

Report on vocational training needs and offers in GI

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Contents

Background	3
Survey method and target audiences	3
Conditions and constraints of vocational GI-education and training	3
Attitudes towards vocational training	3
Course types	4
Employer support and constraints	5
Measuring training success	5
Cost of vocational education in GI	6
Distribution of e-learning content	6
Demanded and Offered contents	Errore. Il segnalibro non è definito.
GIS Core-Technology	6
Application domains and INSPIRE	7
Conclusions	8
References	8
Appendix	8

Background

As geospatial technology is a rapidly growing and changing field, vocational training and education plays an important role to meet workforce needs within Europe. The speed at which new fields are adopting GI-technology, the new challenges of the INSPIRE directive and the rate at which equipment and software are modified and updated make it difficult for many institutions offering vocational education to keep pace with the current developments. Since geospatial technologies are used in many different business sectors, vocational education in GI is offered in various disciplines such as ecology, health care and marketing¹ and subsequently in very different approaches. Together with a heterogeneous vocational education market lacking standardized offers and certifications, it is difficult for employees to find adequate offers of vocational GI-education. VESTA-GIS tries to improve this situation by establishing a multilingual course catalogue combined with a training package builder to assist people in finding the right educational offer tailored to their individual needs.

One of the first activities of VESTA-GIS was the assessment of training needs within the VESTA-GIS target groups, the resulting requirements for professional skills and the evaluation of the training market situation and its key issues at a European level. To achieve these goals a survey was carried out among the market's stakeholders of geo-information. The survey focused on two online questionnaires addressing the demand and the supply side of the GI-training and education market. Along with qualitative interviews the results reported here are intended to help produce a feasible structure for the description and validation of courses to be included in the VESTA-GIS training catalogue.

Survey method and target audiences

Two online questionnaires, one for each target group, form the quantitative basis of the survey which was conducted between April and July 2008. On one hand institutions offering GI vocational education were invited to describe their educational offerings, on the other hand GI-employers from industry and governmental institutions were asked to identify needs, constraints, and qualifications required for their employees in in-service-education and training in GI. A first version of both questionnaires was developed by ZGIS. This draft version was discussed within the project core partners and improved by core partner contributions, especially in the field of the three application domains and INSPIRE. The resulting version was discussed, tested and finally - after some minor changes - approved. From the technical point of view the online questionnaires were implemented at [surveymonkey.com](http://www.surveymonkey.com)² a comparably cheap and easy to use internet service which perfectly served the project objectives.

An invitation to participate was distributed by email to all GISIG member-organizations. In addition the VESTA-GIS project partners used their networks to identify and invite suitable organizations or key-persons from all over Europe. The responses were validated by checking on duplicate entries and plausibility. In ambiguous cases answers were clarified by email, or - if there was no contact given - the record was removed. In total the survey resulted in 104 valid responses – 36 on the educational supply market situation and 68 on the demand situation. Although higher return numbers would be favourable to improve statistical significance, the amount of data - together with several qualitative interviews of trainers' and trainees' organizations and fresh graduates looking for a job - seems sufficient to extract the "big picture".

Conditions and constraints of vocational GI-education and training

Attitudes towards vocational training

In general "lifelong learning" is not just a buzzword anymore: over 90% of the responding employers rate in-service training of co-workers as important or very important. In general larger companies or institutions have more possibilities to require vocational training for their co-workers, providing a budget and education time during working hours. In smaller businesses/institutions, because of the lack of time and the costs of training activities, less education is provided. Especially small private companies often consider in service training as a "waste" of time and money and not as a great investment. If training is provided for their employees, it is mostly limited to occasions when new software or instruments are acquired or upon a specific demand, as for instance special knowledge that is needed to complete a certain project. In these cases the training focus

¹ To reduce complexity here the VESTA-GIS focus was initially narrowed to three application domains (Water Management / Natural Environmental Protection / Coastal Management and Landscape) in addition to common GIS technology

² <http://www.surveymonkey.com>

is often on technical aspects or software skills which are mostly taught in a short intensive course format (1-3 days) in-house or at the location of the training provider.

Course types

For employees of larger companies or governmental institutions it seems to be more easy to get individual support for a more sustainable long-term vocational GI-education in the form of part time, comprehensive courses held as evening classes or via distance learning. This type of education is mainly offered by institutions in the tertiary education sector, hardly by private companies. In contrast to the "short intensive course type" dealing with specific (often technical) issues and following a "tool-approach" of GI, the academic type takes on a broader view of the science and theory that build the foundation for the discipline. Typical samples of this education type, like the UNIGIS courses, use a variety of e-learning tools to establish a sound distance learning environment enabling collaborative and tutored forms of learning. Doing so has proved to be a crucial factor in long-term distance education. Interviews also showed a demand for so called "nano-learning" elements – small junks of context related information, which can be absorbed within a maximum of 15 minutes time length and which are delivered on handheld devices.

For pragmatic reasons it was decided that the basic element to describe within the VESTA-GIS course catalogue should be the smallest possible, individually "bookable" educational unit. In some cases this might be a single e-learning lesson, a half day seminar or even a nano-learning element. In other cases this might be a comprehensive year-long course, composed of a sequence of "modules" which cannot be taken individually. As a consequence for the VESTA-GIS training catalogue, the metadata structure must be capable of accommodating vocational education courses of very different scope.

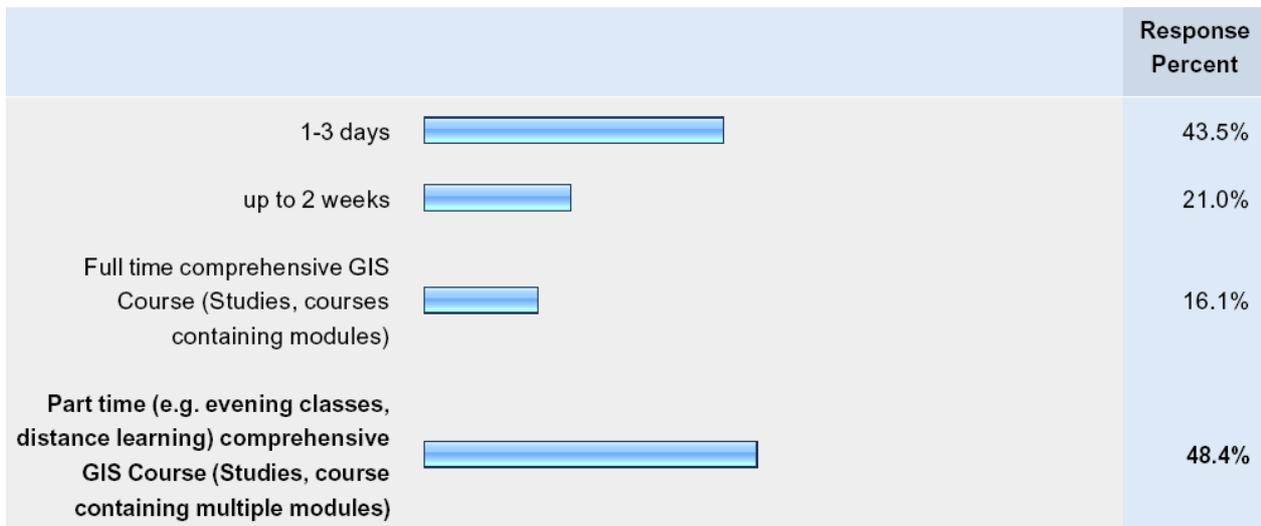


Fig. 1: Which kind of continuing professional education – in terms of duration - would you prefer for your co-workers? (multiple selections possible, n=62)

About one third of the surveyed providers of vocational education are mainly offering tailor-made courses upon request. Notably public institutions tend to request such courses for their GI-staff. In former Eastern Europe countries this kind of vocational education for specific audiences was supported by joint EU TEMPUS projects like OLLO (Open Learning for Land Offices) or SDiLA (Staff Development in Land Administration), but "custom made" education upon request by public authorities is also quite common in western Europe. Again, more task oriented GI-training within this segment is offered by both private companies and academia, while GI-education in a more conceptual context (for example a general SDI-introduction for managers of regional surveying departments) is still the domain of universities.

The VESTA-GIS course catalogue is a great chance for educational institutions to reuse quite specialized, individually tailored courses, by making them visible to a pan-European GI-public. From a consumer perspective seekers of vocational GI-education might find specialized offers that match their needs even better than expected.

Employer support and constraints

In about 60% of the surveyed companies/institutions vocational education is financially supported. In 45% of cases working time can be set aside for education. As the needed time of vocational GI-education is highly variable, depending on working field and individual job descriptions, there is high variation in the given numbers reaching from 2 up to 60 educationally used working days per year (the median is 10). One also has to keep in mind that a considerable amount of vocational education is not formally organized in courses but acquired individually by retrieval of new knowledge through literature or the internet. This is especially true for relatively new and/or fast evolving knowledge-domains within GI, where the educational offer almost always lags behind recent developments.

From an employer perspective the main constraints for vocational education (Fig. 2) are seen in education costs and lack of time (77% each), a complex and unclear continuous professional education market in GI (29%) and missing course offers (27%). As the term "missing" could also be interpreted as "hard to find", the last two constraints strongly support the project goals of providing a catalogue and easy to use gateway for vocational training in GI.



Fig. 2: Where do you see the greatest difficulties in in-service continuing professional education in GI? (multiple selections possible, n = 65)

Measuring training success

When it comes to cost/benefit evaluation of certain training offers, qualitative interviews as well as results from questionnaires showed that the most important quality-benchmark of continuing professional education is the successful application of the acquired skills/knowledge in the job. For this reason employers prefer software training and applied skills over conceptual issues for short-term co-worker training. Nevertheless academic titles gained in long-term vocational education programmes are valued much higher by employers than non-academic, rather skill-oriented certificates. This is especially true, when it comes to the assessment of job applicants' knowledge and skills. Here previously acquired postgraduate degrees like an MSc. are considered important. The required GI-qualifications of job applicants vary considerably, depending on the type of vacant position. At one hand the GI-industry is looking for GIS developers with a strong background in informatics; on the other hand thematic experts with profound GIS user-skills are needed within specific application domains.

When selecting an educational offer or evaluating the relevance of titles/certificates, the reputation of the delivering educational institution seems to play an important role as well. A severe problem is also a missing system of certification for the level of vocational training. The variety of offering institutions (private companies, universities, associations etc.), different target dimensions, audiences and levels of training make it difficult to pick a training offer yielding the desired results. An entry into the VESTA-GIS training catalogue should guarantee a certain quality standard, for instance by validation against the UCGIS Body of Knowledge for the GIS-foundation part (not possible for the application oriented sections). In the US the GIS Certification Institute¹ currently reviews the Body of Knowledge to determine if it may serve as the backbone for an exam-based certification program for GI professionals. First results indicate that the Body of Knowledge is quite well accepted in the GIS community. However, it is perceived as too academic / detached from real world GI-problems in certain knowledge areas².

Cost of vocational education in GI

One third of institutions offer vocational GI-education (in most cases just the learning material but no tutoring) for free. Often these kinds of courses are outcomes of funded educational projects. Typical fees for a basic introductory in-class course per trainee and day are around EUR 300 (median). For advanced topics the median price is slightly higher (EUR 350). The typical fee for a long term comprehensive GIS course/studies (distance learning) per trainee/student and month is around EUR 300-600. Because of different organizational and didactical models (blended learning, different intensities of tutoring) and country-specific price levels, the comparison of prices has to be treated carefully. Since there are possibilities for funding or discount options for certain groups, the metadata structure should accommodate this information beside the course fees.

Distribution of e-learning content

More than half of the surveyed training institutions are using a learning platform like Blackboard/WebCT or Moodle to distribute their content. Besides online content, printed materials are still a common and also requested form of delivery. E-learning standards do not play an important role for training institutions. Only 12% are using standards like SCORM or LOM to structure content. In general education providers have a positive attitude towards catalogue building efforts. 72% want to include their courses / programme in GI in a European database that can be accessed by persons seeking continuing professional education in GI. If given, reasons not to do so can be summarized as "we would need to know more about the conditions before deciding" and "since we only offer tailor-made training there is no course list available". The project's dissemination efforts of emphasizing the benefits for educational institutions and potential users will hopefully clear all doubts in order to generate course metadata for tailored offers.

Contents – Demand and Supply

VESTA-GIS focuses on basic GIS technology plus GI-application issues in three initial application domains (Water Management, Natural Environmental Protection and Coastal Management and Landscape). Considering the actual European challenges, there is a strong need for qualified education on INSPIRE, another important issue VESTA-GIS has to deal with. Other than surveys investigating needs for traditional BSc or Master-GI-curricula (see for example C. BRONX and P. PIRES, 2004³), the VESTA-GIS survey was limited - from a thematic perspective - to the core-topics mentioned above.

GIS Core-Technology

Figure 3 shows that there is a demand in every single field of GI-related vocational education, both for co-workers (second column) and even more so for job applicants (first column). An exception is the slightly higher co-worker demand for training on specific GIS software. This might be due to the training needs and adaptation of workflows for existing staff, when a new software (release) is introduced. There is a corresponding educational supply for every single topics (ref. to third column). The relatively new fields "GIS and IT systems design" and "Distributed GI" are the only topics, where the percentage of institutions offering education is lower than the percentage of people who see demand there. Nevertheless the supply situation seems to be sufficient at first glance. Considering the language barriers throughout Europe, it turned out that

¹ <http://www.gisci.org/>

² BUTLER, A.J., 2007: Does the UCGIS Body of Knowledge Accurately Reflect GISP Skills?
URL: www.gisci.org/PDFs/Butler_BoK_GISP_Competence.pdf [08-09-2008]

³ BRONX, C. and P. PIRES, 2004: Education in Geoinformatics - Career Profiles, Requirements, and Chances. - Fourth European GIS Education Seminar (EUGISES), Villach, Austria 2nd- 5th September 2004.

the whole spectrum of above mentioned topics is only offered in German and English language. It is however hard to draw final conclusions due to the limited sampling of institutions offering in-service training on GI.

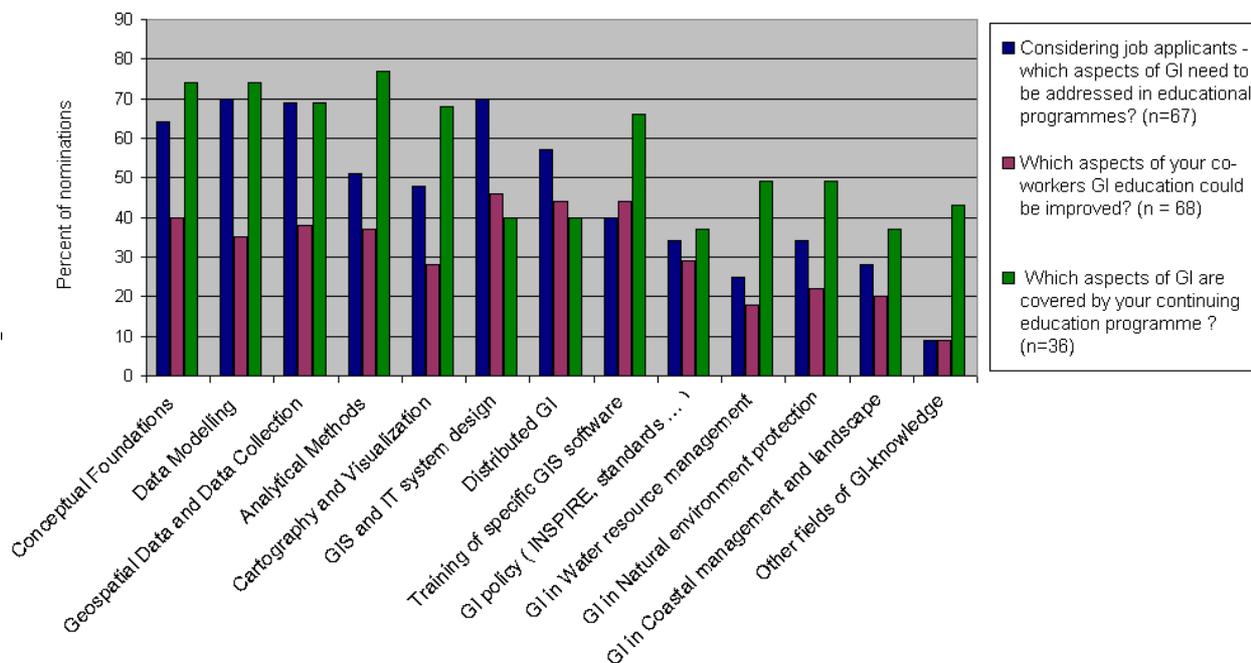


Fig. 3: Educational Demand and Supply

Application domains and INSPIRE

The three application domains which were further divided into subtopics give a similar picture on an overall lower level of demand and supply. In general, both for the courses demand and supply, a clear distinction between the subject areas of the VESTA-GIS project is not possible; in fact many courses have cross-sector material. The catalogue metadata should therefore allow to reference a certain offer to more than just one of the three initial application domains. In terms of INSPIRE almost everyone of the demand group rated knowledge on interoperability as important or very important, but only less than half of the respondents believed that their organisations had the knowledge and expertise to apply INSPIRE principles. According to the change from traditional mapping to mass-market GI, Spatial Data Infrastructures are becoming more and more important to enable this revolution. In the context of SDIs both technicians and SDI users require additional training to improve their soft competences like communication skills, co-operative work forms and project management. Most of the 13 (out of 36) institutions offering vocational education on GI-policy topics work together with other disciplines like ICT or law when setting up training courses on INSPIRE. This can be seen as an indicator that the interdisciplinary implications of SDIs are accommodated in education as well.

Conclusions

As a result of the survey the following aspects should be considered when developing the metadata structure for the VESTA-GIS training catalogue:

- The metadata structure must be capable to adequately describe vocational education offers of very different length and with different aims (skill-oriented training vs. sustainable, more conceptual education)
- There should be a description of target audiences as well as a
- precise description of content in the form of learning objectives and the
- mode of learning (short courses, blended learning, distant-learning)
- If there is a form of formal certification, it must be visible from the metadata
- Within the EU the clear definition of language(s) of material/instruction is an important issue. To enable searching in other languages than English the catalogue should have a multilingual user interface and (additional) metadata in the language(s) of instruction.
- If there is funding available, it should be attached to the pricing metadata.
- The metadata structure should allow to reference a certain offer to more than just one of the three initial application domains.

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Appendix

People interviewed for the training needs:

Heba Hussein Mohamed, Cairo University, Faculty of Engineering, Egypt
Manos Koutrakis, Fisheries Research Institute, Greece
Nicola Bazzurro, IRIDE Acqua Gas Spa, Italy
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Gerhard Stöhr, Austrian Surveying Agency (BEV), Austria
Riccardo Ferrari, CSI Piemonte, Italy
Andreas Poth, lat/lon GmbH, Germany
Stefanie Andrae, FH Kärnten – Geoinformation, Austria

People interviewed for the training offers:

Daniela Bergamotti, Fondazione AMGA, Italy
Alexandra Sena, CDCR Algarve, Portugal
Sandra Caeiro, Universidade Aberta, Portugal
Manos Koutrakis, Fisheries Research Institute, Greece
Michael Fally, Universität Salzburg, Austria
Jiri Horak, Technical University of Ostrava, Institute of Geoinformatics, Czech Republic
Andreas Koch, Runder Tisch GIS, Germany