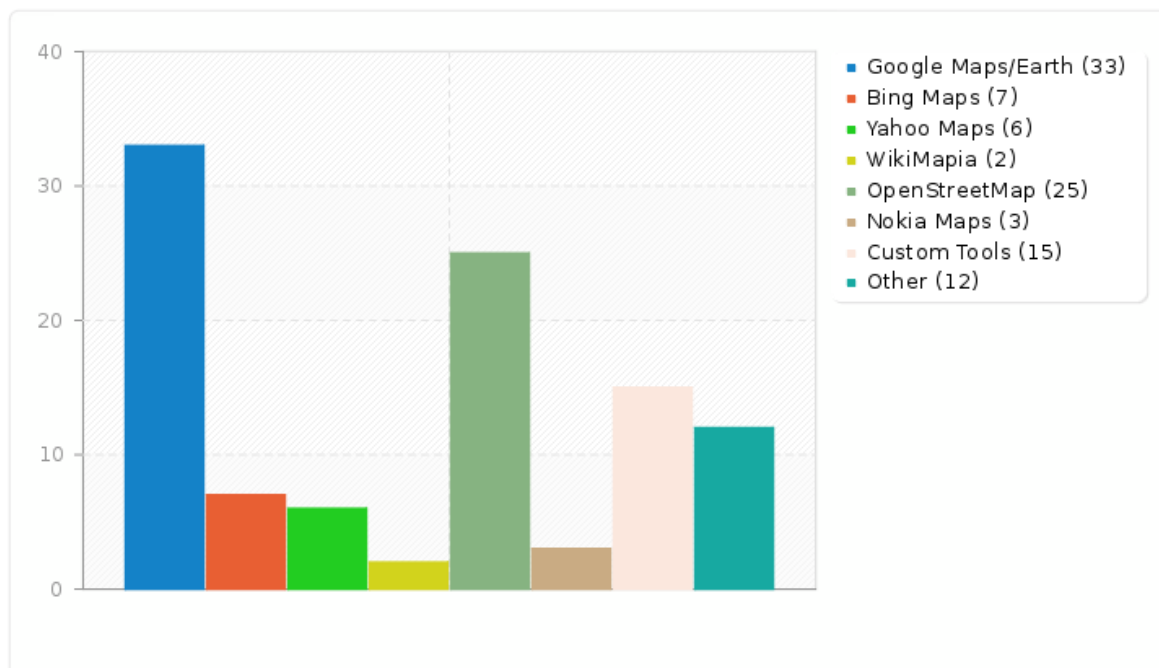


Figure 7: Visualisation tools (S2)

Q13 asked the user to state which of the provided aspects would help his or her business most. As high-level options, we provided four of the main outcomes of the GeoKnow project, including (a) a better free geospatial database, (b) a sound and consistent database of facts about geospatial entities, (c) triple stores with better geospatial capabilities and (d) better visualisation tools for geospatial data. A free text field was given as well, in case the appropriate answers were not provided. However, as opposed to free text fields to add options to other queries, this one was only used three times, so that one might assume that the given high-level options captured the user's needs well. Additional answers given were "improved GeoNames API", "help to build specialized solution to get online users contribution in geospatial web applications" and "Promotion of better concepts and tools for sharing geospatial data to integrate better, no additional silo please". The first wish will not be fulfilled by GeoKnow, however, integrating GeoNames data into GeoKnow Generators data set and using its functionality might provide the API improvement wished for. The second desired feature will be covered in the GeoKnow visualisation and authoring tool. Since GeoKnow will be a platform for integrating data from heterogeneous sources, the issue addressed in the third free text comment is one of the major benefits of the GeoKnow project.

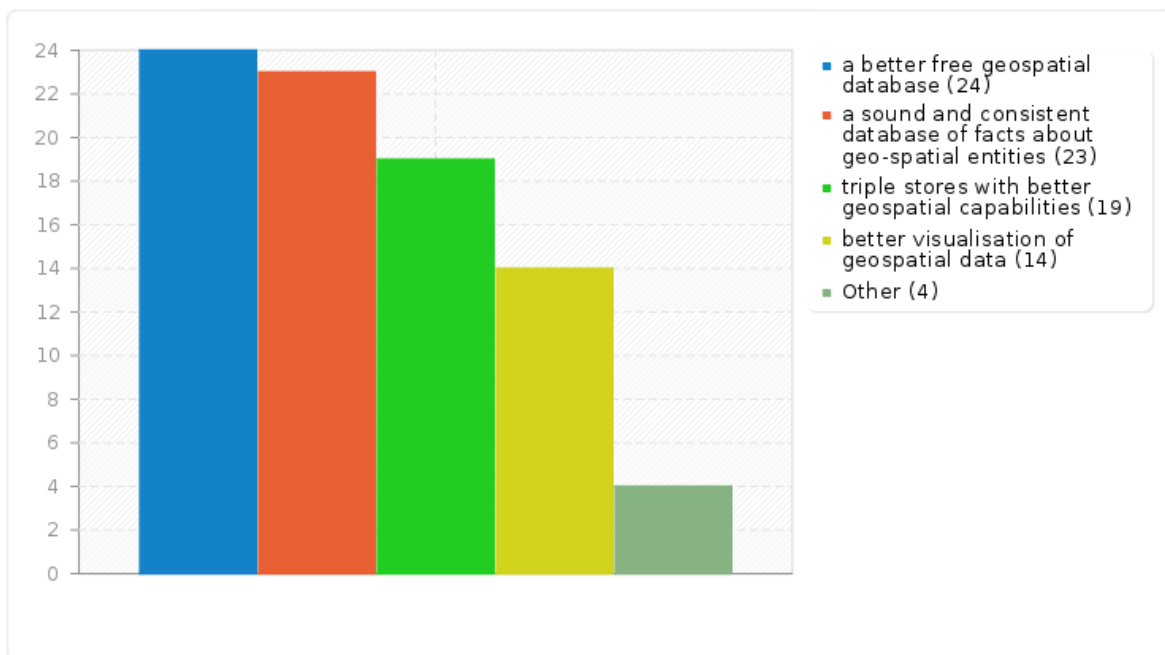


Figure 8: Welcomed features (S2)

2.6 Desired delivery

As one of the most important points in this survey, the user was asked “Presuming you would be interested in acquiring help for your geospatial applications, how would you like to be supported?”. Users seem to prefer to serve themselves using an online platform or an open source toolkit with the new functionality. They are equally happy to be part of an online community with a certain degree of interaction with other users. Contributing to the resulting product by, for example, integrating own data sets is the next popular option. Fewer participants are asking for personal consulting services. The free text input additionally gave “Pay for API access” as an option.

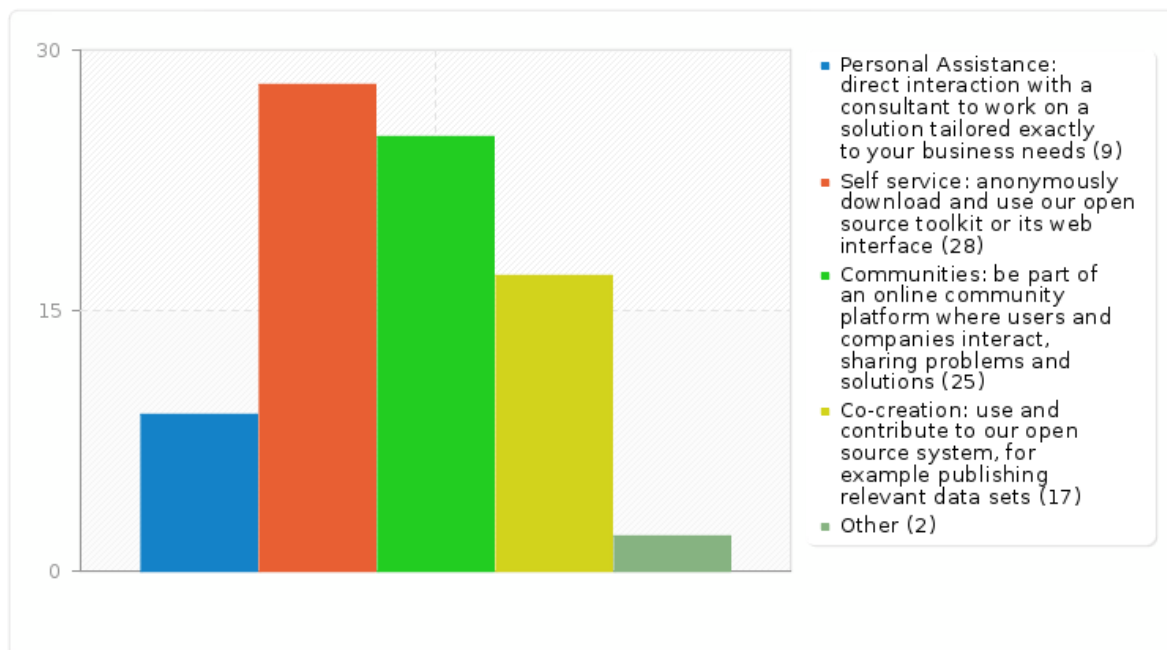


Figure 9: Desired delivery (S2)

2.7 Summary

The surveys presented in this section reconfirmed interest of the objectives of the GeoKnow project and applicability of the planned exploitation means of (a) an open-source platform, (b) building a vibrant GeoKnow community and (c) offering consultancy and commercial solutions tailored to individual users' needs. As an additional idea, pay-for-API access will be considered. The report will now proceed to list and describe general exploitable results of the GeoKnow project.

3 Exploitable GeoKnow results

Section B3.2.1 of the description of work document lists high-level exploitable results of GeoKnow that were identifiable at proposal stage. These will be extended and specified in more detail in this section. After each result description, targets will be summarised for better overview.

Exploitable E1: The GeoKnow Generator	
Tasks	T1.4
Description	The GeoKnow generator as the central implementation of GeoKnow integrates outcomes of work packages two to four. It will provide an efficient infrastructure for geospatial reasoning and allow performant processing of billions of geospatial information and, as a framework, orchestrate all components with an easy to use UI.
Exploitation	In addition to exploitation by consortium member Ontos, Brox and Unister as detailed in their individual statements, the software will be made available to the general public with periodic open-source releases starting from M12 and is hence one of the main instruments to reach out to end user target groups, for example in the open-source community. The first prototype is already available on the project hosting portal github. As the success of open-source products depends on the size of their users and community, the main strategy of exploiting the GeoKnow Generator must be effective dissemination through the communities the partners are involved in (details given in the GeoKnow dissemination plan). A vibrant community of users is the desired outcome. The barrier to use the Generator in an industrial setting will be low because of the different showcases that will be provided in the commercial use cases, potentially opening the door for commercial consulting and deployment assistance services.
Responsible	Ontos, all partners
Targets	<p>Internal: Unister, Brox</p> <p>External: End users (open-source)</p> <p>Commercialisation: Consulting and assistance in deployment upon request.</p>
Exploitable E2: Benchmarking system	
Tasks	T1.3
Description	A benchmarking system based on well-established existing benchmark methods adapted to the linked data scenario is necessary for continuous monitoring of performance improvements in the course of the project.
Exploitation	A GeoKnow benchmark server has been set up by OpenLink in M06 and allows GeoKnow consortium members to perform geospatial benchmark testing upon request.
Responsible	OpenLink
Targets	Internal: All consortium members

Exploitable E3: Improved Virtuoso Universal Server	
Tasks	T2.2-T2.6
Description	The existing Virtuoso Universal Server is extended with support for external geospatial databases (M06), geospatial query optimisation (M12), complex built-in geo problem solving, geospatial clustering (M24), distributed geospatial querying (M30) during GeoKnow.
Exploitation	Virtuoso's increased feature set and performance is exploited in several ways: Consortium Members will benefit in their use cases and the GeoKnow generator. OpenLink's customers for both the commercial and the open-source version of Virtuoso will also welcome the additional functionality as it has often been requested before. OpenLink will extend their consultancy offer to include the new features as soon as they become available. As OpenLink has already received repeated requests for extended geospatial capabilities in their product, the market for the new features already exists.
Responsible	OpenLink
Targets	<p>Internal: All consortium members</p> <p>External: Existing and new customers of the open-source version of Virtuoso</p> <p>Commercialisation: Existing and new customers of the commercial version of Virtuoso, extension of consultancy offer</p>
Exploitable E4: Lifting implicit geographical references in LinkedData	
Tasks	T3.1
Description	Many RDF data sets include geographical references that are implicit, for example city names. Detecting these information and linking them to existing resources is a complex research task. This feature will allow interlinking a number of spatial data sets such as GeoNames, DBPedia and LinkedGeoData. An initial prototype was built in M09, a system to integrate large scale datasets is planned for M21.
Exploitation	Results of this task extend InfAIs previous research activities in this area and will produce a number of high quality publications, participation in conferences and influence teaching activities exploitable by the academic community. Consortium members and all other target groups will benefit indirectly by being able to use the provided novel functionality in the GeoKnow Generator. Results will be distributed over the usual channels for scientific publications like journals and conferences.
Responsible	InfAI
Targets	<p>Internal: all consortium members</p> <p>External: Members of the academic and linked open data community</p> <p>Commercialisation: individual or joint patent application if an invention is made</p>

Exploitable E5: Fusing geospatial data sets from heterogeneous sources	
Tasks	T3.2
Description	Obtaining one consistent data set from several data sets of heterogeneous sources is another challenging research task because of differences in RDF representations, geometries and metadata. The exploitable outcome of research and development in this area is an automatic fusing algorithm overcoming these difficulties. Fusing geographic features will be implemented by M12, geospatial metadata will be merge by M23 and geospatial relations will be tackled by M31.
Exploitation strategy	Missing links in between several data sources are an issue in geospatial data management as stated in section 2, hence outcomes of this task are potentially very welcome among geospatial data owners and creators and should be integrated with the GeoKnow Generator as soon as available. Similar as E4, research done within this GeoKnow task will contribute to international knowledge transfer and excellence building. Within the consortium, Unister and Brox are eager to fuse their own, proprietary data sets to publicly available data to create increased business value. Again, the usual distribution channels for research results apply.
Responsible	Athena
Targets	<p>Internal: all consortium members</p> <p>External: Members of the academic and linked open data community</p> <p>Commercialisation: individual or joint patent application if an invention is made</p>

Exploitable E6: Geospatial Metrics for Linked Data sets and Quality Awareness	
Tasks	T3.3, T3.4, T3.5
Description	Geospatial data collected using a community-based approach is often more detailed and extensive than provided by official and commercial maps. Community-collected data does, however, have a problem with inconsistencies, wrongly categorised or supplied information or lacking precision. In tasks 3.3 and 3.4, metrics for assessing quality of data are generated, algorithms consolidating the meanings of categories are developed in an attempt to pursue a community driven consolidation process.
Exploitation	Inconsistencies and missing resources in available data sets has been identified as one of the key annoyances for creators and users of geospatial data as described in section 2, so it can be hoped that the relevant communities are happy to investigate and improve the quality of their data with the tools provided. Implementation deliverables for spatial knowledge aggregation are due in M17 and M28, metrics for linked geospatial information and comparisons to other data sets are planned for M18 and M34, respectively. The same metrics can be applied to data sets generated by interlinking and fusion in the scope of this project, allowing to assess quality of the results produced within GeoKnow and pointing out aspects in need of further work. Reports on spatial data quality assessment will be provided in months M20 and M32. These metrics will have to be open-source and freely available to make their adoption as widespread and easy as possible and will be supported and promoted in the open-source and geospatial data communities by the consortium members.
Responsible	InfAI, Athena
Targets	<p>Internal: all consortium members</p> <p>External: Providers of geospatial data sources, end users by increased quality of data</p>

Exploitable E7: Exploration component Facete	
Tasks	T4.1-T4.5
Description	GeoKnow aims to annotate fused linked data with semantic facts. Visualising complex data structures as generated in this project in a concise, user-friendly way is not straightforward. Within GeoKnow, a tool for visualisation and authoring of geospatial RDF data called "Facete" is developed, in the initial version aiming to allow data consumers to get an overview of large maps with millions of geospatially annotated facts, including high performance zooming and investigation of contained semantic facts.
Exploitation	Facete will be the primary visualisation component of the GeoKnow project, allowing users with all backgrounds to easily get an impression on our work. The code is already available as open-source project in a github repository. Initial release is planned in M12, several advanced features will follow: authoring widgets (M20) and curation interface (M30) for contributors, coevolution module allowing synchronised evolution of public and company-internal data (M30), mobile version targeting more users (M24, M36).
Responsible	InfAI
Targets	<p>Internal: all consortium members</p> <p>External: End users requiring a performant visualisation and authoring tool for geospatial data</p> <p>Commercialisation: The co-evolution module for synchronised development of public and company-internal data could be interesting for enterprises. Its possible commercialisation should be discussed once the development commences.</p>
Exploitable E8: Supply Chain Geodata management	
Tasks	T5.1-T5.6
Description	In the scope of GeoKnow, the Brox use case will promote the GeoKnow Generator as a platform for spatial linked data driven supply chain management. This is a very complex application scenario with potentially many thousands of suppliers with corresponding data having to be exchanged and evaluated.
Exploitation	The supply chain use case opens a new market for GeoKnow, enterprises in automotive industry being the first candidate as Brox's direct customers. Exploitable results are a supply chain data management infrastructure (M15, M28), a supply chain dashboard providing aggregation and visualisation of the supply chain network (M30) and the release of a mobile version (M36) allowing a better insight for operating personnel. A release of a supply chain version of the GeoKnow Generator in M24 will hopefully demonstrate performance, robustness and usability of the approaches developed within GeoKnow.
Responsible	Brox
Targets	<p>Internal: OpenLink for another reference for commercial Virtuoso application, all consortium members for feedback of research and implementation results</p> <p>Commercialisation: direct business value for Brox, possible commercialisation for other supply chain scenarios</p>

Exploitable E9: E-commerce data and search module	
Tasks	T6.1 - T6.4
Description	Next to integration of e-commerce use data into the GeoKnow Generator for novel recommendation and search opportunities for customers and customer relationship managers, the biggest novelty developed in the e-commerce use case is a motive-based search module, helping a user to find the perfect holiday only expressing a search query based on vague feelings and ideas. The necessary spatial background knowledge can only be provided by outcomes of other work packages.
Exploitation	Results of the e-commerce work package are meant to be exploited by enterprises wanting to connect their legacy data warehouses containing e-commerce data with linked data. These enterprises can include, but are not limited to, other tourism portals. E-commerce data will be integrated within the GeoKnow generator by M15, with results being applied to the Unister portal BlueKiwi. Prototypes of the motive-based search will be done by M18 and M33 and afterwards put to the test on one of Unister's portals, directly adding value for Unister's customers.
Responsible	Unister
Targets	<p>Internal: OpenLink for another reference for commercial Virtuoso application, all consortium members for feedback of research and implementation results</p> <p>Commercialisation: direct business value for Unister, possible commercialisation in other search scenarios, IP for motive-based search to remain at Unister</p>
Exploitable E10: Spatiotemporal analysis use case	
Tasks	T4.6
Description	Advanced spatiotemporal analysis is another exciting use case for demonstrating the applicability of the GeoKnow Generator, which will be extended with relevant validation and transformation components.
Exploitation	Any data consumer interested in analysing data with a temporal dimension can profit from this GeoKnow result. Spatiotemporal analysis was mentioned a few times as desired feature by participants of the survey described in section 2. Releases are planned for M24 and M33 and will be put into practice using public statistical data sets and the Register of Regional Development Measures and Incentives managed by the Serbian Business Registers agency with specific functionalities including the drill-down features across different dimensions such as time or geography as well as tracking possibilities for incentive providers and beneficiaries. Following this example of successful use of the GeoKnow Generator for data publication and processing efforts by local, regional and national governments, it is hoped that other governments will follow.
Responsible	IMP
Targets	<p>Internal: All consortium members for feedback of research and implementation results</p> <p>External: public sector organisations</p>

Exploitable E11: GeoKnow knowledge bases	
Tasks	WP2-6
Description	In the scope of the GeoKnow project, a number of public data sources as well as proprietary ones will be processed and merged to produce Linked Data with enhanced value. An example is T2.7, where INSPIRE compatible data available in Greece will be exposed as LinkedData.
Exploitation	Resulting data sets with no proprietary restrictions will be fed back into the community by (a) public SPARQL endpoints for querying LOD knowledge bases, (b) releases of new public RDF data sets through the Serbian CKAN, (c) linked data publication of LOD knowledge bases and (d) regular releases of data owned by the consortium and third parties as downloads if license restrictions allow. This will provide all data consumers including organisations and individual users with high quality consistent data sets to build their application on.
Responsible	All partners
Targets	External: End-users and organisations
Exploitable E12: Contribution to standards	
Tasks	T7.3
Description	GeoKnow aims at contributing to the following standards: (a) W3C SPARQL Working Group , with SPARQL being the main integration interface envisioned by GeoKnow, (b) W3C Relational Databases to RDF Working Group , with a large portion of existing content being stored in relational databases, (c) W3C Semantic Web Deployment Working Group and W3C Government Linked Data Working Group with information about GeoKnow activities, (d) W3C GeoSemWeb Community Group as the core of a community likely to create or influence standards for the spatial Semantic Web.
Exploitation	Staying up-to-date and in touch with with appropriate standards is needed to ensure emerging and established are taken into account in the project. Contribution to and influencing standards where appropriate will clear the path for interoperability and easy integration of heterogeneous systems beyond the scope of GeoKnow.
Responsible	OpenLink, Ontos
Targets	External: End-users and organisations

This section presented a description and exploitation strategies for each of the exploitable results of the GeoKnow project identified so far. In the next section, the exploitation plan will be completed by individual exploitation statements of the consortium members.

4 Exploitation statements of individual consortium partners

All partners of the GeoKnow project are committed to increasing publicity of the results by the project's web dissemination channels, for example the GeoKnow blog or facebook/linkedin groups. In addition to this, every partner has a different exploitation strategy which will be outlined in this section.

4.1 InfAI: Institute for Applied Computer Science, University of Leipzig

InfAI has a long track record of leading and participating in several large scale collaborative research projects on the national and EU levels, such as the LOD2, BIG, BioASQ and LATC. Results of GeoKnow will provide a substantial contribution to their ongoing excellence building, knowledge transfer and teaching activities:

- Scientific publications in a number of high impact conferences and journals will make the expertise gained within GeoKnow available to the wider academic community and contribute to scientific excellence building.
- GeoKnow outcomes will be presented on a number of events InfAI organises or participates in, for example the annual "Leipziger Semantic Web Tag" and major semantic conferences such as ESWC and ISWC as well as the European Data Forum.
- Beyond state-of-the art GeoKnow results will also influence teaching of students in this academic institution and its partners, which is another vital part of the knowledge transfer process. Teaching material will be distributed via SlideWiki.

Several successful projects closely related to GeoKnow in the sense of working with linked or geospatial data are ongoing at InfAI (for example LinkedGeoData, OntoWiki, DL-Learner, ORE, AutoSPARQL, CubeViz, LIMES and Sparqlify). Many of them include software targeted at end users, engineers or developers with an existing user base, which can benefit from and be extended by GeoKnow results.

Through the LinkedGeoData project developed within GeoKnow, InfAI will continue to approach the OSM community reaching out to users of one of the most popular GIS platforms on the internet.

4.2 Athena: Institute for the Management of Information Systems, Greece

Athena is among the scientific leaders in the areas of Knowledge Management and Geographical Information Systems. In years of experience in related projects, it gained expertise with a wide range of open source tools and technologies for spatial data infrastructures (SDIs), for example projects within the OSGeo initiative. Extending and adding to this stack of well-known Open Source tools and technologies available for geospatial data management is one of the key instruments to make GeoKnow results available to a wider audience. In particular, Athena aims to integrate GeoKnow technologies relating to RDF geospatial management, into the mainstream of open source GIS tools. The ultimate goal is twofold: (a) introduce GIS-experts into the advanced capabilities offered by Semantic Web technologies, and (b) facilitate the transition of geospatial data into the Data Web.

Athena has collaborated with a number of public bodies including the Greek government to promote democratisation of geospatial information on a national and international level. This opens a different exploitation channel for results of the GeoKnow project: Athena will expose available INSPIRE data and metadata as geospatial Linked Data through geodata.gov.gr (Greek Government's open geospatial data catalogue), which will add value

to data provided and used by public sector organisations and governments. Further, Athena will integrate select technologies and services developed by GeoKnow into geodata.gov.gr, in order to showcase the benefits of Semantic Web technologies for improving the quality, reuse, and ultimately the value of open geospatial data.

On another level, Athena is committed to the commercial exploitation of its R&D work, through its Corallia Innovation Cluster (www.corallia.org). Any innovations, achievements and tools developed in the context of GeoKnow are continuously evaluated within Athena, and will be shaped into a spin-off company, should they provide a sufficient and convincing business case.

4.3 OpenLink Software Ltd., UK

OpenLink Software is an acclaimed technology innovator and leading vendor of industry standards compliant data access, integration and management technology. OpenLink's product "Virtuoso Universal Server" is an innovative enterprise grade multi-model data server for agile enterprises and individuals, delivering an unrivalled platform agnostic solution for data management, access and integration. The open-source data integration server and the highly efficient and scalable RDF triple store implementation in Virtuoso will be the basis for the GeoKnow spatial knowledge store.

4.3.1 Virtuoso Universal Server

Within the scope of the GeoKnow project, the geospatial features of the Virtuoso Universal server will be enhanced and improved, both in terms of performance and compliance with available Geo Spatial standards, thereby increasing the competitive advantage of the Virtuoso Universal Server in this space. Due to the increasing need for location services in applications, this will enable OpenLink to market Virtuoso more aggressively and successfully to existing markets as well as opening new ones. In particular these benefits can be made use of in government open geospatial data, publicly available linked geospatial data sets and for enterprises as demonstrated by the two commercial GeoKnow use cases. In addition, OpenLink plans to offer project-oriented development and integration services for the GeoKnow Generator and Virtuoso generally.

In the GeoKnow project, Virtuoso will be enhanced with beyond-state-of-the-art adaptive query optimisation and execution techniques pioneered in the LOD2 project, focusing on fast retrieval when mixing geospatial as well as other search and join criteria. Data organization in Virtuoso will be re-visited to better support highly performant operations on geospatial data. Database resident algorithms for complex problem solving such as route planning or map comparison will be integrated. Virtuoso will be made GeoSPARQL compliant to improve interoperability with other RDF Stores. Benchmarks are planned throughout the project and have started early on, so as to provide constant tracking of performance and verification of improvements geospatial data processing.

All these new features will be part of the Virtuoso open source and commercial products offerings enabling all of the user base to benefit.

4.3.2 Consultancy and Training

The OpenLink Software Professional Services division offers high quality consultancy and training covering, among others, the Virtuoso Universal Server. OpenLink has extensive experience in working with Commercial and Open-Source organisations, in addition to standardisation organisations such as the W3C and the IETF. These services are being extended to include services being developed during the GeoKnow project which are being actively promoted on our professional services Web site, and will include the GeoKnow generator which can

.....

serve to enhance the tools offered in our consultancy and training as part of our dissemination and exploitation activities.

4.4 Ontos AG, Switzerland

Ontos is a provider of semantic technologies with a major focus on text mining and natural language processing. Ontos has developed various portals for news, media and law enforcement bodies. Within those projects triplification of data was a key task leading to the demand of an integrated workbench with an intuitive UI. Existing customers also asked about the support for geospatial information. Therefore the result of the GeoKnow project will highly influence the product and service offer of Ontos. The Geoknow generator will expand the current products like OntosMiner and OntoQUAD.

Ontos became the rep-office of W3C in Switzerland and it is planned to approach the Swiss market, especially the government with the GeoKnow generator framework and pushing the Swiss government to transfer their open data sets into RDF following the 5 star model of W3C.

4.4.1 GeoKnow generator Text Mining extension

Ontos plans to extend the GeoKnow generator framework by adding the Ontos text mining components into the framework. OntosMiner is extracting named entities and facts. Ontos is evaluating how to link the named entity "location" with geospatial data from the GeoKnow project. Further it is planned to deploy the package in the cloud.

4.4.2 OntoQUAD

Experiences made by OpenLink and others in the area of geospatial data management and RDF store will impact the Ontos RDF store called OntoQUAD. This store has been already sold and deployed in the Russian market and it is planned to add the same features for geospatial data treatment into the RDF store OntoQUAD.

4.5 Unister GmbH, Germany

Unister is a leading E-Commerce company with a top position in the B2C and advertisement markets. Unister's internet solutions help companies and customers to connect and perform transactions in different verticals, one of the most important vertical being travel industry. Well-known web portals are ab-in-den-urlaub.de, fluege.de or hotelreservierung.de.

The results of GeoKnow are extremely relevant for all portals, as they will provide an architecture and framework for connecting E-Commerce data warehouses with the Linked Data web based on geospatial semantics. Therefore, the project's results will be widely deployed on Unister's Web portals, currently attracting more than 10M unique visitors per month. The advances in spatial interlinking and fusion will lead to cheaper and more flexible geospatial data integration that will have a direct impact on Unister's B2C E-Commerce offerings.

Integration will most probably be first tried out on the travel search engine BlueKiwi, which currently runs as a silent beta-version and is relatively new to Unister's portfolio. Two examples of exploitable results developed in the GeoKnow project are described below, however, many more GeoKnow outcomes are exploitable and will be used for Unister portals in and beyond the time frame of the project.

4.5.1 A novel recommendation engine

Integrating the Unister hotel review data set described in deliverable 6.1.1 in the GeoKnow generator will allow several new features to be added to BlueKiwi. Users will be provided with spot-on tailored recommendations of hotels or travel regions depending on their preferences based on advanced linking and inference algorithms.

The Unister flight data set, also described in deliverable 6.1.1 is also useful for extracting characteristics of travel regions for recommendation. Appropriate regions can be suggested based on budget considerations or location of user. Another aspect is the time before departure a flight booking takes place or the time of stay before a return journey - customers are a lot less likely to look for destinations far away when booking a short spontaneous trip than if they book a holiday lasting several weeks months in advance.

For flight searches, an airport close to the user's location can be identified and included in the search results. The flight type offered (return or one-way) can also be adjusted for a result. Some destinations might be suitable for spending the whole time in one place, others might be predestined as a start for travelling to another place and returning from there. Finding alternative airports if one airport of choice is not available can be easily facilitated with GeoKnow data.

4.5.2 Motive-based search

Motive-based based search is a challenging research area not yet seen productively used in the big search engines or holiday providers. Motive based searches encompass helping the user to formulate a query based on vague feelings and ideas, or better yet, to understand such vague queries and being able to deliver relevant results right away. No current travel information retrieval system can answer "Winter holidays close to a lake with culture in February" in an acceptable amount of time. The competitive advantage Unister portals will gain supporting motive-based search will be considerable, offering a significantly increased search experience to its users.

4.6 Brox-IT Solutions, Germany

Brox-IT-Solutions is an engineering-driven organization striving to become a truly global information access and semantic infrastructure provider. Key customers include Audi, Bombardier, Bosch, Deutsche Telecom, Dresdner Bank and TUI. Brox operates under the commercial open source business model and provides enterprise class service level agreements.

Brox develops the eccenca Linked Data Suite, which supports the Linked Data lifecycle beginning with the extraction of Linked Data from relational databases and the integration of extracted datasets together with the exploration and management of large datasets. In the course of GeoKnow, the eccenca Linked Data Suite will be adapted to be used in the Spatial Linked Data in the Supply Chain use case (WP5). For this purpose, it will be extended with components for exploring and visualizing supply chain data. GeoKnow results will also fed back into other Brox projects, for example the Eclipse.org project SMILA. This will extend Brox's business opportunities in the new emerging marked of Linked Enterprise information integration.

Furthermore, Schnellecke and other logistics service providers will benefit directly from the supply chain use case due to the increased flexibility and efficiency of the information flows accompanying the supply chains.

4.7 IMP: Institute Mihailo Pupin, Serbia

IMP is a leading Serbian research institute in information and communication technologies with extensive previous experience in projects concerned with semantic web technologies (for example Web4WeB, LOD2). Its

.....

products are used in a wide range of application areas such as process control, traffic management or large information systems.

4.7.1 Excellence building and Knowledge Transfer

IMP has the opportunity to improve and broaden its activities by, for example, exploiting GeoKnow generator software in current and future research projects. IMP will target excellence building and knowledge transfer both internationally, but particularly in Serbia and South Eastern Europe using its position as a regional Centre of Excellence for Semantic Web and Linked Open Data technologies. Presentations of the GeoKnow generator will be given in the form of a 3 hour tutorial and demo session at one of Serbia's international conferences (for example INFOTECH, ICIST).

Similar to Athena and Greek public bodies, IMP will have the opportunity to strengthen its links with the Serbian governmental bodies, especially the Serbian Business Registers Agency and the Statistical Office of the Republic of Serbia.

IMP plans to extend their consulting services to all stakeholders interested in using the GeoKnow Generator for developing custom geospatial applications. A separate website and offer portfolio for LinkedData consultancy will be set up, as the existing one² is too general.

4.7.2 Extended product range

By extending the IMP product offer within the GeoKnow project, existing academic and industry partners and customers can be targeted as well as reaching out to new ones. IMP's main contributions to the project are (a) a novel tool for mobile spatial-semantic visualisation, exploration and authoring, (b) an advanced GUI for exploratory spatiotemporal analysis added to the GeoKnow generator and (c) a mobile version of the consolidated spatial view of supply chain data for the Brox use case.

4.8 Summary

Each of the consortium partners brings unique expertise and connections to potential target groups to the project. Table 3 summarises the connections mentioned that will be used as the starting point for exploitation activities.

²<http://www.pupin.rs/en/products-services/services/>

.....

Group	Examples	Consortium partner
Public sector	Serbian ministries Greek government and public bodies Switzerland Russia	IMP Athena Ontos via Ontos partner called Eventos
Academia	conferences workshops	InfAI, IMP InfAI
Communities	OSM OsGEO DBPedia LinkedOpenData W3C SPARQL Working Group W3C Relational Databases to RDF Working Group	InfAI Athena InfAI InfAI OpenLink InfAI
Enterprises	news and media law enforcement various existing customers various Unister portals automobile industry Schnellecke and other logistics service providers	Ontos Ontos OpenLink Unister Brox Brox
Spin-offs	Corallia innovaton cluster	Athena
Data consumers	web users mobile users users of Serbian CKAN	InfAI, Ontos IMP IMP

Table 3: Target groups

5 Future work and road to the exploitation reports

This report described the plan of exploitation of GeoKnow results. After confirming that GeoKnow objectives and planned distribution channels are in line with potential users' needs with the help of two surveys, a number of individual exploitable results were identified and described including intended targets and exploitation strategy. All consortium members provided exploitation statements describing individual exploitation goals in and beyond the scope of the project.

Staying in touch with our target groups requirements is crucial for the success of the project. Feedback for software releases, published data set or scientific publication will be taken seriously and, if necessary, serve as input for adjustments in the exploitation plan. The exploitation plan survey will stay online as to track changes in the users' opinions throughout the course of the project.

The first exploitation report is due in M20 and will report on the exploitation activities and results regarding

- the first releases of the GeoKnow generator starting from M12
- the first release of the visualisation and authoring component in M12
- Virtuoso releases containing features developed within GeoKnow, if already done
- community building efforts using the GeoKnow portal (website, blog, social networks) and GeoKnow Generator platform
- feedback gained through scientific dissemination, training, education and outreach activities
- first use of the supply chain data management infrastructure
- implementation of an advanced recommendation system in a travel related portal of Unister in M15

All other exploitable aspects as well as activities towards commercial exploitation of the project results will be report on in the second exploitation report due in M28.