A European Community of SMEs built on Environmental Digital Content and Languages

D1.3: Final Report

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Table of contents

SME SPIRE
This project is funded by the European Union under the grant n. 296307

SME SPIRE
This project is funded by the European Union under the grant n. 296307

List of figures

SME SPIRE
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This project
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List of tables

SME SPIRE
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Executive Summary

This report is the outcome of the smeSpire project Work Package 1, which provides an in-depth analysis and comparison of different Geo-ICT companies in Europe and how they relate to INSPIRE.

The study's primary objectives were:
- assessing the market potential for Geo-ICT companies in relation to INSPIRE
- characterizing obstacles for Geo-ICT companies to enter this market, with focus on knowledge gaps and training needs

The study was carried out in four stages:
- desk research using published statistics to describe the Geo-ICT SME sector and its context
- on-line survey to establish an overview of targeted Geo-ICT SMEs in 12 Member States
- in-depth interviews to establish the detailed circumstances of the targeted Geo-ICT SMEs
- workshops where results were discussed and validated in a collaborative approach.

Context

There is no clear and agreed definition for Geo-ICT.

The definition used in this study was restricted to GIS/geo-location activities rather than all activities that could fall within the INSPIRE regulations. A further problem was there is virtually no data on the size of the Geo-ICT SME sector in Europe or in individual Member States.

There is virtually no data on the size of the Geo-ICT sector in Europe. From the studies that have been carried out it appears that Geo-ICT may comprise 1-2% of the overall ICT sector. This would lead to a very crude estimate of about 4,400 geo-ICT companies in the 12 smeSpire Member States (7,000 in EU28). However, this figure could increase if a wider definition of geo-ICT was used that covered companies involved in the creation, analysis and publishing of INSPIRE compliant data.

There is significant variation between Member States in the importance assigned to INSPIRE, its implementation and co-ordination of activities. This variation is a factor in the differing status of Geo-ICT SMEs in the 12 Member States studied by smespire project.

Status of Geo-ICT SMEs

299 companies participated in the study. Most of them regarded themselves as "ICT" companies, and most are relatively young, with 90% created between 1988 and 2008. There is evidence that major technological developments have an effect on the creation of new companies.

Most Geo-ICT SMEs fall within the "small" category in terms of number of employees (<50), but in the "micro" category in terms of turnover (<€2mln). It may be that the type of work undertaken by Geo-ICT SMEs promotes more co-operative working practices.

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It seems that having more employees is an advantage in that turnover in larger Geo-ICT companies is higher than would be expected based simply on comparative number of staff.

The market of Geo-ICT SMEs appears to be primarily at the national and sub-national level with the public sector the primary customer. Geo-ICT SMEs are engaged by "call for tender" as well as direct contracts. Sub-contracting can be important depending on the type of expertise. The high dependency on public sector business seems to have an impact on Geo-ICT SME revenue models, with most companies using the resource/effort based model that is normally generated by public procurement.

More than 80% of the annual turnover of Geo-ICT SMEs comes from "geospatial activities". Most of these relate to the use of spatial data, data modelling and development of client applications, although companies are involved in a range of activities in addition to these primary functions.

Involvement in EU funding is relatively low in Geo-ICT SMEs, but this reflects the position with overall ICT companies. Approximately one third of companies surveyed participated in some EU co-funded projects. Companies used a range of funding models, but most depended on payment for specified activities, the norm for public sector procurements.

Approximately a third of companies are involved in formal standards certification schemes, and in general, familiarity with standards is relatively low. Conversely, there is a much greater familiarity with Open Source Software, which reflects its increasing importance across Europe.

INSPIRE and the Geo-ICT SME sector

Awareness of INSPIRE among Geo-ICT SMEs is, perhaps, lower than expected with more than a third of companies unaware of the Directive.

Those that are involved tend to be aware of the general aspects of the Directive, but less familiar with the more detailed technical aspects.

Only one third of Geo-ICT SMEs have a formal involvement with the INSPIRE process at European level. The organizations involved with INSPIRE cover the whole range of activities, however, there is some bias towards metadata and view services, presumably because these are the priorities of the public sector customers.

A wide range of INSPIRE data themes are covered by Geo-ICT companies; the main interesting themes seem at local level (e.g. land use, cadastral parcels, buildings, elevation, transport networks, addresses, utilities and government services). Provision of expertise on top of data to conduct analyses, syntheses or other added value knowledge on top of the INSPIRE data can be seen as a typical market for new business.

In general INSPIRE has had a relatively low impact on Geo-ICT SMEs, though some benefits have been realized through the introduction of new products/services, ways of working and new customers/markets as well as improved turnover. However, there is a great expectation that INSPIRE will contribute to growth in the future.

Part of the reason for the low impact is that many barriers to Geo-ICT involvement in INSPIRE include budgets, awareness and competency and the scope of the Directive. However, one of the more relevant

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barriers across all Member States is access to data, with varying availability even within individual countries.

Innovation by Geo-ICT SMEs

Little innovation was carried out by Geo-ICT SMEs: even where it is carried out budgets for innovation and R&D is low (<10% of annual budget).

Few companies have formal structures in place to promote innovation; however, collaboration with peers is an emerging strategy for some companies, particularly those working in Open Source Software.

One of the barriers to innovation is that the public sector customer base tends to be risk averse. Others include finances and limited access to data. The main barrier for many companies is the domination of the market by larger established companies, particularly where this leads to exclusion from public sector procurements and tendering. It may be that increased use of Open Source Software by public sector customers could help to address this problem.

Overall, INSPIRE seems to have had little impact on innovation by Geo-ICT SMEs.

Conclusions

The conclusions from the study provide a strong basis for future discussion on the relationship between the Geo-ICT SME sector and INSPIRE, and guide the final stages of the existing smeSpire project. To this end a number of recommendations have been made as part of the study. These are intended to provide the basis for discussion and agreement among the partners of the smeSpire project and beyond.

On this basis, it is considered that this research study has successfully fulfilled its objectives and contributed significantly to our understanding of both the European Geo-ICT sector and the developing implementation of INSPIRE.

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We would like to thank every company that participated in the survey and all people involved in the in-depth interviews (**Annex 9 – List of contacts for interviews**).

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Acronyms and Abbreviations

Abbreviation	Name
ARe3NA	A Reusable INSPIRE Reference Platform
CIP	Competitiveness and Innovation Programme
EC	European Commission
EU	European Union
EULF	European Union Location Framework
FLOSS	Free / Libre Open Source Software
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
GVA	Gross Value Added
ICT	Information and Communication Technologies
INSPIRE	Infrastructure for Spatial Information in Europe
IR	Implementing Rule
ISA	Interoperability Solution for European Public Administrations
JRC	Joint Research Centre
LE	Large Enterprise
LMO	Legally Mandated Organization
MS	Member State
MSCP	Member State Contact Point
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
NGA	National Geographic Association
OGC	Open Geospatial Consortium
OSGeo	Open Source Geospatial Foundation
R&D	Research and Development

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ROA	Resource Oriented Architecture
SaaS	Software as a Service
SBA	Small Business Act
SBIS	Software Based Internet Service
SDI	Spatial Data Infrastructure
SEIS	Shared Environmental Information System
SITS	Software and IT Services
SME	Small and Medium Enterprise
SOA	Service Oriented Architecture
SSBS	Software and Software Based Service
UML	Unified Modeling Language
WP	Work Package

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1. Introduction

This report is the outcome of the smeSpire project Work Package 1, which defines the need for study and assessment of the market potential for Geo-ICT SMEs in relation to INSPIRE. The study took place between July 2012 and August 2013, and included all 12 Member States who are partners in smeSpire. The report provides an in-depth analysis and comparison of different Geo-ICT companies in Europe and how they relate to INSPIRE. The data collected has allowed a number of conclusions to be drawn on the state of the Geo-ICT sector in Europe. The key outcome of the study is a set of recommendations on how to facilitate and stimulate the participation of Geo-ICT companies in INSPIRE in order to reap the business benefits of INSPIRE for small to medium enterprises.

This introductory section discusses the policy context of this study, the study background and the study objectives.

1.1. Policy Context

The INSPIRE Directive 2007/2/EC (European Commission, 2007b), establishes an Infrastructure for Spatial Information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment. INSPIRE is based on the creation, operation and maintenance of infrastructures for spatial information established and operated by the 28 Member States of the European Union plus Switzerland, Norway and Iceland, addressing 34 spatial data themes related to environmental applications.

To ensure that the Spatial Data Infrastructures (SDIs) of the various Member States are compatible and usable at Community level and in trans-boundary contexts, the Directive requires that common Implementing Rules (IR) Legal Acts be adopted in a number of specific areas. These include: Metadata (Regulation 1205/2008), Data Specifications (Regulation 1089/2010), Network Services (Regulations 976/2009 and 1088/2010), Data and Service Sharing (Regulation 268/2010), and Monitoring and Reporting (Decision 2009/442/EC). These IRs Legal Acts are binding in their entirety.

Unlocking the potential of environment information in a coherent manner also contributes to the overall aims of the EU 2020 strategy, and more specifically the Digital Agenda for Europe[1] ("to deliver sustainable economic and social benefits from a digital single market based on fast and ultra-fast internet and interoperable applications"), being coherent with several Key-Actions and contributing to achieve several Key Performance Targets set in the Agenda. In particular 'Action 86: Implement cross-border e-environment services' has a direct reference to the Shared Environmental Information System (SEIS), of which INSPIRE is a fundamental component. In addition there is 'Action 84: Support seamless cross-border e-government services in the single market'. The European Commission will support this strategy through the Competitiveness and Innovation Programme (CIP) and Interoperability Solutions for European Public Administrations (ISA) Programme.

[1] See http://ec.europa.eu/digital-agenda/

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1.2. Study background

Making data available, according to INSPIRE standards, requires specific skill sets seldom found in public authorities. The management of this content represents an opportunity for Small and Medium Enterprises (SMEs) active in this sector. SMEs can enable countries to fulfil the Directive, creating new market opportunities with increased potential for innovation and new jobs. The technical skills and organizational flexibility of SMEs can effectively support the various institutions and stakeholders directly involved in the various commitments related to the implementation of INSPIRE. Due to legal requirements, the INSPIRE implementation becomes the entry-point for crucial business opportunities, opening new or reinforcing existing perspectives.

SmeSpire is a Support Action for SMEs driven by a consortium of key players from 12 different Member States: SMEs, research centres, environmental agencies, a public body and a non-profit association. SmeSpire's purpose is to encourage and enable the participation of SMEs in the mechanisms of harmonizing and making large-scale environmental content available. This will be achieved through 4 key actions:

- the study and assessment of the market potential for geo-ICT SMEs in relation to INSPIRE;
- the collation and exploitation of a Best Practice Catalogue in the management of environmental content;
- the development of a multilingual package to train environmental data analysts in the maintenance and exploitation of environmental data commons; and
- the creation of a network capable of transferring result-driven knowledge throughout Europe with research centres, environmental agencies, progressive technology providers and digital content providers.

1.3. Study objectives

The prime objective of Work Package 1 was the completion and analysis of the smeSpire study, assessing the market potential for Geo-ICT companies in relation to INSPIRE (study objective 1), and characterizing obstacles for Geo-ICT companies to enter this market, in terms of knowledge gap and training needs (study objective 2).

Secondary objectives are as follows:

- provide an accurate and detailed description of the European Geo-ICT sector, in terms of size, turnover, history, composition and geographical distribution
- create insight into the key activities of Geo-ICT companies in Europe, and characterize and quantify INSPIRE supporting activities already performed by the private sector
- quantify the knowledge gap by comparing the actual skill set of SMEs in the geo-ICT sector with the optimal and minimal skill set needed to successfully implement INSPIRE
- define and measure the impact of INSPIRE on the innovative performance of Geo-ICT companies in Europe
- analyze the institutional and policy context in which Geo-ICT companies in Europe operate, and how this context influences their activities, skills and knowledge, and innovative performance

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2. Methodology

The smeSpire study covered all 12 partner Member States involved in smeSpire: Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Italy, Lithuania, Malta, Slovakia, Spain and the United Kingdom. A detailed account of the methodology is presented in Annex 1 – Detailed Methodology.

The study was carried out in four stages. The first three phases were carried out by the project partner active in each of the 12 participating countries, while the fourth involved collaborative workshops. This section provides a brief description of each stage.

2.1. Desk research

Using published statistical information, basic data was collected about the SME sector, the ICT sector and the geo-ICT sector of the 12 countries represented within smeSpire. Based on this information, each partner provided a description of the SME sector, the ICT sector and the Geo-ICT sector in his country. These descriptions include the following aspects: numbers of firms active in each sector, temporal trends in each sector, proportion of national GDP contributed by each partner, distribution of firms by their main activities, and proportion of national value added accounted by each sector. In the descriptions of the ICT sector and Geo-ICT sector, particular attention was given to the presence and operation of SMEs.

Although not all GI companies are solely part of the ICT sector, information on the ICT sector was collected as a reference point for estimating and comparing the number of Geo-ICT companies in Europe. An important output of the desk research phase was the lists of Geo-ICT companies in each country compiled by the Partners. These lists were used as the sample population of the second stage of the study, the online survey.

2.2. Survey

An online survey was carried out among Geo-ICT companies in Europe. The main objective of the survey was to collect quantitative information on the characteristics and the level of knowledge and skills of Geo-ICT companies in the partners' countries.

The online survey was in four parts:
- general characteristics of the company (14 questions)
- knowledge, skills and activities (12 questions)
- impact and innovation (4 questions)
- conclusion (4 questions)

The detailed questions are outlined in **Annex 1 – Detailed Methodology**.

Between November 2012 and the end of August 2013, 299 companies completed the survey with 263 from the 12 Member States of the study (**Figure 20**).

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2.3. In-depth interviews

Based on the results of the online survey, in-depth interviews were conducted in each Member State. The goal was to collect qualitative information about the behaviour and experiences of different Geo-ICT companies in INSPIRE implementation, about the general characteristics of the Geo-ICT sector in different Member States and about the institutional and policy in which Geo-ICT companies in Europe operate. Both the private sector and the public sector were involved in these interviews. In each Member State, interviews were conducted with at least 4 Geo-ICT companies, with a representative of the national geographic association (private sector), with the INSPIRE Member State Contact Point and at least 2 other public administrations (public sector). Overall 113 interviews were carried out (see details in section **A1.4. In-depth interviews**).

Semi-structured questionnaires were used to guide the interviews. Core topics were: characteristics of individual Geo-ICT companies and the Geo-ICT sector in general; the involvement of Geo-ICT companies in INSPIRE and the (national) policy regarding the involvement of the private sector in INSPIRE. Specific topics were then covered for each of the four categories of organization interviewed (**A1.4. In-depth interviews**).

A first review and analysis was performed by the smeSpire partners, resulting in a country report for each Member State. These country reports included an analysis of the interview information, together with the statistical information from the desk research. The country reports form the basis of this final study report.

2.4. Workshops

The results of the research activities in stages 1-3 were further discussed, validated and illustrated in two events:

- 2013 Geospatial World Forum (13-16 May 2013, Rotterdam)
- INSPIRE Conference 2013 (23-27 June 2013, Florence)

Private and public sector organizations discuss the experiences of SMEs in developing innovative solutions based on INSPIRE and Open data policies, the benefits and barriers in involvement in INSPIRE and initiatives to overcome the obstacles, improve communication between SMEs and public administrations and exploit opportunities further.

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3. General overview of the European Geo-ICT sector

This section provides a general description of the SME and ICT sectors in Europe in order to provide context for the detailed review of the Geo-ICT sector in the 12 Member States

The first part is based on EU statistics and information collected for the country descriptions and country reports. For EU statistics, reference material is available in the "Information and communication service statistics - NACE Rev. 2" web sites (Eurostat, 2013a), as well as Eurostat statistics on SMEs (European Commission, 2013b).

3.1. SMEs and ICT companies in Europe

3.1.1. SMEs in Europe

This study uses the term as defined in EU 2003/361 (European Commission, 2013b): "*The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding €50 million, and/or an annual balance sheet total not exceeding €43 million. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed €10 million. Within the SME category, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed €2 million*".

Table 1 summarizes this definition. It is important to note that the ceilings mentioned in the definition apply to the figures for individual firms only. A firm which is part of a larger grouping may need to include employee/turnover/balance sheet data.

Table 1 – SME definition

Company category	Employees	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

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An in-depth analysis of the European SME sector is presented in **Annex 2 – Context**.

Overall, SMEs account for 20.7 million firms in Europe, 99.8% of all enterprises. The vast majority of these (92.2% of the total) are micro-SMEs, with fewer than ten employees (see **A2.1. The European SME Sector**). In 2012 it was estimated that SMEs accounted for 67% of total employment and 58% of Gross Value Added (GVA) and 55% of turnover. These statistics are mirrored by the 12 Member States studied by the smeSpire project; with the number of SMEs estimated in the EC SBA Fact Sheets representing 99.8% of all enterprises. There is only slight variation in this proportion across Member States, from 99.4% (Slovakia) to 99.9% (Czech Republic, Greece, Italy, Malta, Spain).

SMEs' characteristics (number of companies, employees, annual turnover) vary country by country and sector by sector, with annual changes that may differ in the 12 Member States. Overall however, European SMEs remain relatively stable in terms of number of enterprises and number of employees (see **A2.1. The European SME Sector**) despite the economic situation.

Conclusions

Across Europe, SMEs are a highly significant part of the private sector, accounting for 99.8% of all enterprises, with 67% of total employment and 58% of gross value added (GVA) and 55% of turnover. These statistics are reflected in the 12 Member States participating in smeSpire, and indicate that the SME sector is critically important in the economies of these countries.

3.1.2. The EU ICT sector

In 2010 the overall European Union's ICT sector figured some 873,000 enterprises, employing 5.8 million people and generating € 487.9 billion of value added (Eurostat, 2013a). The sector's contribution to the non-financial business economy was 4.0 % of the enterprise population, 4.4 % of the workforce, and 8.2 % of value added[2]. A more detailed analysis of the European ICT sector is presented in the section "**A2.3. ICT facts and figures**".

In the 12 smeSpire Member States SMEs comprise 99.73% of the total number of ICT companies, with 436,647 SMEs out of 437,834 enterprises (Eurostat, 2013a). They account for 56.88% of people employed and 37.86% of turnover. There is some variation across the 12 smeSpire Member States on the proportion of ICT companies that are SMEs, from 96.35% in Slovakia to 99.94% in Greece. Overall, despite the economic situation, the ICT sector in the 12 smeSpire Member States remained almost

[2] Gross value added (GVA) at market prices is output at market prices minus intermediate consumption at purchaser prices; it is a balancing item of the national accounts' production account (Eurostat, 2013b):

- GVA at producer prices is output at producer prices minus intermediate consumption at purchaser prices. The producer price is the amount receivable by the producer from the purchaser for a unit of a product minus value added tax (VAT), or similar deductible tax, invoiced to the purchaser.
- GVA at basic prices is output at basic prices minus intermediate consumption at purchaser prices. The basic price is the amount receivable by the producer from the purchaser for a unit of a product minus any tax on the product plus any subsidy on the product.

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stable (A2.3. ICT facts and figures). However, deeper analysis suggests that a loss of employees registered by LEs seems compensated by an increase of jobs in SMEs. This may be because of a transfer of ICT competences and jobs from large to small-medium companies. (**A2.2. The European ICT Sector**, **Figure 25**). The ICT SMEs in the 12 smeSpire Member States are significant contributors to the economies in their respective countries, with a turnover estimated as 37.9% (294 billion €) of the total ICT market (**A2.2. The European ICT Sector**, **Figure 26**).

In Europe the ICT sector, and in particular ICT services, is highly concentrated (Barrios et al., 2007, p.11). High-tech sectors are generally more concentrated spatially given the importance of knowledge and technological spill-overs in shaping their distribution. This may suggest that ICT and knowledge-related agglomeration economies may be particularly important in the case of ICT services. For example, in terms of employment, ICT companies are more spatially concentrated around the "blue banana" (Brunet, 1989), a banana-shaped metropolitan axis running from London to Milan, with some extensions towards other regions (e.g. Scotland, Madrid, Lazio) and areas in the east of Hungary (Kozep-Magyarorszag), Poland (Mazowieckie) and Czech Republic (Praha) as depicted in the "Regional Innovation Scoreboard 2012" (European Commission, 2012a).

In a report on the "European Software Strategy" (Sharpe, 2009) several key issues affecting ICT SMEs were highlighted. The report finds that very few European ICT SMEs trade internationally, research and innovation is significantly below potential, the ICT SME labour market is inefficient and fragmented and participation of SMEs in European processes (e.g. standardization) remains low. The report shows that partnering with a firm in another Member State may be very difficult, due to difficulties in accessing information about potential SME partners in other countries, fragmented work permit systems, different legal systems, and different national provisions and procedures. The report also identified a number of barriers to progress, including:

- public procurement procedures: heterogeneous, not harmonized and too often not following a "*modular approach*" but focused on "*unnecessary demand of integrated systems*" so increasing the size of tenders and hampering the participation of SMEs; and
- lack of harmonized rules in "*finance and financial infrastructure, employment rules, social and tax schemes*"
- language and cultural differences, as well as different educational requirements and curricula.

Possible actions to overcome these barriers addressed are mainly focused on promoting practical software interoperability, creating clustering opportunities for innovative ICT SMEs, stimulating EU level projects specific to ICT SMEs, and encouraging modularity and interoperable solutions in public procurement rules (Toffaletti et al., 2009).

Conclusions

ICT SMEs are a significant contributor to the economies of Europe as a whole and the 12 smeSpire Member States in particular. Their contribution may be increasing with a shift in employment from large enterprises to SMEs. In part, the variation across Europe may be explained by the "clustering" effect, which could reflect a relative increase in the importance of this area in a European context. The European Software Strategy identified a number of issues that can affect the activities of ICT SMEs. These need to be taken into account in the context of Geo-ICTs and their interactions with INSPIRE.

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3.1.3. Key indicators on EU Member States

Country	Basic indicators				SME sector indicators		ICT sector indicators			
	Population (1)	Area km2 (2)	GDP per capita (3)	Number of local authorities (4)	Number of SMEs (5)	Number of SME employees (5)	Number of ICT enterprises (6)	Number of ICT employees (6)	Turnover by enterprise (7)	Value added by enterprise (7)
EU-28	**506.816.576**	**4.365.660**	**100**	**94.964**	**20.776.847**	**88.707.166**	**794.355**	**5.732.100**	**1.361.364**	**600.911**
Austria	8.404.252	83.858	131	2.366	296.227	1.774.836	15.491	91.076	1.177.955	488.813
Belgium	11.000.638	30.510	119	605	503.739	1.714.611	19.813	124.677	1.573.921	664.629
Bulgaria	7.369.431	110.910	47	264	314.047	1.474.120	7.915	66.337	418.863	198.446
Cyprus (a)	839.751	9.251	91	523	45.440	193.507	787	9.238	1.343.964	761.753
Croatia (b)	4.412.137	56.542	61	577	143.434	737.158	6.034	39.801	658.071	286.626
Czech Republic	10.486.731	78.866	79	6.264	948.332	2.376.820	36.175	112.393	364.177	159.583
Denmark (c)	5.560.628	43.094	125	103	204.214	1.284.655	12.216	108.223	1.780.026	809.046
Estonia	1.340.194	45.226	68	226	52.227	319.105	2.106	16.323	614.530	268.091
Finland	5.375.276	336.593	115	338	208.808	869.610	8.621	90.370	1.799.548	817.481
France	65.048.412	551.695	108	36.809	2.353.510	8.600.051	80.346	701.843	2.098.584	907.738
Germany	81.751.602	357.021	121	11.816	2.108.924	15.700.875	83.593	995.510	2.434.065	1.115.115
Greece	11.309.885	131.940	75	338	762.280	2.080.433	:	:	:	:
Hungary	9.985.722	93.030	66	3.195	569.980	1.809.857	34.056	106.147	323.984	114.620
Ireland	4.569.864	70.280	129	119	146.629	740.084	7.370	67.100	5.468.250	1.282.429
Italy	60.626.442	301.230	98	8.221	3.792.676	12.132.249	100.656	583.984	1.105.604	485.757
Latvia	2.074.605	64.589	62	119	76.151	436.124	2.884	20.650	440.326	199.064
Lithuania	3.052.588	65.200	70	60	105.084	603.916	2.356	24.142	650.849	260.059
Luxembourg	511.840	2.586	271	106	27.709	159.665	1.647	14.119	3.670.431	1.323.801
Malta	415.198	316	86	68	30.174	89.065	:	:	:	:
Netherlands	16.655.799	41.526	128	430	610.319	3.481.622	31.759	267.631	1.742.634	805.265
Poland	38.529.866	312.685	66	2.874	1.391.109	5.494.037	51.705	259.134	435.476	192.036
Portugal	10.572.157	91.568	75	4.261	710.874	2.365.882	14.208	76.760	962.028	380.075
Romania	21.413.815	238.391	49	3.222	532.452	2.717.168	19.638	140.252	423.317	177.462
Slovakia	5.392.446	48.845	75	2.938	81.818	568.331	935	27.780	4.229.091	2.028.877
Slovenia	2.050.189	20.273	82	211	106.531	413.889	5.376	22.335	549.535	191.983
Spain	46.152.926	504.851	97	8.138	2.443.546	9.101.560	48.268	426.454	1.695.098	758.171
Sweden	9.415.570	449.964	128	307	571.929	1.833.867	48.557	189.831	668.536	273.369
United Kingdom	62.498.612	224.820	110	466	1.638.684	9.634.069	144.061	1.084.546	1.364.023	665.855

(1) http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Population_and_population_change_statistics

(2) http://en.wikipedia.org/wiki/Demographics_of_Europe

(3) http://europa.eu/rapid/press-release_STAT-13-98_en.htm

(4) http://www.ccre.org/docs/Local_and_Regional_Government_in_Europe.EN.pdf

(5) http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2012/database_en.zip

(6) http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Information_and_communication_service_statistics_-_NACE_Rev._2

(7) smeSpire elaboration on (5)

(a) includes Nothern Cyprus

(b) http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2010-2011/croatia_en.pdf

(c) 2008

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3.2. The Geo-ICT sector

In principle, Geo-ICT SMEs can be considered simply as a subset of the overall SME and ICT sectors. However, the position is slightly more complex, and this affects our ability to reach an overall understanding of the Geo-ICT SME sector. This section highlights some of the issues. An analysis of the Geo-ICT sector is outlined in **A2.4. The European Geo-ICT Sector**.

3.2.1. Definition of Geo-ICT

There is no standard definition of the Geo-ICT sector, whether at Member State or European level. Most existing studies and policy documents use their own definition of the Geo-ICT sector. Table 2 gives an overview of five existing definitions of the Geo-ICT sector.

Table 2 – Definitions of the Geo-ICT sector

Castelein W.T. et al. (2010)	The geo-information sector works with location specific (x,y,z) information or services. Within the geo-information sector, four areas of activity can be identified: 1) measuring, collecting and storing of data about geo-objects; 2) processing, editing, modelling, analyzing and managing that data; 3) presenting, producing and distributing the data; and 4) advising, educating, researching and communicating about processes and use of geo-information products and services.
Oxera (2013)	Geo-ICT companies can be defined by their position in the "stylized value chain for Geo services", which includes surveyors, census hard-copy map providers, aerial photos providers, base map data providers, satellite and remote sensing imagery providers and software developers (GIS-related products and services providers as well as satellite image programming platform providers)
Geospatial Workforce Development Center (2001)	An information technology field of practice that acquires, manages, interprets, integrates, displays, analyzes, or otherwise uses data focusing on the geographic, temporal, and spatial context. It also includes development and life-cycle management of information technology tools to support the above.
ACIL Tasman (2008)	The modern spatial information industry acquires, integrates, manages, analyzes, maps, distributes, and uses geographic, temporal and spatial information and knowledge. The industry includes basic and applied research, technology development, education, and applications to address the planning, decision-making, and operational needs of people and organizations of all types.
AGORIA (2012)	The sector deals with information related to geographical location through providing solutions in the area of the Geographical Information Systems (GIS) which are designed to gather, store, process, analyze, manage, organize, present and diffuse all types of geographical data. The Geo-ICT sector includes thus ICT-based products and services related to four main types of activity which are: acquisition, processing, storage and diffusion of geo-information.

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Some of these definitions include a reference to the ICT sector, highlighting that the ICT sector is frequently considered a main reference sector for private companies dealing with geographic information and geomatics, smeSpire however is intended to cover the micro-small-medium sized private companies that work on Geographic Information in one or more activities that are covered by INSPIRE:

- Data modelling
- Data creating/processing/analyzing/publishing
- GI/SDI software development/customization
- Training / consultancy

Therefore, a broader definition is adopted that covers all SMEs involved in the creation and publishing of data covered by the INSPIRE Regulations, as well as the more traditional GIS/geo-location based activities, and the broader activities that fall within ICT.

Conclusions
There is no standard definition of the Geo-ICT sector, and most studies and policy documents use their own definition. SmeSpire defines the Geo-ICT sector as all companies involved in the creation and publishing of spatial data and more traditional GIS/geo-location based activities.

3.2.2. The European Geo-ICT Sector

Little information and data is available on the overall European Geo-ICT sector. However, some studies are available that focus on the Geo-ICT sector in one single Member State.

Castelein W.T. et al (2010) made an analysis of the Dutch Geo-ICT sector in 2008. The analysis showed that in that year, the Dutch private Geo-ICT sector had a turnover of € 900 million from geo-information products and services for which 9977 employees were responsible. The sector was responsible for 66% of the total "geo" workforce and 64% of the overall geo-information economic value (see Table 24). Geo-ICT was responsible for 3.64% of the total number of ICT employees (**Table 25**), and 1.04% of the overall number of ICT companies (see **Table 26**). The most active area of the private Geo-ICT sector, with a total turnover of € 297 million, was measuring, collecting and storing geographic data. These are the more traditional land surveying activities of the sector, using increasingly more digital techniques. Other geographic information system (GIS) related activities such as processing, editing, modelling and analyzing of data accounted for € 234 million, while consultancy related activities accounted for € 216 million.

For several years, AGORIA, the Belgian federation for the technology industry, has assessed the Geo-ICT sector in Belgium. Most recent figures show the Belgian Geo-ICT sector comprises approximately 60 companies, generating a total annual turnover of more than € 335 million, and offering jobs to an estimated 1850 employees.

The UK Location Market Survey 2012 undertaken by Consulting Where (Masser & Waters, 2012) provides an assessment of both the current size and future directions of the UK Market for Location Information Products and Services. The estimate for location related software, professional services,

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data and hardware in 2012 is £1.23bn. The authors also predict continued growth at a modest 1 to 2% in real terms over the following 3 years.

Information on the size of the German Geo-ICT sector has been provided by MICUS (2010). In the year 2000 the market volume amounted to €1 billion, and by 2007 this had increased by 51% to just over €1.5 billion. According to the report, the geobusiness market can be classified into three main sectors: navigation and mobile services, planning and documentation systems and geo-marketing. Notably, in the navigation sector the volume of sales more than doubled between 2000 and 2007, from €350 million to €728 million.

Conclusions

No information and data are available on the overall European Geo-ICT sector. Based on existing studies at country level, it appears that Geo-ICT companies comprise 1-2% of the overall ICT sector, with a crude estimate of about 4,400 geo-ICT companies in the 12 smeSpire Member States, and 7,000 in the EU28.

3.2.3. General description of the Geo-ICT sector in the 12 Member States

Based on existing studies and the information from interviews with key stakeholders in the private and public Geo-ICT sector, a general description can be made of the Geo-ICT sector in the 12 Member States.

The **Belgian** Geo-ICT sector can be described as a very diverse, as different groups and types of Geo-ICT companies can be distinguished. Companies in the geo-ICT sector are active in the field of data collection and surveying, data integration & processing, publication & distribution of spatial data, and in the development of added value services & applications built on top of the data. Several companies offer technical support to implement GI-technology and SDI components. Besides the larger IT companies with a small Geo-ICT division, the majority of companies in the Belgian Geo-ICT sector are SMEs, with less than 50 employees. Several companies are located in or around Brussels or in the proximity of a university or knowledge institution. Although there are many similarities between the ICT sector and the Geo-ICT sector and both sectors are dealing with similar matters, the level of interaction between both sectors is still limited. Key strengths of the Belgian ICT sector are its long history in the collection, processing and use of spatial information, the strong collaboration and linkages with universities and research institutions and the presence of very talented people with specialized skills and knowledge.

The Geo-ICT sector in **Bulgaria** exists in a very difficult market especially in regard to GI/ SDI services and applications. The GIS market is occupied by big companies and there are few opportunities for SMEs to promote solutions and services. The Geo-ICT sector is active and contributes in different ways to the development and distribution of spatial data. The main types of companies in the Geo-ICT sector are data providers, software or service providers. A significant number of companies are involved in surveying and cartography. There are many geodetic and cadastre companies that are rather well developed. For most companies, developing GIS and SDI is very difficult and most companies are not able to provide software and services. The GIS software market is dominated by one vendor.

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In **Cyprus**, there are only a few companies involved in Geo-ICT activities, and most of these are not fully active in the domain of Geo-ICT. These companies are primarily involved with updating digital maps, developing applications, developing navigation software and the application of geospatial knowledge to various (research) projects. All Geo-ICT companies, and practically all IT companies have less than ten employees. Due to their small size, it is difficult for most companies to expand their geo-ICT activities outside Cyprus, and to develop internationally applicable expertise and qualifications.

There is a long tradition in providing of Geo-ICT services in the **Czech Republic**. The first private companies started their businesses very shortly after fall of the communist regime in the early 1990's. They have quickly adopted the technology and started their own activities either implementing third party software products or developing brand new solutions fit to Czech customers and reality. Many of the companies started as data producers for spatial planning, having a geodetic background, eventually evolving into service and technology providers. Around 1995, an evolution was made from simple digital data collection to data analysis, but also a demand came up for online spatial information. Now, a transition is on-going towards online-editing, use of clouds, crowdsourcing and geo-processing and georeporting. The core business of Geo-ICT SMEs in the Czech Republic varies from GIS data creation and maintenance to GIS software and application production and sale of value added products generated using GIS tools and methods. Some of the enterprises have also a geodetic unit, some of them have an IT department, specializing not only in GIS applications but also in portal solutions in general. Some enterprises are Czech branches of foreign companies selling the GIS product of their "mother" company, adding some services of local importance (support for Czech S-JTSK coordinate system, adding of precise transformation parameters, localization of foreign products into Czech language, etc.). Most of them are of the Czech origin.

The **German** Geo-ICT sector consists mainly of small enterprises with less than 50 employees. The average number of employees is around 12. More than 600 companies exist and the number is still rising. The sector developed exponentially in the past 15 – 20 years and more and more companies are recognizing the business potential of geo-services. From 2000 to 2008 the sector grew by more than 50%, but still the Geo-ICT sector is small, contributing only 0.03% to the national gross turnover. Technology and solution companies are the main types in the German Geo-ICT sector. Service providers, consultants, system integrators and marketing companies are also present. The marketing sector is underrepresented, especially internationally, while business intelligence is becoming more important. In many cases most of the services are offered by the same company. The sector provides software, data and specialized services to many sectors such as business, engineering, environment & nature, transport, utilities, public authorities, architecture, cartography, surveying and much more. The companies are distributed nationwide with clustering in regions with academic and technical impulses like Munich, Stuttgart, Bonn, Münster and Leipzig. The sector has a good standing in the international context and is fast and flexible.

The Geo-ICT sector in **Greece** consists mainly of SMEs of 5 to 15 people. Those are very small companies with a turnover of a few million euros per year. The majority work mostly inside Greece, however a few have expanded into other areas of Europe, the Balkans and Middle East. The majority of companies are located in the capital city of Athens, another small core is located in the second largest city, namely Thessaloniki, and the remaining companies are distributed around Greece. All the GEO-ICT companies in Greece are public works contractors. Their activities include data and metadata implementation, transition, view services, download services, transformation services and geoportals.

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Some companies provide data needed for special purposes. The most common is a navigational road network for navigation devices and fleet management companies.

In terms of size of the sector, the number of Geo-ICT SMEs in **Italy** is a very small percentage (in the order of 1.5% – 2%) of the total number of ICT SMEs, which in turn represents 2% of the total number of enterprises. However, there is a trend according to which the geospatial activities related to broader businesses, like the utilities and, in general, all the location-based services/applications, are increasing. There are also many pure ICT companies looking with more interest at the potential of the geospatial information as an added value to their existing services/applications. Moreover, this aspect has the additional benefit of extending the environmental intrinsic dimension of INSPIRE to other application domains like geomarketing and, more in general, almost all the decision making processes of the public sector. With reference to the data value chain and, in particular, to the distinction between the activities related to the raw data acquisition, including land survey and topography, and to the activities related to the extraction of information from the raw data, to the development of applications and to the provision of services based on the information extracted, there is a trend according to which there are less companies involved in the first type of activities and more companies working in the added-value chain.

No precise numbers (details of enterprises, staff, GDP share etc.) characterizing the Geo-ICT sector in **Lithuania** are available. Most stakeholders agree that the sector is developing rapidly but still remains relatively small. There are several larger companies-developers with a specific Geo-ICT specialization. These companies are situated in large cities and provide IT services and implement solutions both in domestic and foreign markets. However, the sector is dominated by smaller companies which are geo data collectors and managers. They are spread across the country and work mainly in their own municipality or region. Geo-ICT sector companies operate in different areas: they distribute (seldom develop), implement and maintain technologies, develop, deploy and maintain solutions, develop services and applications for specific tasks, providing surveying services and contribute to maintenance of geo data sets. The sector has great potential for growth because the needs for spatial data solutions and technologies are not met and are still growing. The sector is characterized by highly-skilled professionals and internationally competitive service prices.

The Geo-ICT sector in **Malta** is very small and there are only a few private companies involved in Geo-ICT activities. The contribution of the sector to economic growth is very limited. In general, there is a lack of awareness and knowledge of INSPIRE and SDI which is the main obstacle impeding any proliferation of Geo-ICT. The sector is expected to grow once the benefits of geo spatial technology unfold.

The Geo-ICT sector in **Slovakia** mainly consists of small SME companies with less than 10 persons. Bigger companies (more than 10 persons) have wider activities and Geo-ICT is represented by departments or divisions in such companies. Most Geo-ICT companies are limited companies and self-employed. The Geo-ICT sector is small and currently is affected by a low number of domain related public tenders or limited project calls. Big projects are supported by EU structural funds but there are still missing regular orders, requirements, or demands from municipalities (building geoportals and services for citizens) and public administration (GIS orientated information systems).

The Geo-ICT sector in **Spain** mainly consists of small companies working at local level, populated by young employees, with an average of 4-30 employees per company. Official statistics on the number of companies in the Geo-ICT sector are not available, however it is estimated there are around 100 Geo-

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ICT companies/SMEs in **Spain** and most have made a shift from geo-related activities towards Geo-ICT activities. Among the Geo-ICT companies, there is a small group of ICT companies using Geo component, in terms of geolocation, coming from the statistics and mobile sector. There are also some infomediary companies that are not developing or implementing GI applications, but use geodata for new and innovative developments. Geographically, Geo-ICT companies are throughout **Spain**, although centralized in the main areas of technological development where it is easier to promote innovation and research. The main types of companies in the Spanish Geo-ICT sector are in the areas of technology and end clients' solutions; they offer consultancy and are service providers.

In the **UK**, private sector companies in the Geo-ICT sector fall into four broad categories by business focus: geospatial information specialists, marine survey and positioning services, geomatics organizations and systems integrators. There is a full range of companies in the Geo-ICT sector in the UK, ranging from the very large, often multi-nationals or part of a wider group, down through medium sized companies to SMEs. There is a preponderance of SMEs, many of them micro companies, formed by individuals wishing to exploit knowledge or ideas, often obtained while working in the user environment. Medium-sized companies are under-represented in the sector because, as with other areas of ICT, if successful they often are taken over by larger companies. A key strength of the Geo-ICT sector in the UK is its diversity. There is a great range of companies carrying out all kinds of activities, with much innovation. They have a lot of knowledge and expertise in both technology (software and services) and applications. In addition, the high quality mapping base means that beneficial applications can be built. The main activities performed by companies active in the Geo-ICT sector are the supply of data, the supply of software and systems and professional services including specialist expertise, data management, system management, business and technical consultancy, research and training. Many companies carry out more than one of these activities.

Conclusions

In most Member States, the Geo-ICT sector mainly consists of medium-sized and especially small enterprises. Besides these Geo-ICT SME's, in most countries larger ICT companies with a small Geo-ICT division are also providing Geo-ICT products and services. In general, companies in the geo-ICT sector seem to be active in many different fields and carry out all kinds of activities: data collection, data integration and processing, consultancy and service provision, application development, research and training, etc.

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3.3. INSPIRE in the 12 Member States

This section summarizes the status and recent progress of INSPIRE in the 12 smeSpire Member States. This is an important context for the relationships between Geo-ICT and INSPIRE in individual Member States. Information reported was collected through interviews from Member State Contact Points (MSCPs) and Legally Mandated Organizations (LMOs), focusing on the importance of INSPIRE, the already available components, and strengths and weaknesses of INSPIRE. The information collated from Member States is fully recorded in sections **Annex 3 – INSPIRE seen by Member States**, from **Table 28** to **Table 31**.

3.3.1. The importance of INSPIRE

The importance of the INSPIRE Directive in each Member State is reflected in many different ways. The clear definition of roles in the implementation, the budget defined for the implementation[3], the presence of a well operating co-ordination structure, and the involvement of actors at a lower administrative level all provide an indication of the importance of INSPIRE at Member State level. A summary of the current situation in each Member States is presented in **Table 3**.

Regarding the definition of roles in the implementation of INSPIRE, even if almost all countries defined an organizational structure (see **Table 30**), in some cases the roles and responsibilities regarding data themes and/or network services are not clearly defined: this is the case of Greece ("*where there are still thematic dataset that do not have a responsible agency*"), Italy (where the "*the activities of the steering committee never started*" and there is a tremendous "*lack of a co-ordination policy about INSPIRE implementation*"). In most Member States (e.g. Lithuania and Slovakia) organizations responsible for INSPIRE Annexes themes have been clearly defined, also through web surveys, in order to discuss roles and avoid overlaps between different organizations.

Information about costs and budget often seems to be incomplete and difficult to provide: only interviewees in Belgium, Germany, Lithuania, Malta, Slovakia and Spain reported budget and/or estimates at national or sub-national levels; some values are strictly related to INSPIRE activities (e.g. at federal level Belgium), others refer to SDI implementation as whole (e.g. GDI-DE in Germany, or IDEE in Spain, or in Malta), some others to specific components (e.g. geoportal in Lithuania).

In general, all Member States have some form of central co-ordinating structure in place. Key differences between the co-ordination structures in different Member States are related to the operational status of these structures and to the actors that are represented in these structures, in particular, the link to and involvement of lower administrative levels remains limited in several Member States.

[3] An interesting presentation at the INSPIRE Conference 2013 about costs for implementing INSPIRE components was the one on the Polish National Geoportal (Grudzien, 2013)

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Table 3 provides a general comparison between Member States regarding the 'importance' of INSPIRE: whether responsible parties have been clearly defined, if the budget has explicitly been allocated for INSPIRE related activities, if a co-ordination structure is in place and if lower administrative levels are involved. A more detailed discussion of the issues described in table 3 can be found in the INSPIRE & NSDI State of Play reports (Vandenbroucke et al, 2012) and in the Member States' reports on implementation of the INSPIRE Directive.

Table 3 – Importance of INSPIRE in the 12 Member States

country	*Responsible parties clearly defined*	*Budget for INSPIRE activities explicitly expressed*	*Co-ordination structure*	*Bridges with lower level(s)*
Belgium	Yes	Yes	Yes	Yes
Bulgaria	Yes	No	Yes	No
Cyprus	Yes	No	Yes	Yes
Czech Republic	Partly	No	Yes	Yes
Germany	Yes	Yes	Yes	Yes
Greece	No	No	Yes	Yes
Italy	No	No	Partly	Partly
Lithuania	Yes	Yes	Yes	Partly
Malta	Yes	Yes	/	No
Slovakia	Yes	No	Yes	Partly
Spain	No	No	Yes	/
United Kingdom	Yes	No	Yes	Yes

Conclusions

There clearly is variation in the importance given to INSPIRE by different Member States. This variation can be seen by the degree to which the roles and responsibilities of different parties are clearly defined, in the existence of an explicit budget for INSPIRE implementation, in the presence of a co-ordination structure and in the involvement of lower administrative levels.

3.3.2. Implementation of INSPIRE components

Table 4 provides an overview of the current status of the implementation of INSPIRE in the 12 Member States based on the indicators they provided for monitoring the implementation and use of the national infrastructures for spatial information. During the interviews with Member States' experts, more qualitative information was collected on the current status of INSPIRE implementation in each country.

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The most frequent components already implemented in different Member States and their public authorities are the metadata. In only a few Member States the existence and compliance of metadata is still weak. Most Member States have developed and implemented an INSPIRE compliant metadata profile and have created INSPIRE compliant metadata for most of their data sets and services.

Most Member States also made significant progress in the implementation of network services, especially discovery services. In most Member States, discovery services to search for spatial data sets and services exists for the majority of the reported data sets and services. The implementation of view services, and especially download services is relatively limited. While discovery services often are developed centrally, many view and download services are being developed – or need to be developed – by the responsible data provider. In most countries, only some data providers have implemented these services for their own data. In many public authorities, these services are still under development or are not fully compliant with INSPIRE.

While several Member States do not have any spatial data sets that are INSPIRE compliant, in some Member States there already are a few INSPIRE compliant data sets.

The information in **Table 4** is based on the eight general indicators for monitoring the implementation and use of the national infrastructures for spatial information provided by the Member States in 2013[4].

According to Commission Decision 2009/442/EC of 5 June 2009 implementing the INSPIRE Directive, EU Member States have to report these indicators and the specific indicators that are used to calculate the general indicators annually. The eight general indicators measure:

- the existence of metadata for the spatial data sets and services ('metadata existence' - general indicator MDi1)
- the conformity of metadata for the spatial data sets and services with the implementing rules ('metadata compliance' – general indicator MDi2)
- the extent of the Member States territory covered by the spatial data sets ('data sets extend'- general indicator DSi1)
- the conformity of the spatial data sets and their corresponding metadata with the implementing rules ('data sets compliance' – general indicator DSi2)
- the extent to which it is possible to search for spatial data sets and spatial data services on the basis of their corresponding metadata through discovery services ('metadata accessibility'- general indicator NSi1)
- the extent to which it is possible to view and download spatial data sets through view and download services ('data sets accessibility'- general indicator NSi2)
- the use of all network services ('services use'- general indicator NSi3)
- the conformity of all network services with the implementing rules ('services compliance' – general indicator NSi4).

Precise information on how these indicators are calculated is provided in the Commission Decision 2009/442/EC of 5 June 2009.

[4] http://inspire.jrc.ec.europa.eu/index.cfm/pageid/182/list/indicators/y/2013/sel/2

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Table 4 – Implementation of INSPIRE components in the 12 Member States (comparative)

	Metadata		Data sets		Services			
	Existence	*Compliance*	*Extend*	*Compliance*	*Metadata Access*	*Data sets Access*	*Use*	*Compliance*
Belgium	80%	59%	99%	2%	53%	37%	577.899	56%
Bulgaria	20%	6%	34%	0%	5%	3%	0	0%
Cyprus	/	/	/	/	/	/	/	/
Czech Republic	100%	80%	97%	2%	96%	18%	7.973.064	55%
Germany	71 %	66 %	99 %	5 %	66 %	16 %	514.349	50 %
Greece	59%	28%	98%	0%	34%	34%	0	50%
Italy	95%	51%	98%	1%	65%	34%	405.532	0%
Lithuania	/	/	/	/	/	/	/	/
Malta	94%	94%	99%	0%	94%	53%	59	0%
Slovakia	/	/	/	/	/	/	/	/
Spain	93%	90%	99%	10%	78%	7%	1.299	69%
United Kingdom	95%	95%	100%	0%	94%	14%	94.048	100%

While **Table 4** above is based on the indicators for monitoring the implementation and use of the national infrastructures for spatial information provided by the Member States[5], a qualitative description and analysis of the implementation of INSPIRE components in the different Member States is provided in **Table 29** in **Annex 3 – INSPIRE seen by Member States**.

Conclusions

While most Member State already have made significant effort in the creation and provision of INSPIRE compliant metadata and in the implementation of view services, the implementation of download and harmonisation services and the compliancy of data sets is still relatively weak.

[5] http://inspire.jrc.ec.europa.eu/index.cfm/pageid/182/list/indicators/y/2013/sel/2

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3.3.3. Strengths and weaknesses of INSPIRE implementation

During the interviews with stakeholders in the public and the private sector, several strengths and weaknesses of INSPIRE and the way it is implemented in each Member State, were identified.

Several Member States see the federated manner in which INSPIRE is implemented in their own country has an important strength. Actors at different levels and in different domains are involved in the implementation, and are responsible for the implementation in their own – geographic or thematic – area. Therefore, a clear distribution of responsibilities and competences is considered a key requisite for a successful implementation of INSPIRE. In Member States where such a distribution of responsibilities is missing, this is often seen as an important weakness. For example, the most important weakness of INSPIRE implementation in Greece is that there are still thematic datasets that do not have a responsible agency.

Responsibilities and competences on the implementation of INSPIRE are allocated in different ways. A key strength of INSPIRE implementation in Slovakia, is the centralized structure and approach, which allows a hierarchical distribution of responsibilities within the public sector. In this context, the small size of certain countries, such as Malta, is often considered as an advantage, because entities for which the INSPIRE directive applies, can be reached easily. In other Member States, such as Belgium and Germany, a more collaborative and consensus-based approach is (or needs to be) followed. This can be considered a strength, because the implementation of INSPIRE is fully based on co-operation and solidarity between involved actors. Conversely, however, this is also a weakness, as different parties have their own agenda and vision, making the process of reaching consensus difficult and time-consuming.

Many stakeholders refer to the issue of awareness, in both a positive and a negative manner. For example, according to the Belgian public administrations, INSPIRE had a positive impact on the awareness about geo-information at political level, and due to INSPIRE, the geo-domain has received more attention and additional financial resources. However, in many Member States, a lack of awareness about INSPIRE among public authorities responsible for managing spatial information forms an important barrier to INSPIRE implementation. In the Czech Republic, there are still several data providers who are not aware of the relevance of INSPIRE to their own organizational activities, and in Italy, for many public sector organizations, the awareness of INSPIRE related business processes is low.

Several Member States also refer to the need to have a clear strategy and a co-ordination policy on INSPIRE. In Germany, the presence of clear objectives which are written down in an agreement is considered as the main strength of the national SDI. In the Czech Republic and Italy, a clear co-ordination policy which defines what needs to be done, is still missing, and this clearly hinders the implementation of INSPIRE. Moreover, several Member States (e.g. Belgium, Lithuania, Slovakia) also mention the lack of financial resources.

When discussing the strengths and weaknesses of INSPIRE implementation many interviewees highlighted the involvement of private companies. This is both positive and negative. In Italy, the high concentration of companies involved in INSPIRE related issues and the presence of a pro-active GI association are seen as key strengths in the way INSPIRE is implemented. Also in Malta, the support provided by private companies to public organizations implementing INSPIRE is an important strength.

However, in most countries the involvement of private companies in the process of INSPIRE policy formulation and implementation is rather limited.

Table 5 – Strengths and weaknesses of INSPIRE implementation in the 12 Member States

	Strengths	**Weaknesses**
Belgium	Awareness at political level Implementation based on collaboration and trust	Implementation slowness Political support and financial resources not sufficient
Bulgaria	/	/
Cyprus	Low cost for data collection and transformation	Lack of knowledge and readiness among government departments
Czech Republic	Technical aspects	Absence of co-ordination policy Some data providers not involved Lack of financial resources in state budget
Germany	Clear objectives, written down in management agreement	Need to reach consensus slows down the decision making process
Greece	Support from the private sector	Thematic datasets without responsible agency
Italy	Realization of several components Involvement of private sector	Lack of awareness Lack of co-ordination policy and communication strategy
Lithuania	Clear organizational structure Open and freely available data	Lack of financial resources Complex legal and organizational data exchange procedures
Malta	Easy to involve responsible authorities Cohesive institutional framework	/
Slovakia	Centralized government structure Possibility to build up the SDI from scratch (and learn from other countries)	Lack of competences and expertise Low investments
Spain	Availability of and access to data Directive well known in the private sector	Lack of knowledge about INSPIRE among private companies Use of SDI cannot properly be ensured
UK	Federated approach, data providers responsible for implementation in their own area	Private sector not adequately engaged, Geo-ICT sector only has a minimal role in policy process

Conclusions

When discussing the strengths and weaknesses of INSPIRE implementation, most Member States refer to the same or similar issues. Key issues in the implementation of INSPIRE are the allocation of responsibilities and tasks, the awareness of and knowledge about INSPIRE, the presence of a clear strategy and co-ordination policy and the involvement of private companies in the implementation. The level to which a Member State is successful in addressing each issue, determines whether is it considered as a weakness or a strength in that Member State.

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3.4. Involvement of private sector in INSPIRE/SDI policy

As mentioned previously, the issue of involving private companies in the formulation and implementation of INSPIRE/NSDI policy was already discussed, in the identification of the strengths and weaknesses of INSPIRE implementation. This section analyses the issue in greater detail, and discusses the actions and initiatives taken in different Member States to facilitate and stimulate the involvement of private companies in the INSPIRE/NSDI policy process.

It should be noticed that in general, the involvement of private sector companies in national GI/SDI policies is very low. In many countries no effort is made to allow private companies to participate in the process of SDI policy. This is, for example, the case in **Bulgaria** and **Malta** where there is no specific policy for the involvement of private Geo-ICT companies. In **Spain**, the GEO-ITC sector has not been consulted in the SDI policy formulation process, which instead mainly focuses on those components relevant to public administration sectors. In **Italy**, a coherent and harmonized GI/SDI policy is not yet in place, and no current actions are undertaken for building up a GI policy taking into account the private sector. The unique example of private sector involvement in defining a nation-wide policy is represented by the vision document and guidelines for smart cities, developed by Agenzia per l'Italia Digitale (AGID) and involving both public and private sectors.

In some Member States, private companies are involved in the policy making process, but only in an informal or indirect manner. **Cyprus** is involving private companies active in the Geo-ICT domain in the formulation of the national GI/SDI policy through informal consultations. In the **UK**, the Geo-ICT sector has little direct involvement in the process of SDI policy formulation and implementation. Their only link is through the Association for Geographic Information (AGI). Some private sector companies are members of the Location Programme Technical Working Groups. In **Lithuania**, actions related to SDI implementation are made in consultation with all those partners (including social) that represent Geo-ICT sector (public organizations and private companies). Moreover, the private sector can submit comments for legislation, but there is a lack of legal and organizational mechanism for involving private sector (especially SMEs) in SDI policy formulation.

There are some examples of more structural and formal involvement of private companies in the SDI decision making process. In **Slovakia**, the current practice of policy making and evaluation process allows involvement of private sector representatives via various channels. Active influence of private sector is possible via specific working groups established by relevant responsible governmental authority. There are also specific standardization working groups with participation from the private sector aiming to harmonize standardization activities with policy making ones.

In the **Czech Republic**, the private Geo-ICT sector has always been a strong player in the development of the national spatial information strategy and policy. For INSPIRE, the involvement of companies is even higher, as many companies are members of technical working groups that support the activities of the National INSPIRE Co-ordination Committee. In Germany, a key initiative to stimulate the involvement of companies in the SDI policy is the GeoBusiness Commission, which is setup to increase the added value of geographic information. This Commission is an initiative of the Federal Ministry of Economics. However, due to existing political structures the influence of the Commission remains limited.

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The SDI in **Germany** originated from companies but nowadays it is controlled by public authorities. Currently, the Geo-ICT sector is mainly involved in the SDI policy by consulting and technical support. Several German Geo-ICT companies are at the forefront of development, and in fact determine the strategy in terms of norms, standards and introduce everything into INSPIRE.

In **Belgium**, private actors are represented in the co-ordination structures of the federal and regional SDI's. In Flanders, there are separate co-ordination bodies in which actors outside the public sector are represented: the 'SDI-council' and the 'technical commission'. The SDI-Council is an advisory body made of stakeholders from the private sector, academic sector and utility sector. In the technical committee, which focuses on the technical aspects of the SDI, private actors are informed of the future strategic and technical developments within the SDI. This allows them to adjust/adapt their future activities, services and products. Also in Brussels (GeoBru technical committee), Wallonia (Strategic Committee) and at federal level (Board of NGI) private actors are involved in the central co-ordinating body. In addition to these formal co-ordination bodies, co-ordination and information sharing between the public sector and private companies happens in an informal manner. In Flanders, the SDI testbed is an important channel for providing information (and access to services and applications 'under development') to private companies. A general observation is that involvement of the private sector in SDI policy making is increasing. A major criticism however is that it is still difficult for private companies to influence the decision making process.

Table 6 below summarizes the level of involvement of Geo-ICT SMEs in the overall SDI policies of the Member States.

Table 6 – Involvement of the private sector in INSPIRE/NSDI Policy

	Involvement of private companies in policy	**Instruments/activities for stimulating the involvement**
Belgium	Yes	Participation in co-ordination structure Informal involvement
Bulgaria	No	/
Cyprus	Partially	Informal consultation
Czech Republic	Yes	Involvement in SDI strategy & policy development INSPIRE working groups
Germany	Yes	GeoBusiness Commission Consulting and technical support
Greece	/	/
Italy	No	/
Lithuania	Partially	Consultation Commenting on legislation
Malta	No	/

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Slovakia	Yes	Working groups Standardization working groups
Spain	No	/
UK	Partially	Through the Association for Geographic Information (AGI). Membership in technical working groups

Conclusions

In general, the involvement of private sector companies in national INSPIRE/SDI policies is rather low. In most Member States, little effort is made to involve the Geo-ICT sector in the INSPIRE/SDI policy process. In some Member States, participation of companies in this process happens in a rather informal and unstructured manner. However, there are some good examples of initiatives and actions to facilitate the participation of companies in the policy process.

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4. In-depth analysis and comparative evaluation

This section summarizes the results and main findings of the survey and the interviews with a special focus on innovation of Geo-ICT SMEs. A key element of this is the comparative evaluation presented in the following sections, aiming to define possible refinements for future research.

4.1. Background of the SMEs surveyed and interviewed

From November 2012 to August 2013, 299 companies completed the survey, with 263 from the 12 Member States of the study (**Annex 1 – Detailed Methodology**, **Figure 20**).

There was considerable variation between Member States in the number of respondents (**Annex 1 – Detailed Methodology**, **Table 14**). This depended on local circumstances as defined by the project partners. In general the distribution of Geo-ICT companies in the 12 Member States reflected the overall distribution of ICT companies in these countries (**A2.3. ICT facts and figures**, **Figure 29**). This is probably to be expected given the close correlation of definitions of Geo-ICT and wider ICT.

Indeed 83% of the companies surveyed defined themselves as "ICT" companies, referring to one or more of the ICT sub-divisions of the NACE Rev.2 section "J" (Eurostat, 2008).

The work carried out by the surveyed Geo-ICT SMEs covered the full range of these ICT functional definitions, as indicated in **Figure 1**, although the largest single activity fell within the definition of "computer programming" (30.5%).

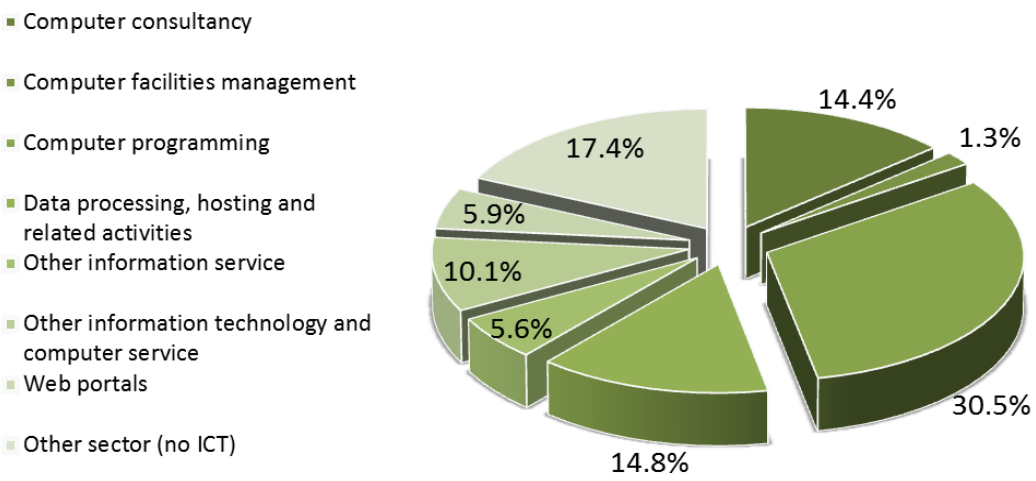

Figure 1 – Companies by sub-divisions of NACE Rev.2 "J"
(source: smeSpire)

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Most of the companies are relatively young. 90% were created between 1988 and 2008, 34% during the 1990s and nearly 12% only founded after 2000 (
Figure 2).

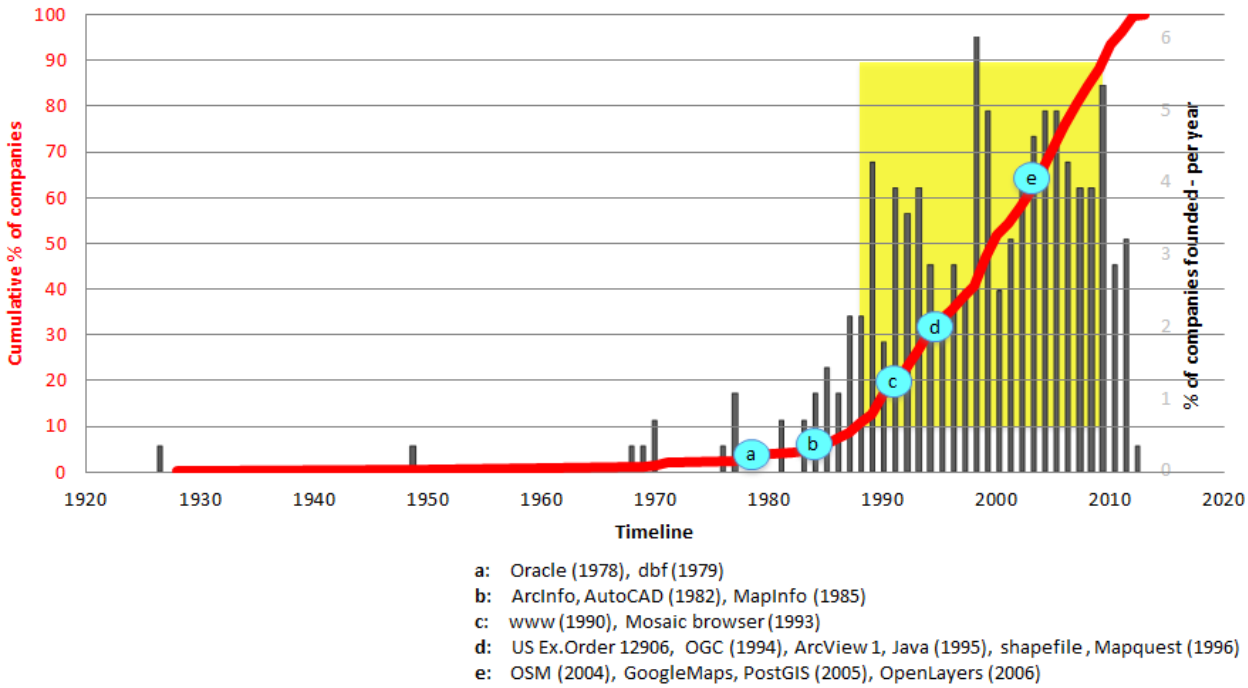

Figure 2 – Year of foundation of Geo-ICT companies
(source: smeSpire)

The graph shows some interesting correlations between the development of the Geo-ICT sector and major technological developments such as the first database platforms and formats in the late '70s, the development of CAD/GIS (workstation) software in the '80s, the birth of the internet and GIS desktop tools for pc, together with the implementation of open source software and new open format specifications in the '90s, and the explosion of internet based mapping services in the beginning of the 21st century.

This shows the importance of such major technological shifts to the Geo-ICT SME sector.

Many of the Geo-ICT companies fall within the "small" category in terms of workforce, with a median value of 11[6] employees (FTE[7]). Overall, 59.4% of Geo ICTs are 'micro' enterprises, while 31.5% are

[6] This value refers to exact numbers of employees declared by SMEs during the interviews. The value here is expressed as median instead of average so to avoid distortions from minimum (1) and maximum (128) values.

[7] Full Time Equivalent

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"small" (**Figure 3**). This differs significantly from the general ICT sector, where 90% of companies are 'micro' (less than 10) and 8% are 'small' (between 10 and 49).

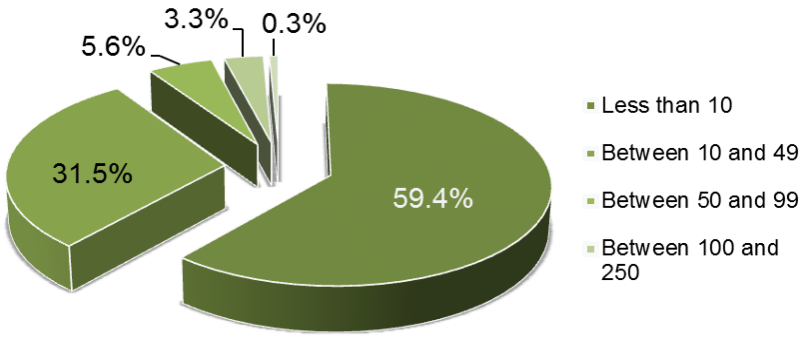

Figure 3 – Number of FTE employees of Geo-ICT companies
(source: smeSpire)

More than 15% of the companies that participated in the survey are part of a group. This is an interesting finding. Taken together with the previous observation on size of company it could lead to the conclusion that Geo-ICT involves more co-operative working than "mainstream" ICT. Of course this could have implications for the results of the survey as according to the EU definition of SME "*a firm which is part of larger grouping may need to include employee/turnover/balance sheet data from that grouping too.*"(European Commission, 2005).

No information about the age profile of Geo-ICT SMEs was collected: we may consider as reference the median age of 39 resulting from an external survey (European Association of Remote Sensing Companies, 2013, p.5).

The survey outcome highlights some interesting differences at country level, but there do not appear to be any overall trends on a European level.

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Conclusions

The distribution of Geo-ICT SMES in the 12 smeSpire Member States appears to reflect the overall distribution of ICT SMEs in Europe, suggesting the wider ICTs clustering could be a significant factor in SME development.

The Geo-ICTs surveyed defined their activities in terms of ICT activities. The full range of activities was covered, though 30% of the effort fell into the "computer programming" category.

Many Geo-ICT SMEs are relatively young companies. There is some correlation between the number of companies being created and the major technological developments in Geo-ICT.

This suggests that such technological changes could continue to be a major factor in future Geo-ICT SME development. There appears to be a difference in the relative proportion of "micro" and "small" SMEs between Geo-ICT s and the wider ICT sector. This could suggest that there is a greater need for co-operation within and between Geo-ICT SMEs.

4.2. Activities and competences

This section presents findings about the main activities, the revenues and the customers, as well as the competences of the Geo-ICT companies.

4.2.1. Markets and customers

The market level of Geo-ICT companies is mainly sub-national, with almost half of the companies surveyed (46%) indicating their primary market is local, and their secondary market (41%) is national (**Figure 4**).

182 companies out of the 299 surveyed (61%) are already doing business with other EU countries, mainly as their secondary (79) or tertiary markets (78%).

Extra-EU market is primary only for 14 companies (5%), while 24 is consider it their secondary market (9%) and 50 (30%) consider it a tertiary market.

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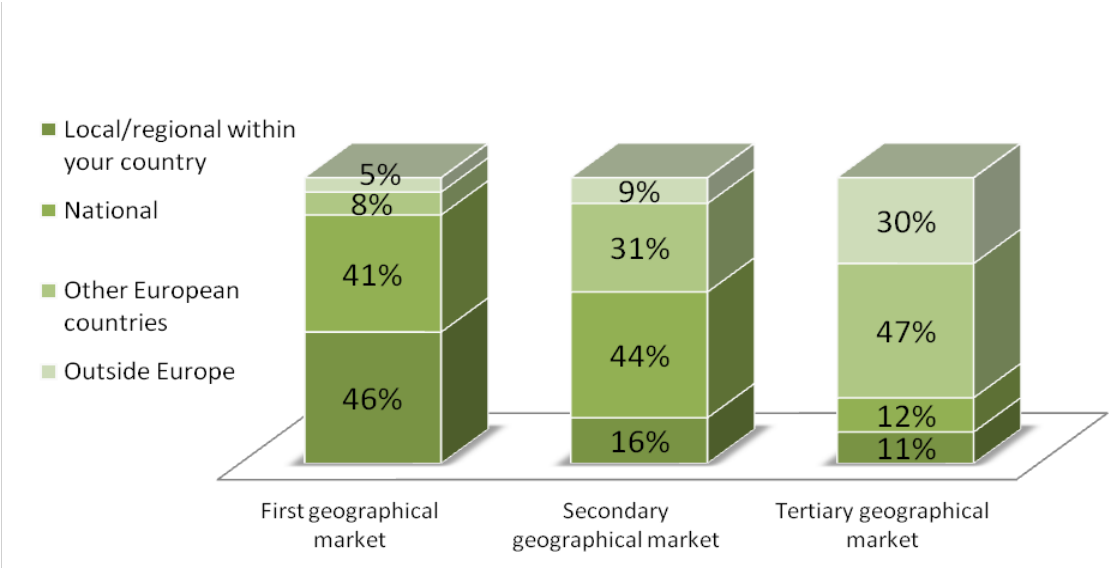

Figure 4 – Geographical markets of Geo-ICT companies
(source: smeSpire)

The public sector is the principal customer for Geo-ICT SMEs representing more than half of the business, for 63% of the companies, and between 20% and 49% of the revenue of a further 21% (**Figure 5**).

The high dependency of Geo-ICT companies on the public sector is a crucial finding of the study, also considering the so-called "*vendor lock-in*"[8] problem: according to a recent Communication of the European Commission (European Commission, 2013c) 16% of procurements is by brand names.

[8] Also known as "*proprietary lock-in*" or "*customer lock-in*", "vendor lock-in happens when customers are made dependent on a specific vendor for products or services, and they are not able to switch to another solution without substantial costs. European public authorities are estimated to be spending unnecessarily some €1,1billion per year as a result of the restricted number of bidders caused by the reference to brand names.

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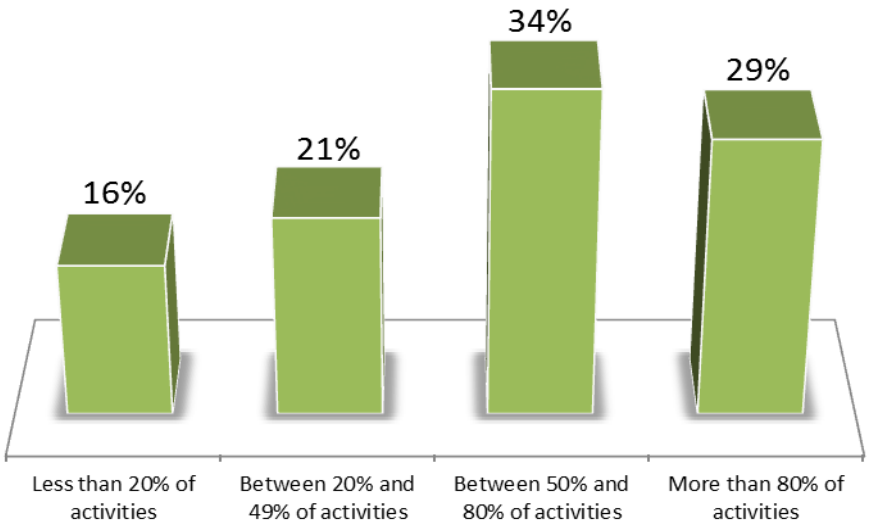

Figure 5 – Public Sector as main customer of Geo-ICT companies
(source: smeSpire)

For the large majority of Geo-ICT SMEs (85%) customers are public authorities within the Member State (**Figure 6**), covering both national and local administrations.

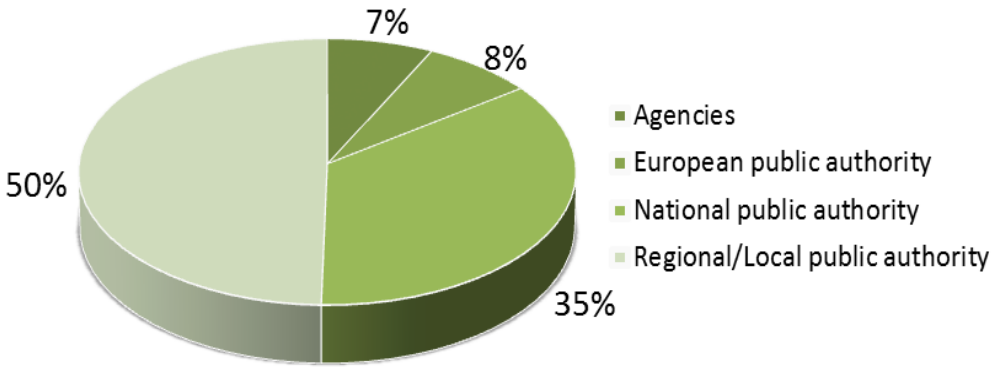

Figure 6 – Type of Public Sector involved as customer
(source: smeSpire)

The survey found that public sector customers come from different domains: agriculture, cadastre, environmental monitoring, spatial planning, and transport. Private customers are mainly from building and infrastructure, real estate, telecoms, utilities.

SMEs are engaged through "call for tenders" as well as direct contracts, often for licenses and maintenance: frequently procurements are also managed by private companies on behalf of governments. A significant finding is the considerable use of sub-contracts often involving high-specialized 'micro' companies, with IT or domain skills.

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Of course this value varies depending on the size of the company, its market and the type of (geospatial) activities provided.

Conclusions

Geo-ICT SMEs are generally involved in markets within their own Member State. The degree of involvement in wider EU business increases with the size of the company. The customer base is significantly skewed to the public sector, covering both local and national public authorities. This is a significant finding from the study. As well as direct contracts, Geo-ICT SMEs are often involved in sub-contracting depending on the degree of specialization of their skills.

1.2.2. Turnover and revenue models

In terms of the formal definitions, almost all Geo-ICT companies are 'small', having a turnover of less than €10million per annum.

The comparison between Geo-ICT and "mainstream" ICT with regard to turnover is different from that of company size (Table 7 and Figure 7). The classification adopted in the smeSpire survey differs from the official definition of SME (European Commission, 2013b): in the official definition the 'micro' class includes companies with an annual turnover of less than € 2 million, and the term 'small' defines companies with a turnover between € 2 million and € 10 million; in the smeSpire classification 'micro' refers to companies with less than € 1 million turnover, and 'small' defines companies with a turnover between € 1 million and € 10 million.

According to the interviewees, the average ratio of turnover/enterprise for the Geo-ICT sector is €1.7million (2011), higher than the ratio for the overall ICT (€1.3million)[9].

Table 7 – Comparative turnover between Geo-ICT and overall ICT SMEs
(source: smeSpire elaboration based on data from European Commission, 2012d)

	Micro (≤ €2million)	**Small** (≤ €10million)	**Medium** (≤ €10million)
Overall ICT	27%	30%	43%
Geo-ICT	73% (≤ €1million)	24% (between €1million and €10million)	3%

[9] Source: smeSpire elaboration based on (European Commission, 2012d)

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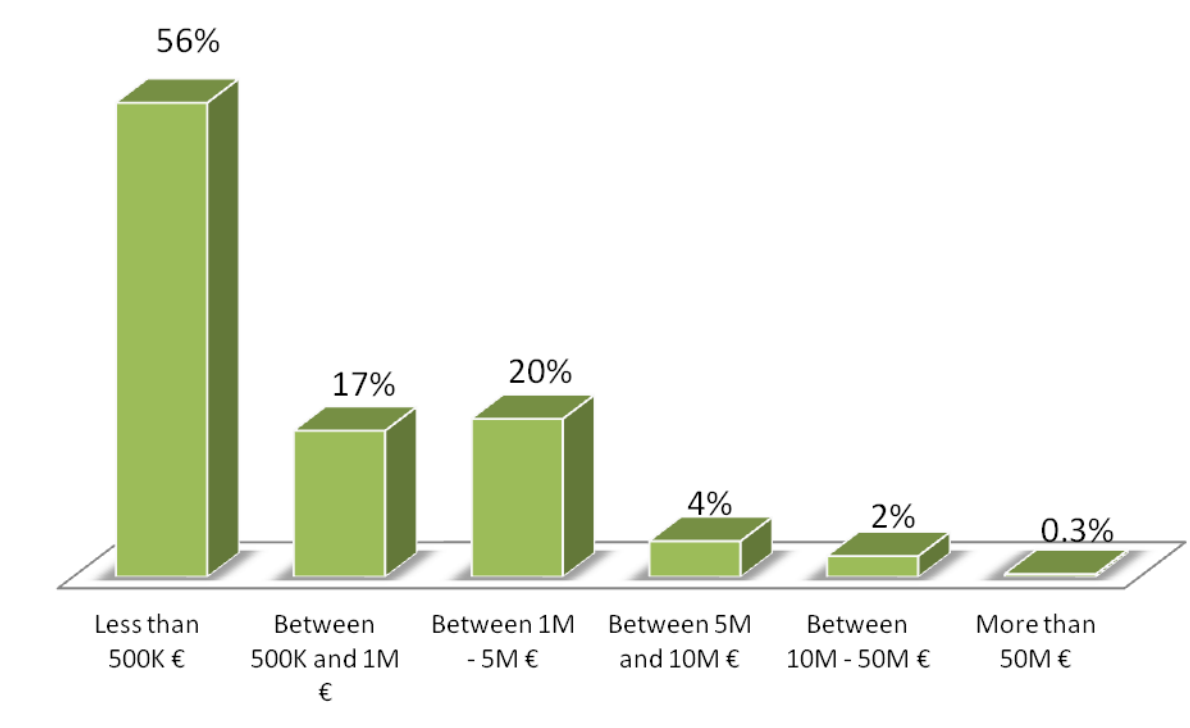

Figure 7 – Annual turnover
(source: smeSpire)

There is a relationship between the annual turnover and the number of employees. While the average value is €52,000 per head, there is a significant variation depending on the size of the company. The higher the number of employees, the higher is the ratio of turnover/employee, suggesting that the advantage in having more employees is more than simply having additional "hands".

Only 32% of companies were involved in one or more EU co-funded projects in 2011. The relative proportion involved in the different projects is outlined in **Table 8**.

Table 8 – Relative involvement in EU Funded Projects

Type of project	Distribution of Geo-ICTs actually involved in projects
FP7	64%
European Regional Development Fund	32%
LIFE+	21%
Competitiveness and Innovation ICT	20%

Of the 102 companies involved in EU co-funded projects in 2011: 69 of them were involved in one project, 21 in two projects, and 12 in three or more projects[10].

It would seem some Geo-ICT companies are quite adept at obtaining funds, even if this is significantly lower compared to the budget received by Large Enterprises[11] 81 companies provided information about the annual amount of co-funded budget received: 28% of them indicated it was less than €10,000, 38% were between €10,000 and €100,000 and 34% more than €100,000 (**Figure 8**).

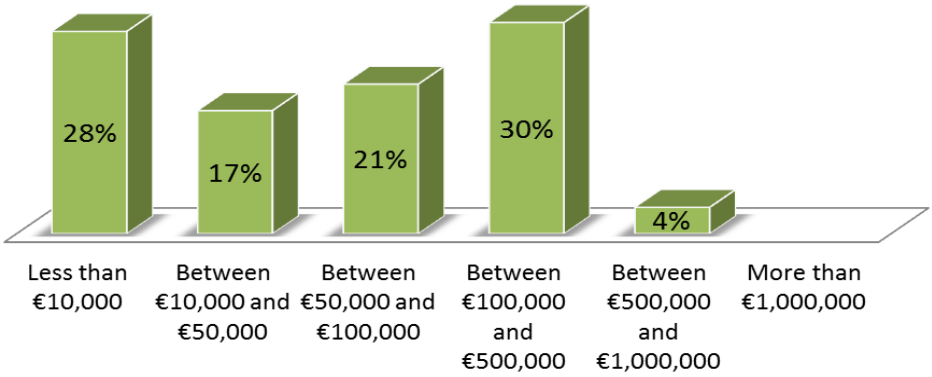

Figure 8 – EU co-funded annual budget
(source: smeSpire)

These low percentages confirm the general trend of FP7 on overall ICT: in the period 2007-2011 the overall budget received by the 1,615 SMEs involved in FP7 was €696million, 14% of the overall budget (€4,979million). In the same period 1,195 Large Enterprises (LEs) received some €1,024million (21%). (source: European Commission Open Data Portal[12]).

Giron et al. (2009a, p.33) defined four main revenue models for the overall ICT sector:

[10] These results are in line with the ones provided by Barak N., Crockett J. & Heilingbrunner K. (2013): in that study the authors highlighted the strong importance of awareness of and experience in previous European projects ICT SMEs as a prerequisite to take part to FP7 project.

[11] According to the open dataset of ICT research projects funded under FP7 in the period 2007-2011, only 14% of the overall EC budget was received by SMEs, while 21% went to Large Enterprises (European Commission, 2013e).

[12] The dataset available on the EC Open Data Portal covers all ICT research projects having received grants under the EU's Seventh Framework Programme (FP7) - Cooperation programme, since 2007. A row/record is generated for each organization participating in a project. Projects have multiple partners and an organization can be the partner of multiple projects. Until 31 December 2011, around 15.000 participations have been registered. The dataset provide details about the thematic area of each project, the legal nature of the partners, their geographical location and the amount of EC grants. An annual report analyses the dataset with the purpose of providing a statistical base for the monitoring of the programme (European Commission, 2013e)

- *license + standard maintenance*: users pay a license fee to own the right to use the software
- *associated IT services*: customers pay human efforts necessary to build, implement and run/maintain the software (in this study this type is also applied to "data services")
- *paid-web-based*: it is usually considered in the "Cloud computing" segment, where users pay depending on the use of the service
- *online advertising*: it usually refers to specific services on the web (e.g. communication, search).

These were used in the analysis of the Geo-ICT SMEs; in general all companies apply more than one model, with a great predominance of "Associated IT services" (more than three-quarters of the business), followed by the sales of "Licenses and maintenance" (one-fifth).

This finding is closely correlated to customer type: the higher the share of business based on public sector, the more the company "depends" on public procurements, where the major business component is represented by "human efforts" paid activities (thus, Associated services).

Conclusions

The vast majority of Geo-ICT SMEs are within the "micro" category with regard to turnover.

It seems that having more employees is an advantage in that the turnover in larger companies is higher than would be expected based simply on comparative number of staff.

Involvement in EU funding is relatively low in Geo-ICT SMEs, but this reflects the position with overall ICT companies.

The high dependency on public sector business seems to have an impact on Geo-ICT SME revenue models, with most companies using the resource/effort based model that is normally generated by public procurement.

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4.2.3. Geospatial activities

More than half of the companies analyzed base their core business on some "geospatial activities", meaning that more than 80% of their annual turnover comes from products or services strictly related to geographic information; only 30% of them have their business based on different activities, sometimes related to generic support IT or to specific domains consultancy (**Figure 9**).

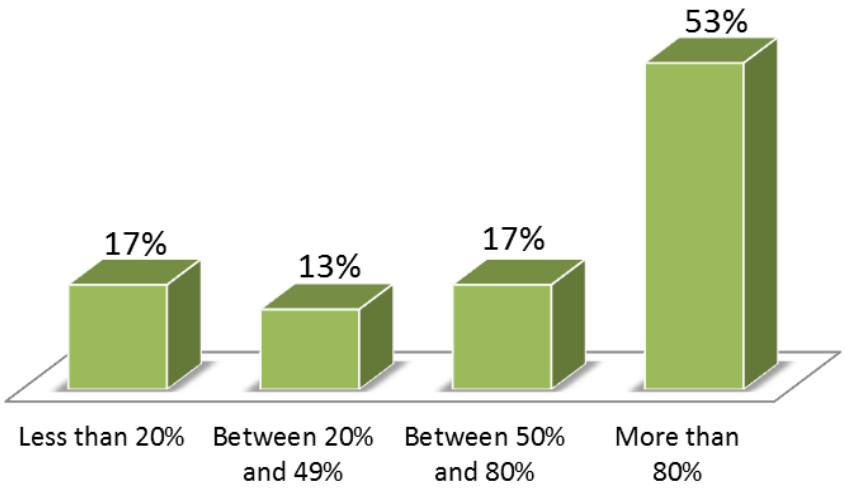

Figure 9 – Turnover from geospatial activities
(source: smeSpire)

The "geospatial activities" covered by the smeSpire study were further defined based on the categories described by Castelein W.T. et al. (2010, p.71) and other studies.

These were expanded to consider other activities closer to ICT, like the development and the customization of GI/SDI software components (**Figure 10**).

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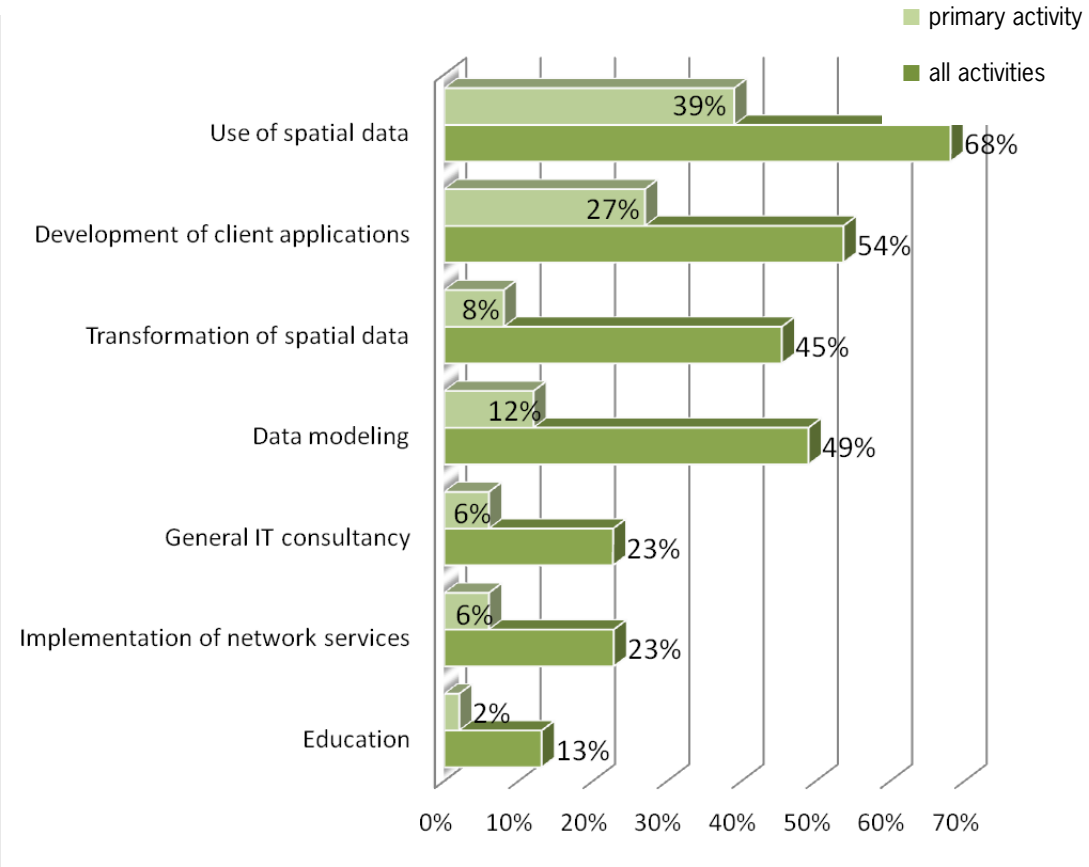

Figure 10 – Geospatial activities
(source: smeSpire)

It is of interest that 86% of the principal activity of Geo-ICT SMEs falls within only 4 categories, with 39% declaring themselves 'users' of spatial data, 27% working in the development of client applications and 20% involved in data modelling and/or transforming.

These findings are reflected throughout the whole activity set (primary, secondary and tertiary)[13] undertaken by companies. The majority (68%) are using data across the span of their activities: the implementation of network services is rather weak (23%) compared to the development of client software (54%), data modelling (49%) and data transformation (45%).

This reflects a pattern of business which combines a range of activities: measuring, collecting and storing geodata together with creating added value services above the data stored or GIS software delivery together with processing, editing and analysing data. In some cases the principal activities are related to data exploitation: they do not actually produce data. In other cases they complete the entire data cycle from creation/collection to exploitation and dissemination, as well as services and application developments.

[13] In the smeSpire survey, the question about "geospatial activities" was structured as "ranking type", to allow respondents to select up to three options and rank them in order of importance. From the point of view of respondents, the activities ranked as "rank 1" are the most important.

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Of course, sometimes one activity dominates the others, but their different combination makes company A different from company B.

Conclusions

Unsurprisingly, the majority of the business of Geo-ICT SMEs can be defined as geospatial activities. Within this, data usage, client application development and data modelling/transformation are by far the most significant activities.

In general, companies are involved in a range of activities in addition to their primary functions.

4.2.4. Standards and Competences

Affiliation with professional associations

More than a quarter of companies are involved in sectorial/geographic associations at national level: this underlines the importance of National Geographical Associations for the Geo-ICT private sector, although there are many differences depending on the country considered.

Conversely, ICT association (15.7%) and SME associations (18.7%) seem to be playing a subsidiary role and seem less important for Geo-ICT companies.

9.8% of the participant companies are also members of the Open Geospatial Consortium (OGC), while only 6.8% are members or have a liaison with a National Standardization Body.

Certification and awareness of standards

Certification systems (e.g. ISO9000 series) seem important assets for one-third of the companies, with a predominance (29%) of "quality management" certified companies (ISO9000), while "environmental management" certification (ISO14000) applies to 6.8% and "Information security management" (ISO27000) only to 2%.

The need for being "certified" is tightly coupled to public procurement procedures, and in many cases this requirement still represents an obstacle for 'micro' and 'small' companies, due to costs and bureaucratic procedures.

In general, competence/awareness of wider geographic information and geomatics standards and technical specifications was variable, with 30 – 50% of companies showing very low to low familiarity with a range of relevant standards (**Figure 11**).

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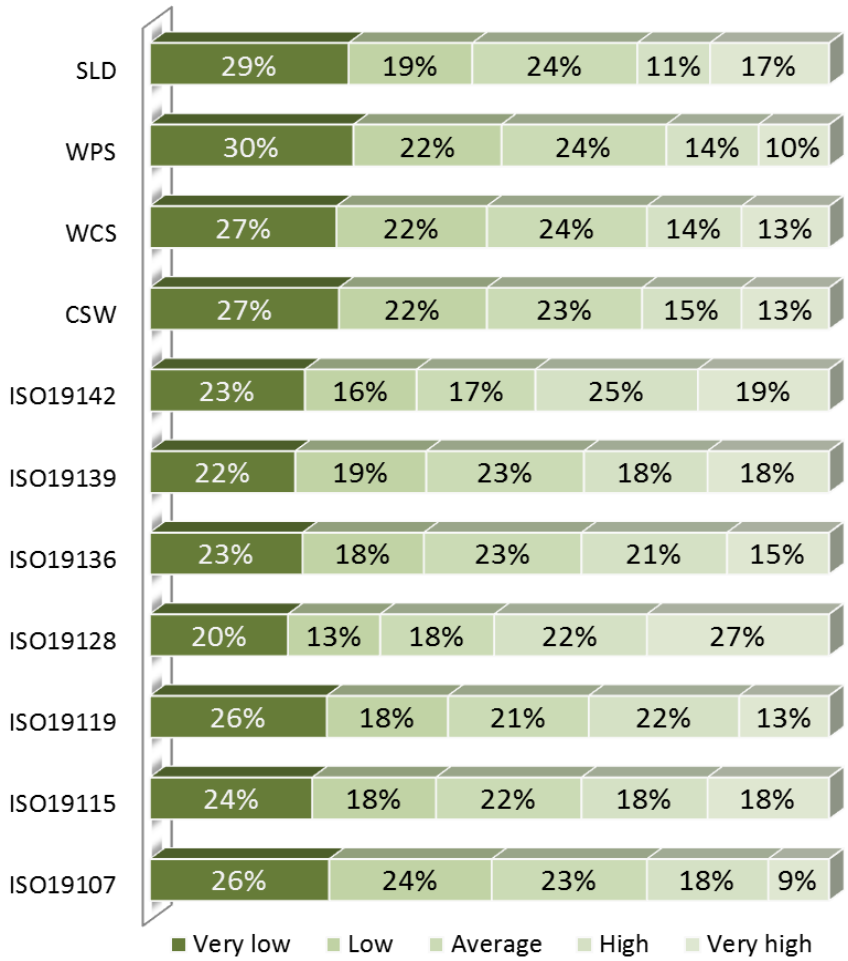

Figure 11 – Familiarity with standards for geographic information and geomatics
(source: smeSpire)

WMS (EN ISO 19128) and WFS (EN ISO 19142) from OGC are well known, while on metadata (OGC CSW and EN ISO 19115/19139) as well as GML (EN ISO 19136) need for improvement. WPS and SLD are still hidden and less known.

ICT competencies

A relatively high percentage of companies indicated themselves to be competent or very competent in Open Source Software (57%) together with the competence about Service Oriented Architecture (48%).

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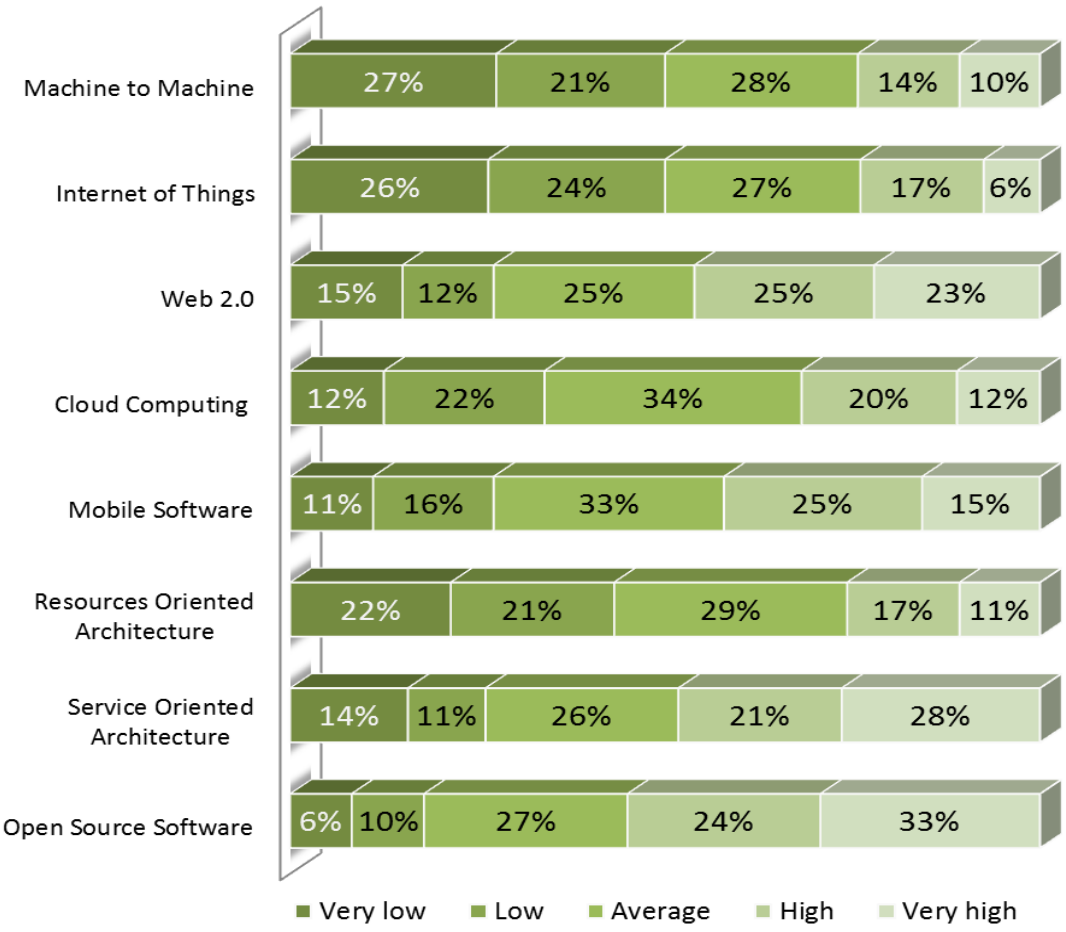

Figure 12 – Familiarity with ICT segments
(source: smeSpire)

This reflects the increasing importance of Open Source Software across Europe.

There were variations in the approach to standards and competencies across the smeSpire Member States. However, it is not possible to draw general conclusions from these observations.

Conclusions

Affiliation with national geographic associations seems more important to Geo-ICT SMEs than with ICT and SME associations.

Therefore the "geo" aspect of their identity seems to be more important than the other elements.

The approach to certification is variable, as is an awareness of geographic standards and technical specifications: this appears to be a significant gap in the knowledge of Geo ICT SMEs.

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A significant finding is the high level of knowledge about Open Source Software: this reflects the increasing importance of Geographic Free Open Source Software (GFOSS) across Europe.

4.3. INSPIRE and the Private Sector

This section presents and discusses the role of the private sector in INSPIRE implementation and the policy regarding the involvement of private companies in INSPIRE/NSDI. The data is collated from the survey and interviews with the smeSpire SMEs, and the LMOs contacted in the individual Member States.

4.3.1. Awareness of and involvement in INSPIRE by the private sector

4.3.1.1. Awareness

General awareness of INSPIRE is good, with 69% of the Geo-ICT companies aware of INSPIRE as an overall concept. However, a significant finding is that 31% have no knowledge of INSPIRE at all.

Although, the knowledge of general objectives and principles of INSPIRE is generally high, the more detailed regulations about "Data" and "Network services" are less known (**Figure 13**).

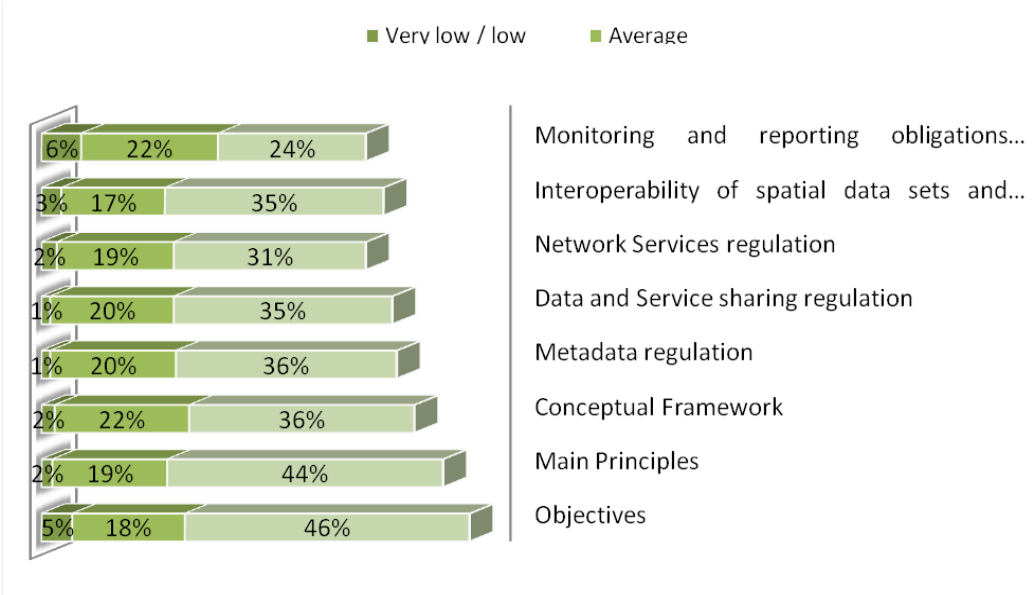

Figure 13 – Knowledge of INSPIRE
(source: smeSpire)[14]

[14] These percentages are only considering the cases of companies aware of INSPIRE: companies that replied "Not aware" were not asked this question.

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This is also reflected by the facts that (only) 34% of the respondents are somehow involved in INSPIRE activities, and only 15% are actively involved in EU INSPIRE groups.

Table 9 – How Geo-ICT SMEs are involved in INSPIRE

Experts in INSPIRE Working Groups	5%
Members of SDICs	10%
Contractors to Public Authorities implementing INSPIRE	19%

One third of Geo-ICT companies surveyed (102) have been involved in some EU co-funded initiatives, 69 in one project, 21 in two projects, and 12 in 3 or more projects: this indicates that Geo-ICT companies are quite capable of obtaining funds from existing public measures, even if the budget received is still low compared to the budget received by Large Enterprises[15].

The majority of these companies (65%) worked in the 7th Framework Programme (FP7), while another 31% in the European Regional Development Fund (ERF), 23% in LIFE+ and only 18% in Competitiveness and Innovation Programme (CIP).

Among the companies involved in such projects, 81 provided information about the annual amount of co-funded budget received: 28% of them declared that was less than €10,000, 38% were between €10,000 and €100,000 and 34% more than €100,000.

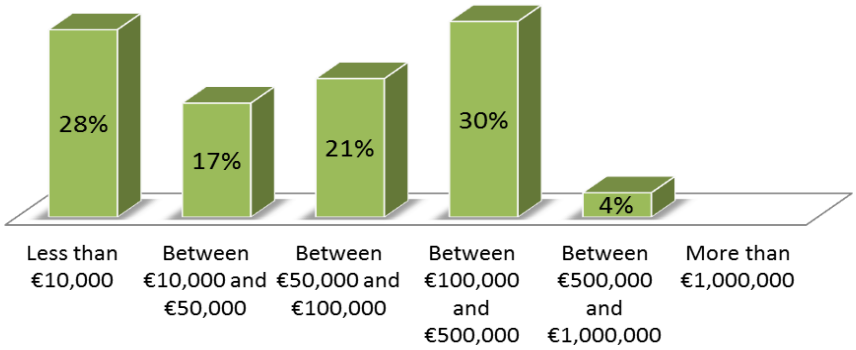

Figure 14 – EU co-funded annual budget
(source: smeSpire)

[15] According to the open dataset of ICT research projects funded under FP7 in the period 2007-2011, only 14% of the overall EC budget was received by SMEs, while 21% went to Large Enterprises (European Commission, 2013e)

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4.3.1.2. Involvement

In general, the smeSpire SMEs that are involved with INSPIRE consider their competencies cover the whole range of activities, though there is a slight bias towards metadata and view services, probably because public authorities are actively involved in these areas (**Figure 15**).

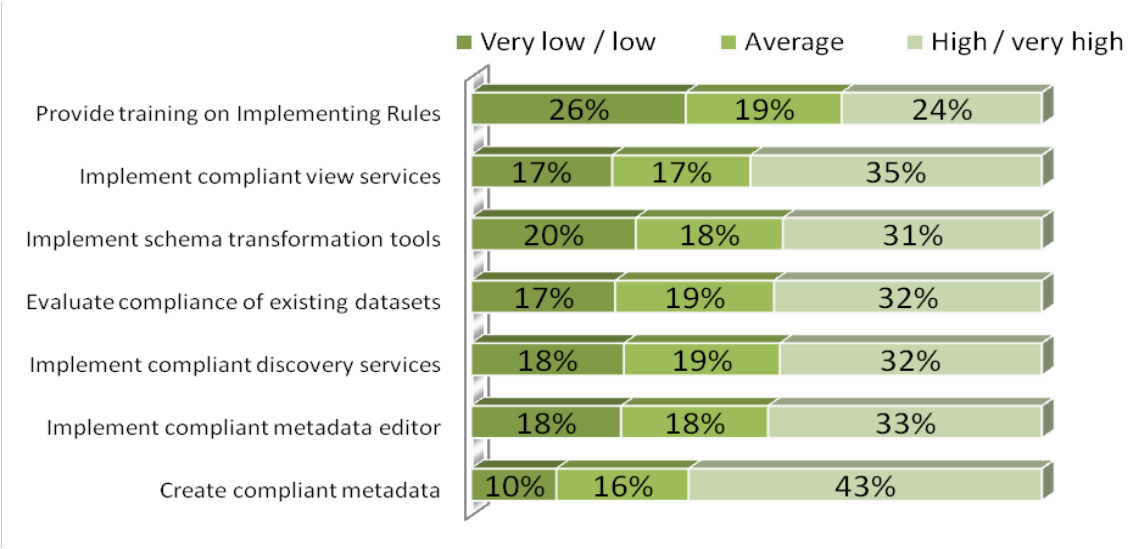

Figure 15 – INSPIRE competencies
(source: smeSpire)[16]

This is reflected in the actual development work carried out by the companies involved in INSPIRE (**Figure 16**). Two thirds of activity is in the data modelling, metadata and view services area.

[16] These percentages are only considering the cases of companies aware of INSPIRE: those companies that replied "Not aware" were not asked this question.

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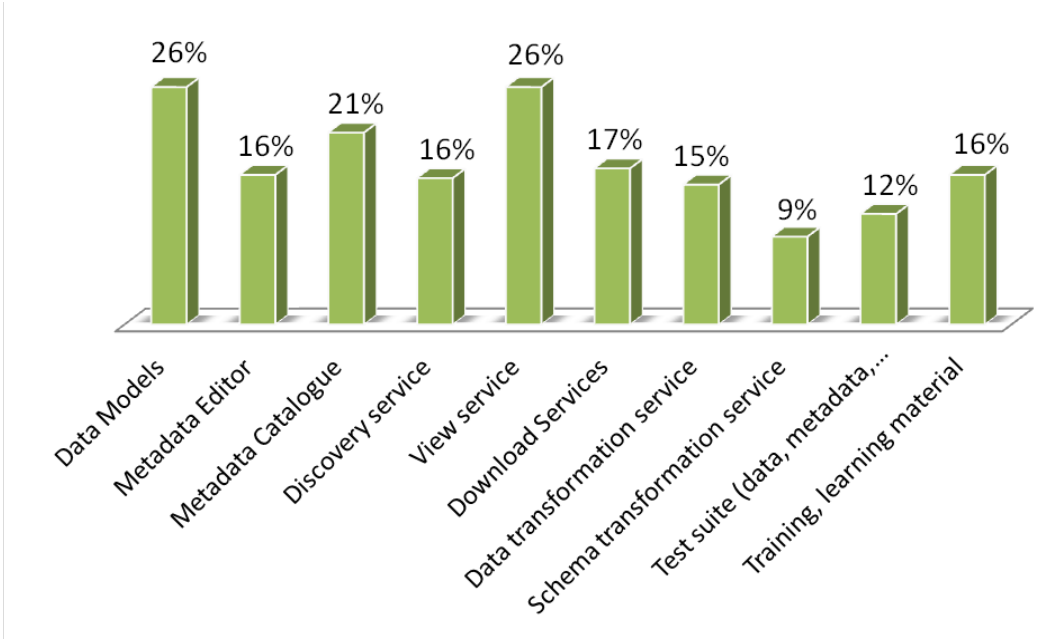

Figure 16 – INSPIRE developments
(source: smeSpire)

Companies mainly involved in development of view services and data modelling (both 26%) and metadata catalogue (21%); lowest involvement is on schema transformation (9.6%).

The survey shows that smeSpire SMEs can be divided into three distinct categories:

- *High Involvement*
  This is the smallest category. Companies having high skills and effort allocated to INSPIRE-related activities: some SMEs declared almost all the staff are aware of INSPIRE requirements and consider the potential implications of INSPIRE for their company; in such cases, companies usually have direct contacts and good relationships between themselves and "INSPIRE-people" (i.e. experts in INSPIRE Draft Working Groups or Thematic Working Groups, or at European Commission)
- *Medium involvement*
  A small number of companies where a few people are really focused on INSPIRE requirements. This category seems to consist of companies that came across INSPIRE during EU projects or as a contractor to Public Authorities, but these companies do not really allocate effort and skills on INSPIRE requirements, and do not consider INSPIRE as a trigger for improving their business
- *Low or no involvement*
  Companies that are aware of INSPIRE but have never worked on it: these represent the majority of the SMEs that were analyzed. They have knowledge of the Directive and its principles, but they have no real experiences and see no need for improving knowledge of INSPIRE details (e.g. roadmap, regulations and technical specifications).

The low involvement of companies in INSPIRE implementation is also related to the existence of companies that see themselves more as 'users' of INSPIRE and INSPIRE services than as 'implementers', so these companies are just "waiting" for services and data to be available for creating added-value services. This is an important finding as it links to the role of Geo-ICT SMEs as contractors to the public sector which are the key players in INSPIRE at Member State level.

The Geo-ICT SMEs involved in INSPIRE cover a wide range of data themes. Presumably this reflects the priorities of the public administrations with whom they deal.

Table 10 – Main data themes of interest for Geo-ICT SMEs

Theme	Percentage of respondents
Land use	57%
Cadastral Parcels	50%
Co-ordinate reference systems	50%
Land cover	47%
Buildings	46%
Orthoimagery	45%
Elevation	44%
Transport networks	43%
Addresses	42%
Utilities and government services	42%

4.3.1.3.. Variation between Member States

Awareness of INSPIRE at private sector level varies from country to country, from cases where the private sector knows more about INSPIRE than the public administrations to cases where INSPIRE is not seen as particularly relevant.

The involvement of the private sector is summarized in **Table 11**.

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Table 11 – Involvement of the private sector in INSPIRE implementation (comparative)

country	*Private sector aware of*	*Already occurred involvement*	*Foreseen involvement*
Belgium	Most Geo-ICT companies aware and informed	Private companies involved in most national SDI and INSPIRE implementation activities, mainly as contractors. Private companies also involved at state level	One state proposes further involvement in data transformation
Bulgaria	Average level of awareness	Mainly by tenders	Mainly by tenders
Cyprus	Private sector involvement prescribed by law	Data fully available	Rules will be determined by end of 2013
Czech Republic	High awareness	Private companies involved in implementation INSPIRE compliant solution of public authorities at national level	Awaiting INSPIRE business activity at other public authorities (mainly at regional and local level) , but may be few customers needing compliant solutions
Germany	Involvement of private sector is crucial. Have to be involved due to national procurement law	Most developments at national and state level being done by private sector as service providers, particularly where OSS is involved.	Future developments will involve private sector because of national procurement law.
Greece	Private sector aware through tendering procedures	Majority of INSPIRE transition work done by private sector through tenders	Majority of work will be done by private sector through tenders
Italy	Private sector only aware through tendering procedures	Mixed picture. Some public authorities use in-house skills Some rely on private sector through tendering. Sometimes contacts awarded to companies with low technical competence due to price criteria	No information, but probably mixture of in-house activity and private sector tendering will continue.

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country	*Private sector aware of*	*Already occurred involvement*	*Foreseen involvement*
Lithuania	Mixed picture. Awareness sufficient in companies that are directly involved. Low awareness in companies not involved in implementation Service user companies invited to participate in dissemination events	Private sector involved as service provider contractors n national SDI and producing specific data.	No information, but role of private sector contractors will presumably continue.
Malta	private companies have a better knowledge of INSPIRE than the government departments due to involvement in EU projects	No information	No information
Slovakia	Low awareness; companies are partially involved in implementation through isolate projects and tenders of public administration	Varied involvement dependent on level of implementation. Some companies provide view services based on licensing	Involnment through future projects and tenders of public administration
Spain	Awareness is very variable	Limited involvement, mainly at development stage	Potential for continued limited involvement unless resources made available
United Kingdom	Mixed awareness depending on degree of contact with individual data providers	Mixed picture as involvement in implementation is through individual data providers and different procurement mechanisms. No central process for private sector involvement.	No information but involvement of private sector only through individual data providers will probably continue.

In general there is good awareness of INSPIRE from the private sector and there is widespread involvement in implementation by the private sector. This is largely from contractors and service providers. Regarding data, private companies are now usually involved in data modelling activities, but only in a few cases do they play a primary role in the production or processing of spatial data within the scope of INSPIRE.

The overall picture is mixed however, with variations both between and within Member States.

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4.3.1.4.. General observations

During the interviews some interesting observations have been made. These cannot be quantified, but give some useful insights into the involvement of the private sector in INSPIRE:

- knowledge (of INSPIRE) within the company is usually limited to a few people, directly involved in the implementation of horizontal SDI components
- in general terms, companies do not have a homogeneous level of knowledge of INSPIRE principles, objectives, conceptual framework
- the main reasons are often related to the lack of communication strategy between national and regional/local administrations.
- quite often companies have difficulties in explaining INSPIRE to their customers, since customers from local public sectors are not highly focused on INSPIRE, nor are private customers interested
- many SMEs, although aware of INSPIRE, are mostly holding a watching brief, screening INSPIRE standards and requirements and waiting for growth to come from new INSPIRE compliant products, mainly data and software.
- the more "technological" companies know very well OGC standards, that represent the basis of INSPIRE Technical Guidance (not binding), and criticize many OGC and ISO specifications because they capture generic needs and are not based on real users' needs
- there can be a misconception of what INSPIRE really is. Many projects are put under the umbrella of INSPIRE, mainly because they share the same principles, although they do not have anything to do with INSPIRE in practical terms.

Conclusion

There is widespread engagement of the private sector in the implementation of INSPIRE as contractors and service providers, this does vary between and within Member States. However lack of involvement persists at policy level.

The intense involvement of service providers contrasts markedly with the relatively low levels of involvement by private sector companies as data and service users.

Private sector involvement in GI/SDI policy development is very low: there are few mechanisms in place to allow private sector participation.

In many cases there is restricted access to and availability of public sector data for the private sector.

Awareness of INSPIRE among Geo-ICT SMEs is, perhaps, lower than anticipated with more than a third of companies unaware of the Directive.

Those involved tend to be aware of the general aspects of the Directive, but are less familiar with the more detailed technical aspects. Geo-ICT SME involvement tends to be in metadata and view services, probably reflecting the priorities of public administrations in delivering INSPIRE targets.

There are three types of Geo-ICT SMEs – a few with high involvement, some with a medium involvement largely due to public administration activity, and the majority with little or no current involvement.

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This is partly because many companies are waiting for others to create data and services to which they can add value. The survey revealed a number of interesting observations that illustrate the limitations of INSPIRE with regard to the private sector.

4.3.2. Impacts

4.3.2.1 Impacts of INSPIRE

Even if INSPIRE (with other initiatives) has already had some positive impact on data availability, it is clear that significant changes can only be expected when data is made available more widely, in a transparent way. Only then can INSPIRE actually be valuable for companies that base their own business on added-value services and need transparent and high-quality information.

Basic data were to be freely available to all users, for all types of use.

Figure 17 is an estimate of the impact that INSPIRE has already had in terms of new products/services, new methods, new customers and markets, or improvement of productivity (cost/time reduction).

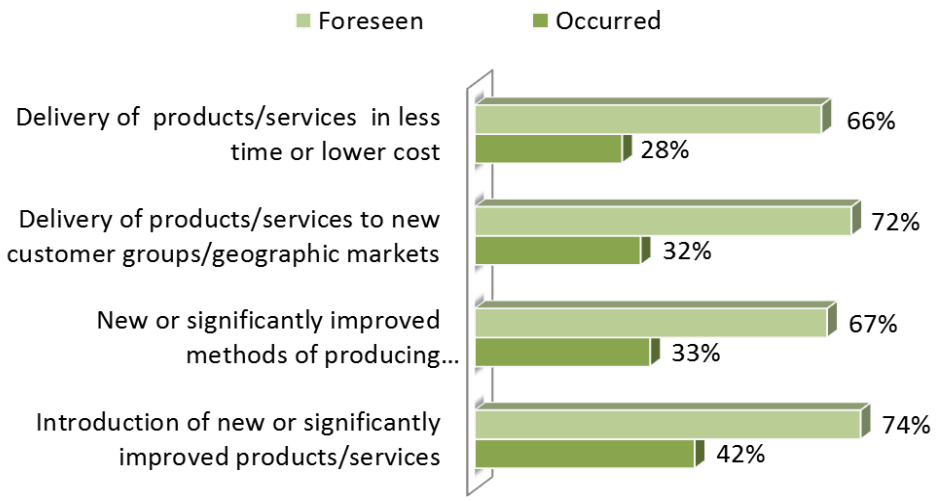

Figure 17 – INSPIRE impacts
(source: smeSpire)

Importantly, **Figure 17** shows there is a great expectancy around INSPIRE and how it will contribute to growth in the future (2020). The benefits are mainly to do with the introduction of new products/services, ways of working and new customers/markets. However, a number of companies have identified time/cost savings as a result of engaging with INSPIRE. In some cases this has been reflected in upward changes in turnover, with 44% declaring a significant impact in 2011, with changes mainly related to introduction of new products (13%) and/or new services (12%) (**Figure 18**).

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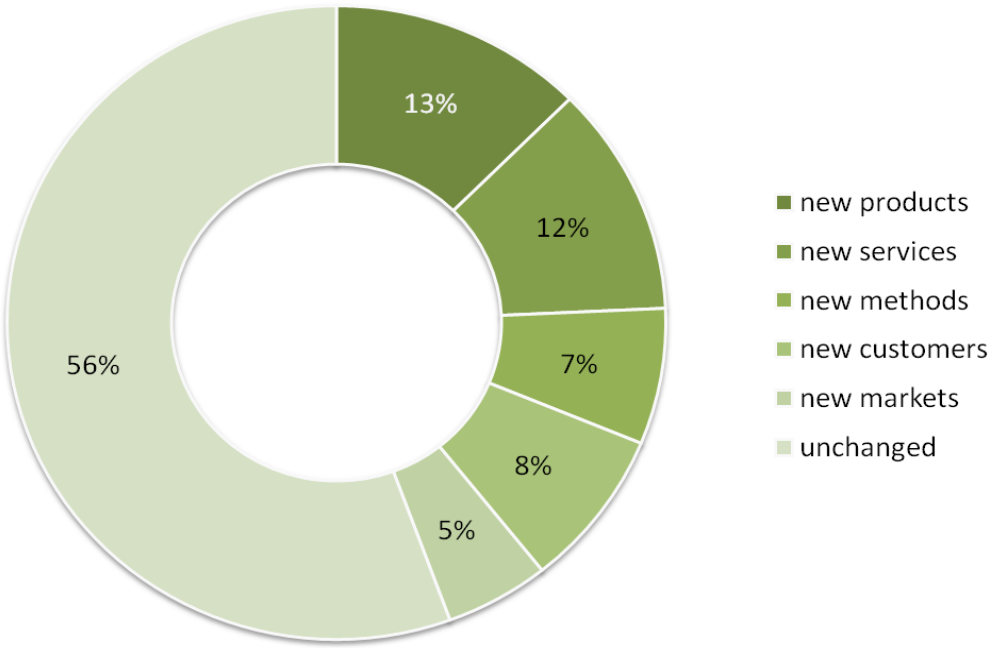

Figure 18 – INSPIRE impacts on turnover
(source: smeSpire)

In general terms, private companies see a potential in building new market opportunities by increasing demand for data and software-based services coming from data providers as well as data re-users. Significantly they saw this developing in conjunction with Open Source Software and Open Data initiatives.

Conclusions

INSPIRE has already had an impact, mainly through the introduction of new services, ways of working and markets.

There has also been an improvement in productivity, reflected in a change in turnover in a number of Geo-ICT SMES.

However, the main benefits have yet to be realized, with most companies expecting to see new market opportunities through increased demand for new data and software based services.

4.3.2.2. Variation between Member States

Within this overall picture there is a great deal of variation between Member States also in terms of the impact of INSPIRE on private sector.

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Interview outcomes anticipate growth thanks to INSPIRE, and conclude there have already been positive impacts in terms of data accessibility, software developments and added value services implementation.

Although the information provided was limited it seems that impact of INSPIRE on the private sector has been very low, although currently this is difficult to measure.

This is due to a lack of public sector finance for software development and innovation, and a lack of access to public sector data that could trigger value added services. There is a widespread view that there is considerable potential for benefit in the future through provision of services to the public sector and access to public sector data.

Some interesting observations include:

- concerns that INSPIRE may not stimulate enough growth and innovation for software developers (Germany, UK)
- potential growth is seen mainly in "data-drive services", namely providing technical skills for transformation and harmonisation and producing value added data (Belgium, Germany), in the development of view and download services (Bulgaria), services, portals and applications
- growth may be limited by the lack of funds in the public sector (Italy), but possible benefits are foreseen from wider open data and open source agendas (Italy, Slovakia, Spain, UK)
- some evidence of benefits of openness and standardization of data have already mentioned in some countries (Germany, Lithuania), while no or very low information was provided by interviewees about occurred impacts on GI/SDI software and added value services.

Conclusions

As far as can be seen, the impact of INSPIRE on the private sector is very low.

This seems mainly due to a lack of public sector finances for contracts and innovation and lack of access to the public sector data that would facilitate value added services.

It is widely believed that there are potential benefits for the private sector in these areas. Better availability of public sector data is the aim of most Member States and so it is possible that opportunities may arise for value added private sector services.

However it is difficult to see how there can be improvements in accessing public sector service contracts unless there is a widespread improvement in funding for INSPIRE and other spatial projects.

4.3.3. Barriers to private sector involvement in INSPIRE

The perceived barriers to Geo-ICT involvement vary greatly in significance among Member States and it is not possible to define an overall picture.

In general, the main barriers are seen in the lack of awareness of INSPIRE outside the public sector and outside the environment domain; this is causing limitations to the overall scope of INSPIRE and hampers the availability of funds and data (**Table 12**).

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Table 12 – Barriers to INSPIRE (comparative)

country	*Awareness*	*Scope*	*Budget*	*Data*	*Rules*
Belgium	Awareness low outside the specialist Geo-ICT sector	Public sector do not consider it relevant to involve private sector Implementation limited to a few components	No information	Strong focus on data, but means insufficient focus on use cases	No information
Bulgaria	Public sector should specify the needs so thus private sector could implement them	No information	Data owners should open their data	No information	
Cyprus	Little awareness Little involvement or expertise	No funds to purchase services from private sector	No government funds available for private sector	No information	No information
Czech Republic	Private sector aware of opportunities	Private sector ready and available to develop solutions	No public sector budget for INSPIRE therefore no private sector market	Access to state data for private companies too complicated or too expensive	Technical guidance documents too long, not suitable as a brief "guide book" for private companies

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country	Awareness	Scope	Budget	Data	Rules
Germany	Private sector aware but significant barriers to involvement	INSPIRE completely controlled by public sector. No consideration given to how private sector could benefit	No information	Barriers to private sector are: Inconsistent and complicated licenses, poor availability of open geodata and centralism of data storage, and slow complex administrative procedures	High complexity
Greece	Private sector aware but pessimistic about benefits	No information	No information	Public sector consider there will be growth and innovation when implementation complete	No information
Italy	Private sector generally aware of issues	INSPIRE not sufficiently seen as a priority by public sector. Lack of national and sub-national co-ordination is a problem Lack of monitoring and reporting means no knowledge of current status of implementation	Lack of resources is a barrier to development	No information	Over-legislation is a barrier Complexity of INSPIRE technical specifications

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country	*Awareness*	*Scope*	*Budget*	*Data*	*Rules*
Lithuania	Lack of awareness and low level of information	INSPIRE not oriented towards business	No information	No information	Over regulation raises private sector costs for data INSPIRE technical standards are not compatible with widely used standards
Malta	Private sector aware	Lack of skills and expertise of government officials is a barrier	No information	Costs and data protection are the main obstacles	
Slovakia	Private sector aware	Main focus is on public sector. A small country has a small market and big players are taking the majority of the work	Funding and financing is an issue	Transparent and easy to implement licensing scheme is required	Transparency with procurement is required. There is too much complexity of technical components
Spain	Private sector aware	Currently no participation of private sector. INSPIRE is public sector initiative	Lack of public sector resources to fund private sector involvement	Not enough dissemination	Too much regulation
United Kingdom	Private sector aware	Currently limited involvement of private sector. INSPIRE is public sector initiative	Most public sector data providers carry out operations themselves	No information	Requirements not always very clear

Overall, there is a wide variation in the issues with regard to INSPIRE and the private sector. The private sector is generally aware, but is little involved as INSPIRE is seen as a public sector initiative and restricted to 'environmental' policies. There is a widespread lack of public sector funding to engage the private sector as contractors. There is a view that there is too much complexity of rules, norms and technical specifications and that Member States are over regulating and over legislating.

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Other areas of difficulty can be related to the awareness, complexities and competences among private companies about INSPIRE. Data access is a key issue. The survey revealed that as well as large discrepancies in data availability between Member States, there can be great variation in the ability of the private sector to get access to data even at a regional level.

Conclusions

The most frequently made observation is that INSPIRE is seen as a public sector initiative with little regard for the private sector.

Even if there is a desire to involve the private sector, the lack of public sector finance is a major concern. However there is a widespread view that the technical complexity is too great and Member States are over regulating and over legislating.

The overall picture suggests there is good participation by the private sector in INSPIRE implementation by contractors and service providers. However, this involvement is limited by the availability of public sector finances. In general there is very low involvement in INSPIRE/SDI policy making and few Member States have mechanisms in place to engage with the private sector in this area. In general, INSPIRE is seen as a public sector initiative, designed for the public sector. It is not seen as something that is currently of benefit to the private sector.

A widespread and significant problem is the restricted access to public sector data either by restrictive licensing, lack of availability or publishing by public sector organizations. This significantly limits the development of value added services by the private sector. Given that metadata and discovery services are widely developed across the Member States, it is not difficult to see that there could be great frustration – companies can see that the data is there, but they cannot access it!

There is a general view that INSPIRE can potentially provide benefits to the private sector. However, unless the fundamental barriers – INSPIRE seen as a public sector activity, limited public sector funding restricting the issue of contracts and restrictive access to and limited availability of public sector data – are removed, it is difficult to see how these benefits can be realized.

4.4. Innovation by Geo-ICT SMEs

It is difficult to define what innovation means in practical terms for a company.

Innovation is not just “turning ideas into money”; it is usually depicted as a long process, requiring an open mind and a lot of interactions. From the perspective of a private company, innovation is somehow improving efficiency, reducing effort/time/costs to improve better existing “assets”, rather than inventing new ones.

SMEs are considered to be more likely to be innovative than large companies, for a variety of reasons. This is examined in detail in **Annex 7 – SMEs and Innovation**.

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In principle therefore, Geo-ICT SMEs should be more likely to engage in innovative activities than larger companies and certainly they should be more innovative than the public sector. Also, in principle, INSPIRE should provide many opportunities for Geo-ICT SMEs to take the lead in developing new products, services, markets, ways of working etc.

One of the objectives of the study was to evaluate the innovative performance of Geo-ICT SMEs in Europe. This section of the report highlights innovation, as this is one of the key factors that make SMEs critical to the European economy.

4.4.1. Scale of innovation in Geo-ICT SMEs

Ideally, for the Geo-ICT SMEs of this study, the innovation workflow could be described as the chaining of "*new markets* > *new customers* > *new methods* > *new products/services*". Innovation can also be achieved by re-using the experience and technology from one domain and applying it to another (i.e. applying the ideas of INSPIRE to the aviation and maritime domains).

In practice, the survey showed that real pioneering developments are rare among European Geo-ICT companies and there are few real innovation leaders.

Innovation is also difficult to measure in terms of effort allocated by private companies. However, where it is recorded, the effort is low: the mean percentage of budget dedicated by interviewed SMES for innovation and R&D activities is 10%.

Many of the interviewees working on Open Source Software (OSS) declared they invest a lot of time/effort in peering within OSS communities (mailing lists, blogs, instant messaging, etc.) with some 10-15% of the scheduled time devoted to the community.

In only a few cases, the interviewed companies explicitly declared that a large part of profits are reinvested for innovation activities; often, these cases correspond to new start-ups with high technology content reinvesting up to 70% of their revenue in innovation and R&D. This percentage is close to that described for companies involved in Earth Observation Services (European Association of Remote Sensing Companies, 2013, p.10).

Conclusions

Surprisingly, compared with the wider SME sector, Geo-ICT SMEs have little involvement with innovation. Even when engaged in innovative practices, effort within companies is low at 10%. A key reason for this may be the large scale dependence on the public sector, which traditionally is seen as risk and innovation averse. Therefore customers who already have their own tools and methods may regard innovative products with suspicion. For instance, in some cases the introduction of data validation procedures based on Open Source databases can be hampered by the need to replace existing procedures based on proprietary solutions, because of the needs for training and the complexity to change internal management processes. Barriers to innovation are further discussed in section **4.4.3. Barriers to innovation for Geo-ICT SMEs**.

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4.4.2. Innovation channels

As a counterpoint to the observation that customer resistance is a key factor in stifling Geo-ICT SME innovation, customer demand is actually the main channel for innovating. Sometimes innovation is not directly and explicitly demanded by customers: therefore internal resources are dedicated to marketing and working with customers to find out new requirements.

Few of the companies surveyed have a formal, internal R&D unit. More often, the structure is very horizontal, with innovative solutions shared and discussed among different employees working in different units. This mainly occurs in Geo-ICT companies that have an innovation-driven culture, with Human Resources policies focused on attracting and retaining best talents and highly educated staff (e.g. to PhD level).

In other cases, the SMEs may rely on a 'parent' company (e.g. in case of group[17]), with opportunities to develop demo projects to set up and test new initiatives.

Collaboration with peers (as in the case of networking with concurrent or complementary companies) is an emerging strategy for some companies: within large projects, networking with peers facilitates to spread the cost and share the core competencies.

Social media is increasingly used, in particular (low-cost) channels for innovative development. Specifically, micro and small companies involved in OSS developments are using efficiently one or more tools (Facebook, Twitter, LinkedIn, Slideshare, YouTube) to engage both peers and customers. This is also confirmed by research (Millward Brown, 2012) carried out among 2700 professionals in 7 European Member States, where more than 32% already used external social media or in-house (23%) for work related purposes.

Partnering with Universities and R&D Centres is easier in some countries (e.g. Belgium, Germany) and more difficult in others (e.g. Italy, UK) and limited to a minority of cases, with universities more competitive rather than collaborative, therefore hampering open innovation with private companies.

European projects (i.e. FP7, ESA) are often a valuable channel for research and innovation: one third (102 out of 299) of the companies surveyed by smeSpire project participated in one or more EU co-funded projects in 2011.

Conclusions

Just as customer resistance can stifle innovation, customer demand can be a key factor in encouraging Geo-ICT SMEs to innovate. A variety of mechanisms are used to encourage innovation with social media increasingly used as a low cost communication channel, particularly for companies involved in Open Source development. European projects can be a valuable mechanism for generating research and innovation, though only a third of Geo-ICT SMEs have participated in such projects.

[17] For a definition of 'group' please see (European Commission, 2005)

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4.4.3. Barriers to innovation for Geo-ICT SMEs

Several factors are perceived to work against innovation. These are summarized in **Figure 19**.

Internal finance is an important factor. The current financial situation in Europe usually requires employees to generate an instant income affecting their ability to spend time on innovative / non-profitable activities. As outlined in the sections **4.4.1** and **4.4.2**, the unpredictable customer demand for innovative solutions can be a barrier. Conversely, customer demand is often seen as the main channel for innovating.

The main barrier for 46% of the surveyed companies is however, the dominance of the market by established (larger) enterprises, while the lack of finance from sources outside the enterprise (e.g. banks loan, overdrafts, etc.) is the second crucial factor for 44% for SMEs.

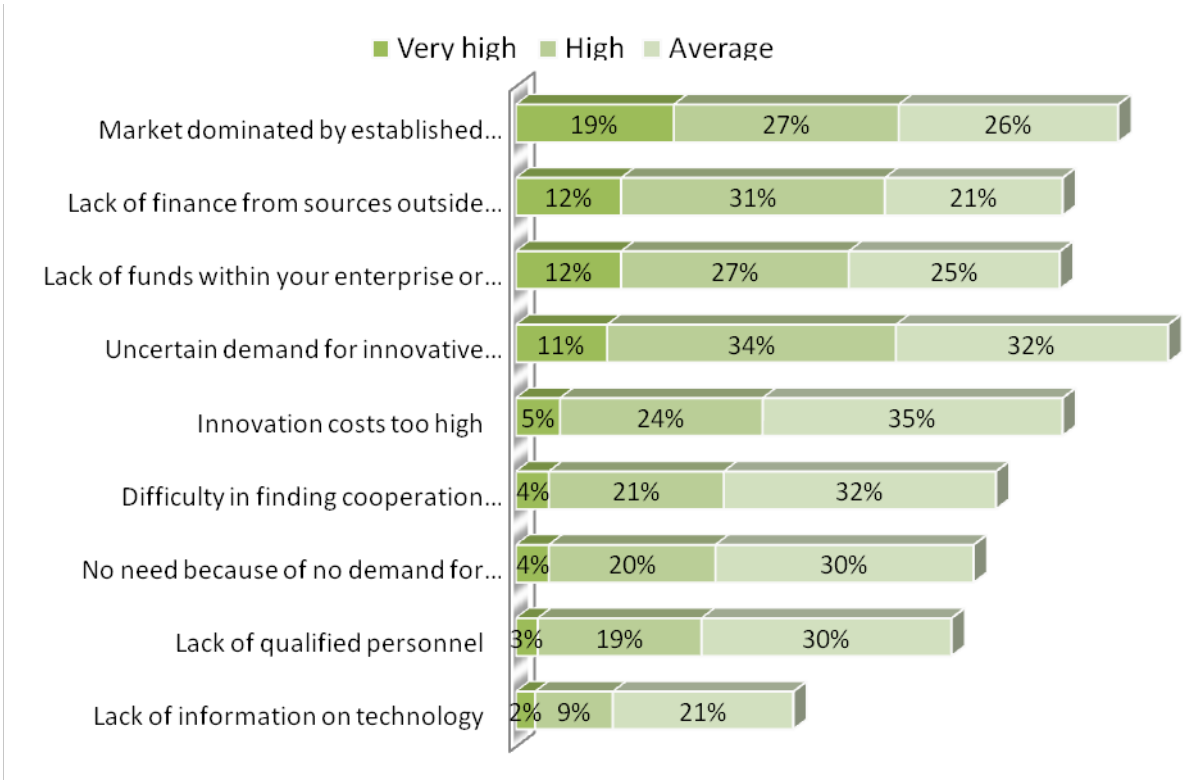

Figure 19 – Innovation barriers
(source: smeSpire)

These findings for Geo-ICT SMEs reflect the wider picture. The most pressing problem for EU SMEs is not the access to finance (usually for loans to cover working capital) but finding new customers and/or enlarging the market (European Commission, 2011)[18].

[18] One-third of the SMEs that applied for a bank loan were rejected or received only part of the requested money or had higher interests than planned; 25% of "young" SMEs (2-5 years old) were rejected (European Commission, 2011)

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Other barriers mentioned by Geo-ICT SMEs are:

- limited access to data: the licenses for re-use spatial data and the costs curb innovation
- difficulties in entering or participating in EU co-funded projects (due to the complexity of bureaucracy and time requested to prepare administrative documents)
- a lack of skills and experienced personnel. In practice this problem is restricted to a few countries (e.g. Cyprus, Lithuania) with a limited internal market, while in the remaining countries this is not seen as a barrier hampering innovation.

A high level of fragmentation and discrepancies exists between EU, national and sub-national activities on open data: different laws and rules, different technologies and procedures, and different data policies, are making data available on different portals but not easy-to-use, with quality problems[19].

The release of public sector data as Open Data has a practical, direct impact on increased entrepreneurial activity: many IT-start-ups and established companies have a significant interest in (and willingness to pay at marginal cost for) public sector information. In this direction, it is noteworthy the survey undertaken in Sweden in 2011 and 2012 (Lakomaa & Kallberg, 2013) taking into consideration geodata from cadastral and land survey agency.

Conclusions

Geo-ICT SMEs have identified a number of barriers to innovation including finance, access to data and customer resistance.

One of the most significant barriers is the dominance of large companies in both the data production market and the software market; in this second case the problem is mainly situated at political level, with many European public institutions that make frequent use of "American" software, and very few protectionist governments only buying and using "local" technology and requesting for Open Source, to protect their own companies.

The problem of a market dominated by established enterprises (often large ICT brands) is usually tightly coupled to the 'vendor lock-in' issue[20]: a number of studies have indicated an extensive use (16% to 36%) of brand names in procurement documents.

[19] An interesting example is the one from Open Knowledge Foundation on "Key datasets in high quality, easy-to-use and open form" (Open Knowledge Foundation, 2013), where a set of key reference and indicator datasets such as country codes, currencies, GDP and population is regularly sourced, normalised and quality checked.

[20] A 'lock-in' situation will usually imply that procurement documents for the next contract related to the ICT system causing the 'lock-in' will contain references to the brand name of that system. Purchasers must resort to reference to brand names, because the lack of information about the ICT system makes it impossible to describe the system sufficiently precise in any other way. (source: European Commission, 2013c).

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A survey carried out in 2011 (Europe Economic Chancery House, 2012) among 244 European public authorities showed that the majority use brand names in invitations to tender, with 23% always or often referring to brand names, and just under 40 % sometimes doing so. Moreover, at least 40% considered that changing their existing ICT solution would be too costly because it would involve changing many other systems that use the data of the system that they would like to change (European Commission, 2013c).

The release of public sector data as Open Data has a practical direct impact on increased entrepreneurial activity (Lakomaa & Kallberg, 2013, p.562): many IT-start-ups and established companies have a significant interest in (and willingness to pay for, at a marginal cost) public sector information.

It is worth noting the survey undertaken in Sweden in 2011 and 2012 (Lakomaa and Kallberg, 2013) with more than 100 enterprises replying to 19 questions about business plans and open data. The 12 dataset considered in the survey were geodata from cadastral and land survey agency.

In this study, Open Data is presented as a potential catalyst for innovation (Lakomaa and Kallberg, 2013, p.561), from simulating viability and ensure funding, to providing information about potential markets, to the decrease of cost-time in the exploitation of R&D projects.

4.4.4. Impact of INSPIRE on innovation

One of the most striking outcomes of the survey is that INSPIRE is having either no or very low impact on innovation by Geo-ICT SMEs.

Public authorities are already asking for INSPIRE-compliant solutions, but too often “call for tenders” suffer from insufficient and heterogeneous details about technical requirements for being “INSPIRE-compliant”.

This is mostly true for metadata and view services, with very limited impacts on harmonised data: INSPIRE’s impact needs to shift from “technology” (software for serving, presenting and applying data) to “content”; at software level opportunities are expected more for desktop clients than geoportal/services, to access and use “locally” harmonised data coming from distributed sources.

Companies foresee new opportunities as soon as harmonized data is available (as open data). These are likely to be added value services provided to private sector companies in other domains (e.g. intelligent transport systems and energy performance of buildings).

Data transformation/harmonization are seen as both a significant challenge and also a business opportunity for private companies; the main concern is that data modelling activity is often “hidden” and not fully recognized both inside and outside the organization, so can be difficult to evaluate and finance.

Only 38 companies (12%) are already involved in some “test suite” implementation to check the conformity of metadata, data and services: this confirms the lack of customer demand (public sector) for “compliant” and interoperable solutions.

SME SPIRE
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Conclusions

INSPIRE is not considered innovative per se, and in consequence it is having a low impact on innovation. Several things have to change if INSPIRE is to stimulate and enhance innovation.

The main opportunities in the near future will be at (harmonised) data and metadata levels. There must be pragmatic solutions for SMEs to participate in INSPIRE, through the enforcement of open data and e-government, with new business models that can be developed.

Publicly available data improves customer service and thus contributes to innovation: the more data available to organizations and people, the more demand is created for the SMEs' services and solutions.

Public administrations participating in co-funded projects (e.g. Horizon 2020) should be strongly encouraged to make their geodata available as open data, in order to guarantee ex-ante the re-use of information collected and/or processed in such projects.

Test suites for data and web services for validation are not yet taken seriously into consideration. The biggest interest should be around download services, but these should be "open services" for downloading "open data"; transformation services are interesting mainly for professional and high-skilled users (again, this implies lowering constraints on use and access of data).

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5. Overall conclusions and discussion

A great number of conclusions have been drawn from the results of the study, and these have been already detailed in the sections above.

This section summarizes these conclusions and relates them to the objectives of the study; further detailed recommendations are contained in the following section (**6. Recommendations**) and provide the basis for discussion and agreement among the partners of the smeSpire project and beyond.

Definition of "Geo-ICT" sector

The methodology used provides both a broad overview of the geo-ICT SME sector across Europe and a detailed analysis of the relationships between SMEs and INSPIRE within Member States.

Nevertheless, there is still no clear and unique definition of Geo-ICT, whether at European or Member State level. A relatively narrow definition has been adopted for this study, covering GIS/geo-location based activities, with cross-reference to those specifically related to ICT. However, there is a case to extend this definition to cover SMEs involved in all aspects of the data covered by the INSPIRE Regulations.

There is virtually no data on the size of the Geo-ICT sector in Europe. From the studies that have been carried out it appears that Geo-ICT may comprise 1-2% of the overall ICT sector. This would lead to a very crude estimate of about 4,400 geo-ICT companies in the 12 smeSpire Member States (7,000 in EU28).

However, this figure could increase if a wider definition of geo-ICT was used that covered companies involved in the creation, analysis and publishing of INSPIRE compliant data.

The distribution of Geo-ICT SMES in the 12 smeSpire Member States appears to reflect the overall distribution of ICT SMEs in Europe, and suggests that, as with the wider ICTs clustering could be a significant factor in SME development. The Geo-ICTs surveyed defined their activities in terms of ICT activities, covering the full range of such activities. Many of the Geo-ICT SMEs are relatively young companies. There seems to be some correlation between the number of companies being created and the major technological developments in Geo-ICT. This suggests that such technology changes could continue to be a major regulating factor in future Geo-ICT SME development. There is a significant difference in the relative proportion of "micro" and "small" SMEs between Geo-ICT s and the wider ICT sector. With other evidence, this could suggest that there is a greater need for co-operation within and between Geo-ICT SMEs leading to the employment of more staff.

Despite this, the vast majority of Geo-ICTs SMEs are within the "micro" category with regard to turnover. It seems that having more employees is an advantage in that turnover in larger companies is higher than would be expected based simply on comparative number of staff. Involvement in EU funding is relatively low in Geo-ICT SMEs, but this reflects the position with overall ICT companies. The high dependency on

public sector business seems to have an impact on Geo-ICT SME revenue models, with most companies using the resource/effort based model that is normally generated by public procurement.

Markets, jobs and activities of "Geo-ICT" sector

Geo-ICT SMEs are generally involved in markets within their own Member State. The degree of involvement in wider EU business seems to increase with the size of the company.

The customer base is highly significantly skewed to the public sector, covering both local and national public authorities. This is a significant finding from the study, as dependence on public sector business has major impact in the activity and development of Geo-ICT SMEs.

As well as direct contracts, Geo-ICT SMEs are often involved in sub-contracting depending on the degree of specialization of their skills.

Most Geo-ICT SMEs define their business as geospatial activities. Within this, data usage, client application development and data modelling/transformation are by far the most significant activities.

This is clearly driven by customer requirements. In general companies are involved in a range of activities in addition to their primary functions.

Provision of expertise on top of data to conduct analyses, syntheses or other added value knowledge on top of the INSPIRE data can be seen as a typical market for new business (Hradec, 2013, p.9).

Knowledge of and involvement in INSPIRE

Awareness of INSPIRE among Geo-ICT SMEs is, perhaps, lower than expected with more than a third of companies unaware of the Directive.
Those that are involved tend to be aware of the general aspects of the Directive, but less familiar with the more detailed technical aspects. Geo-ICT SME involvement tends to be in metadata and view services, probably reflecting the priorities of public administrations in delivering INSPIRE targets. There are three type of Geo-ICT SME – a few with high involvement, some with a medium involvement, largely due to public administration activity, and the majority with little or no current involvement. Part of the reason for this is that many companies are waiting for others to create data and services to which they can add value.

The survey revealed a number of interesting observations that illustrate the limitations of INSPIRE with regard to the private sector. The overall picture is that there is a good participation by the private sector in INSPIRE implementation as contractors and service providers. However, this involvement is limited by the availability of public sector finances. In general there is very low involvement in INSPIRE/SDI policy making and few Member States have mechanisms to engage with the private sector in this area. In general INSPIRE is seen as a public sector initiative, designed for the public sector. It is not seen as something that is of currently of benefit to the private sector.

A widespread and significant problem is the restricted access to public sector data either by restrictive licensing or lack of availability or publishing by public sector organizations. This significantly limits the

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development of value added services by the private sector. Given that metadata and discovery services are widely developed across the Member States, it is not difficult to see that there could be great frustration – companies can see that the data is there, but they cannot get access to it!

There is a general view that INSPIRE can provide many potential benefits to the private sector. However, unless the fundamental barriers – INSPIRE seen as a public sector activity, limited public sector funding restricting the issue of contracts and restrictive access to and limited availability of public sector data – are removed, it is difficult to see how these benefits can be realized.

At European Union level, two important activities have recently been undertaken among the ISA Programme (Interoperability Solutions for European Public Administrations)[21]. The first is to create a European Union Location Framework (EULF)[22] addressing the EU-wide, cross-sector interoperability framework for the exchange and sharing of location data and services; the second aims to establish a reference platform and develop common components for the successful implementation of INSPIRE (ARe3NA)[23], and to ensure that the Digital agenda for Europe and open data related initiatives will be taken into consideration.

Affiliation with national geographic associations seems more important to Geo-ICT SMEs than with ICT and SME associations. Therefore the "geo" aspect of their identity seems to be more important than the other elements. The approach to certification is variable, as is awareness of geographic standards and technical specifications. This appears to be a significant gap in the knowledge of Geo-ICT SMEs. A significant finding is the good level of knowledge about Open Source Software. This reflects the increasing importance of Geographic Free Open Source Software (GFOSS) across Europe.

Impact of INSPIRE

INSPIRE has already had an impact, mainly through the introduction of new services, ways of working and markets. There has also been an improvement in productivity, reflected in a change in turnover in a number of Geo-ICT SMES. However, the main benefits have yet to be realized, with most companies expecting to see new market opportunities through increased demand for new data and software based services.

Compared with the wider SME sector, Geo-ICT SMEs have little involvement with innovation. Even when engaged in innovative practices, effort within companies is low. It may be that a key reason for this is the large scale dependence on the public sector, which traditionally is seen as risk and innovation averse. Conversely, customer demand can be a key factor in encouraging Geo-ICT SMEs to innovate. A variety of mechanisms are used to encourage innovation with social media increasingly used as a low cost communication channel, particularly for companies involved in Open Source development.

[21] http://ec.europa.eu/isa/

[22] http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-13action_en.htm

[23] http://ec.europa.eu/isa/actions/01-trusted-information-exchange/1-17action_en.htm

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European projects can be a valuable mechanism for generating research and innovation, though only a third of Geo-ICT SMEs have participated in such projects.

Geo-ICT SMEs have identified a number of barriers to innovation including finance, access to data and customer resistance. However, one of the most significant barriers is the dominant position of large companies in both the data production market and the software market. Many European public institutions make frequent use of "American" software, and very few protectionist governments only buy and use "local" technology and request Open Source, to protect their own companies.

The problem of a market dominated by established enterprises (often large ICT brands) is usually tightly coupled to the 'vendor lock-in' issue (European Commission, 2013c): this reflects the position in wider ICT procurement where the majority of European public authorities in a survey used brand names in invitations to tender (Europe Economics Chancery House, 2012). Many considered that changing their existing ICT solution would be too costly because it would involve changing many other systems that are currently integrated (European Commission, 2013c).

The release of public sector data as Open Data has a practical direct impact on increased entrepreneurial activity (Lakomaa & Kallberg, 2013) many IT-start-ups and established companies have a significant interest in (and willingness to pay for at a marginal cost) public sector information.

Therefore, Open Data is a potential catalyst for innovation through stimulating viability ensuring funding, providing information about potential markets, and decreasing cost-time in the exploitation of R&D projects.

INSPIRE is not considered innovative per se, and consequently it is having a low impact on innovation. Several things have to change if INSPIRE is to stimulate and enhance innovation:

- there must be pragmatic solutions for SMEs to participate, through the enforcement of open data and e-government, with new business models that can be developed
- publicly available data improves customer service and thus contributes to innovation: the more data available to organizations and people, the more demand is created for the SMEs' services and solutions
- public authorities are asking for INSPIRE-compliant solutions, but too often call for tenders suffer from insufficient and heterogeneous details about technical requirements for being "INSPIRE-compliant"
- the main opportunities for the near future are seen at data and metadata levels
- INSPIRE's impact needs to shift from "technology" (software for serving, presenting and applying data) to "content"; at software level opportunities are expected more for desktop clients than geoportal/services
- data transformation/harmonization can be a big challenge and business opportunity for private companies; the main concern is that data modelling activity is often "hidden" and not fully recognized both inside and outside the organization, so difficult to finance
- test suites for data and web services for validation are not yet taken seriously into consideration. The biggest interest should be around download services, but these should be "open services" for

downloading “open data”; transformation services are interesting mainly for professional and high-skilled users (again, this implies lowering constraints on use and access of data).

Final remarks

This is the first study of the Geo-ICT SME sector at European level.

Many of the findings reflect issues that are already well known – for example the dependence of SMEs on the public sector for contracts. However, other findings are, perhaps, more surprising – for example the relatively low levels of innovation among Geo-ICT SME. Overall, the depth and breadth of the data collected by the study has allowed a great number of conclusions to be drawn about the state of the Geo-ICT SME sector, the factors that influence it and the impact of INSPIRE on the sector.

For both private companies and public organizations, INSPIRE’s main benefit is its contribution to raising awareness about geographical information in general, while underlining the need for data sharing through interoperable data and services. This should increase the availability of (harmonized and interoperable) information and the quality of data provided.

According to many of the SMEs interviewed, INSPIRE is going to enhance National Spatial Data Infrastructures (NSDIs), and well-developed NSDIs means opportunities for the public and private sectors.

Common data models and interoperable network services to access data are the main strengths of INSPIRE, as seen by both the public and private sector.

Indeed, the final goal for having interoperable and interchangeable geographic information is limited by the complexity of regulations and technical specifications: in some cases such specifications are only extending international standards (i.e. ISO and OGC), therefore easy to implement even if sometimes conflicting with widely used de-facto standards.

The complexity is mainly related to data models, requiring a good knowledge of UML rules, data modelling and domain expertise, and for many SMEs is virtually impossible to cover all the aspects.

On the other hand, thematic experts like civil servants working in public organizations implementing INSPIRE, usually don’t understand data models, nor have sufficient IT skills to talk the same language of GI/SDI software providers: in these cases co-operation between data modellers and thematic experts is crucial in order to implement INSPIRE data structures.

This can be profoundly reflected in the demand for INSPIRE compliance from the public sector that is not always clear, with “calls for tender” just mentioning INSPIRE as a reference but without detailing specific requirements, and not related to real use cases or needs.

Certainly, some INSPIRE specifications are too detailed and often contain unclear restrictions, and it is not easy to understand how conformance can be demonstrated in practice.

In addition, many of the interviewed companies have complained about ‘distorted’ public procurement procedures: the vendor lock-in problem and the awarding criteria heavily dependent from the "best price" are the main causes of distortions, with cases of projects that are sometimes awarded to companies offering highly discounted price, but they are lacking the necessary technological skills.

SME/SPIRE
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Moreover, strict financial constraints and/or certification requirements (e.g. ISO9000 or ISO20000) are other points of weakness of some calls for tender requiring some INSPIRE implementation.

Negative aspects are not to be seen in the Directive itself nor in its regulations, but in the unique focus on environment and public sector: awareness outside these contexts is still very low, and there is a strong need for broader cross-domain scenarios where interoperable geographic information may play a leading role.

The main challenge is how to actively involve companies. From their perspective the slowness and the fragmentation of the entire process, together with some complexity regarding data models, is still representing a discouraging factor. Only a few companies are able to invest time (therefore money) for participating in standardization working groups.

Possible solutions to these barriers are:
- allocate funds for specific dissemination activities about geo-information at Member States level
- improve the communication strategy about INSPIRE at all levels (European, national, sub-national)
- support the debate and the discussion on INSPIRE mainly at local (Municipal) level, so to increase the general awareness and skills
- involve private companies in defining guidelines and national specifications based on (or extending) INSPIRE ones
- encourage the active involvement of private companies in the INSPIRE Maintenance and Implementation Framework (MIF)[24] also through existing networks (e.g. smeSpire, OSGeo, National and European Geographic Associations)
- encourage Open Source Software (OSS) reference solutions and make them more visible, also by setting up a clear EU strategy on OSS for geodata related to INSPIRE (e.g. Are3NA)
- focus on the real market (public authorities) by collecting real use cases, also (but not only) through EU co-funded projects
- facilitate and support public-private partnership initiatives, especially on training and knowledge exchange.

Unsurprisingly, one interesting topic addressed during the interviews was “public-private partnership” for practical activities, mainly regarding:
- training and dissemination
- strategic and vision documents

There is a strong need to support training modules and consultations about skills and knowledge improvement (mostly for “INSPIRE beginners”) and where possible make technical documentation clearer and easier, are the main challenges.

This should also be targeted to support joint ventures between private companies and the academic sector to link research with application in practice, establishing and enlarging networking and capacity

[24] http://inspire.ec.europa.eu/mif/

building activities with trans-national scope in order to share and effectively utilize particular expertise via international projects, experts exchange stages, workshops and training.

In order to facilitate the involvement of the private sector in the implementation process, some countries have already defined possible solutions. In the case of Germany, the GDI-DE for example, involves the economy within public reviews which are organized to evaluate ideas of the GDI-DE. They also offer a partner programme, which has the remit to partner with companies and organizations from the Geo-ICT sector for the establishment and expansion of the SDI in Germany.

Likewise, the RGI[25] program in the Netherlands about "Space for geo-information" is another good example of knowledge exchange network aiming to shorten "time to market" innovative solutions (Bregt & Meerkerk, 2007).

In this case, the RGI program created a smart mix of more than 140 organizations (research centres, private companies and users) to stimulate innovation and the flow of knowledge, also through tendering procedures for 'small' pilot projects (€50,000) for fresh and innovative solutions.

It is worth mentioning two other well-known examples of programmes and initiatives aiming to mix up different multi-disciplinary stakeholders and to stimulate innovation and growth: the Canadian Geoide and the British Geovation.

The Geoide Network was funded by the Networks of Centres of Excellence program (NCE), establishing unique partnerships among 32 Canadian universities (and 38 foreign universities), 54 industry partners, 42 governmental and non-profit organizations, aiming at turning Canadian research and entrepreneurial talent into economic and social benefits for all Canadians (Global Spatial Network, 2013). In the overall period of the project (1999-2013) the initiative coordinated 121 projects with a total value of 79.4 million Canadian dollars (€56.6million).

Geovation is the innovation challenges promoted by Ordnance Survey in the UK; it addresses specific community needs, which may be satisfied, in part, through the use of geography. Entrepreneurs, developers, community groups, innovators can enter our GeoVation Challenges for a chance to win innovation funding to help develop their ideas (Ordnance Survey, 2013).

These examples should be taken as references for the future evolution of the smeSpire Network, aiming at:

- improve the links between "education, research and labour market" (European Commission, 2012c)
- generalize INSPIRE to "a wider location context independently of the thematic sector", as part of e-government programmes (European Commission, 2013d).

[25] Started in 2004 as part of the broader BSIK initiative, the RGI (http://www.rgi-otb.nl/) was a €20 million programme to improve and to innovate the National Geo-Information Infrastructure and geo-knowledge field in the Netherlands for an adequate and efficient administration and a powerful business.

6. Recommendations

6.1. Recommendations for further research on Geo-ICT private sector

As already discussed, there is still the need to have a clear definition of European Geo-ICT SMEs.

At the same time, it is also crucial to continue and improve this study on Geo-ICT private companies, covering all EU28 area and targeting on a broader generalization of INSPIRE activities, towards a wider location context, independent of the thematic sector.

The following recommendations are provided for further research on Geo-ICT:

- agree a definition of Geo-ICT SME that reflects the existence of companies that create and use INSPIRE compliant data but do not regard themselves as traditional GIS companies, so extending the definition used in this study to better cover SMEs involved in all aspects of the data related to the INSPIRE Regulations
- as a matter of urgency establish accurate figures for the Geo-ICT SME sector, repeating and enlarging the study undertaken and taking into account the wider definition, and defining a set of possible indicators to cluster Geo-ICT SMEs
- continue and improve this research with a strong focus on INSPIRE extension for e-government and within a broader cross-sector interoperability framework for the exchange and sharing of location data and services
- investigate current status and potential of clustering effects for Geo-ICT SMEs, with regard to the benefits of co-operation in Geo-ICT activities.

6.2. Recommendations for changes in policy/approach

Geo-ICT SMEs are key stakeholders, but they need to stimulate the demand for INSPIRE-driven solutions, considering the “real world” in terms of existing and used technologies, approaches and methodologies.

Given the predominance of public sector administrations in the customer base of Geo-ICT SMEs, encourage Member States to promote better links between public and private sectors.

Moreover, in some Member States the over-legislation existing at national and sub-national levels, is often not compensated by clear dissemination and communication strategies, and there is an increasing misunderstanding about binding obligations, non-binding requirements, and responsibilities of different organizations involved in the INSPIRE implementation chain.

The following recommendations are provided regarding changes and improvements in policy and approach:

- Member States to promote greater awareness of INSPIRE among Geo-ICT SMEs
- The public sector to actively involve private companies in all phases of the INSPIRE implementation, so to realize the potential benefits of INSPIRE and to scope opportunities for innovation

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- Member States to overcome the barriers to data release. Availability of public sector data is seen as one of the biggest hindrances to development by Geo-ICT SMEs
- Greater co-operation between public and private sectors needs to include development of better knowledge of INSPIRE requirements in public administration procurements
- European Commission and Member States to jointly promote more involvement of Geo-ICT SMEs in EU funded projects: a key to the success of Horizon 2020 is to improve the image of European research projects and to increase awareness among SMEs
- Future framework programmes for research and innovation (e.g. Horizon 2020) to stimulate fresh and innovative 'small' projects: to be really achievable for 'micro' and 'small' enterprises, SMEs need 'small' and smart projects
- European Commission and Member States to encourage Regions in the use of ICT Innovation Vouchers[26] to support Geo-ICT SMEs
- European Commission and R&D programmes to require public administrations to make their geodata available as open data when participating in co-funded projects (e.g. Horizon 2020), in order to guarantee ex-ante the re-use of the information collected and/or processed in such projects
- European Commission to establish a transparent and easy-to-implement licensing framework in order to support the use and creation of added value for digital spatial content: this is one of the valuable initiatives that can contribute to lowering the existing barriers regarding data accessibility by private companies
- Member States to promote guidelines for public procurement procedures related to INSPIRE: harmonised basic public procurement procedures with minimal requirements and methods are essential (this may fall within the scope of the current EULF Study)
- Public administrations to address the problem of "closed" procurements that prevent Geo-ICT SMEs tendering: this could be assisted by greater use of Open Source Software by public administrations
- European Commission and Member States to promote the adoption of pre-commercial procurement[27] approaches when activities such as solution exploration and design, prototyping, etc.
- Standardisation bodies to make more efforts to engage with Geo-ICT SMEs, particularly with regard to INSPIRE standards and specifications.

6.3. Recommendations for the smeSpire Network

Geo-ICT SMEs need to build up a critical mass, focused on real needs and requirements: in this direction SMEs need to improve their networking capabilities (social media or individual social behaviour are not sufficient in a global market).

SMEs also need a clearer communication strategy around INSPIRE, and they need to actively participate in INSPIRE debates also to better describe benefits to public authorities at local level.

[26] For a definition of ICT Innovation vouchers, please see (European Commission, 2013f)

[27] For a definition of pre-commercial procurement, please see (European Commission, 2007a)

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In line with these requirements the following recommendations are provided for the future of the smeSpire Network:

- The smeSpire Network should act as a mediator and facilitate the connections with other European Commission initiatives like the ISA actions (e.g. EULF and ARe3NA)
- The smeSpire Network should also support SMEs to play an active role in the INSPIRE Maintenance and Implementation Framework (MIF)[28]
- The smeSpire Training Platform (smeSpire Consortium, 2013b) and the Best Practice Catalogue (smeSpire Consortium, 2013a) should be shaped as a sort of marketplace where different members may offer their own expertise to improve quality and quantity of training modules for "INSPIRE beginners", provide reference implementation solutions for INSPIRE
- The smeSpire Network should become a legal entity (e.g. European Economic Interest Group[29]) in order to provide ancillary activities and services to the members, for example to improve knowledge and skills of Geo-ICT companies about project management and ERP[30] methodologies and tools

[28] http://inspire.ec.europa.eu/index.cfm/pageid/5160

[29] For a definition of EEIG, please see (European Commission, 1998)

[30] Fore a definition of ERP, please see (Wikipedia, 2013a)

SME SPIRE
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Annex 1 – Detailed Methodology

A1.1. Study approach

The study approach possessed the following key characteristics.

Use of different study methods

In order to realize the objectives of the study, different methods were applied. The study consisted of four phases, each followed a different method. The four phases were: 1. desk research, 2. survey, 3. in-depth interviews, and 4. workshops. The study followed a sequential and structured path, progressing from a general to more detailed analysis. The first two phases utilized a quantitative approach. The last two phases relied on qualitative methods of analysis.

Involvement of both private sector and public sector

Although the focus of the study was primarily on companies in the Geo-ICT sector, throughout the different study phases both the private sector and the public sector were involved in the data collection. The desk research phase dealt with the analysis of existing documents and statistics and did not include interactions with companies, geo-ICT companies were however actively involved in all other phases. In particular the survey organized in phase 2 focused on companies in the geo-ICT sector, who were invited to provide information about their activities, characteristics and competences. In the third and fourth phase of the project, data was collected from both private sector and public sector representatives.

A cross country approach

The scope of the study included the 12 partner Member States involved in smeSpire. These Member States are Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Italy, Lithuania, Malta, Slovakia, Spain and the United Kingdom. Each of the study phases was carried out by the project partner active in each of the 12 participating countries. The role of the partner in the data collection was crucial, because they understood the national situation in relation to the SME and Geo-ICT sector. They also had the ability and opportunity to help overcome any linguistic issues which may be a barrier to small enterprises working at local level and reading information about national contexts.

A1.2. Desk research

The main objective of the desk research was to collect statistical information about the SME sector, the ICT sector and the geo-ICT sector of the 12 countries represented within smeSpire. Although not all GI companies are solely part of the ICT sector information on the ICT sector was collected as a reference

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point for estimating and comparing the number of geo-ICT companies in Europe. An important output of the desk research phase were the lists of geo-ICT companies in each country, compiled by the Partners. These lists were used as the sample population of the survey.

The desk research was focused on the analysis of MS-related documents, for example, national industrial censuses, sectorial studies and other relevant documents. Partners utilized these documents to collect information about the current situation of Small and Medium Enterprises in their country, about the characteristics and activities of firms working in the ICT sector in their country and about the activities of firms working in the Geo-ICT sector in their country.

Based on this information, each partner provided a description of the SME sector, the ICT sector and the Geo-ICT sector in his country. These descriptions include the following aspects: numbers of firms active in each sector, temporal trends in each sector, proportion of national GDP contributed by each partner, distribution of firms by their main activities, and proportion of national value added accounted by each sector. In the descriptions of the ICT sector and Geo-ICT sector, particular attention was given to the presence and operation of SMEs.

A1.3. Survey

In the second phase of the study, an online survey among Geo-ICT companies in Europe was organized. The main objective of the survey was to collect quantitative information on the characteristics and the level of knowledge and skills of Geo-ICT companies in the partners' countries. Data collected through the survey were used for statistical analysis. The survey was available in 12 different languages (English, Bulgarian, Czech, Dutch, German, Greek, French, Italian, Lithuanian, Maltese, Spanish and Slovak).

The lists of companies that were compiled throughout the desk research, constituted the survey sample. The survey was organized in such a manner that the link to the survey can easily be shared with other people. All project partners were tasked with populating and disseminating the survey, increasing awareness among potential participants of the existence and importance of the survey. Partners were required to implement strategies and practices to increase the rate response. Different channels are used to communicate the existence and the importance of the survey, and to encourage Geo-ICT companies to participate in the survey: national, European and thematic mailing lists, workshops, conferences and remote support.

The survey consisted of four main sections, in which information was collected on different topics. Table 1 provides an overview of the four sections and the topics that were addressed in each topic.

Table 13 – Topics of the smeSpire survey questionnaire

	Questionnaire topics
Part 1. General characteristics of the company	Location of the company Year of foundation Number of employees Part of larger enterprise group

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	Sector(s) in which company is active Geographic market(s) in which company is active Number and types of customer in the public sector Involvement in geospatial activities Annual turnover Turnover related to geospatial activities Involvement in EU co-funded research activities
Part 2. Knowledge, skills and activities	Membership of association or network Certification by other authority (e.g. ISO) Familiarity with technological developments Main geospatial activities Knowledge of GI-standards Awareness of INSPIRE Knowledge of INSPIRE regulation Current involvement in INSPIRE Competences related to INSPIRE implementation Development of INSPIRE compliant components INSPIRE themes to which activities are related
Part 3. Impact and innovation	Current and future changes due to INSPIRE Changes in turnover due to INSPIRE Increased business potential outside own country Factors preventing and/or hampering innovation
Part 4. Conclusion	Additional comments and questions regarding smeSpire Willingness to participate in further study activities Contact information of the respondent

The survey was launched on November 2012. At the end of August 2013 299 companies submitted a survey, with 263 from the 12 Member States of the study. Table 2 shows the distribution.

Table 14 – Distribution of respondents across the smeSpire countries

Country	Number of respondents
Belgium	14
Bulgaria	8
Cyprus	8
Czech Republic	12
Germany	58
Greece	23
Italy	59
Lithuania	19
Malta	4
Slovakia	15
Spain	25
United Kingdom	17
Other countries	36
Total	**299**

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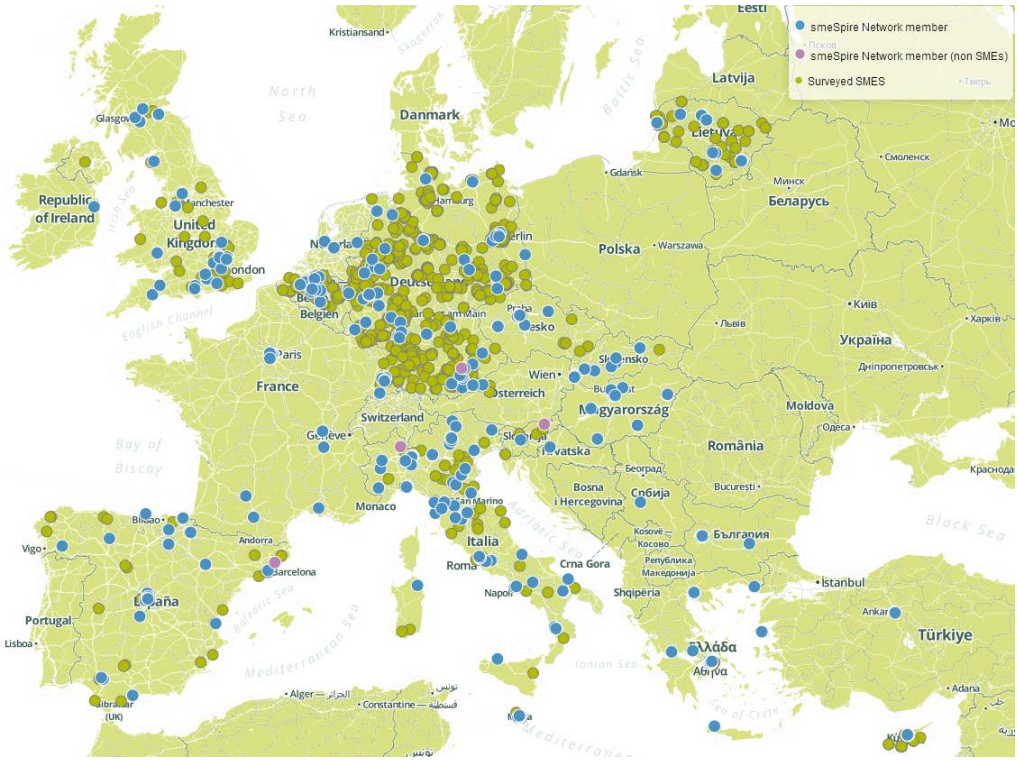

Figure 20 – Location of Geo-ICT organizations in the 12 Member States
(source: smeSpire)[31]

Figure 1 shows the number of submitted surveys for each month from November 2012 to August 2013. The majority of the answers were collected between December 2012 and February 2013.

[31] The map was produced using location of companies that submitted the online survey (Nov-2012 – Aug-2013); the majority of companies located in the map are from the 12 Member States represented in the smeSpire project by the 15 partner, but other companies are from other countries.

SME SPIRE
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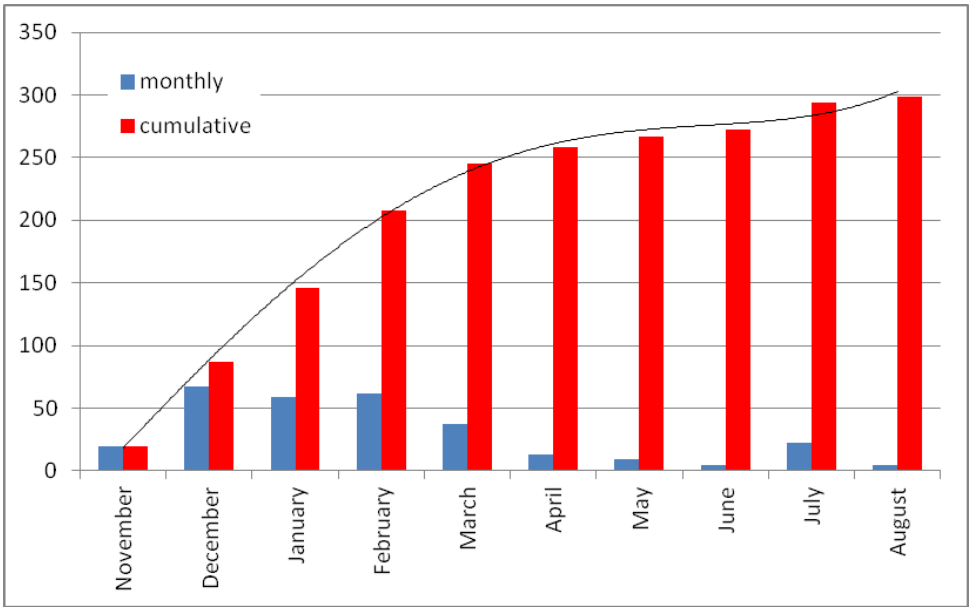

Figure 1 – Surveys submitted from November 2012 to August 2013

(source: smeSpire)

A1.4. In-depth interviews

In the third phase of the study, a series of in-depth interviews was conducted in each Member State. The goal was to collect qualitative information about the behaviour and experiences of different Geo-ICT companies in INSPIRE implementation, about the general characteristics of the Geo-ICT sector in different Member States and about the institutional and policy in which Geo-ICT companies in Europe operate. Both the private sector and the public sector were involved in these interviews. In each Member State, interviews were conducted with at least 4 Geo-ICT companies, with a representative of the national geographic association (private sector), with the INSPIRE Member State Contact Point and at least 2 other public administrations (public sector) as Legally Mandated Organizations.

Table 3 Total number of interviews with different types of organizations

Type of organization	**Number of interviews**
INSPIRE Member State Contact Points	12
Geo-ICT SME's	60
Geo-ICT association	8
Public administration (LMOs)	33
Total	**113**

SME SPIRE
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Semi-structured questionnaires were used to guide the interviews. Core topics were: characteristics of individual Geo-ICT companies and the Geo-ICT sector in general; the involvement of Geo-ICT companies in INSPIRE and the (national) policy regarding the involvement of the private sector in INSPIRE. These topics were covered in each of the interviews. However, for each of the four types of interviews, a different questionnaire was used. Table 4 provides an overview of the central topics in each interview.

Table 4 Interview topics

	Interview topics
SME's	Company characteristics Innovation in their company Involvement of company in INSPIRE implementation Evaluation of INSPIRE and its impact on company View on the Geo-ICT sector in their country
NGA	Role and activities of association General overview of Geo-ICT sector Evaluation of national policy on Geo-ICT sector Evaluation of INSPIRE and its impact on private companies
MSCP	Implementation of INSPIRE at national level National policy regarding involvement of Geo-ICT sector Involvement of Geo-ICT sector in INSPIRE implementation General overview of Geo-ICT sector
LMO and other public authorities	Implementation of INSPIRE in their own organization Involvement of Geo-ICT sector in INSPIRE implementation National policy regarding involvement of Geo-ICT sector View on the Geo-ICT sector in their country

A first review and analysis was performed by the smeSpire partners, resulting in a country report for each Member State. These country reports included an analysis of the interview information, together with the statistical information from the desk research. The country reports were used as input for the final study report, which will provide a cross-country and a cross-company analysis.

A1.5. Workshops

In the fourth and final phase of the study, two events were organized in which the results of the previous research activities were further discussed, validated and illustrated by the experiences of speakers and participants from the private sector and the public sector (smeSpire Consortium, 2013c).

At the **2013 Geospatial World Forum** (13-16 May 2013, Rotterdam) a one day dialogue session was organized to share the experiences of SMEs in developing innovative solutions based on INSPIRE and Open data policies, and make recommendations on how to exploit the opportunities further. Key topics addressed during this session were the benefits SMEs may enjoy by contributing to the INSPIRE implementation, obstacles that may hinder the participation of companies in INSPIRE, actions and initiatives to overcome these obstacles and different ways collaboration may be achieved between companies, public administrations and other key stakeholders.

During the **INSPIRE Conference 2013** (23-27 June 2013, Florence) an open discussion was organized with private and public sector representatives on how synergies can be developed between the public and the private sector to facilitate the involvement of Geo-ICT companies in INSPIRE, boosting the economy of the geo-ICT sector. This open discussion was organized as a roundtable in which different panelists addressed topics such as the barriers in public tendering procedures, the importance of R&D opportunities for SMEs, actions to facilitate the reuse of open data by SMEs and the need for partnerships between public and private entities.

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Annex 2 – Context

A2.1. The European SME Sector

EU recommendation 2003/361 provided the definition of Small and Medium-sized Enterprises (SME), referring to the following factors (European Commission, 2013b, see also **Table 1**):

- number of employees and
- either turnover or balance sheet total.

With more than 87 million people employed in Europe, SMEs are broadly considered as the backbone of the EU economy and are primarily responsible for wealth and economic growth, next to their key role in innovation and R&D.

In the last 5 years the European Union faced challenging economic conditions, with an intensifying sovereign debt crisis in the euro zone and weakening growth in even the better performing nations (ECORYS, 2012, p.15).

Throughout the downturn, however, SMEs have retained their position as the backbone of the European economy, with some 20.7 million firms accounting for more than 99 per cent of all enterprises, of which the lion's share (92.2%) are firms with fewer than ten employees.

For 2012 it was estimated that SMEs accounted for 67% of total employment and 58% of gross value added (GVA) and 55% of turnover.

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Table 15 – Number of enterprises, employment and GVA in EU27, by size-class
(source: ECORYS, 2012)

	Micro	Small	Medium	SMEs	Large	Total
Number of enterprises						
Number	19,143,521	1,357,533	266,573	20,727,627	43,654	20,771,281
%	92.2	6.5	1.1	99.8	0.2	100
Employment						
Number	38,395,819	26,771,287	22,310,205	87,477,311	42,318,854	129,796,165
%	29.6	20.6	17.2	67.4	32.6	100
Gross value added						
€ Millions	1,307,360.7	1,143,935.5	1,136,243.5	3,587,540	2,591,731.5	6,179,271.4
%	21.2	18.5	18.4	58.1	41.9	100

(source: ECORYS, 2012)

In the 12 Member States studied by the smeSpire project, the number of SMEs estimated in the EC SBA Fact Sheets represent 99.8% of all enterprises, ranging from 99.4% (Slovakia) to 99,9% (Czech Republic, Greece, Italy, Malta, Spain).

In 2008-2009 the total number of all enterprises in the 12 MS of this study decreased from 12.9 million enterprises to 12.8: during this period the positive trend of annual change (% of enterprises compared to the year before) fell down from +3.5% to -0.2%: it is worth noting that Large enterprises (LEs) suffered a stronger decrease passing from +8.3% in 2008 to -4.0% in 2010; by contrast, in the same period, the number of SMEs had a more stable curve, ranging from +3% in 2008 to -0.2% in 2010.

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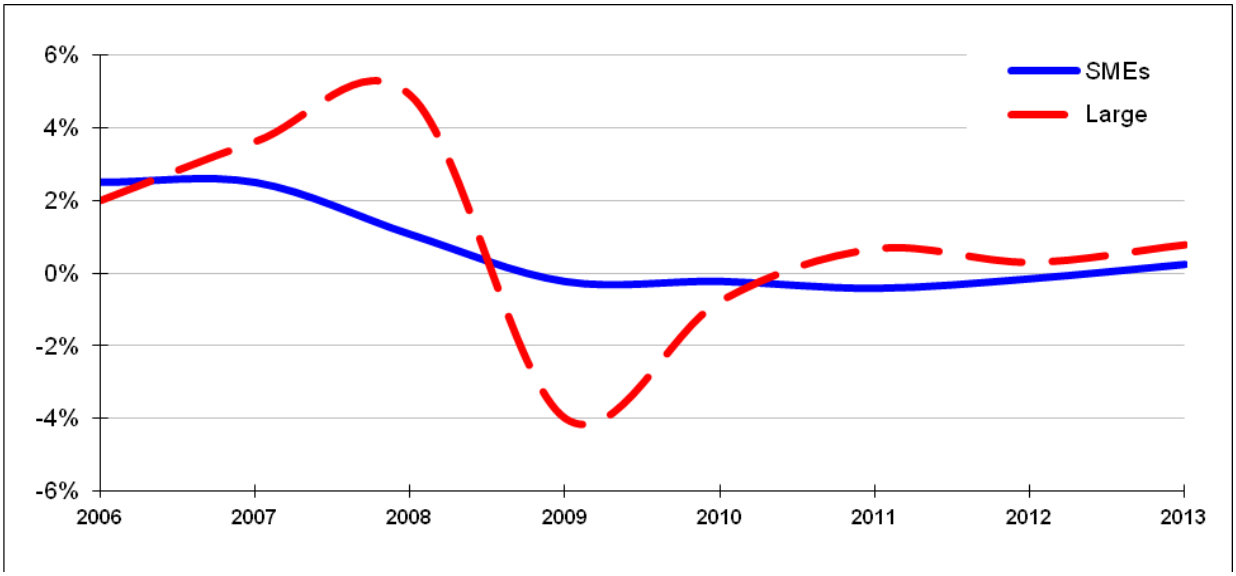

Figure 21 – Annual change of number of SMEs and LEs in the 12 Member States
(SmeSpire elaboration on data from European Commission, 2012b)

As shown in the figure above, SMEs remained more stable in terms of number of enterprises, and also considering the annual change of number of employees.

In the period 2005-2013, European Commission estimates (European Commission, 2012d) that the overall number of employees in SMEs coming from the 12 MS increased from 52.2 to 55.6 million of people (+6.6%), while LEs increased from 25.2 to 26.7 (+5.9%).

From 2008 to 2010, the SME class lost 1.6% of employees, while the LE sector lost 6.3%.

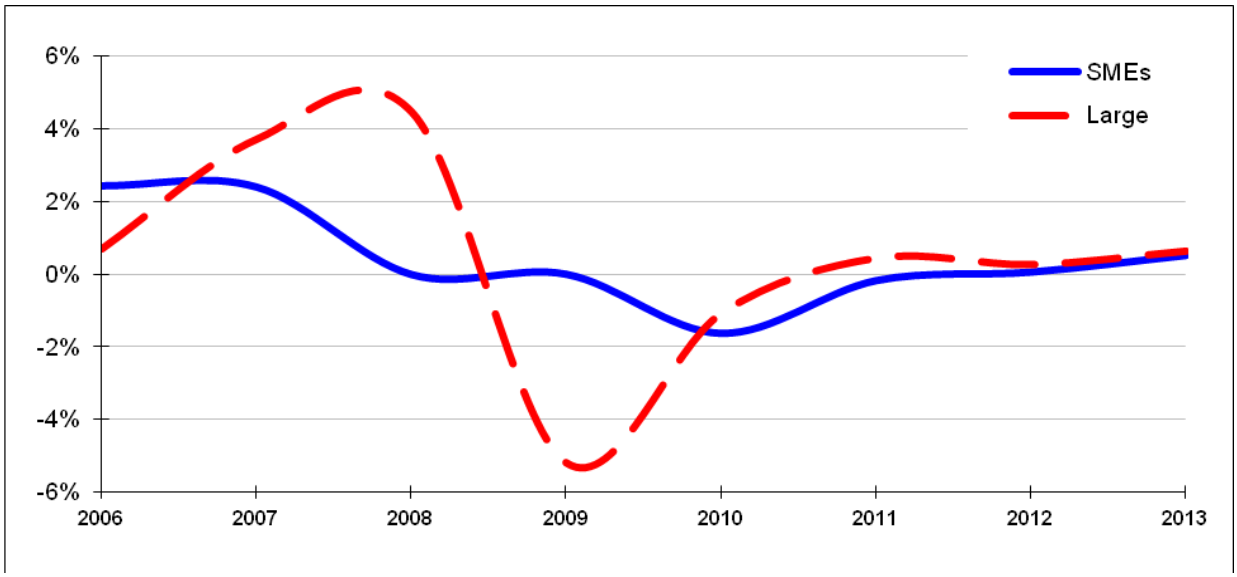

Figure 22 – Annual change of number of employees of SMEs and LEs in the 12 Member States

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In terms of turnover, European Commission (2012d) estimate that SMEs decreased their overall percentage of total turnover from 56.6% (2005) to 54.8% (2013).

The negative peak of turnover was in 2009, with SMEs loosing 11.6% compared to the year before, while LEs loosing 12.5%.

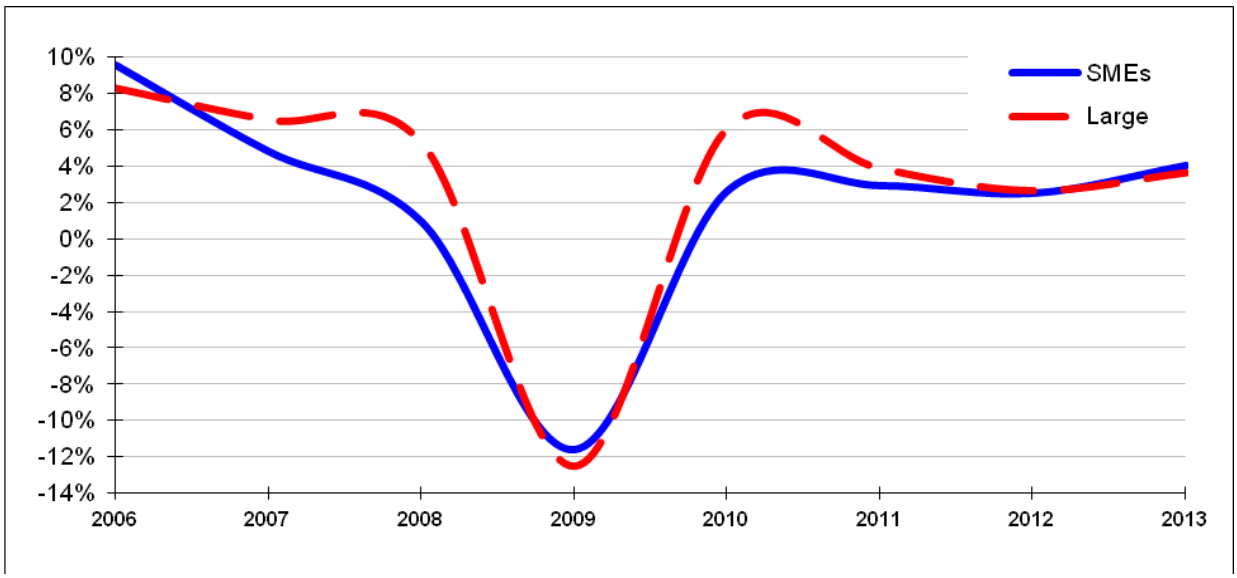

Figure 23 – Annual change of turnover of SMEs and LEs in the 12 Member States

The biggest sector where SMEs are involved is sector "G – Wholesale and retail trade; repair of motor vehicles and motorcycles" of the NACE2 (Eurostat, 2008) classification: more than 30% of all SMEs in the 12 countries are involved in that sector, with 3.843 million SMEs out of 3.847 total enterprises.

Looking at the single percentages of SMEs belonging each sector in each of 12 MS, values vary depending on sector and country, and also depending the dimension considered (number of SMEs, employees and turnover):

- Sector D (Electricity, gas, steam and air conditioning supply) and sector E (Water supply; sewerage, waste management and …) have the biggest range, with values varying a lot from country to country[32]
- Sector F (Construction), sector I (Accommodation/food services) and sector L (Real estate activities) have the lowest range, with very small differences between the 12 countries[33]

[32] In the case of sector D values vary from 0% (Cyprus, where the unique company is not a SME) to 99.85% (Spain); for sector E, values range from 85.71% (Malta) to 100% (Cyprus, with 156 SMEs out of 156)

[33] For these sectors the percentages have variations below 0.5% from country to country

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A part from considering the number of companies, to size the SMEs market we need to take into account the other two dimensions: number of persons employed and turnover

The table below shows the percentages of the three dimensions (SMEs, employees and turnover) for each NACE2 sector, in the whole area of the 12 MS.

Table 16 – Percentage of SMEs by NACE2 sector in the 12 Member States of the smeSpire project

NACE v.2 sector	% of by sector		
	SMEs	Employees	Turnover
Sector: B: Mining & quarrying	98.81%	41.35%	28.86%
Sector: C: Manufacturing	99.26%	60.24%	38.53%
Sector: D: Electricity, gas, steam and air conditioning supply	98.49%	22.46%	32.33%
Sector: E: Water supply; sewerage, waste management and …	98.28%	51.61%	54.78%
Sector: F: Construction	99.94%	89.54%	81.00%
Sector: G: Wholesale and retail trade; repair of motor …	99.89%	70.35%	64.26%
Sector: H: Transportation and storage	99.71%	52.99%	52.73%
Sector: I: Accommodation/food services	99.86%	82.40%	77.63%
Sector: J: Information and communication	99.73%	56.88%	37.86%
Sector: L: Real estate activities	99.95%	86.23%	86.67%
Sector: M: Professional, scientific and technical activities	99.93%	81.81%	72.09%
Sector: N: Administrative and support services	99.36%	48.08%	61.38%

(source: European Commission, 2012d)

SMEs' characteristics (number of companies, employees, annual turnover) vary country by country and sector by sector, with annual changes that may differ in the 12 MS.

For example, for the ICT sector (used in this study as a "reference" sector deeply related to Geo-ICT) the European Commission (2012d) estimated that in the period 2005-2012 the overall number of ICT companies increased by 22.6% (12 MS), however this increase was not consistent across the countries in this study.

A2.2. The European ICT Sector

In 2010 the overall EU-28's ICT sector (NACE2 section "J") figured some 873 thousand enterprises, employing 5.8 million people and generating EUR 487.9 billion of value added. The sector's contribution to the non-financial business economy (Sections B to J and L to N and Division 95) was 4.0 % of the enterprise population, 4.4 % of the workforce, and 8.2 % of value added (European Commission, 2012d).

SMEs estimated in the EC SBA Fact Sheets (European Commission, 2012) in 2013 in the 12 Member States are at 99.73%, with 436,647 SMEs out of 437,834 enterprises; the range of the country percentages regarding the number of SMEs varies from 96.35% in Slovakia to 99.94% in Greece.

In terms of people employed the percentage is 56.88%, while for turnover the percentage is 37.86%.

From 2008 to 2010 the ICT sector in the 12 Member States suffered from the effects of global crisis: the annual change (in %) of ICT companies decreased in 2009 from positive to negative trends for both SMEs and LEs: according to the estimates of the EC SBA Fact Sheets, SMEs should register an inversion in 2013, while the number of larger ICT companies is expected to continue to decrease.

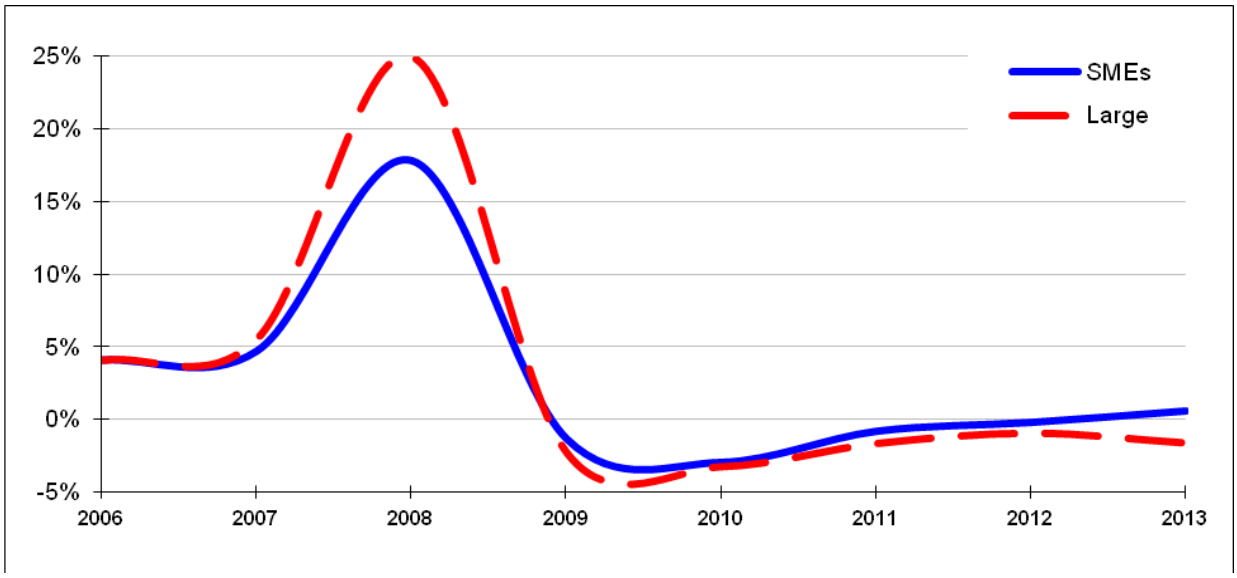

Figure 24 – Annual change of number of ICT SMEs and LEs in the 12 Member States

In terms of numbers of employees it is worth noting the ICT sector in the 12 countries remained almost stable, registering an overall -2.06% from 2005 to 2013 (3.509 million people employed in ICT in the 12 MS in 2013, with a growing percentage involved in SMEs at 58.66%).

Deeper analysis suggests the loss of employees registered by LEs seems compensated by the increase of jobs in SMEs: from 2005 to 2012 the ICT LEs lost 625,000 employees, from 2.1 million to 1.5, while

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in the same period SMEs increased by 550,000, from 1.4 million to 2 million people: the reason may be the transfer of ICT competences and jobs from large to small-medium companies.

In terms of turnover both LEs and SMEs increased their values from 2005, varying respectively by +22.7% and +78.4%,

In 2005 the portion of ICT SMEs turnover in the 12 countries was 29.5% (164 billion €), while in 2013 SBA Fact Sheets estimate them to reach 37.9% (294 billion €) of the market.

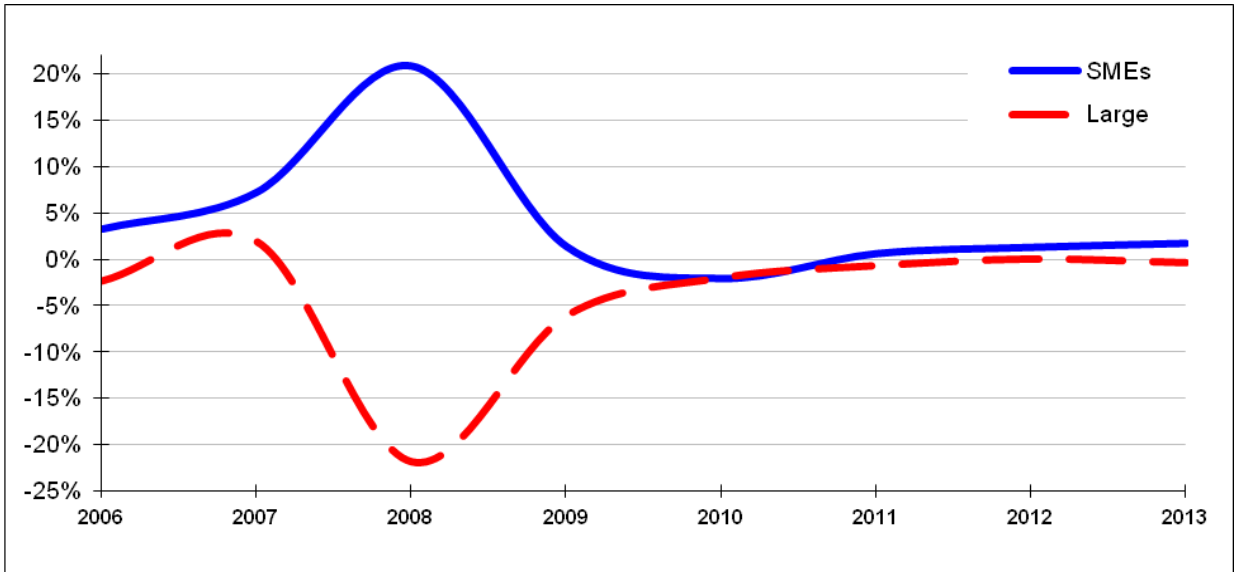

Figure 25 – Annual change of employees in ICT SMEs and LEs in the 12 Member States

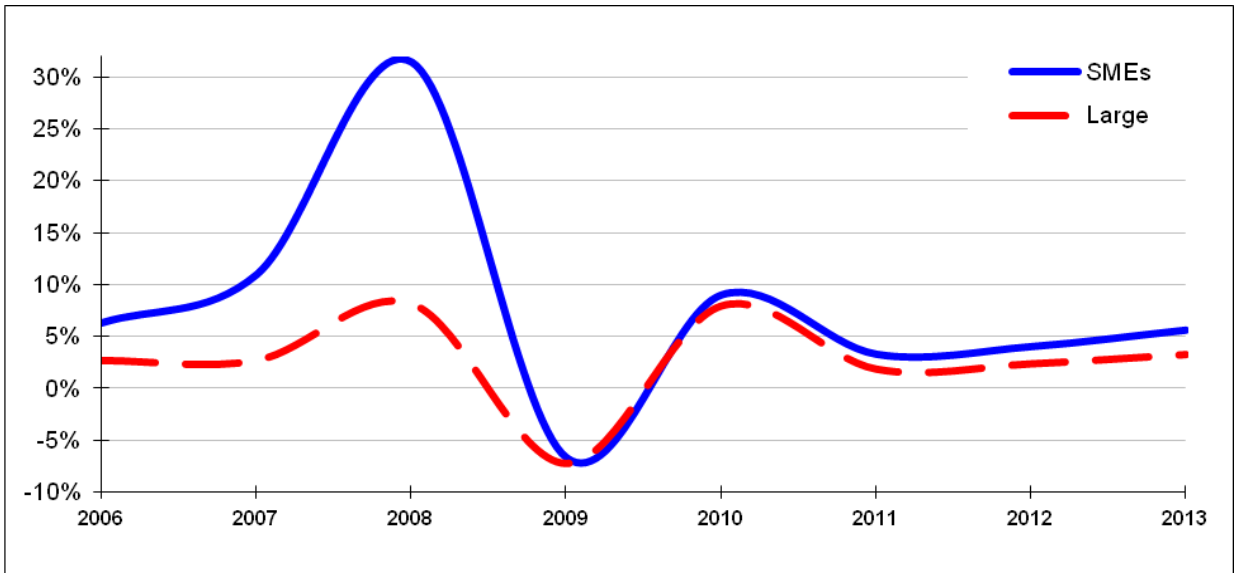

Figure 26 – Annual change of turnover of ICT SMEs and LEs in the 12 Member States

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The ICT sector, corresponding to the NACE2 class "J", is furthermore divided into the following sub-classes:

- 58 Publishing activities
- 59 Motion picture, video and television programme production, sound recording and music publishing activities
- 60 Programming and broadcasting activities
- 61 Telecommunications
- 62 Computer programming, consultancy and related activities
  - 62.0 Computer programming, consultancy and related activities
    - 6201 Computer programming activities
    - 6202 Computer consultancy activities
    - 6203 Computer facilities management activities
    - 6209 Other information technology and computer service activities
- 63 Information service activities
  - 63.1 Data processing, hosting and related activities; web portals
    - 6311 Data processing, hosting and related activities
    - 6312 Web portals
  - 63.9 Other information service activities

The following data are mainly focused on J62 and J63 subsectors, and are sourced from Eurostat indicators (Eurostat, 2013a).

Table 17 – Percentages of value added and employment by NACE Rev.2 sub-sections (*)

	% value added	% employment
Information and communication	**100.0**	**100.0**
Telecommunications (**)	37.7	18.9
Computer programming, consultancy and related activities	35.7	45.3
Publishing activities	12.3	15.6
Information service activities (**)	5.7	8.3
Programming and broadcasting activities	5.6	4.3
Motion picture, video and television programme production, sound recording and music publishing activities	4.4	7.2

(*) Ranked on value added.

(**) Value added, 2009.

Source: Eurostat (online data code: sbs_na_ind_r2)

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At European Union level, the sectorial analysis of employment by enterprise size class in the ICT sector is well represented by the following figures (Eurostat, 2013a).

Figure 27 shows the share of employment by sub-classes, while **Figure 28** represents the same in terms of value added.

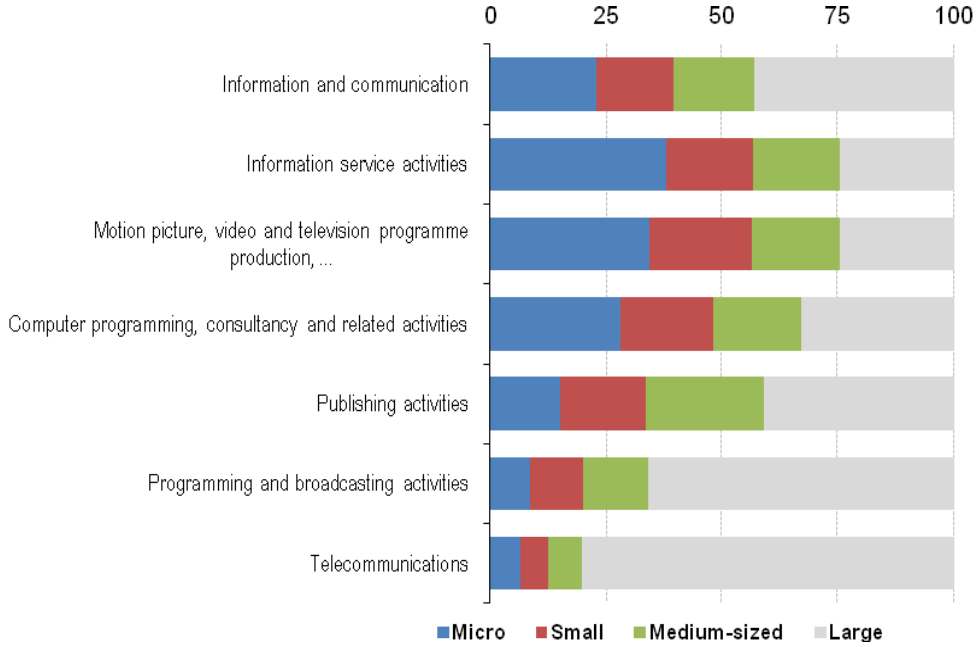

Figure 27 – ICT employment by enterprise size class
(source: Eurostat, 2013a)

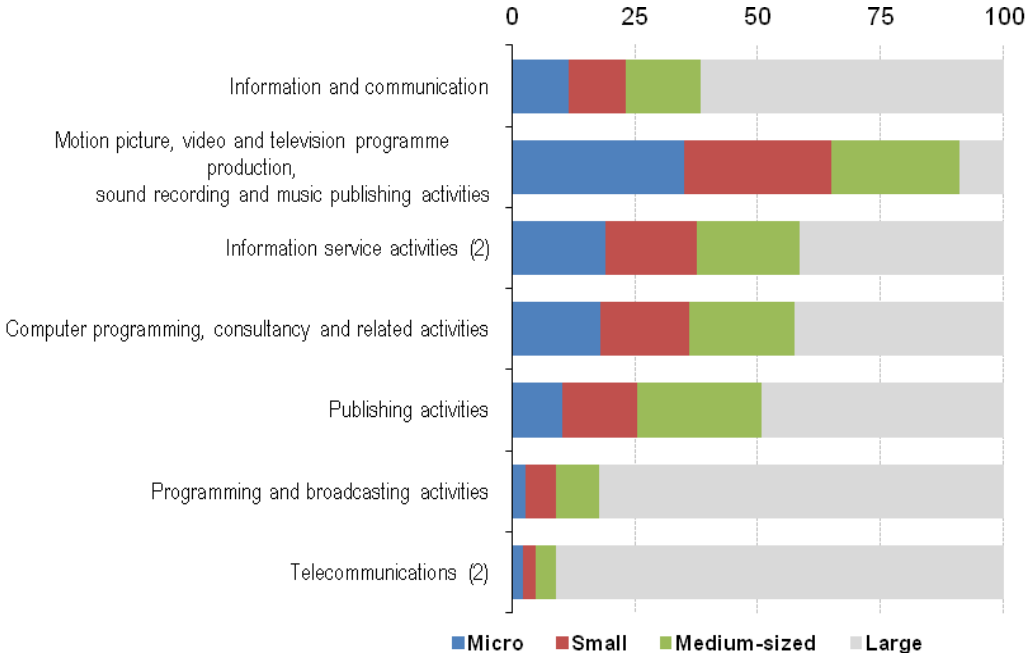

Figure 28 – ICT value added by enterprise size class
(source: Eurostat, 2013a)

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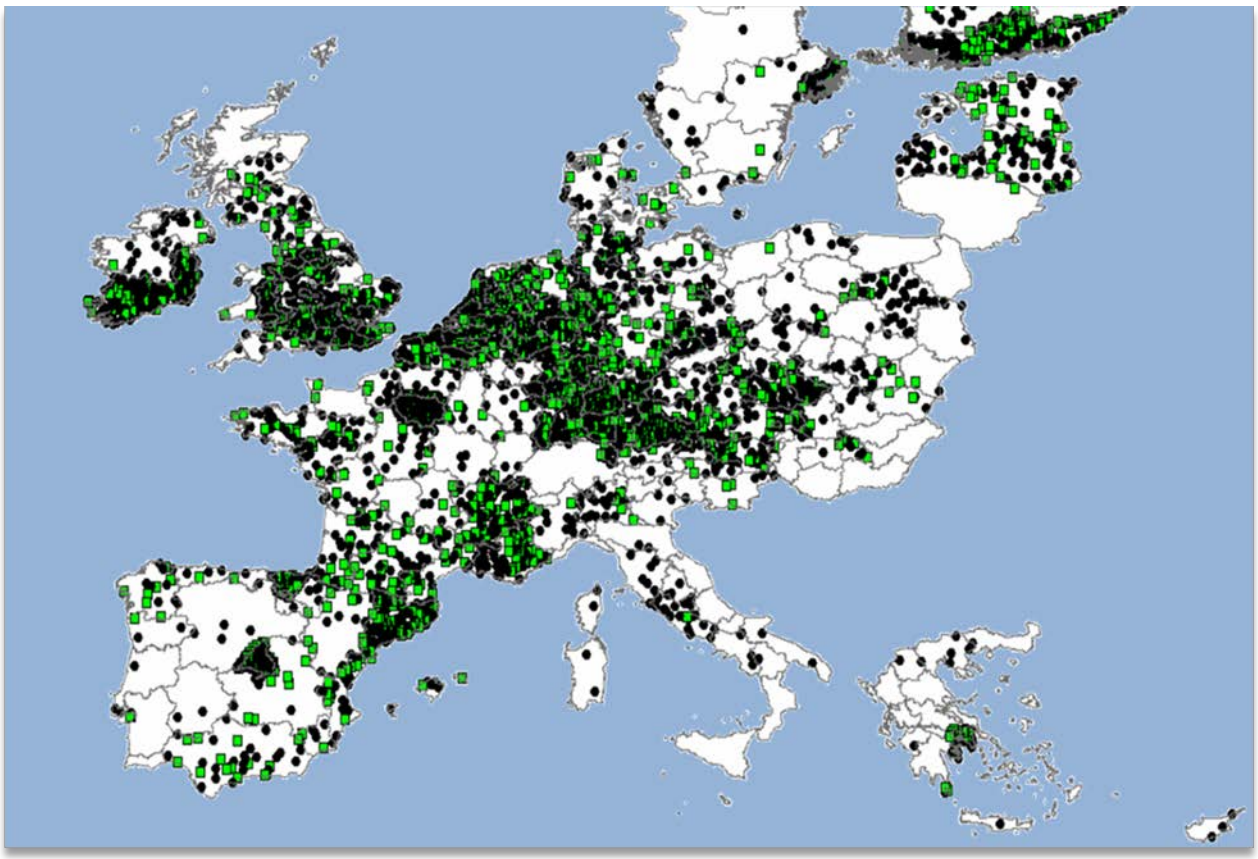

Figure 29 – Location of new ICT SMEs in the period 1995-2004
(source: Barrios et al., 2007)

The ICT sector, and, in particular ICT services, is highly concentrated spatially (Barrios et al., 2007, p.11). High-tech sectors are generally more concentrated spatially given the importance of knowledge and technological spill-overs in shaping their spatial distribution. This may suggest that ICT and knowledge related agglomeration economies could possibly be particularily important in the case of ICT services.

Figure 29 above shows the location of new SMEs involved in Computing services & related activities (NACEv2 sector "J", former NACEv1 sector "72") in the period 1995-2004 in EU25 Member States Barrios et al., 2007, p.98).

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Among the other sub-sector, "Computer and related activities" (corresponding to the NACE Rev.2 section "J62") are the most concentrated, having a Gini index of 0.64[34].

In terms of employment, ICT companies are rather spatially concentrated around the "blue-banana" (Brunet, 1989), with some extensions towards other regions (e.g. Scotland, Madrid, Lazio) and areas in the east of Hungary (Kozep-Magyarorszag), Poland (Mazowieckie) and Czech Republic (Praha).

In 2009, the European Commission invited representatives of Europe's Software Industry to propose concrete ideas for a European Software Strategy (Sharpe, 2009). Leading industry experts (software vendors, SMEs, business associations and analysts) collaborated in seven Working Groups in reviewing the status of the software industry and formulating recommendations.

Regarding ICT SMEs, the following issues were highlighted (Toffaletti et al., 2009):
- very few European ICT SMEs trade internationally
- research and innovation is significantly below potential
- inefficient and fragmented labour market
- partnering with a firm in another Member State may be very difficult, due to
    - difficulties in accessing information about potential SME partners in other countries
    - fragmented work permit systems
    - different legal systems
    - different national provisions and procedures
- low participation of SMEs in European processes (e.g. standardization)

Main trends discussed focused on increasing co-operation between SMEs primarily due to the usage of free (open) source components.

ICT SMEs were described by participants of the Working Group as potential "*software service providers*", mainly due to SMEs having the required personal relationship with local customers.

Cloud computing, open source and the global economic crisis were also defined as factors affecting new business models of ICT SMEs.

The main barriers were found in:
- public procurement procedures: heterogeneous, not harmonized and too often not following a "*modular approach*" but focused on "*unnecessary demand of integrated systems*" so increasing the size of tenders and hampering the participation of SMEs; and
- lack of harmonized rules in "*finance and financial infrastructure, employment rules, social and tax schemes*"
- language and cultural differences, as well as different educational requirements and curricula

The report underlined the need for ICT-SME specific networks and associations, since ICT SMEs are "*not yet sufficiently aggregated at associative level or too dependent on large vendors*".

[34] The Gini coefficient can theoretically range from 0 to 1 and measures statistical dispersion.

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Possible actions addressed by (Toffaletti et al., 2009) were mainly focused on promoting practical software interoperability, creating clustering opportunities for innovative ICT SMEs, stimulating EU level projects specific to ICT SMEs, and encouraging modularity and interoperable solutions in public procurement rules.

Moreover, the Working Group emphasized the need for creating a "*European SMS database/inventory*", with names, statutes, sectors of expertise, company revenue, and other additional information.

According to the study on "Economic and social impact of Software and Software based Services" (Giron et al., 2009), the software industry has been traditionally segmented into three main branches: system software, application software and software-maintenance services.

In the recent past, the major changes influencing these three branches were:
- the explosion of internet-based services, triggering the demand for Software Based Services (e.g. SaaS: Software as a Service; Cloud computing) also facilitated by new components and new collaborative development models based on Free / Libre Open Source Software (FLOSS)
- web 2.0 and the convergence of IT, telecom and media
- the great shift to mobile devices and mobile Internet services (e.g. apps)
- Service Oriented Architectures (SOA) and Resource Oriented Architectures (ROA)

Four software types can be defined accordingly (Giron et al., 2010, p.27):
- Applications
    - Business
    - Technical
    - Office automation
- Tools
    - Portals and collaboration
    - Information management
    - Modelling and development
    - Execution and integration platforms
- System infrastructure software
- Games

A more detailed classification of Software and IT Services (SITS) can also be found in (Châlons, 2013) and it is well synthesized through the following picture.

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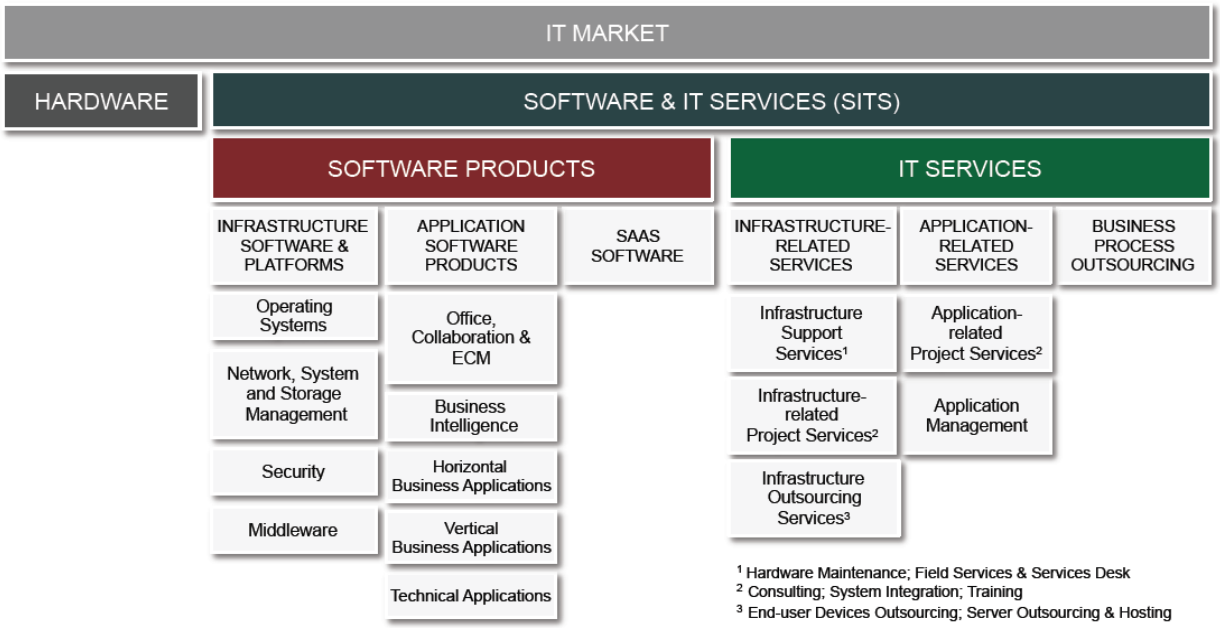

Figure 30 – IT Market segmentation
(source: Châlons, 2013, p.5)

Considering the dimension of "revenue models", the same authors identified four significant models (Giron et al., 2009, p.33):

- *License + standard maintenance*: users pay a license fee to own the right to use the software
- *Associated IT services*: customers pay human efforts necessary to build, implement and run/maintain the software
- *Paid-web-based*: it is usually considered in the "Cloud computing" segment, where users pay depending on the use of the service
- *Online advertising*: it usually refers to specific services on the web (e.g. communication, search, …)

Noteworthy is the trend forecasted for the so-called "Software and Software Based Service" (SBSS)[35] market in EU27 region (Giron et al., 2010) for the "Paid-web-based" model: the market size estimated for this model ranges from 228.7 billion € in 2008 to 383.5 billion € in 2020, with a market share increasing from 5.2% to 26.1%.

The picture below shows the evolution forecast for all SBSS segments until 2020: the "Software-Based Internet Service" (SBIS) segment represents the set of services for which the "value to the customer is intrinsically related to the IT resources delivered via the Internet" (Giron et al., 2010, p.6)

[35] The definition of "Software and Software-Based Services" (SBSS) provided by Giron et al. (2010) with the last two revenue models in the list presented here: "Paid-web-based" and "Online advertising"

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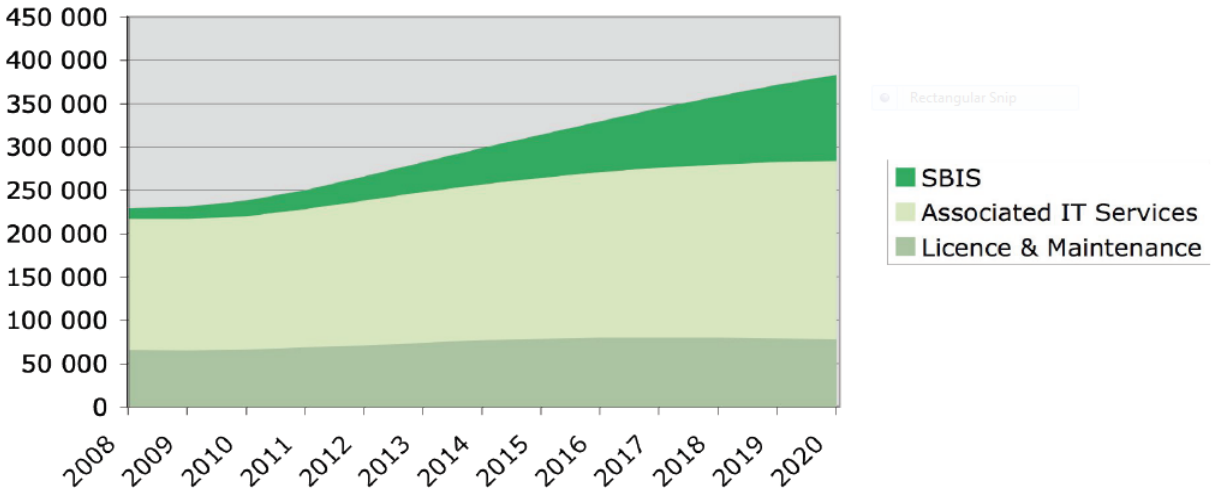

Figure 31 – Evolution of SBSS market segments
(source: Giron et al., 2010, p.12)

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A2.3. ICT facts and figures

(source: European Commission, 2012d)

Table 18 – ICT companies in the 12 Member States of the smeSpire project

(Number of companies)

		2005	2006	2007	2008	2009	2010	2011	2012	2013
Belgium	*total*	14,655	16,472	18,992	18,593	19,814	20,430	20,773	20,984	21,189
	SMEs	14,612	16,429	18,944	18,540	19,761	20,380	20,724	20,935	21,141
Bulgaria	*total*	4,018	4,199	4,812	6,342	7,914	8,588	8,803	9,043	9,318
	SMEs	4,005	4,183	4,794	6,321	7,893	8,567	8,781	9,022	9,298
Cyprus	*total*	317	348	362	653	787	1,146	991	886	794
	SMEs	315	342	355	649	782	1,139	985	880	789
Czech Republic	*total*	23,165	23,393	25,388	33,759	36,174	32,116	32,166	32,020	32,145
	SMEs	23,138	23,362	25,350	33,710	36,122	32,063	32,113	31,967	32,093
Germany	*total*	55,742	61,146	64,301	84,063	83,593	83,024	85,367	87,952	91,794
	SMEs	55,387	60,767	63,919	83,624	83,182	82,615	84,962	87,557	91,411
Greece	*total*	6,408	6,826	7,192	6,966	7,300	7,412	7,393	7,385	7,188
	SMEs	6,392	6,813	7,168	6,962	7,296	7,408	7,389	7,381	7,184
Italy	*total*	94,049	96,041	96,943	102,467	100,654	95,977	96,114	96,274	96,468
	SMEs	93,913	95,910	96,815	102,299	100,477	95,807	95,945	96,105	96,301

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		2005	2006	2007	2008	2009	2010	2011	2012	2013
Lithuania	*total*	1,687	1,868	2,818	2,315	2,356	2,240	2,619	2,394	2,614
	SMEs	1,681	1,862	2,812	2,308	2,349	2,234	2,612	2,388	2,608
Malta	*total*	1,569	1,698	1,827	848	836	859	853	846	831
	SMEs	1,567	1,695	1,824	845	833	856	850	843	828
Slovakia	*total*	1,499	1,766	2,089	2,980	935	1,066	781	635	548
	SMEs	1,493	1,758	2,075	2,962	912	1,045	760	614	528
Spain	*total*	35,446	38,431	39,160	48,029	48,267	46,480	45,850	45,827	47,884
	SMEs	35,331	38,311	39,032	47,840	48,083	46,309	45,693	45,672	47,733
United Kingdom	*total*	118,516	119,546	125,409	151,629	144,060	140,151	134,309	130,980	127,061
	SMEs	118,285	119,311	125,159	151,277	143,722	139,829	133,988	130,656	126,733

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Table 19 – ICT Workforce in the 12 Member States of the smeSpire project

(Number of employees)

		2005	2006	2007	2008	2009	2010	2011	2012	2013
Belgium	*total*	131,929	132,360	138,995	121,020	124,677	124,552	125,778	126,873	127,663
	SMEs	50,473	53,142	57,748	67,596	68,070	68,003	69,204	70,035	70,834
Bulgaria	*total*	63,830	61,685	63,758	61,379	66,337	66,205	70,242	68,762	67,395
	SMEs	23,521	25,582	28,868	40,322	45,087	44,983	47,917	47,742	47,623
Cyprus	*total*	5,867	6,346	13,622	9,136	9,239	10,070	10,216	10,469	10,673
	SMEs	2,064	2,785	8,885	4,877	4,787	5,190	5,291	5,464	5,598
Czech Republic	*total*	121,566	126,892	141,844	110,964	112,393	110,683	112,356	113,648	115,123
	SMEs	50,479	52,779	62,616	72,498	72,691	71,629	72,783	73,596	74,812
Germany	*total*	1,021,749	1,064,679	1,086,231	1,026,124	995,510	982,568	992,394	996,362	1,004,334
	SMEs	350,473	380,331	410,389	546,166	551,085	544,737	558,082	571,333	591,251
Greece	*total*	63,363	60,894	63,286	62,084	65,063	66,072	65,940	65,874	64,453
	SMEs	15,621	27,006	24,457	23,592	24,724	25,108	25,045	25,014	24,341
Italy	*total*	632,639	637,253	643,623	575,427	583,983	558,289	562,253	566,750	572,226
	SMEs	302,318	307,095	315,079	364,909	364,731	349,633	353,206	357,694	363,882
Lithuania	*total*	23,301	23,868	26,247	24,195	24,141	22,726	26,113	23,976	25,940
	SMEs	11,042	11,621	13,787	19,162	18,979	17,851	20,472	19,012	20,634

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		2005	2006	2007	2008	2009	2010	2011	2012	2013
Malta	*total*	5,289	4,885	4,653	4,144	4,090	4,204	4,236	4,270	4,281
	SMEs	3,789	3,373	3,252	2,487	2,455	2,523	2,522	2,517	2,491
Slovakia	*total*	41,332	42,793	45,521	39,522	27,780	24,555	25,538	26,303	27,091
	SMEs	14,385	15,582	16,707	25,257	12,083	10,738	11,050	11,252	11,554
Spain	*total*	359,440	383,445	403,304	438,753	426,455	395,749	371,891	372,525	372,269
	SMEs	161,728	171,708	181,543	242,407	235,911	219,292	209,834	212,614	216,861
United Kingdom	*total*	1,113,458	1,035,859	1,097,859	1,125,377	1,084,547	1,087,505	1,088,175	1,105,374	1,118,448
	SMEs	458,588	441,128	477,419	525,690	562,083	563,503	560,484	565,477	566,473

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Table 20 – ICT turnover in the 12 Member States of the smeSpire project

(Million €)

		2005	2006	2007	2008	2009	2010	2011	2012	2013
Belgium	*total*	25,513	28,479	30,264	30,290	31,184	46,619	49,053	50,339	51,997
	SMEs	11,773	12,613	13,225	13,871	14,006	22,250	23,588	24,298	25,219
Bulgaria	*total*	2,092	2,248	2,659	3,340	3,315	3,325	3,412	3,573	3,755
	SMEs	630	611	770	1,420	1,392	1,395	1,449	1,549	1,665
Cyprus	*total*	628	709	774	1,089	1,058	1,107	1,134	1,176	1,236
	SMEs	211	244	226	508	480	507	524	552	593
Czech Republic	*total*	8,252	9,813	13,613	14,139	13,174	12,706	12,848	12,906	13,088
	SMEs	2,885	3,433	4,719	5,951	5,731	5,642	5,695	5,716	5,785
Germany	*total*	155,727	157,038	160,609	210,170	203,471	223,496	230,181	238,646	250,700
	SMEs	37,268	40,814	45,091	77,309	77,734	84,715	88,529	93,422	100,505
Greece	*total*	9,735	10,836	10,999	5,932	6,027	7,009	6,782	6,747	6,972
	SMEs	2,418	2,816	1,914	2,530	2,570	2,989	2,913	2,902	2,977
Italy	*total*	100,338	104,134	104,389	116,876	111,286	114,847	116,459	118,603	121,795
	SMEs	27,399	30,887	33,395	41,767	37,697	38,912	39,707	40,770	42,367
Lithuania	*total*	1,141	1,256	1,464	1,831	1,533	1,457	1,543	1,638	1,760
	SMEs	487	532	693	1,056	887	840	900	967	1,054

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		2005	2006	2007	2008	2009	2010	2011	2012	2013
Malta	*total*	370	471	369	444	452	449	463	480	500
	SMEs	253	342	250	267	273	271	278	287	297
Slovakia	*total*	2,436	2,817	3,659	4,557	3,954	2,393	2,395	2,380	2,388
	SMEs	842	941	1,175	1,948	1,237	724	725	720	723
Spain	*total*	59,142	63,334	68,691	85,556	81,819	87,946	89,187	91,277	95,068
	SMEs	12,026	13,308	15,489	25,992	26,081	28,287	28,905	29,954	31,884
United Kingdom	*total*	192,773	197,787	211,366	229,253	196,503	206,643	211,190	218,219	227,337
	SMEs	68,600	68,585	77,321	82,618	70,000	72,885	74,648	77,386	80,957

The following tables represent the share of micro, small and medium enterprises in the ICT sector, expressed in terms of number of companies, employees and annual turnover (source: smeSpire elaboration, based on data from European Commission, 2012d)

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Table 21 – Percentages of ICT micro, small and medium enterprises (dimension: companies)

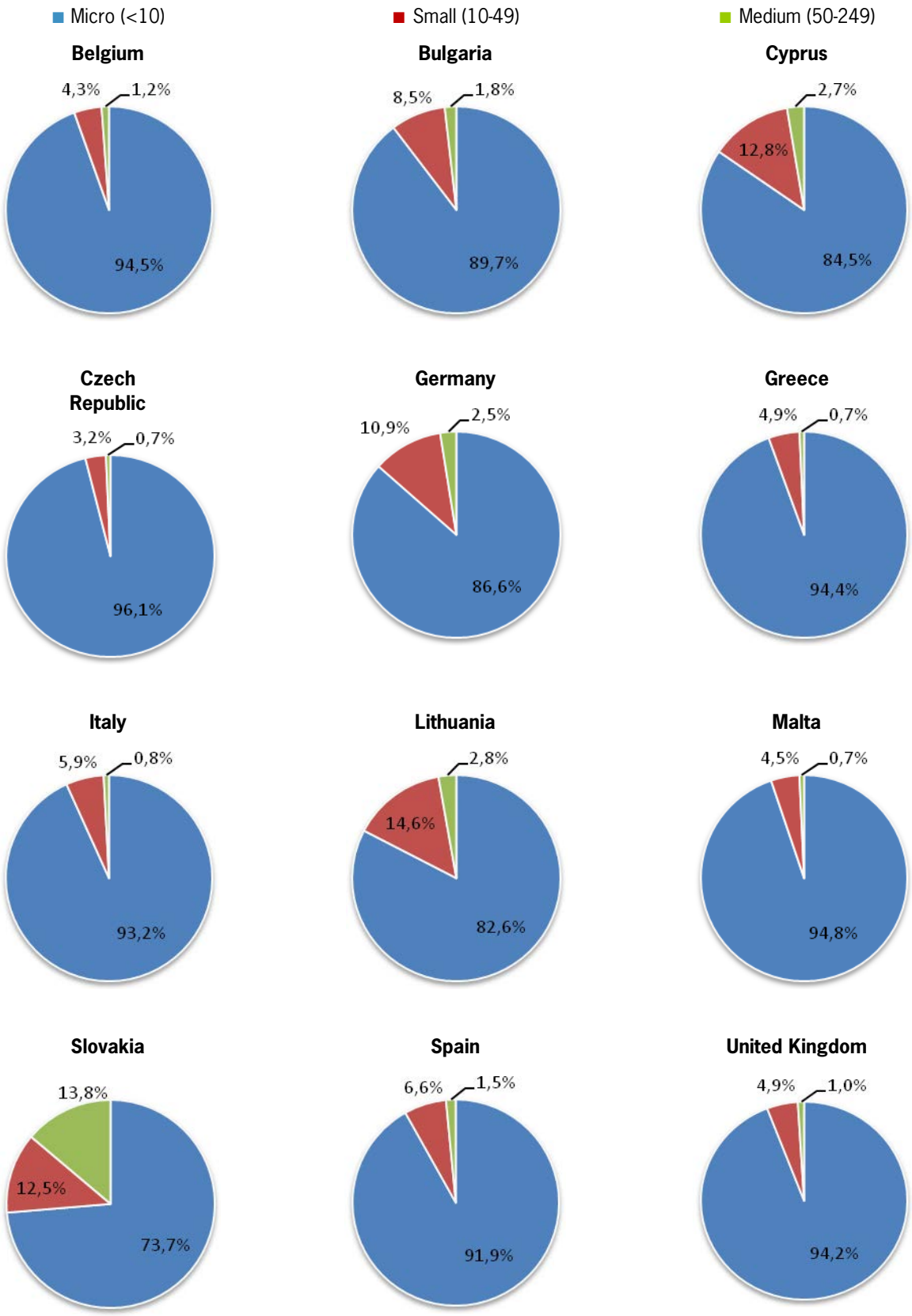

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Table 22 – Percentages of ICT micro, small and medium enterprises (dimension: employees)

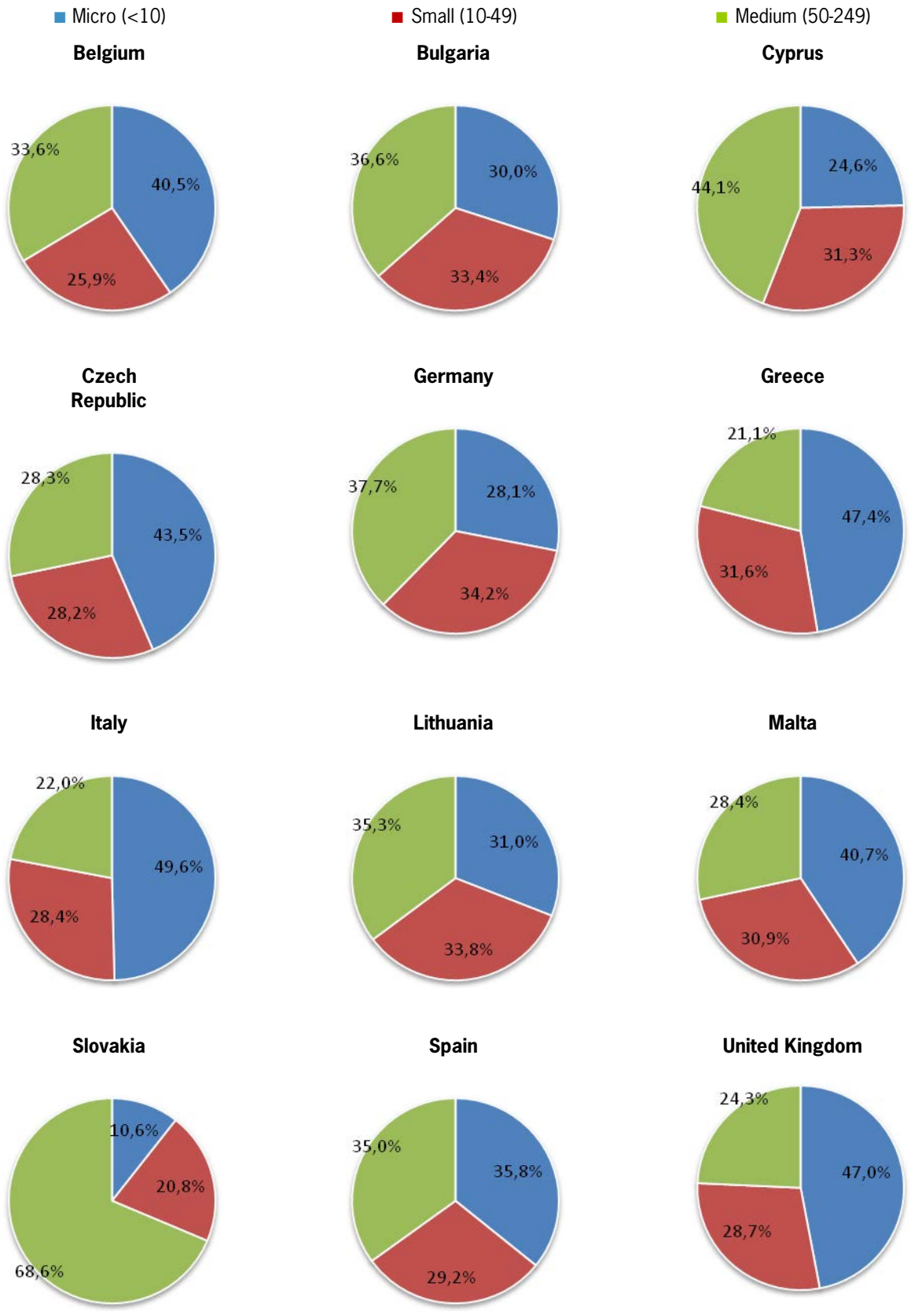

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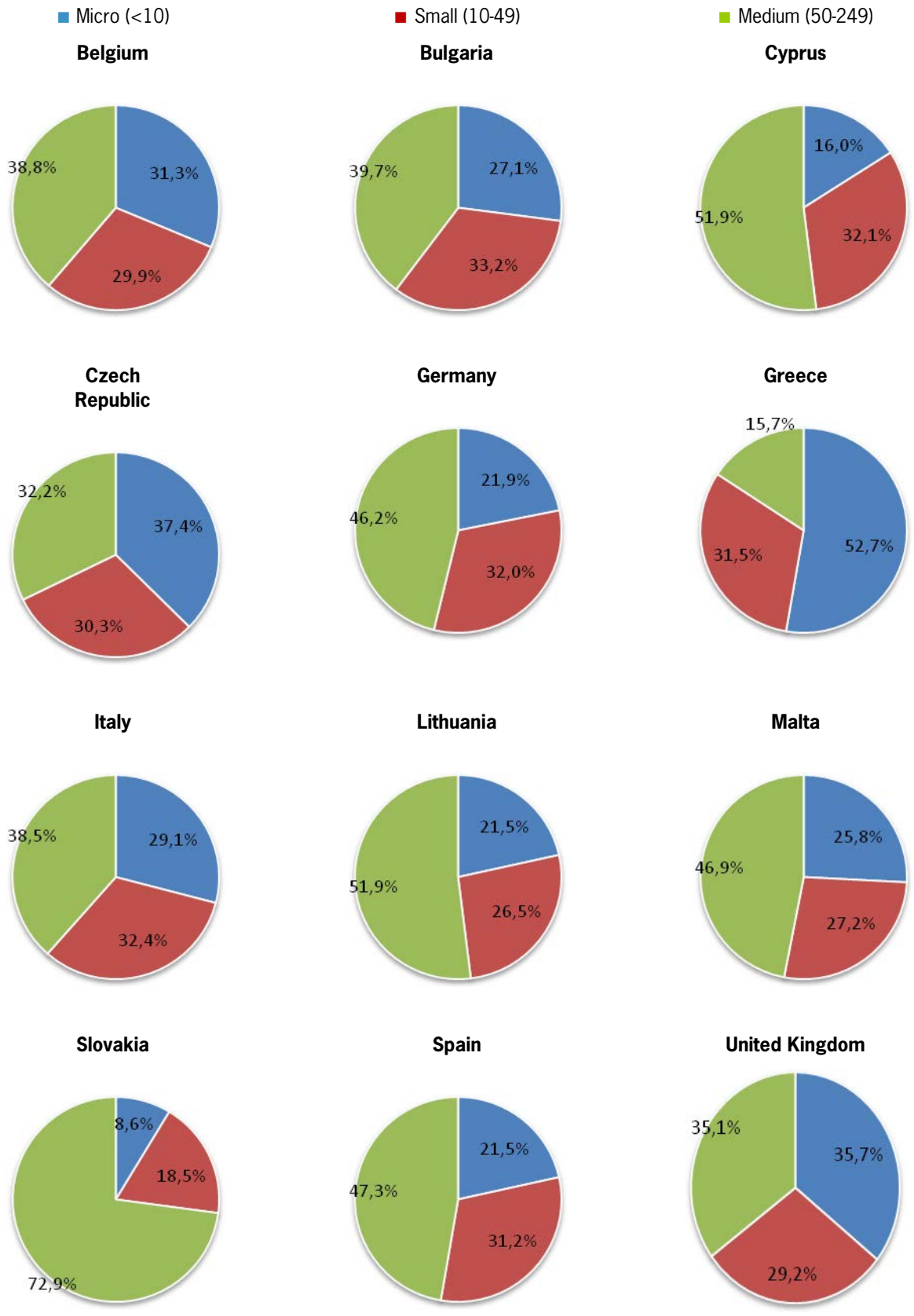
Table 23 – Percentages of ICT micro, small and medium enterprises (dimension: annual turnover)



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A2.4. The European Geo-ICT Sector

As mentioned above (see **3.2.1. Definition of Geo-ICT**), two definitions can be used in this study to define the Geo-ICT sector.

According to (Castelein W.T. et al., 2010, p. 63), the whole geo-information sector can be subdivided into three sub-sectors:

1. private sector (private companies dealing with geographic information)
2. governmental sector (public authorities managing geographic data and geo-services)
3. research sector

As a benchmark, the aforementioned sub-sectors represented in The Netherlands (2008) the following percentages in terms of workforce and economic value:

Table 24 – Share of geo-information economic value by sub-sector

Sub-sector	% workforce	% economic value
private	66.2%	63.8%
governmental	30.8%	33.0%
research	3.0%	3.2%

Considering again the study carried by (Castelein W.T. et al., 2010) and using data available from (European Commission, 2012d) for the ICT sector in the same year (2008):

Table 25 – Share of Geo-ICT sector in ICT (dimension: employees)

	ICT	Geo-ICT
employees	274,187	9,977
share		3.64%

Hence, in terms of employees, the Geo-ICT sector in 2008 in The Netherlands corresponded to 3.64% of the whole ICT.

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While, considering the number of companies:

Table 26 – Share of Geo-ICT sector in ICT (dimension: companies)

	ICT	Geo-ICT
companies	274.187	300[36]
share		1.04%

Therefore, on the basis of the information available from literature and from the analysis performed in the smeSpire project, a smooth estimation of Geo-ICT companies leads to 4,400 for the 12 Member States considered by this study.

Table 27 – Activities of and political strategies on the ICT sector in different MS

Belgium	The six main domains of expertise in ICT are (Deprest, 2011) : Nano-electronics, nano-technologies & micro-electronics; Financial security solutions & smart card technology; Telematics, GPS, cartography & Location Based Services, Geo-ICT; Telecommunication & Network equipment; Digital audio-video products & digital printing; Software products. According to the Federal Ministry of Economy, the Belgian ICT sector is dominated by ICT-services providers, representing 96,9% of all businesses in the ICT-sector in 2005 (FPS Economy, 2007) .
Bulgaria	n.a.
Cyprus	The main focus is on developing Wireless Access System Networks, and expanding and internationalizing the Cypriot ICT sector through fast-track review and issuance of necessary permits of foreign companies.
Czech Republic	According to the Czech Statistical Office the biggest share of ICT companies is represented by IT services (62.8% of enterprises, 45.5% of employees) and information and media services (23% of enterprises, 14% of employees)
Germany	In 2010 the ICT companies were mainly active in computer programming, consultancy and related activities (67.1% of enterprises), as well as information services, data processing and hosting, web portals development and related activities (11.9%), while telecommunication and broadcasting services play a minor part
Greece	IT services and telecommunication represent respectively 87% and 13% of the sector, but the top5 companies holding the 44% of total ICT turnover are telecoms
Italy	n.a.
Lithuania	ICT sector is dominated by companies providing services, with IT services at 71.2% of share, wholesale at 12.4% and telecoms at 12.9%

[36] *The survey to collect data about the private sector was distributed among 300 Dutch geo-information companies. The target group was defined by the association of the Dutch geo-information industry, Geobusiness Nederland. The 100 members of the association were part of the target group, as did a further 200 companies which were considered as potentially being part of the geo-information sector. The names of the additional 200 companies came from the network of the first 100 members, representing large and small companies.* (Castelein W.T. et al., 2010, p.62)

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Malta	In Malta, as for Cyprus, the political commitment is mainly focused on facilitating vertical strategic alliances with leading international ICT firms, with the development of "SmartCity Malta" Technology Centre of Excellence as the major deliverable of the national strategy.
Slovakia	ICT companies paid over 170 million € income tax in 2009 that is more than all companies altogether from the entire Slovak industry; the main weakness at national level is the absence of a meaningful government strategy on ICT
Spain	IT services (59.4%) and digital contents (25.3%) are the main sub-classes in terms of companies, while considering the workforce the percentages in 2011 were respectively 79.9% and 20.1%.
UK	The main fields of ICT activities are software development, mobile services, data centres, system integration and e-government

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Annex 3 – INSPIRE seen by Member States

Table 28 – Importance of INSPIRE in the 12 Member States (details)

Belgium	Four parties are responsible for implementing INSPIRE Directive: the federal government, the Walloon Region, the Flemish Region and the Brussels Region. The federal SDI will be developed by the National Geographic Institute (NGI), one of the main data producers at federal level. A budget of 3.2 milllion € was set up for implementing INSPIRE and the federal SDI. In Brussels, the implementation of INSPIRE is steered by the GeoBru committee. Two organizations have the key role in the implementation: Brussels Environment and the Centre for Informatics of the Brussels Region (CIBG); the total budget for INSPIRE is limited to 800,000 € in 5 years. In Wallonia, the Geomatics department of the Walloon Public Service (SWP) is responsible for co-ordinating INSPIRE and the regional SDI; the "Data Integration Unit" is co-ordinating activities, but with limited budget and only few people involved. In Flanders, the co-ordination and implementation of INSPIRE takes place within the SDI-Flanders partnership, with representatives from different levels and stakeholders. The AGIV (Agentschap voor Geografische Informatie Vlaanderen, Agency for Geographic Information Flanders), is responsible for the operational development of the GDI.
Bulgaria	At this stage the application of the INSPIRE requirements is mainly done by experts of the Executive Agency 'Electronic Communication Networks and Information Systems', playing the role of INSPIRE National Contact Point. Also other organizations like the 'Executive Environment Agency' and the Department of Identification of agricultural parcels at the 'Ministry of Agriculture and Foods' have not approved budget for implementing INSPIRE components.
Cyprus	The Department of Lands and Surveys (DLS) was immediately involved in the creation of the Cyprus Law regarding the INSPIRE Directive, and now undertakes the leading role in the organisation and implementation. DLS estimates that the financial commitment required by the whole Cypriot Government to fully implement INSPIRE will be about 15 million €. DLS does not expect that all the (INSPIRE compliant) environmental and geospatial data will be collected on time, but it envisages that the new Strategic Development Plan for a new Land Information System will add new impetus to the INSPIRE implementation. The Strategic Development Plan will encompass the development of a Geo-Information Portal that will include all the spatial and environmental data collected by government departments in INSPIRE compliant format. The NSDI of Cyprus will be developed under the Strategic Development Plan and will be based on the progress that was accomplished in several projects implemented by the DLS.
Czech Republic	Since the INSPIRE Directive entered into force, Czech LMOs have been divided into two groups: - ones who are aware of their duties as the obligatory spatial data providers; in LMOs of this first group employees are dedicated to INSPIRE implementation, they are active in all other INSPIRE related activities (as a membership in various national working groups, delivering comments to draft versions of implementing rules, active participation at national

	INSPIRE conference - ones that use the fuzzy provisions of the Czech transposition law to avoid the obligation of data providing; sometimes it is simply because spatial data is not used at all in their organisation, sometimes it is because these LMOs hope, someone else will take over their responsibility. In general, in both groups, LMOs appreciate the level of standardization that INSPIRE brought, however often the excessive detail of INSPIRE specifications is criticised. Since there is no national SDI law in the Czech Republic, just the INSPIRE one, certain rules have been set to the geo-informatics domain by implementing INSPIRE. Both groups also appreciate the amount of data available through view services. None of the Czech LMOs receives anything from the state budget. But some LMOs have dedicated resources for the INSPIRE implementation internally, others ensure the implementation at the expense of other duties and responsibilities. Key investments and actions can be monitored much easily after the INSPIRE entered into force, reporting obligation with its setting "costs and benefits of INSPIRE implementation" serves as the supporting instrument. Data providers started to control their investments into NSDI, because most of them would be done within the INSPIRE. Examples of key investments can be building of National INSPIRE geoportal with all the INSPIRE relevant components, building of geoportal by other organizations (COSMC) and regional authorities. Moreover, INSPIRE will be wrapped by the national geoinformation strategy and will be one part of it.
Germany	Since the implementation of INSPIRE is a legal obligation, all German Authorities are not allowed to act in contravention of the Directive. € 2.3 million per year are being invested for the implementation of INSPIRE. Through an administrative agreement with state and federal governments, the SDI Germany (GDI-DE) gets € 1.4 million per year for technical operation, maintenance and servicing of the components and € 900,000 for centralized tasks of monitoring and co-ordination. Costs and expenses are distributed to 250 locations German-wide. LMOs see the importance of INSPIRE primarily in the legal obligation of the implementation. LMOs are at a relatively early stage of the implementation. INSPIRE has not arrived yet in the daily processes of the GDI-BY and much is still in at the beginning. Not all LMOs have an annual budget for INSPIRE.The GeoBusiness Commission has a yearly budget of € 480,000, the Cologne District Government is spending approximately € 50,000 to € 100,000 per year for the operation of services like viewing and download services, but the exact costs are unknown as these offers are still in the testing phase. The costs for data transformation into INSPIRE data models are relatively low. They were estimated at one time as 20,000 €.
Greece	Cost: no information available. The implementation of INSPIRE in Greece is still in the beginning. LMOs already have implemented the metadata to have recorded their data and their status. The data implementation is more time and money consuming so it hasn't finished yet. Of course all the new data that are being developed, are INSPIRE compatible. The biggest problem is that it is not clear which authority is responsible for every dataset and most of the authorities do not have the expertise or the money for the transition. All the big authorities based in the capital are working on the transition. There are many dataset that are in the responsibility of the municipalities or small authorities who haven't start working in the INSPIRE yet and they don't have the capacity to do it by themselves. The Greek legislation before the 3882/2010 law which incorporates the INSPIRE directive, was very general about the Greek SDI policy. INSPIRE is seen as a solution to solve all the problems related to discrepancies between data from different departments and agencies, and to reduce the effort and the cost for data in every agency.
Italy	As a rough estimation, the overall annual budget spent by the 20 Regions for

	developing/maintaining geoportals should be in the range of 30 Million Euro. According to another rough estimation, the costs for the control/functioning of the National Geoportal is in the order of 0,5 Million Euro per year, with additional 0,5 Million Euro per year for its technological upgrading. INSPIRE is seen more in terms of administrative/legislative processes needed for its transposition into the national legal framework (formal aspects), rather than a substantial opportunity to strengthen the geo-ICT sector. INSPIRE is almost unknown at sub-regional level, is almost unknown by decision makers and politicians, at national as well as at sub-national level, is really known only by few offices in few departments of public sector working on environment and there is a lack of co-ordination/synergies with eGov initiatives.
Lithuania	The implementation of INSPIRE components is financed by EU funds and state budget. The Ministry of Agriculture manages assignations. State budget assigns app. € 260,000 annually for the support of the portal (data creation excluded). The National Land Service (NLS) is responsible for the development of the infrastructure means which ensure the functionality of Directive's themes' metadata, datasets, net services, sharing services and access through INSPIRE geoportal. SE GIS-Centras is in charge of management and development of the Lithuanian Spatial Information Infrastructure portal (www.geoportal.lt). This portal is the technological platform where INSPIRE requirements are implemented The Environmental Protection Agency (EPA) provides data, metadata and services for the national SDI portal.
Malta	Malta Information and Technology Agency (MITA) is responsible for implementing the directive. Inspire is considered vital as it eases access to data and interoperability the directive is considered differently by such bodies. Unlike MCST and Heritage Superintendence, MEPA enhances the role of the directive and it is creating data and spatial information. Although MEPA is enforcing the directive, it does not avail of a budget for it. Unlike the LMOs, MITA allocates an approximate €250,000 per annum on INSPIRE components.
Slovakia	INSPIRE is highly respected in Slovakia mainly because of its principles and legal force and, but compared to other ICT initiatives related to eGovernment, the lack of support, budget reductions and delays in deployments of some of the key components Estimated costs related with INSPIRE implementation were identified within the range of 600,000 – 900,000 € yearly for period between 2009-2012[37]
Spain	All the interviewed LMOs are participating in INSPIRE development, but they do not consider the Directive in the same way. Some LMOs have integrated INSPIRE in the work programme, and consider INSPIRE as very important, in the sense that the Directive helps to obtain data of good quality and to make data available. For other LMOs, INSPIRE as philosophy and way of sharing information is very good, but the practical implementation carries out complications that they do not consider necessary. Some consider INSPIRE as important because it tries to organize and harmonize the information that is generated. The economic investments in the implementation and the time dedicated to prepare the tools for the transformation to INSPIRE are very difficult to evaluate, because this takes part of the daily operations One LMO mentioned that the economic investment in the implementation is zero, but some

[37] http://inspire.enviroportal.sk/Upload/CountryReport_SK_v1_5_sk.pdf

	resources are dedicated to the participation in the Thematic Working groups and the preparation of some tools for the transformation. In general, the budget is difficult to evaluate, also at National level. Expenses are shared among different administrations by means of collaborative projects. One expects >40 million € saving annually (thanks to co-operation and reusability). The investment for services in the Spanish SDI common node (IDEE) is paid by IGN: 1.3 million €/year from 2005 to 2008 + 1 million/year from 2009 to 2012+ <0.5 million € in 2013 (single maintenance services).
UK	INSPIRE forms part of the broader UK Location Programme. LMOs generally are only concerned with their own activities and tend to regard INSPIRE as an additional burden placed upon them. In part, this is because they have to cover their own costs. There is no central budget for INSPIRE implementation and there are minimal central components. A range of public sector bodies are responsible for different data themes, with sometimes more than one collaborating for a particular theme.

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Table 29 – Implementation of INSPIRE components in the 12 Member States (details)

Belgium	The National Geographic Institute (NGI) implemented a new metadata profile, compliant to INSPIRE. At the moment only 'Coordinate Reference Systems' and 'Geographical grid systems' themes are INSPIRE compliant. Several INSPIRE compliant discovery services are available; download services are still under development. In Brussels an INSPIRE compliant metadata catalogue was developed based on GeoNetwork; also the geoportal is based on open source technologies. Discovery services are available and view services implemented; download services are operational but not fully compliant to INSPIRE. Wallonia has only few datasets under Annex I: these data are available but not fully compliant to INSPIRE. Metadata software 'MetaWal' is compliant, based on GeoNetwork. In Flanders, AGIV has made its existing metadata management system INSPIRE compliant, together with 7 consulting services and up to 22 INSPIRE datasets, grouped according to INSPIRE Annex I and II themes. Downloading of data is possible through a Direc Access Download Service.
Bulgaria	There are partially developed metadata, no institutions have been specifically identified for the different INSPIRE themes and Network services.
Cyprus	Some government departments still have their data in paper (non-digital) format, and there is lack in the IT knowledge and infrastructure. The development of the Geographical Part of the Land Information System is the foundation for the development of the GIS systems of the other agencies, having as target the creation of a NSDI, which will also comply with INSPIRE.
Czech Republic	INSPIRE compliant components have been developed either centrally or by particular data providers. For the centrally operated components before INSPIRE there had been a long tradition of metadata catalogue of the Ministry of the Environment of the Czech Republic and a geoportal also operated by the Ministry of the Environment, but available at the Portal of public administration of Ministry of Interior. The National INSPIRE geoportal was developed during 2010 – 2012 and it is available at http://geoportal.gov.cz. The geoportal includes metadata editor with validation against the INSPIRE metadata profile, INSPIRE view services can be displayed, data can be downloaded as the predefined data sets (for the moment), moreover data providers fulfil their monitoring obligation using the monitoring tool. The most frequent component already implemented is metadata. Data providers create it either by using their own software tools or by using metadata editor at the National INSPIRE geoportal. A year ago COSMC made available transformation service for coordinate systems transformation. So far it has been the only transformation service available in the Czech Republic. Transformation of data models has not been planned by any of the data providers, keeping "national data set" and "INSPIRE data set" will remain as the most probable practice, even if not very flexible and suitable. The only transformation service available is at the moment non-compliant. Regarding compliance of data sets: At the moment there is only one data provider that during building a complete new national information system rebuilt his database and in parallel made his the data sets INSPIRE compliant. The information system is "The base register of territorial identification, addresses and real estate" and it has been built and maintained by COSMC.
Germany	A centralized INSPIRE compliant geocatalog called Geodatenkatalog.de is available, which serves discovery-services and merges the content of approximately 30 additional metadata systems. The GDI-DE also provides a test suite to test the compliance of geodata and

	services with INSPIRE (GDI-DE, 2012)[38]. The Country and Federal States/Bundesländer operate together a geoportal (Geoportal.de). It provides data and services from all over Germany. Geoportal.de was implemented with open source software. All other services are not held centralized but by the holding spatial data centres or service providers. Furthermore according to Article 4, the affected bodies which hold spatial data are responsible for Annex I and II, thus there are at least 250 bodies, probably even more. The responsibility for Annex III is not yet certain and depends on the legal system of each Federal State/Bundesland. For the year 2011 Germany reported 2078 geo datasets and 727 geo data services related to the Annexes I, II and III. 73 % of the metadata for the geo datasets and 83 % of the metadata for the geo data services were provided as INSPIRE compliant. 6 % of all geo datasets including their metadata were INSPIRE compliant. 73 % off all metadata were accessible via discovery services and 54 % of all datasets were available through view services. Only 4 % of all datasets were accessible via download services.
Greece	Until today only Ktimatologio SA and the national contact point "Hellenic Mapping and Cadastral Organization – HMCO (OKXE)" have implemented components (at 19th July 2013). Both of them have implemented only metadata.
Italy	The National Geoportal represents a reference implementation of a component of the NSDI, and it is also a building block in the national legislation transposing INSPIRE. Important components of the National Geoportal are the discovery service, many datasets available through WMS/WFS services (besides their availability within the webgis application built-in into the Geoportal) and the recent Coordinate transformation service. In terms of metadata, a big effort has been made by AGID on metadata, both from a normative and implementation point of view, with the RNDT (Repertorio Nazionale Dati Territoriali), which is a set of tools/services to search and provide metadata about datasets and the related network services sourced by all Public Authorities. RNDT is integral part of the National Infrastructure for the Spatial Information and the Environmental Monitoring, set by the Decree 32/2010, which is the INSPIRE national transposition norm. The National Geoportal, developed in-house, is a web application (based on open source) for the metadata editing, compliant to INSPIRE and to RNDT. The Discovery Service is based on ESRI Geoportal Server technology; WMS, WCS and WFS are based on Map Server, whilst the coordinate transformation service is based on Degree. The RNDT (National Metadata Catalogue) has also been developed in-house by the former CNIPA (then DigitPA), using PostGIS, PHP and other open source solutions, in order to provide all interested Authorities with a platform re-usable in their own contexts (at the moment only 2 Regions are re-using this solution). Local Administrations adopt heterogeneous solutions, with an increasing number of them based on open source technologies, mainly because of lack of funds at public sector, but often without a real strategy in mixing together proprietary and OSS solutions. However, within this context it is important to remind the cause-effect relationship between the increasing usage of OSS in public sector and the increasing lack of money, but without any national or sub-national strategy on OSS.
Lithuania	All the INSPIRE components except data specifications (so far, no new data was created or substantially restructured) are implemented. Currently, search, view, download and transformation services are available in the national SDI portal.

[38] GDI-DE (2012): GDI-DE: Geodaten vernetzen. Online-source : http://www.geoportal.de/DE/GDI-DE/gdi-de.html?lang=de (2013-04-30)

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	The technical details about these components: - Data: Oracle and SQL Server database management systems - Metadata: ArcIMS search service, created/programmed application for metadata management - View services: ArcGIS for Server - Download services: Safe software FME, created/programmed application - Transformation services: Safe software FME - Geoportal: LSI portal as CMS works under IBM WebSphere (application server). The subsystems of the portal are programmed using the software for data publishing, transformation and etc. The access to data and web services uses Con Terra software: securityManager, serviceManager - Test suite: not developed yet
Malta	MITA have implemented the metadata and view components and they are currently populating the data. Each entity can adopt the technical knowhow to publish its data. MEPA is responsible for the majority and the rest of the components.
Slovakia	Implemented INSPIRE Components are: - Metadata: Metadata Client for metadata discovery and creating/import available via pilot Geoportal - Network Services (Discovery, View): Map client of pilot Geoportal - Validation Component (Metadata, Discovery+View Services) - Annex I, II and III compliant datasets: Mainly as outcomes of INSPIRE testing and some related projects (e.g. NatureSDIplus ,HlanData)
Spain	In general, there are data that are not fully compliant with INSPIRE. Metadata exist and are almost all fully INSPIRE compliant and accessible from the IDEE geoportal. Regarding services, there are many visualization services (> 2000 WMS, WMTS, WSC) but still far from being in line with INSPIRE. There are services at national, regional and local levels. Some WFS download services (> 200), and WCS, WTS for transforming both data models and reference systems have also been developed. The largest lack is in downloading services (> 75 linked via ftp that are not compliant) Some of them state that data required by INSPIRE is not enough for their organization and users need more contents than provided by INSPIRE provide. LMOs have already implemented several visualization and downloading services and also a geoportal; they all have information but not all of the services are INSPIRE compliant One LMO has adapted some internal and open source applications to be used as Test Suite, but they believe this tool should be provided by INSPIRE team at EU level.
UK	A central discovery metadata service has been established. A central catalogue service (CSW) is used by data publishers for creation and validation. View services and direct downloads are provided by individual data owners, with some available on the central data.gov website. There are no transformation services established as the data publishers will do this where required. There is no central geoPortal. Data owners are responsible for their own data; data is currently being produced in the appropriate form required by INSPIRE.

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Table 30 – Co-ordination and roadmap of INSPIRE in the 12 Member States (details)

Belgium	The organisational structure (laid down in a co-operation agreement between regions and the federal state) consists of the Member State Contact Point (MSCP), the INSPIRE Forum and the INSPIRE Co-ordinating Committee. The MSCP is the contact point for the European Commission regarding operational aspects and the interface for sharing information between the EC and the parties concerned in Belgium. The Co-ordinating Committee is a committee with representatives from the four levels, which is responsible for co-ordinating the INSPIRE implementation across them; the Committee is responsible for designating the reference dataset version required by INSPIRE, in the cases where there are several identical copies of data relating to INSPIRE themes, and to negotiate about the establishment of reference data for each theme.
Bulgaria	The INSPIRE co-ordination is established at central level: the 'Ministry of Transport, Information Technology and Communications' is responsible for the implementation of the Directive, while the Executive Agency 'Electronic Communication Networks and Information Systems' is in charge for the establishment of a national portal for spatial data.
Cyprus	The DLS Portal will include all the data collected by all Cypriot governmental departments. The project to develop a Strategic Plan for the Department of Lands and Surveys will be directed by foreign experts, who will be supported by local consultants. Thus, the INSPIRE know-how will be transferred to Cypriot private companies, also involving them through tenders and direct contracts.
Czech Republic	A National INSPIRE co-ordination committee was established to coordinate the process of INSPIRE implementation and to support the data providers. It is an advisory body of the minister of the Environment. It has 18 members from almost all the ministries, one from co-ordinating body for regional authorities and one from co-ordinating body for local authorities; one member represents private companies, universities (Czech Association for Geoinformation). The co-ordination committee operates in two levels – a co-ordination and decision making group and supporting technical working groups (for each of the INSPIRE components – metadata, data, services, monitoring and reporting, data sharing and two more – one for financial aspects of INSPIRE implementation and one for education). The co-ordination group tasks to be solved are passed to technical working groups, there the problems are discussed, solved and a suggestions or final decisions are passed back to the higher level. The committee aims to meet about 6 times a year, the technical working groups meet irregularly, based on the importance of an issue to be solved.
Germany	The GDI-DE is an organizational structure, which is based on a management agreement between the federal and state governments and consists of a union of multiple political decision-making bodies, in which the federal government, all Federal States/Bundesländer and municipal associations are represented. The administrative arrangement requires the contractors (federal government and each Federal State/Bundesland) to finance both the co-ordination tasks and the technical operation tasks for the implementation of INSPIRE through the GDI-DE. The most important measure for bridging National and Local SDIs is the administrative agreement GDI-DE between the Country and the Federal States/Bundesländer. The regulations within the Federal States/Bundesländer to connect federal state and municipality are also important. The LMOs and the MSCP follow different strategies in order to increase the level of awareness of INSPIRE. The strategies also have some points in common.
Greece	Until 12/7/2013, the "Hellenic Mapping and Cadastral Organization" (HMCO) was the coordinator and the national contact point for the INSPIRE and every public body has to

	establish a focal point for the INSPIRE. There is also the National Geoinformation Committee that reports to the Minister of Environment, Energy and Climate Change and to the Prime Minister and checks the HMCO. All duties has transferred to The NATIONAL CADASTRE & MAPPING AGENCY S.A. (NCMA S.A.) which is a Legal Entity of Private Law and its mission is the study, development and operation of the Hellenic Cadastre. The most important step and milestone is the establishment of the 3882/2010 law that included the INSPIRE directive in the Greek regulations. That law defined the coordinator and his responsibilities and the administration structure. All the tenders that refer to geodata now include INSPIRE in the specifications of the projects. HMCO has organized many seminars / training for the public bodies. He also organized a public conference to inform the private sector.
Italy	The INSPIRE MSCP is a pool of experts belonging to the Cabinet Office of the MATTM Minister, which take care of the administrative, legislative and reporting issues, with the technical support of ISPRA. On a yearly basis the MSCP sends to Regions instructions for the reporting of their INSPIRE related activities, but it quite difficult to chase their replies. There was not any possibility to appoint thematic experts directly for INSPIRE themes, nor to coordinate available experts from the local levels nor from the private sector. In 2011 the transposition national law defined the role of coordinator to be assigned to a steering committee (Consulta nazionale per l'informazione territoriale ed ambientale), but the activities of this committee never started.
Lithuania	The Ministry of Agriculture is responsible for INSPIRE implementation. Co-ordination works are done by NLS. Also NLS collaborates with third parties, which are responsible for spatial data sets conforming INSPIRE themes A joint EU project was carried out two years ago. Another project started in 2012: “The development of services of the Lithuanian spatial information infrastructure by implementing priority tools of the INSPIRE directive”. There were feasibility studies carried out for bridging local spatial data infrastructures. Bridging demands big investments so project involving municipalities is expected in the future.
Malta	No information available about co-ordination structure. Malta does not contain any local SDIs, but only a structure of national administrations.
Slovakia	The Ministry of the Environment is the main responsible body. The INSPIRE Co-ordination Council (ICC) has been established, composed of representatives of main public domains and other relevant stakeholders. It is not yet possible to establish the bridge between the national and local SDI, as local level SDIs doesn’t exist except some regional, city, or local level instances, real systematic SDIs are still not common practice. In order to identify liable entities, related web survey has been launched on 2010. This survey was also focused on identification of related data sources. In connection to these activities, proposal for Annex I, II, III themes responsible bodies has been distributes in 2010. The responsibility for network services lies with data owner/service provider. In some cases exceptions can occur. In cases, where a data producer doesn’t have capacities or resources to deploy appropriate services, another body can create services based on INSPIRE sharing principles and agreed licensing.

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	The overall INSPIRE/SDI awareness is still relatively low on local level. Specific dedicated INSPIRE Info Days39, together with EnvirolForum Conference40 are the main INSPIRE related events providing information about the status of INSPIRE development and implementation.
Spain	The National Geographic High Council NGHC ("Consejo Superior Geográfico") is the governmental collegiate body appropriate as Public Authority in Spain to define, develop, coordinate and manage the NSDI (IDEE) and its national Geoportal. The NGHC is the INSPIRE contact point and responsible for the NSDI co-ordination. The LISIGE (national law transposing the INSPIRE directive) established a new body: the Spanish NSDI Executive Board. At this moment, more than 400 representatives are working in 12 second-level working groups. LISIGE also created an organizational structure involving all regions and autonomous provinces, ministries, seeking co-ordination among all of them. First steps for the implementation included the creation in 2002 of the Working group of the Spanish SDI (IDEE). From 2010, JIDEE became more international inviting Portugal, Andorra and now also France to participate and discuss in a common forum all SDI related issues.
UK	INSPIRE comes within the wider Location Strategy. Implementation is through the UK Location Programme (UKLP), which is implemented by individual departments. Currently leadership of this is with DEFRA (Department of Environment, Food and Rural Affairs), although this is expected to change shortly. The UK Location Strategy is a federated structure, with the SDIs in the devolved administrations (Scotland, Wales, Northern Ireland) designed to connect. The Location Council works actively to increase awareness of INSPIRE within the public sector. Wide public awareness and consultation is handled through the Association for Geographic Information (AGI).

[39] http://inspire.gov.cz/kalendar-akci/uskutecnene-akce/576-inspirujme-se-2012

[40] http://enviroiforum.sazp.sk/

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Table 31 – Strengths and weaknesses of INSPIRE in the 12 Member States (comparative)

Belgium	Strengths: - awareness about geo-information at the political level; due to INSPIRE, the geo-domain has received more attention and financial resources - opportunity to speed up the implementation of SDI components - INSPIRE seen as valuable for addressing cross-border issues - co-operation and solidarity as basis of INSPIRE implementation. Weaknesses: - implementation slowness - co-ordination at national level is difficult because of different visions/agendas by regions; lack of knowledge and ideas exchange - strong dependency on goodwill of individuals, political support and financial resources are still not sufficient
Bulgaria	No enough experience and practice to give an objective opinion about strengths and weaknesses.
Cyprus	The main strength is the low cost for data collection and transformation (involving private companies in making those data INSPIRE compliant). Nevertheless, data are not yet fully available from all government departments.
Czech Republic	Strengths: - Czech Republic has always done very well with the any technical aspects. Examples of INSPIRE compliant metadata had been released even before the 2010 deadline; Weaknesses: - The absence of co-ordination and data policy of the state. With missing state strategy or at least vision of state what the data is needed for, how often updates should be done and what data the state is going to invest to, companies' role is very unclear. - Because of very slow and complicated beginnings of the functioning of the National INSPIRE co-ordination committee, some of the data providers still stand aside. These data providers might have not even started with any INSPIRE related activities because they think that INSPIRE is not their issue. This is a group of data providers, who could be customers of private companies, but as they are not "in", the companies are again in the same unsure situation.
Germany	The strength of the implementation with respect to organizational and operational issues is the clear objective, which is written down in the management agreement of the GDI-DE. A weakness is that it is necessary to work by consensus between 20 parties, which makes the decision making sluggish.
Greece	The most important weakness is that there are still thematic datasets that do not have a responsible agency. The National Geoinformation Committee with the HMCO must decide who is responsible for what. On the other hand the strength is that the private sector supports all the actions since it is for the best interest of the sector.
Italy	Strengths: - National Geoportal and the RNDT (literally, National Repository of Spatial Datasets), as examples of reference realization of SDI components - high concentration of Italian companies and individuals directly involved in OSS as lead developers - presence of a pro-active GI Association (AMFM) who stimulates INSPIRE related discussions at national level. Weaknesses: - lack of awareness of the INSPIRE related business processes, mainly within the

	public sector organizations responsible for the management of spatial information - lack of communication strategy aiming at filling-in the awareness gap and at stimulating the different stakeholders to a broader participation into the INSPIRE activities - lack of co-ordination policy about INSPIRE implementation, both at National as well as at Regional/local level
Lithuania	Strengths: - open, free and freely available data - data usage becomes more effective - organizational structure is clear, infrastructure is developed, the number of users increases Weaknesses: - Municipality integral data is unavailable yet - The lack of the companies and financial resources - Complex legal and organizational data interchange procedures
Malta	Malta' small size is counted as an advantage because the entities for which the directive applies can be reached easily. In addition to this, there is a cohesive institutional framework with the corresponding small number of legally mandated bodies relevant to data themes listed in INSPIRE.
Slovakia	Strengths: - centralized governmental structure, providing hierarchical distribution of responsibilities and competences within the public sector - possibility to build the SDI from a scratch (with potential to learn from mistakes, in other countries with SDI already established) - high percentage of spatial data structure defined by INSPIRE Weaknesses: - lack of competent expertise in public sector. - high fluctuation – difficulty to ensure systematic continuity. - low investments. - data sharing obstacles
Spain	The general opinion is that INSPIRE may be useful for organizations without any data, but it is difficult for those who already have a lot of information and data models. In the public sector the Directive is well known, but not in the private sector, in which the knowledge is at the personal level for specific interest or because their clients need data compliant with INSPIRE. The availability and access to official information that ensures quality and it is provided in a free manner is an important strength. Some weak points have been also detected in terms of the use of SDI that can properly not be ensured. Lack of knowledge about INSPIRE by private companies is also considered as a weakness. A weak (misleading) point is that INSPIRE is offering very few data comparing with existing and needed information, and the format established by INSPIRE is not always the most suitable for the purpose of the users.
UK	The main strength of the way that INSPIRE is being implemented is that it is a federated approach in that data providers are responsible for implementation in their own area. Key data providers have been identified for the various INSPIRE themes. The main weakness of the way that INSPIRE is being implemented is that the private sector has not been adequately engaged. The Geo-ICT sector has a minimal role in the process of policy formulation and implementation. More input is needed from outside organizations.

Annex 4 – Variation in Geo-ICT SME sector between Member States

Table 32 – Variation in Geo-ICT SME sector in the 12 Member States

Belgium	Belgium is characterized by Geo-ICT companies being 'micro' sized in terms of workforce (64% have less than 10 employees) but having an annual turnover of more than €1million in 43% of the surveyed cases. The market is mainly "local" (50%) with EU customers playing an important role (21%). Companies are largely depending on public sector (86%), having more than half of their business coming from public bodies. Belgian companies are highly involved in EU co-funded projects (43%).
Bulgaria	Bulgarian companies surveyed were 'micro' or 'small' sized, in relation to either the workforce or the turnover. The Geo-ICT market is mainly at national or local levels, with a high percentage (three-quarters) of the business depending on public sector.
Cyprus	The Cypriot companies that participated to the survey are 'micro' (employees and turnover), and almost fully dependent on local market. According to the surveyed and interviewed companies, it is interesting the fact that the public sector does not represents the main customer for the majority.
Czech Republic	The main feature of Czech companies surveyed in terms of size is the absence of 'XS' companies (less than 10), and presence of only small and medium sized companies. This is confirmed by also looking at the size in terms of turnover, with more than half of the companies having more than €1million per year. Less than two thirds of them depend on public sector.
Germany	Two thirds of the German companies surveyed are 'micro' either in terms of workforce or 'turnover'; when considering the annual revenue it is worth noting that 15 companies out of 58 (26%) declared more than €1million per year. The market is strictly local or national (88%), with only 7% of business coming from other EU countries and 5% from outside Europe. Only 13 companies of 58 (22%) participated to EU co-funded projects.
Greece	Greek companies are on average 'micro' or 'small', with more than half of them having less than 10 people employed and annual turnover of more than €500thousand. The Geo-ICT market is mainly at national level, with predominance of public sector (74% of companies' business depends on public bodies).
Italy	Similarly to Greece on many features, Italian companies are characterized by a more predominant share of 'micro' enterprises (70% in employees, and 59% in turnover), and a market more 'locally-based' (sub-national). As with other countries, the participation to EU co-funded projects is above the average, with 39% of companies.
Lithuania	Of the 19 Lithuanian companies surveyed, 16 are 'micro' or 'small' in terms of staff, with 12 of them having an annual turnover of less than €500thousand. The Geo-ICT market is almost exclusively local, with few companies having national level at first place.

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	The public sector is not the main customer and only one company was involved in EU co-funded projects.
Malta	All the four Maltese companies surveyed have between 10 and 49 employees (small), but are characterized by an annual turnover of less than €1million in two cases. The market is mainly national, with three companies having more than 50% of their business related to the public sector.
Slovakia	The main feature of the 16 Slovak companies is the market level, mainly national, with only 4 companies focused on the local level. Three of them are medium-size staffed, with more than 50 people employed, while 8 are 'small' (10-49 employees).
Spain	Of the 25 Spanish companies Analyzed, 4 companies (16%) have more than 100 employees; 11 out of 25 have a turnover of more than €1million (and 3 companies above €5million). Market is only at local (64%) and national levels (28%) or outside EU (8%): Spanish companies seem not to do business in other European countries.
UK	In the UK, the survey's results confirm the predominance of 'micro' companies (often "one-man band") in 77% of cases, with 'small' enterprises (10-49 people) far below the average. The market level is largely at national level (68%), with more than two-thirds of companies' business depending on public sector. Only 18% of companies surveyed participated to EU co-funded projects.

SME SPIRE

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Annex 5 – Variations in competencies across the smeSpire Member States

At country level we found many differences: Czech and Italian companies seem more "certification-oriented", with more than half of the analysed companies in the two countries having one or more ISO certificates; at the same time, Belgium, Germany and UK have less than one-fifth of companies certified.

In some cases, the 60 SMEs interviewed described their own companies focusing more on software development and implementation, some on data management and processing, some other on consultancy and training services.

From these qualitative (and sometime specific) information collected during the 59 interviews to Geo-ICT SMEs, we can summarize some possible outcomes in terms of:

- "software-oriented" companies (software developers)
- "data-oriented" companies (data analysts, domain experts, …)
- "other-services" companies (consultancy, training)

Table 33 – Activities and competences of Geo-ICT companies interviewed (by country)

	SMEs interviewed	software			data		other	
		proprietary	OSS	service integration	domain specific	generic	training	consultancy
Belgium	5	2	1	3				1
Bulgaria	2					1	1	1
Cyprus	5	1		2		2		2
Czech Republic	6	1	1		3	2	1	
Germany	6	2		3	4	3	2	1
Greece	4			1	2	1		2
Italy	7	3	5	3	3	3	1	1
Lithuania	5	2		1	1	3		
Malta	5				4			2
Slovakia	5	1		2	2	2	1	
Spain	5	1		2	2	3		
UK	5	2		3	2	3	2	3

Skills and competences vary depending on the core business of each company, and it is very difficult to compare answers related to this topic.

From the figure above we only have a very general overview of tendency about data-centric companies, software-centric or consultancy-centric companies.

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Annex 6 – INSPIRE and Private Sector

Table 34 – Involvement of the private sector in INSPIRE (details)

Belgium	Most Geo-ICT companies in Belgium are now aware and informed of INSPIRE. Some of these companies are also directly involved in the implementation of INSPIRE, mainly as contractor developing and implementing various technological components. According to the AGIV, there are hardly any projects or activities related to the development of the SDI and the implementation of INSPIRE in which the private sector is not involved. In Wallonia, private companies were involved in the creation of metadata: both the development of the metadata software and the development of a metadata catalogue. One of the tasks that was outsourced by the NGI, was the implementation of a view service. The NGI also notices that the maintenance and management of the IT infrastructure is increasingly being outsourced to the private sector. Often private actors are involved in the development and implementation of a strategy for implementing SDI/INSPIRE, and providing supporting study activities. Companies also contribute to the implementation of INSPIRE by offering consultancy and services. Outside the scope of INSPIRE, private companies are involved in the production and maintenance of spatial data in the different regions. The Geomatics department of the Walloon government plans to cooperate with private companies in the first phase of the data transformation process, in order to determine a general approach that can be applied for all datasets.
Bulgaria	MSCP states that cannot precise this information due to the lack of enough observation.
Cyprus	The project to develop a Strategic Development Plan for the Department of Lands and Surveys (DLS) will be directed by foreign experts, who will be supported by local consultants. Thus, INSPIRE know-how will be transferred to Cypriot companies. Private companies may be involved in the development of INSPIRE and/or the National Spatial Data Infrastructure (SDI) through tenders and direct contracts (as prescribed by Cypriot law).
Czech Republic	Private sector is very well aware of INSPIRE and is awaiting any related business activity. At the national level there are only a few customers requiring INSPIRE compliant solutions apart from requirements on publishing INSPIRE view services, nevertheless these few customers create very important contracts for the private companies.
Germany	Most interviewees from the public sector agree that the involvement of private companies in the INSPIRE implementation is crucial. Open Source Software also plays an important role in the implementation process. Most geo-portals are being developed by companies which act as service providers. In many cases these companies use open source products. The GDI-DE and many federal states rely on Open Source Software Companies are usually being involved through tenders because the administrations are generally tied to the Public Procurement Law and to the secondary statutory regulations. Direct and service contracts are also being used.
Greece	The private sector is highly involved in the INSPIRE transition. The majority of the work will be done by private companies through tenders.
Italy	Some of the Public Authorities implementing INSPIRE have their in-house companies with the technological skills needed to develop their applications, therefore they rarely involve private sector in their procurement activities. Those not having in-house technological companies, issue public procurement tenders,

	mostly based on the best quality/price awarding criteria. It happens that offers with a highly discounted price are awarded to companies lacking of the necessary technological skills.
Lithuania	The awareness and the knowledge are sufficient in the organizations which are directly responsible for the implementation. However, in other organizations and companies the awareness and the knowledge of INSPIRE are not sufficient yet. Geo-ICT companies are involved in the implementation of INSPIRE and the development of a national spatial data infrastructure as contractors in national SDI development project or producing specific data according to the specifications. The companies are involved as service providers in national SDI development projects in the tenders. As service users, the companies are invited to participate in dissemination events.
Malta	MEPA pointed out that private agencies are more aware of the directive than government departments/authorities, owing to their involvement in EU projects. A number of government institutions are rounded up on INSPIRE as they have collaborated in certain projects with MEPA.
Slovakia	The involvement of private companies is strongly dependent on the status of implementation of the different components: there are some view service endpoints provided by Geo-ICT companies accessible based on specific licensing conditions.
Spain	The Geo-ICT companies that were interviewed have different levels of knowledge about INSPIRE. Their involvement is not very high, and they are mainly participating in the development of tools. SMEs have difficulties to participate in SDIs: there is a need to provide resources for SMEs participating in INSPIRE; voluntarism does not serve anymore.
UK	Involvement of Geo-ICT companies in INSPIRE implementation is down to individual data providers. Some work is done by non-Geo ICT companies, e.g. for web services. Where private companies are involved, this is down to individual data providers, and can be by a range of means. There are also some individual direct calls to tender by public sector bodies, but no central calls.

Table 35 – Impact of INSPIRE on private sector (details)

Belgium	Many public administrations indicate that it is still too early to see the impact of INSPIRE, as the implementation of INSPIRE is limited to only a few components. The current impact is still described as rather limited. It is claimed that INSPIRE brings about a change in the behaviour of the main customer of most geo-ICT companies in Belgium, the public sector. Particularly companies that already provide products and services to the public sector, will see an increase in their activities and sales. INSPIRE has led to an increase in the awareness on the value of spatial information. A larger impact of INSPIRE is expected when private companies will have access to public sector data. Companies can play an important role in 'popularizing' the SDI, building applications and services on top of the SDI. It is expected that private companies will also contribute to the transformation and harmonization of data; private actors will mainly provide the technical skills that are needed for transforming and harmonizing data.
Bulgaria	The INSPIRE Directive will stimulate the growth and innovations in the country especially in regard to private companies. The major opportunity is to provide INSPIRE services and metadata through the national geo portal. Some opportunities for the private sector are seen in the development of data, metadata, view and download services.
Cyprus	Currently, there are no opportunities for the participation of the private sector in the implementation of INSPIRE in Cyprus, as there are no government funds to purchase INSPIRE-related services from the private sector.
Czech Republic	Under the pressure of INSPIRE, the national geoinformation strategy is rising from the ashes, nevertheless responsible persons admit that INSPIRE has achieved in few years much more than they have been trying to establish for more than ten years. However there is still a danger that the strategy only defines important targets but will not solve the financial part of the matter.
Germany	There are numerous future opportunities for the participation of the private sector in the implementation of INSPIRE, mainly in software development and services. Those opportunities are to produce data formats for public administrations and to offer appropriate services. Pilot projects in co-operation with the private sector would be important to jointly develop an approach to the implementation. The impact of INSPIRE can be diverse for private companies. Developers can get involved in the entire process, build portals for applications and use service oriented architecture Concerning the possible growth and innovation stimulated by INSPIRE, the statements of the interviewees are rather cautious. Whether the INSPIRE process is innovative enough for the sustainable participation of software developers remains to be seen. If it wasn't for INSPIRE, fewer people would be interested in SDI. At the moment, the private sector assesses the impact of INSPIRE as low. Most SMEs hold the opinion that INSPIRE will produce growth and innovation The main strengths of INSPIRE with regard to private companies, named by the interviewees

	from both the public and the private sector, are the standardization of data and the openness. The interviewees named different ways in which the private sector could contribute an added value to the implementation of INSPIRE. Private companies could formulate requirements and add their own enterprise data from areas like the insurance industry, commerce and energy into the INSPIRE infrastructure. They could contribute by consulting on contents Moreover, private companies could improve the quality of records and the methodology can be described and distributed/passed within the metadata. The private sector could also contribute to the implementation by developing software for INSPIRE-compliant data
Greece	According to the public sector, INSPIRE will stimulate growth and innovation for the private sector. The companies will undertake contracts for the transition of the public sector giving work for many of them for the next year. As well as the direct benefits with the contracts, there will be indirect benefits form the access to national data through the INSPIRE geoportal. The private sector agrees that the contracts will be a push for them for the next years but they are cautious about the indirect benefits.
Italy	Public Bodies, particularly at National Level, think that INSPIRE can constitute a big opportunity for the private sector Still uncertain remains the view of how the market can be stimulated on the demand side. Despite there are many Public Authorities which need technical support to fulfil the INSPIRE obligations; there is a general lack of financial resources in the Public Sector. A strong positive impact could come from the Open Data initiatives, as well as from obligations coming from thematic legislation (air quality, flood directive, etc.).
Lithuania	Public organizations which took part in the interviews evaluate the current and future impact of INSPIRE as positive. But this impact is rather indirect. The impact is associated with the ability to provide geographic information services and to get better access to geographic data. Future opportunities are similar to current opportunities: - participate as service providers in national SDI development projects - delegate their representatives to the INSPIRE work groups, prepare specifications in accordance of INSPIRE requirements - use all services and content of national SDI portal
Malta	Although SMEs could not identify concrete benefits, they are confident that INSPIRE can yield a number benefits. MITA is confident that the advantages will accrue once download services are fully implemented. In fact, this will lead to the proliferation of new data driven services.
Slovakia	The contribution of INSPIRE to the private sector is not a top priority of the public sector. However, public sector representatives are aware that in many cases only with the contribution of the third parties they will be able to fulfil the requirements of INSPIRE. Moreover, integral, unified and available data promotes and facilitates the use of geographic information on a large scale
Spain	INSPIRE has strengthened the need of sharing information. This is really interesting and the possibility of accessing official information is a clear advantage. Private companies think that considering the concept of interoperability in order to increase

	the use, cloud data sharing and re-using is really important and will stimulate growth and innovation. The topic of migration, accessibility that must be redesigned, is really important for private companies. It will be necessary to bring the information closer to the citizen and end user, who are also requesting standardized data. Only standards and interoperability (other strengths) are not enough and SME's must be able to use this information, not to remain behind. INSPIRE is also helping to strengthen the sector of spatial and cartographic data, but for encouraging the growth and innovation it would be also necessary to increase awareness of politicians and Parliament about the importance of spatial data.
UK	The impact of INSPIRE on private companies has been limited, because of the lack of funding. INSPIRE has not triggered the public sector buying software. Most implementation is being carried out within the public sector. INSPIRE is unlikely to stimulate growth and innovation by itself, but may do so indirectly in combination with other developments. It may eventually stimulate growth and innovation, in parallel with the Open Data Agenda. There is scope for future opportunities by innovative SMEs for value-added applications building on Open Source architecture.

SME SPIRE

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Table 36 – Barriers to and weaknesses of INSPIRE (details)

Belgium	There are several reasons why the involvement of private actors in INSPIRE and the impact of INSPIRE on companies are still limited. Developing a GI/SDI-policy for the private sector is not part of their competence. This means that the private sector is only indirectly concerned with the GDI and INSPIRE. Many public administration indicate that it is still too early to see the impact of INSPIRE, as the implementation of INSPIRE is limited to only a few components. The awareness of INSPIRE in companies is often very low, and definitely in companies outside the Geo-ICT sector. The strong focus of INSPIRE on data, and not (or insufficiently) on actual use cases, is also seen as a reason why the impact of INSPIRE is limited.
Bulgaria	Interviewees state that at the moment there is not enough observations and information to give an objective assessment.
Cyprus	Currently, there are no opportunities for the participation of the private sector in the implementation of INSPIRE in Cyprus, as there are no government funds to purchase INSPIRE-related services from the private sector. The impact of INSPIRE on private companies is limited, because: - most private companies are not even aware of the existence of INSPIRE and its implications, most private companies are not involved in Geo-ICT projects, as they have no expertise in this field, and - there are no government funds available to invite tenders, and thus to purchase services from the private sector
Czech Republic	There is only one major barrier which prevents from full implementation of INSPIRE. That is a lack of budget. Private companies are waiting for customers that would be eager for INSPIRE compliant solutions, but they are not coming; they are not asking for developing and building INSPIRE solutions. There is no INSPIRE market as there is no budget for it.
Germany	The main reasons why the impact of INSPIRE on private companies is limited are the inconsistent licence and data protection regulations. INSPIRE doesn't specify/issue anything regarding licence and data protection regulations. Administrative processes are too slow, they require very high personnel expenses and are sparsely user-oriented. The impact is also limited because of political reasons: The growth is obstructed by federalism vs. centralism in data storage. Since INSPIRE is still young, there are not enough data available yet from which value can be drawn. To address these limitations the public sector is primarily in demand. The usage of consistent licences can only be defined and specified at the political level. The major weaknesses of INSPIRE according to the interviewees are the lack of standardization of licence and data protection regulation, the high complexity which also requires capable software and that it hasn't been considered how the private sector could be involved or how it could benefit from INSPIRE. Another weakness of INSPIRE is that it is completely controlled by the public administration, since it was made for it. Furthermore, it has been ignored how the companies could benefit

	from it.
Greece	According to the public sector there are no barriers in the impact of INSPIRE in the private sector. They believe that when the implementation finishes it will stimulate growth and innovation. The private sector on the other side believes that INSPIRE is a little more complicated than it should be and they are pessimistic about the benefits.
Italy	Key barriers to INSPIRE are: - lack of financial resources - lack of co-ordination at national and sub-national levels - INSPIRE not seen really as a priority - over-legislation (national norms broader than or no fully mapped to INSPIRE; regional laws often too general or not tightly coupled) - inadequateness of the actual monitoring and reporting system, whose indicators are not contributing to assess a correct status of implementation of INSPIRE From the private sector perspective, the complexity of INSPIRE technical specifications; together with the lack of clear strategies about Open Source Software (at both EU and national levels) are also key weaknesses.
Lithuania	Private and public sector respondents identified the – missing - awareness and the lack of information as the main reasons why INSPIRE impact on private companies is limited. Also public sector organizations identify several weaknesses of INSPIRE with regard to private companies: - over-regulation (if companies need specific data, they need extra resources for data adaptation) - INSPIRE is not oriented towards business Private companies identified as a weakness the fact that technical standards are incompatible with widely used standards.
Malta	Costs and data protection as the main obstacles. Lack of skills and incompetence by government officials will hamper the development of the Geo-ICT sector.
Slovakia	Some limitations of INSPIRE implementation in Slovakia are: - size of the market and key players – countries with small Geo-ICT market are facing reduced competition environment with a few “big” players who take the majority of offers and what remains as not attractive goes to SMEs. - transparency with the procurement - complexity of technical components - main focus on public sector Potentially relevant and valuable initiatives might be: - reducing high co-financing requirement on national and EU level - introduce motivation mechanisms (e.g. Tax reductions) - support training and consultation activities - support join ventures with academic sector to link research with application in practice - establish and enlarge networking and capacity building activities with trans national scope in order to share and effectively utilize particular expertise via international projects, experts exchange stages, workshops and trainings - establish transparent and easy to implement licensing framework in order to support the use and creation of added value for digital spatial content

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Spain	Nowadays, private companies do not participate directly in INSPIRE. Spanish companies are well positioned but they are strongly dependent on public administrations, which is a critical issue currently. Moreover there is also too much regulation, but still very little dissemination. The risk is thus the lack of resources for implementing INSPIRE, but also this aspect can be mitigated by providing tools that facilitate this return of investment for the SMEs
UK	The impact of INSPIRE on private companies is limited because, INSPIRE is seen as a public sector initiative. Most data providers carry out most of their operations themselves. As a result there are only limited opportunities for SMEs, usually in vey specialist areas. To facilitate involvement of private companies in INSPIRE implementation, there needs to be confidence that there is a long-term opportunity. The public sector needs to be a more intelligent customer, use common approaches, use flexible contracts, clarify its requirements and support the supplier community.

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Table 37 – Involvement of the private sector in SDI policies definition (details)

Belgium	In the different regions, private actors are represented in the co-ordination structure of the regional SDI. In Flanders, there are separate co-ordination bodies in which actors outside the public sector are represented: the 'SDI-council' and the 'technical commission'. The SDI-Council is an advisory body made of stakeholders from the private sector, academic sector and utility sector. In the technical committee, which focuses on the technical aspects of the SDI, private actors are informed of the future strategic and technical developments within the SDI. This allows them to adjust/adapt their future activities, services and products. Also in Brussels (GeoBru technical committee), Wallonia (Strategic Committee) and at federal level (Board of NGI) are private actors involved in the central co-ordinating body. In addition to these formal co-ordination bodies, co-ordination and information sharing between the public sector and private companies also happens in an informal manner. In Flanders, the SDI testbed is an important channel for providing information (and access to services and applications 'under development') to private companies. A general observation that is made is that the involvement of private sector in SDI policy making is increasing. A major criticism, however, is that it still is difficult for private companies to influence the decision making process. At the federal level access to data for private companies is not realized yet, although many companies indirectly have access to data. Generally, all governments expect significant changes in the access to data for businesses in the near future, mainly driven by the 'open data' agenda (and less by INSPIRE).
Bulgaria	Not too much is happening on national level to stimulate GEO-ICT sector in the process of SDI policy. The current access to spatial data for private companies is very limited and sometimes even impossible.
Cyprus	Cyprus is involving the private companies that are continuously or occasionally involved in GEO-ICT projects in the formulation of the national GI/SDI policy through informal consultations. It should also be stressed that private companies have access to all spatial data produced by the Department of Lands and Surveys (DLS), except those that are classified as confidential/secret for national security reasons.
Czech Republic	The private Geo-ICT sector has always been a strong player in the forming of the national geoinformation strategy. For INSPIRE, the important involvement in the national co-ordination is even higher. Many companies are members of technical working groups that support the activities of the National INSPIRE Co-ordination Committee.
Germany	The initiative of the Federal Ministry of Economics, the GeoBusiness Commission, implements a policy for the participation of the Economy. The overall objective of the GeoBusiness Commission is to increase the added value of geoinformation. The Geo-ICT sector is mainly involved in the SDI policy by consulting and technical support. It is the key sector in policy development.

	About data access, no clear policies nor key data exist and there are co-ordination problems. The policy is restrictive. There are high hurdles to get data. The biggest problem is the licensing; however, public sector representatives state that the access to spatial data for private companies has visibly improved in comparison to the level of 10 years ago. But from the private sector perspective, the access is very heterogeneous, complex and the costs are confusing, and sometimes data can only be used internally for a project.
Greece	No information is available about GI/SDI policy. About data, there are only a few public bodies that sell their data to the private sector. The biggest problem is that the National Geographic Authority of the Army has most of the data and they are classified.
Italy	At the moment there is not a coherent and harmonized GI/SDI policy, neither actions undertaken for building up a GI policy (until now) took into account the private sector. The unique example of private sector involvement in defining a national-wide policy is represented by the vision document and guidelines for smart cities, developed by Agenzia per l'Italia Digitale (AGID) and involving both public and private sectors[41]. About PSI, in July 2013 AGID published national guidelines for addressing public administrations to release public data as standardized and interoperable manner, at national scale[42].
Lithuania	Lithuanian SDI policy is defined by the law of Geodesy and Cartography The current GI/SDI policy is not oriented towards the private sector. Solutions related to SDI policy formulation and implementation are made in consultation with all those partners (including social) that represent Geo-ICT sector (public organizations and private companies). The private sector can submit comments for legislation, but there is a lack of legal and organizational mechanism for involving private sector (especially SMEs) in SDI policy formulation. The spatial data accessibility for private sector is evaluated as average. Access to basic spatial data is quiet good while access to thematic data is poor
Malta	There is no specific policy devoted to private companies and NSDI. The policy is quite vast and it is guided by a general Government ICT sector. Spatial data access is facilitated by the concentration of data in a limited number of public authorities.
Slovakia	The current GI/SDI legal framework provides in most cases an appropriate definition and scoping for the main components influencing GI/SDI establishment There are areas of responsibility defined by the relevant governmental sectors with overall co-ordination by Ministry of Justice. Current rules and practice of policy making and evaluation process allows involvement of private sector representatives via various channels. Active influence of private sector is

[41] AGID, 2012, "Architetture per le comunità intelligenti – visione concettuale e raccomandazioni per la Pubblica Amministrazione", v.2.0 (2012-10-03) - http://www.digitpa.gov.it/sites/default/files/ArchSC_v2.0.pdf

[42] http://www.digitpa.gov.it/sites/default/files/allegati_tec/LG_Val_PSI_v1.0.pdf

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	possible either via specific working groups established by relevant responsible governmental authority. There are also established specific standardization working groups with possible membership also from private sector aiming to harmonize standardization activities with policy making ones.
Spain	The private sector has not participated in the SDI policy in Spain. There are still certain other gaps derived from the centralization of SDI development in Public administrations. The GEO-ITC sector is not engaged enough and has not been considered in the SDI policy formulation process, which mainly focuses on those components are relevant to public administrations. There does not exist real knowledge about INSPIRE data or services in the SDI working groups, but only information sharing sessions. More involvement from SMEs and more public-private partnerships are still needed. Data access is free, so data are widely used. Access to spatial information has changed very much; the policy of reinforcing open data represents a milestone, especially the decision made at the IGN to open all the data has made other organizations joining the movement by opening their information as well. Business should be more focused in offering added value services; it is necessary to be imaginative and provide new ideas for using the information and services.
UK	The Geo-ICT sector has little direct involvement in the process of SDI policy formulation and implementation. Their only link is through the Association for Geographic Information (AGI). There are regular consultations on policy formulation. Some private sector companies are members of the Location Programme Technical Working Groups. There is an open approach to data provision. Access by private companies is growing, but is not good enough yet.

Annex 7 – SMEs and Innovation

The growing accessibility of information technologies puts the tools required to collaborate, create value and compete at everybody's fingertips. This new mode of innovation and value creation is called peer production or peering.

New low-cost collaborative infrastructures – from free Internet telephony to open-source software to global outsourcing platforms – allow thousands of individuals and small producers to co-create products, access markets and delight customers in ways that only large corporations could manage in the past. People can contribute to the "digital commons" at very little cost to themselves, which makes collective action attractive.

(Tapscott & Williams, 2007)

Size and flexibility of SMEs have always been seen as advantages for innovating.

Small companies are usually characterized by:

a) dynamic and entrepreneurial approach
b) good (and informal) internal communications
c) capabilities of technical staff higher than larger companies

These factors usually drive to lower costs for innovation (Cooper, 1964, as cited in Scozzi & Gavarelli, 2005, p.125).

According to (OECD, 2009, p.9) there are 'four' drivers that are gradually transforming the manner in which companies innovate:

- co-creating value with customers and tapping knowledge from users
- global knowledge sourcing and collaborative networks
- global challenges as a driver of innovation
- public sector challenges as a driver of innovation

Again, according to (Tapscott & Williams, 2007) there are 'four' key principles that are becoming "mantras" for an increasing number of ICT companies: openness, peering, sharing and acting at global scale.

Openness is a force for growth and competitiveness for a growing number of smart companies, mainly from the SME class, sharing their own knowledge with knowledge residing in suppliers, customers, competitors, and academia.

The participation of 'customers' (for Geo-ICT companies customers are also 'users') may happen at different levels, in a direct or indirect way, during different phases of the innovation process:

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Table 38 – Framework for mapping user-driven innovation processes
(source: Wise & Hogenhaven, 2008, p.25)

	HOW	WHAT
direct	**User innovation** The users are company's innovators or participate as members of the company's innovation team. Typical methods for involving the users could be the lead user approach[43].	**Experiments with users** The users are involved directly in the process but they are not part of the innovation team. Typical methods are personal interviews, role-playing and living labs.
indirect	**User tests** The users are not part of the innovation team, but their indications are taken at face value. Typical methods for involving users are focus groups and different kind of user tests.	**Observation of users** The users are involved indirectly in the process, and the users' indications are not taken at face value. Typical methods are ethnographic such as shadowing, user self-observations, …)

At the same time, peering production forms and the sponsoring of open source and open content developments is a recognized emerging business model, with many small, medium and large international companies[44] already providing added value services on top of "open" components.

Innovation, of course, is largely depending on endogenous and exogenous factors:

- endogenous: level of education, age, skills and knowledge, investments on R&D and training, intellectual assets
- exogenous: markets and customers, networks, culture

When considering the Innovation Union Scoreboard at country level (European Commission, 2013a) it is clear which European countries can be generally considered as:

- innovation 'leaders' (well above the EU average)
- innovation 'followers' (above the EU average)
- 'moderate' innovators (below the EU average)

[43] For a definition of Lead user, please see http://en.wikipedia.org/wiki/Lead_user

[44] The best known example is IBM, investing on Linux project (http://www-03.ibm.com/linux/) but there are significant example also in the OSGeo community (http://www.osgeo.org/sponsorship/opportunities)

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- 'modest' innovators (well below the EU average)

Based on a total of 25 different indicators (classified in enablers, activities and outputs)[45], the Innovation Union Scoreboard indicates:

- Germany as one of the 'innovation leaders'
- Belgium, Cyprus and UK as 'innovation followers'
- Czech Republic, Greece, Italy, Malta, Slovakia and Spain as 'moderate innovators'
- Bulgaria as 'modest innovator'

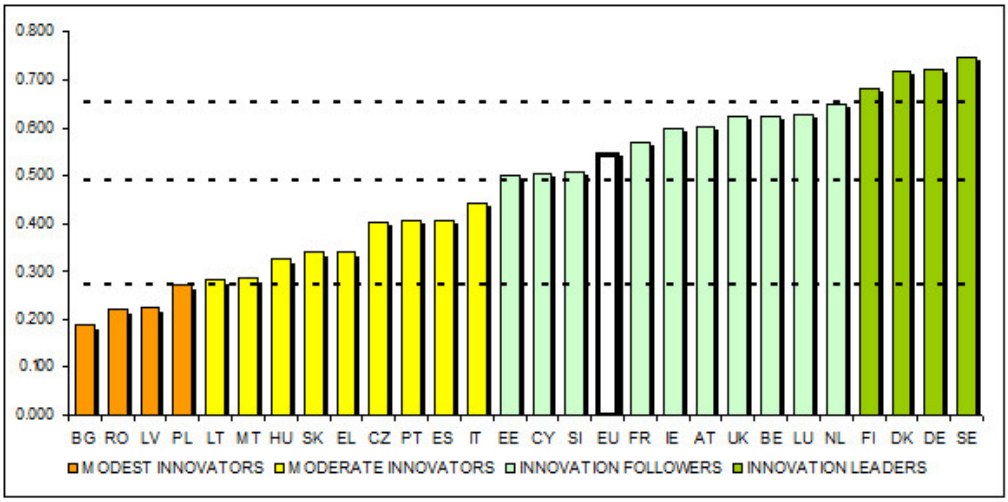

Figure 32 – Innovation performance in EU Member States
(source: European Commission, 2013a, p.10)

[45] Enablers capture the main drivers of innovation performance external to the firm (human resources; open/excellent and attractive research systems; finance and support). Firm activities capture the innovation efforts at the level of the firm (investments; linkages & entrepreneurship; intellectual assets). Outputs cover the effects of firms' innovation activities (innovators; economic effects) – (European Commission, 2013a, p.10)

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Annex 9 – List of contacts for interviews

Belgium

Role	Organisation	Contact person
MSCP	AGIV	Leen De Temmerman
LMO	CIRB	François Du Mortier
LMO	NGI	Ingrid Vanden Berghe
LMO	SPW	Xavier Demarets
NGA	AGORIA	Tanguy De Lestré
SME	Avia-GIS	Guy Hendrickx
SME	GEO Solutions	Rombout Verwimp
SME	Geosparc	Dirk Frigne
SME	GIM	Caroline Heylen
SME	Luciad	Christoph De Preter

Bulgaria

Role	Organisation	Contact person
MSCP	Executive Agency "Electronic Communications Networks and Information Systems", Ministry of Transport, Information Technology and Communications	Lilyana Turnalieva – Tsolova, Head of Department "Spatial Data"
LMO	Executive Environment Agency, Bulgaria	Nikolay Zafirov, Valya Zhelyazkova
LMO	Ministry of Agriculture and Food, Bulgaria	Lyuba Ilieva State expert at "Identification of agricultural parcels" Department
SME	IT Systems	Kalin Gelov
SME	URSIT	Ulrich Boes

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Cyprus

Role	Organisation	Contact person
MSCP	Depatment of Environment (DOE)	Ms. Nasia Dikigoropoulou
LMO	Department of Information Technology Services (DITS)	Mr. Emilios Alexandrou
LMO	Department of Lands and Surveys	Mr. Andreas Hadjiraftis
SME	Dynamic Works Ltd	Mr. George Georgiou
SME	EXA High Performance Ltd	Dr. Hari Radhakrishnan
SME	Geomatic Technologies Ltd	Mr. Louis Tofas
SME	Novatex Solutions Ltd	Mr. George Georgiou
SME	Omnius Technology Innovations Ltd	Mr. Yiannis Papazachariou

Czech Republic

Role	Organisation	Contact person
MSCP	CENIA	Jitka Faugnerová
LMO	Czech Geological Survey	Dana Èápová, Lucie Kondrová
LMO	Czech Office for Surveying, Mapping and Cadastre	Eva Pauknerová
LMO	Ministry of transport	Ondøej Šváb
NGA	CAGI	Karel Janeèka
SME	Arcdata PRAHA s.r.o.	Jan Novotný, Marcel Šíp
SME	GEPRO	Ivo Lindovský, Zdeník Hoffman
SME	GISAT, s.r.o.	Tomáš Soukup, Jan Kolomazník
SME	Help Service - Remote Sensing s.r.o. (HSRS)	Karel Charvát
SME	Hrdlièka s.r.o.	Jan Jiránek, Jan Kohout

SME	HSI s.r.o.	Zdeněk Švenkr, Lucie Malíková

Germany

Role	Organisation	Contact person
MSCP	Bundesamt für Kartografie und Geodäsie, GDI-DE	Dr. Martin Lenk
LMO	Bezirksregierung Köln	Ulrich Düren
LMO	Kommission für Geoinformationswirtschaft	Dr. Jörg Reichling
LMO	Landesamt für Vermessung und Geoinformation, GDI-BY	Markus Seifert
NGA	Deutscher Dachverband für Geoinformation e.V.	Hon. Prof. Dr.-Ing. habil. Gerd Buziek
SME	ASPE-Institut GmbH	Renate Gebhardt-Brinkhaus
SME	GDM GeoService	Fred Mitzkatis
SME	GI Geoinformatik	Dr. Klaus Brand
SME	Planungsbueros Laengst & Voerkelius	Ulrich Voerkelius
SME	smart geomatics	Michael Griesbaum
SME	Sonntag Geoconsult	Hermann Sonntag

Greece

Role	Organisation	Contact person
MSCP	National Cadastre and Cartography Organization	Mrs.EleniGrigoriou
LMO	Ktimatologio SA	Mrs.AndrianaKatsina
SME	Epsilon International SA	Prof. Marc Bonazountas
SME	Geoset	Mr. Michael Salachoris
SME	GeoSystems Hellas	Mrs. Betty Charalampopoulou
SME	Get Map	Mr. Gabi Mavrelis

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Italy

Role	Organisation	Contact person
MSCP	Ministero dell'Ambiente e della Tutela del Territorio e del Mare	Fabio Annunziata, Stefano Martini (MATTM) Michele Munafo', Carlo Cipolloni (ISPRA)
LMO	Agenzia per l'Italia Digitale	Gabriele Ciasullo
LMO	Istituto Nazionale di Statistica	Alessandro Cimbelli, Francesco Di Pede
LMO	Regione Emilia-Romagna	Giovanni Ciardi
LMO	Regione Lombardia	Donata Dal Puppo
NGA	AMFM-GIS Italia	Mauro Salvemini
SME	Epsilon Italia	Giacomo Martirano
SME	Faunalia	Paolo Cavallini
SME	GeoSolutions	Simone Giannecchini
SME	Meeo	Simone Mantovani
SME	Planetek	Massimo Zotti
SME	Sinergis	Luigi Zanella
SME	TerrAria	Mauro Pomatti

Lithuania

Role	Organisation	Contact person
MSCP	Department for Land Policy of Ministry of Agriculture	Audrius Petkevičius
NGA	Lithuanian Association of Surveyors	Vaidotas Sankalas
LMO	Environmental Protection Agency	Žilvinas Mačerinskas
LMO	National Center of Remote Sensing and Geoinformatics GIS-Centras	Giedrė Beconytė
LMO	National Land Service under the Ministry of Agriculture	Jurgita Špuraitė

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SME	Aplinkos Inžinerija	Tatjana Naumenko
SME	Geoconsulting	Marius Stankevičius
SME	Geotakas	Darius Galeckas
SME	InfoEra	Paulius Litvinas
SME	Hnit-Baltic	Linas Gipiškis

Malta

Role	Organisation	Contact person
MSCP	MITA	Matthew Gatt
LMO	Heritage Superintendence	Mr. Nathaniel Cutajar
LMO	MCST	Joseph Sammut
LMO	MEPA	Saviour Formosa
SME	AIS Environmental LTD	Ruth Debrincat
SME	CAMILLERI & CUSCHIERI Consulting Engineers	Charles Cuschieri
SME	JCR LTD	Jonathan Attard
SME	Randolph Camilleri Surveys Limited	Michelle Camilleri
SME	Solidbase Laboratories ltd.	Mr. Paolo Bugeja

Slovakia

Role	Organisation	Contact person
MSCP	Slovak Environmental Agency - SAZP	Marek Ziacik, Martin Tuchyna
LMO	Cartography and Cadastre Authority of Slovak Republic - UGKK	Katarina Leitmannova
LMO	National Forest Centre - NLC	Robert Cibula
LMO	State Nature Conservancy of the Slovak Republic - SOPSR	Zuzana Santova

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NGA	Slovak Association for Geoinformatics - SAGI	Robert Fencik
SME	ArcGEO Information Systems s.r.o.	Martin Mydliar
SME	CORA GEO, s.r.o.	Martin Vallus
SME	MK18 s.r.o.	Tomas Kliment
SME	Ing. Arch. Martin Baloga	Martin Baloga
SME	YMS group a.s.	Miroslav Holubec

Spain

Role	Organisation	Contact person
MSCP	National Geographic High Council	Sebastián Más
LMO	Institut Cartografic de Catalunya	Elena Sánchez
LMO	General Directorate for Biodiversity Ministry of Environment	Blanca Ruiz Franco
LMO	General Directorate of Cadastre	Amalia Velasco
NGA	Sociedad Española de Cartografía Fotogrametría y Teledetección	Ramón Lorenzo Martínez
SME	Arquitopo	Elias Santiago Figueruelo
SME	Centro de Observación y Teledetección Espacial S.A	Jose Angel Molero
SME	Estudios GIS S.L.	Alvaro Arroyo
SME	Geograma	Alejandro Guinea de Salas
SME	Idearium Consultores	David Portolés

United Kingdom

Role	Organisation	Contact person
MSCP	Department of the Environment, Food and Rural Affairs	Alex Coley
LMO	Local Government Association	Gesche Schmid

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LMO	Natural Resources Wales	Rod Kedge
LMO	Ordnance Survey	David Henderson
NGA	Association for Geographic Information	Rob Walker
SME	Astun Technology	Mike Saunt
SME	Consulting Where	Les Rackham
SME	Ocean Wise	John Pepper
SME	RSW Geomatics	Robin Waters
SME	Snowflake Software	Richard Rombouts

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