INTERNATIONAL STANDARDIZATION AND THE PROGRESS OF THE FIG-TASK FORCE ON STANDARDS

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Abstract. Uniformity, standardization and exchangeability of data, methods and systems are essential economic criteria for producers and users of geoinformation. In line with the worldwide development of GIS, the importance of standardization has led to the establishment of corresponding technical committees within CEN 1992 and ISO 1994. It is also evident that a coordination of the activities of the users on the national and international level as well as quality management are extremely necessary. About the results and current development will be reported.

At the FIG-Conference'1998 in Brighton FIG was decided to take special care of 3 professional areas: Standardization, Sustainable development and Underrepresented groups by establishing of 3 Task Forces. Especially standardization nowadays has very high importance, because it is not concentrated just to some countries, but is most effective for all countries in the world, for all FIG-members, concerning GIS. ISO/TC 211 is developing futural standards concerning Geographic Information/Geomatics. CEN-results are already available.
In the brainstorming in Brighton are pointed out topics of this task force.

To get an overview what is going on in the FIG-member countries, the FIG-Task Force on Standards has decided to send out a questionnaire to all member associations of the FIG in order to know the need of standards, which standards are already available or which other rules, so called 'de-facto standards', are used in the FIG-member countries. This information are the basis for further activities of the Task Force and defined in the FIG-work in the meantime, f. e. to improve the knowledge and the use of the family of ISO-Standards for simplifying and cost-saving development of national standards and at the same time to improve the exchange of data between neighbour countries and globally in an effective way for all applications of GIS.

The result of the questionnaire gives an overview about official standardization activities of 23 countries which are in majority members of ISO/TC 211 and dealing with ISO/TC 211, TC 59, TC 172 and TC 204, and ISO 9000. The Regional Standardization Bodies are CEN (Comitée Européen de Normalisation), where the basic standardization work concerning GIS has been done since 1991 by participant-members, and Pacific Area Standards Committee since some years.

National standardization activities are not homogenious and depend on the structure and quality level of the system of large and small scale - GIS. Currently 'de facto-standards' are still used, which are mainly derived on the basis of the national or local cadastre and surveying laws.

The FIG-members require from FIG Task Force Group on Standards f. e. more information about standards, and to simplify the transfer of the standards into practice. FIG should play a more important role in ISO/TC 211.

1. INTRODUCTION

The development of national and international Geographic Information Systems is proceeding rapidly since many years. In the meantime in some countries, like in Germany since 1970, experiences in establishing, maintaining and especially using them, are available. Additionally other problems must be solved e. g. coordination, quality management and nowadays economic management instruments become more and more important. Many activities are focussed on these tasks worldwide. In all fields the role of international standards is steadily increasing.

2. STANDARDIZATION

2.1 General aspects and definition

Standardization is one of the tools we use to organize our technical world. It has become an integral part of our economic, social and legal systems.

International and European standards can remove trade barriers and promote business across national frontiers. They are thus especially important for a country like Germany.

The national standards of highly developed industrial countries are a readily accessible source of information on the current state of the art. They represent an important vehicle for the global transfer of technology and hence also foster economic cooperation with the Third World.

Standards play an essential part in the solution of many technical and economic problems; they serve all involved in trade and industry as an explicit and accurate medium of communication.

The work of standardization as undertaken by DIN is a service in the field of science and technology that ist provided for the entire community. The whole of the national economy benefits from the results of standardization.

DIN ist the authorized national standardization body of Germany and may be mentioned by way of example on national level. In its work DIN ist guided by ten principles: voluntary basis, public, participation of all interested parties, uniformity and consistency, relevance, consensus, alignment with the state of the arts, alignment with economic factors, alignment with the public benefit, and global approach.

Standardization is the systematic process by which tangible or intangible subjects are reduced to a desired degree of order by the joint efforts of the interested parties for the benefit of the entire community (DIN 820 Part 1).

DIN Standards are technical rules. They promote rationalization, quality management, safety, environmental protection, and communication in industry, technology, science, government and the public domain.

On the European level it is CEN (Comité Européen de Normalisation) and on the worldwide level ISO (International Organization for Standardization) which are the authorized standardization bodies to develop ‘standards’; all other organizations on national and international level produce „de facto-standards“.

International standards are important for use and exchange of spatial data, terminology and quality management are criteria to increase the economic effects.

2.2 National standardization

The actual work of standardization by DIN ist carried out by about 34 000 external experts organized in 4 000 technical committees.

The national professional work of „surveying, geoinformation“ is done by 4 committees: ‘geodesy’, ‘photogrammetry’ and remote sensing’, ‘cartography and geoinformation’, ‘surveying instruments and apparatus’.

2.3 European Standardization

The aim of European standardization is to create a uniform body of standards meeting modern needs and applying throughout the unique European market. This task is the responsibility of CEN/CENELEC and ETSI. European Standards are generally based on ISO-Standards, if available.

The focus of DIN’s activities has shifted increasingly towards European standardization in the past few years. The proportion of purely national standardization work has fallen continuuously since 1984 and now stands at a mere 15 %.

Concerning ‘Geographic Information’ the Technical Committee CEN/TC 287 is developing standards since 1992 (Secretariat AFNOR, France), mandated by CEN. This basic work is done by 4 working groups and 5 project teams. By decision of the plenary all standards have been finalized on ENV-status or as CEN-reports in 1998.

They will serve as well as a basis for ISO.

Results of CEN/TC 287 ‘Geographic Information’

- DIN V ENV 12009: 1997-10
  Geographic Information - Reference Model
- DIN V ENV 12160: 1998-02
  Geographic Information - Data description - Geometry
- ENV 12656:1998-10
  Geographic Information - Data description - Quality
- ENV 12658: 1998-10
  Geographic Information - Data description - Metadata
- ENV 12658:1998-10
  Geographic Information - Data description - Datatransfer
- ENV 12661: 1998-10
  Geographic Information - Referencing - Geoidentification
- ENV 12762: 1998-11
  Geographic Information - Referencing - Direct Position

- prENV 13376: 1998-11
  Geographic Information - Data description - Rules for application schemas

- CR 13425: 1998-11
  Geographic Information - Overview

- CR 12660: 1998-11
  Geographic Information - Processing - Query and update, spatial aspects

- CR 13436: 1998-11
  Geographic Information - Vocabulary

CEN/TC 278 „Road Transport Telematics“ developed the GDF-Standard (Georgraphic Data File), which is also used by ISO.

2.4 Worldwide standardization

Standardization at the international level ist the responsibility of the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the International Telegraph and Telephone Consultative Committee (CCITT), all located in Geneva.

In ISO, the national standards bodies of some 120 countries cooperate in activities that aim to facilitate the international exchange of goods and services by creating uniform standards with global validity and to stimulate cooperation in the scientific, technical and economic fields across national frontiers.

Concerning distribution of the general work load in ISO, DIN is number one of the involved countries. DIN offers cooperation to interested countries to transfer its experiences and to support the developing activities of the partner-countries.

ISO/TC 211 ´Geographic Information/Geomatics’ had been established in 1994 (Secretariat NTS, Norway). In the meantime this committee has steadily increased, there are 33 full-members, 16 observer-members. Further the internal liaisons: besides 9 "internal" liaisons with other ISO-committees there are 12 "external" (A-)liaisons:

- Centre for Earth Observation (CEO)
- Digital Geographic Information Working Group (DGIWG)
- European Petroleum Survey Group (EPSG)
- International Association of Geodesy (IAG)
- International Cartographic Association (ICA)
- International Federation of Surveyors (FIG)
- International Hydrographic Bureau (IHB)
- International Society for Photogrammetry and Remote Sensing (ISPRS)
- International Steering Committee for Global Mapping (ISCGM)
- OpenGIS Consortium, Incorporated (OGC)
- The Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP)
- United Nations Economic Commission for Europe (UN/ECE)

and

- CEN/TC 287 ‘Geographic Information’

One of the important A-Liaison-Members is the OpenGIS Consortium (OGC) with the following definitions:

OpenGIS - Open and interoperable geoprocessing, or the ability to share heterogeneous geodata and geoprocessing resources transparently in a networked environment. „The highest level of the interoperability specification."

OpenGIS Specification (OGIS). A software specification that enables geodata sharing and geoprocessing interoperability. An interface standard for interoperable geoprocessing.

OpenGIS Consortium, Inc. A member-based consensus forum dedicated to the development of OpenGIS technologies and the integration of geoprocessing into enterprise computing.

By OGC there ist a challenge to interoperability:

Internet e-services are evolving rapidly around an open environment. Data traditionally separated from each other are now available in a homogeneous way via easy-to-use access methods. Considering the fact that a vast majority of data have a geospatial reference, web-based geo-services are a logical consequence.

In this challenging environment, the Geographic Information Systems (GIS) industry is facing a paradigm shift. Moving away from its traditional role of primarily being a data producer, the new focus is now on supplying services towards a virtual geodata merket place. From the multiple utilization of geospatial data captured with automated data acquisition methods new application segments will emerge.

Geospatial data are national infrastructure data. Their availability and utilization is an economic success factor. The vision is that geodata as national infrastructure data are generally available in the web. Authorization and licensing procedures for using these data are transparent and market oriented. This „globalization" of geodata implies standards in access and semantics, the keyword ist **interoperability**.

The **OpenGIS Consortium Inc. (OGC)** is the leading industrial organization represented f. e. In Europe by its leading principal member SICAD Geomatics, which is promoting interoperability between GIS systems. OGC's vision is the complete integration of geospatial data and geoprocessing resources into mainstream computing. Users will be enabled to exchange geodata without the necessity of translating these data. OGC's standardization process is conducted in a close and efficient consensus-based cooperation between the OGC members: GIS vandors, IT industry, systems integrators, academia and especially large users like government organizations. However, the activities are not restricted to theory: testbeds and prototypes are an important supplement to the Technology Development Program. The Web Mapping Testbed for example has the goal to evaluate and develop next-generation interoperable web-based mapping technology solutions by integrating geospatial information from multiple sources simultaneously.

ISO/TC 211 and OGC established in 1999 a special cooperation for promoting the results and mutual benefits (see some mainpoint of the agreement):

Co-operative agreement between ISO/TC 211 Geographic Information/Geomatics and the OpenGIS Consortium, Inc. (OGC)

- **Purpose and Background**

- **General principles**

  - OGC wishes to obtain ISO International Standard status for its Industry Implementation Specifications.
  - ISO/TC 211 wishes to adopt appropriate Industry Implementation Specifications as ISO International Standards or other ISO deliverables.
  - OGC wishes, while retaining its market responsiveness, to align with ISO/TC 211 on working practices.

- ISO/TC 211 wishes, within the constraints of the ISO Directives, to co-operate with OGC in assisting the alignment of life cycle working practices.
- OGC and ISO/TC 211 wish to harmonize and agree their respective work programmes and to set up a group to handle issues under this agreement.
- OGC and ISO/TC 211 wish to achieve mutual benefit from sharing the expertise of domain experts of the two organisations and they welcome cross-project participation.

- **Alignment of procedures**

  - Liaison

  - Early collaboration

  - Co-ordination group

    OGC and ISO/TC 211 have established a joint co-ordination group. This group will meet as necessary and will be the forum for discussing and resolving issues that may arise from time to time. The group will support the individual liaisons between ISO/TC 211 working groups/project teams and OGC working groups, and shall not in any way usurp the responsibilities of existing organizational structures in OGC or ISO/TC 211.

    The terms of reference for the co-ordination group are developed and accepted by OGC and ISO/TC 211 prior to the establishment of the group (3/99).

- **Maintenance of standards**

The 26 working items are handled by 5 working-groups:
'Framework and reference model', 'Geospatial data models and operators', 'Geospatial data administration', 'Geospatial services' and 'Profiles and functional standards' and numerous project teams.
Every country should join this ISO/TC 211 as participant-member.

ISO/TC 211 Working Groups and Working Items

WG 1 - Framework and reference model

WI 15046 - 1 - Part 1:	Reference model	2. CD - 98-12
WI 15046 - 2 - Part 2:	Overview	2. CD - 99-04
WI 15046 - 3 - Part 3:	Conceptual schema language	2. CD - 00-03
WI 15046 - 4 - Part 4:	Terminology	2. CD - 99-11
WI 15046 - 5 - Part 5:	Conformance and testing	2. CD - 98-10
WI 16569:	Imagery and gridded data	2. CD - 99-06
WI 17754:	Imagery and gridded data components	Stage 0
SQL	Simple Feature Access - SQL-Option	1. CD - 99-11

WG 2 - Geospatial models and operators

WI 15046 - 7 - Part 7:	Spatial schema	2. CD - 99-11
WI 15046 - 8 - Part 8:	Temporal schema	2. CD - 99-11
WI 15046 - 9 - Part 9:	Rules for application schema	2. CD - 99-11
WI 17753:	Schema for coverage geometry and functions	2 CD - 00-09

WG 3 - Geospatial data administration

WI 15046 - 10 - Part 10:	Feature cataloguing, methodology	2. CD - 98-11
WI 15046 - 11 - Part 11:	Spatial referencing by coordinates	2. CD - 99-10
WI 15046 - 12 - Part 12:	Spatial referencing by geographic identifiers	2. CD - 99-10
WI 15046 - 13 - Part 13:	Quality principles	2. CD - 98-11
WI 15046 - 14 - Part 14:	Quality evaluation procedures	2. CD - 99-11
WI 15046 - 15 - Part 15:	Metadata	2. CD - 99-11

WG 4 - Geospatial services

WI 15046 - 16 - Part 16:	Positioning services	2. CD - 00-03
WI 15046 - 17- Part 17:	Portrayal	2. CD - 99-06
WI 15046 - 18 - Part 18:	Encoding	2. CD - 99-11
WI 15046 - 19 - Part 19:	Services	2. CD - 00-03

WG 5 - Profiles and functional standards

WI 15046 - 6 - Part 6:	Profiles	2. CD - 00-03
WI 15854:	Functional standards	2. CD - 99-04
WI 16822	Qualifications and Certivication of personnel	2. CD -01-06

2.5 Remarks

Due to the fact that the work in CEN/TC 287 and as well in ISO/TC 211 make good progress there are already decisions concerning standardization available for the progress of development on the national level. Many efforts are needed; specialists and budget from the involved organizations accompanying the international work, which are often not available. The standardization work for ISO is continuously increasing from 5 % of the DIN-work to 32 % in 1996 during the last 8 years.

3. FIG STANDARDS TASK FORCE

Background

The development of standards is a long process and currently involves few surveyors. This often results in impractical or outdated standards. FIG believes that it can assist in the creation of workable standards covering survey activities by being involved in the work of standardisation bodies (including but not limited to ISO); as an international NGO, FIG is one of the few bodies through which surveyors can formally be represented in international standardisation activity. FIG can also assist in publicising and explaining the implications of standards for surveyors. The Standards Task Force will co-ordinate this activity on behalf of FIG.

External Relationships

The Task Force will need to create working relationships with standardisation bodies, starting with ISO. In this regard, the Task Force can play an important part in the promotion and marketing of FIG to a wider community. There are three primary roles:

- gaining liaison status and appointing experts to appropriate Technical Committees of standardisation bodies, to assist in the creation of workable and current standards;
- creating explanatory material and guidance notes as to the implications of standards for surveyors; and

- proposing FIG guidelines which can be translated into standards as technology and methodology matures (in the future, it is possible that professionals should be initiating standards activity rather than reacting to work begun by others).

A questionnaire distributed in early 1999 indicates that the appropriate relationships with standards bodies are at the global level for FIG, and at the national level for Member Associations.

Another key group of relationships is with other NGOs representing surveyors (for instance, IAG, CLGE and ISPRS); the particular relationship on standards will need to be built.

Internal Relationships

The Task Force will be directed by the Bureau and the General Assembly.

The key relationships for the Task Force during its work will be with the Commissions, Permanent Institutions and Member Associations. In essence, the Task Force will provide the external face of FIG to the standardisation bodies, translating the requirements of each to the other and providing appropriate contacts as necessary. The Task Force will also be responsible for prioritising the proposed standards work of FIG and ensuring that the appropriate commissions take these priorities and turn them into action. The Commissions will work within their fields of specialism, always conscious of the possible use and implications of standards in that work, and consulting with the Task Force as to how best this can be accomplished.

Work

The work plan for the Task Force has been shaped by the responses to the 1999 questionnaire to Member Associations. This showed a particular requirement to collect and disseminate information about the activity of ISO, and a need for FIG to take part as an active member of standardisation bodies to gain more influence in decision making.

The work of the Task Force will include:

1. the creation of a working relationship with the ISO Central Secretariat to acquaint them with the benefits that a relationship with FIG can bring them, and agree the most appropriate ways in which to realise the benefits;
2. reviewing the current standardisation activity which impact on surveyors and determining (with the Commissions) how these can best be interpreted for surveyors - the ISO work highlighted in the questionnaire results is that of TC59, TC172, TC204 and TC211;
3. a review, with the Commissions, Permanent Institutions and Member Associations, of items of their work (past, present and future) which relate to or impact on standards;
4. discussing with other international organisations representing surveyors how we can work most effectively together in the field of standards;
5. discussing with instrument manufacturers and others how they have become involved in standardisation activities, to see what lessons we can learn from their experiences;
6. creating a guide for the Bureau and Commissions as to how they can best integrate FIG material with standards, and for member associations as to how they can best influence national and international standardisation activity;
7. creating and maintaining, with the Commissions, an appropriate list of FIG experts to relevant standardisation activities;

8. in light of progress with ISO, determining the most appropriate standardisation bodies to build further relationships (for instance, the International Valuation Standards Committee - IVSC) and how this may be best accomplished;
9. maintaining a flow of information on the activity of the Task Force to members of FIG, for instance through articles in the FIG Bulletin and on the FIGTree.

During the period between the 1998 and 1999 General Assemblies, the Task Force has worked in the following areas:

- determining its work plan and membership;
- playing an active part in the work of ISO TC211 (Geographic Information/ Geomatics), not least in the proposed work item on the qualification and certification of personnel;
- building a relationship with the ISO Central Secretariat;
- distributing a questionnaire on current standards activities, and collating the results.

A future work plan is worked out.

Time Scale

The building of relationships with external bodies will take time; it is proposed that the Task Force should unitially run until the 2001 General Assembly, with reports to the intermediate General Assemblies.

4. FIG QUESTIONAIRE ON STANDARDS (RESULTS)

Introduction

The FIG Task Force on Standards has decided to send out a questionnaire to all member associations of FIG. The aim of this questionnaire is to collect as much information as possible world-wide about standards and activities in different countries in this field. A side effect if this questionnaire shall be to collect addresses of interested people in the FIG family. So there should be a chance to it could be possible to establish an information network in FIG.

The questionnaire was developed by Iain Greenway (Chairperson, UK), Winfried Hawerk and Hans Knoop (Germany) and sent out to all the 85 member associations by the FIG Office in Denmark. It was requested to send back the questionnaires before 31 March 99.

In addition to that Winfried Hawerk sent out the questionnaire to all delegates to FIG Commission 7.

Until May 1999 there were 40 replies from the 23 countries shown in Figure 1. This rate was very good. The Task Force was very grateful for these contributions. Because Winfried Hawerk reported already in Sun City on occasion of the last PC-Meeting about the results, I just mention some extracts of our paper. These is a big quantity of information sent back to the Task Force to be further evaluated.

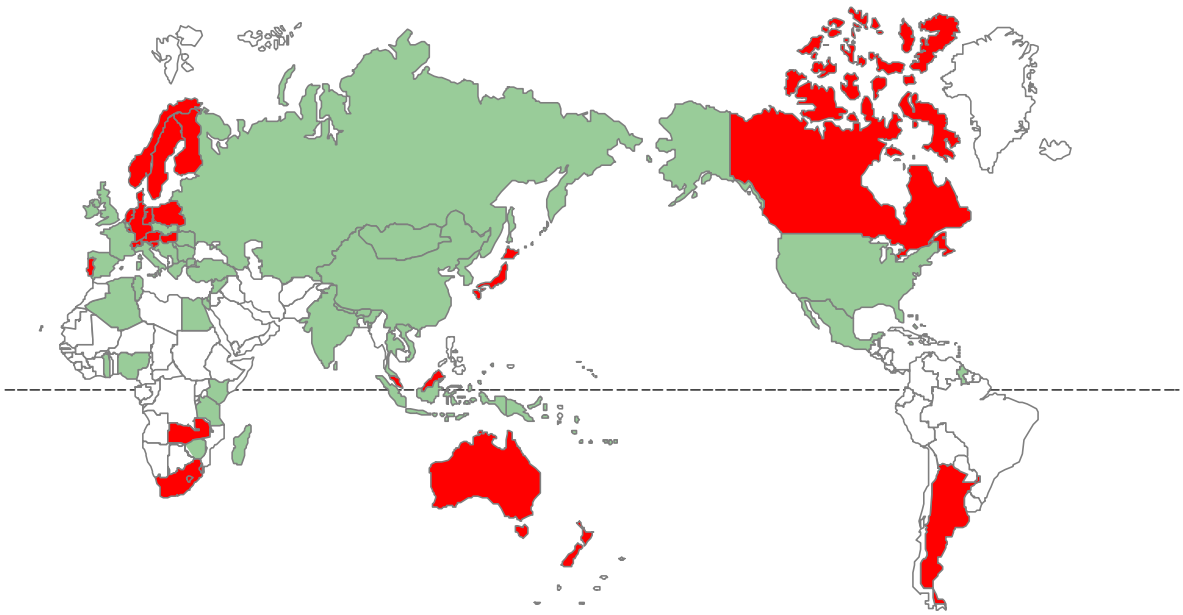


Figure 1: Member countries of FIG and countries which replied the questionnaire

Official Standardisation Activities

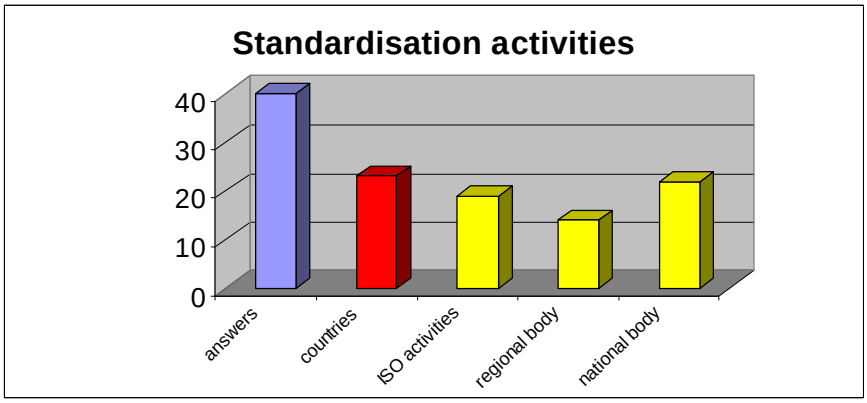


Figure 2: Activities in standardisation bodies

The majority of the countries replying the questionnaire are members of ISO. Besides being member of ISO most countries are member of a regional standardisation body. Regional standardisation bodies which are listed in the questionnaire are CEN in Europe with 19 participant-members and 14 affiliates and the Pacific Area Standards Congress in Asia, Australia and New Zealand. Australia and New Zealand cooperate very closely to harmonise their national standards. Except one country answering this questionnaire all countries have a national standardisation body.

Activities in ISO

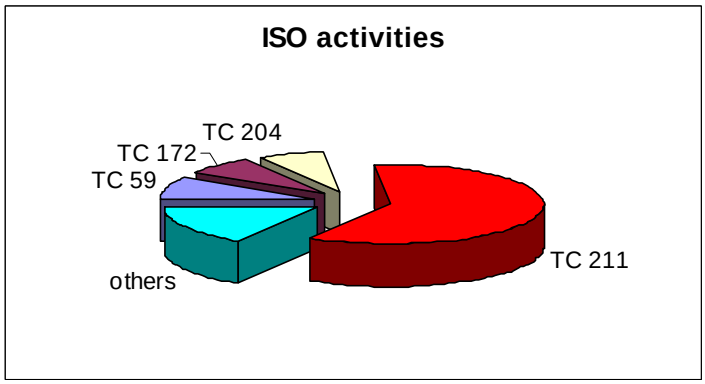


Figure 3: Activities in ISO

The replies show that the major activities in ISO may be found in TC 211. TC 59, 172 and 204 play as well an important role in the work in which surveyors are involved but the main tasks on Geographic Information issues are discussed and developed in TC 211.

These results are shown in Figure 3. Main topics are the description of metadata, GI co-ordination conceptional scheme languages as well as spatial referencing by co-ordinates. Most answers came from experts representing their country in ISO TCs and working groups. Not as many answers as expected mentioned activities in the fields of geodetic instruments.

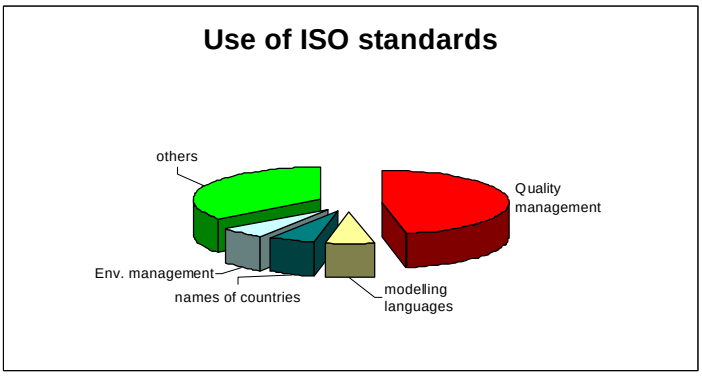


Figure 4: ISO standards in practice

Most ISO standards which are recently in practical use are ISO 9000 for quality management as it is shown in Figure 4. These ISO standards are momentous in most countries. Some countries use the ISO standards for names of countries and codes, dates and time. Most countries find a great importance of standards for the exchange and the description of Geographical data and modelling languages. Standards in the field of Environment management are in use only in a few countries. Probably a lot more ISO standards are in use by surveyors all over the world may be in the fields of land management, geodetic instruments and information technology and more but were not reported in the answers.

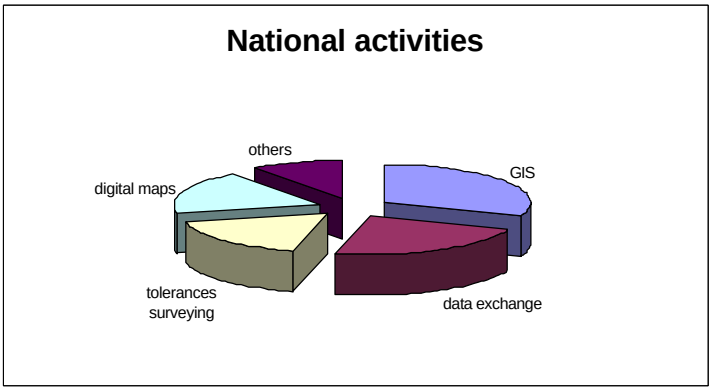
Regional Standardisation Bodies

Regional standardisation bodies as it is understood by the Task Force are authorized organisations in which standards are defined between several countries. The answers show only two regional standard bodies in the world Comieteé Européen de Normalisation (CEN) in Europe and the Pacific Area Standards Committee. Most European countries are member in CEN and the answers show that the main topics which are interesting for surveyors are the same as in ISO. These topics are Geographic information (CEN/TC 287) and road construction (CEN/TC 278). CEN has finished most standardisation work in this field and the members concentrate their work more on ISO activities.

The standards respectively the pre-standards from CEN in the field of GI are used by surveyors in a number of European contries. The activities of the Pacific Area Standards Committee are more in the field of GI co-ordination but are not described very clearly in the answers to this questionnaire.

The usefulness of regional standards is not as big as expected because the further development of ISO standards in these fields progress very quickly.

National standardisation activities



The description of national standardisation activities vary from almost nothing to a long list of activities like in Germany especially in the field GI, geodesy, mapping, instruments, quality management etc. Some national standards are based on ISO standards or regional standards but it seems that sometimes these developments are not as consequently coordinated as it could be. The results of the evaluation is shown in Figure 5.

Figure 5: National standardisation activities

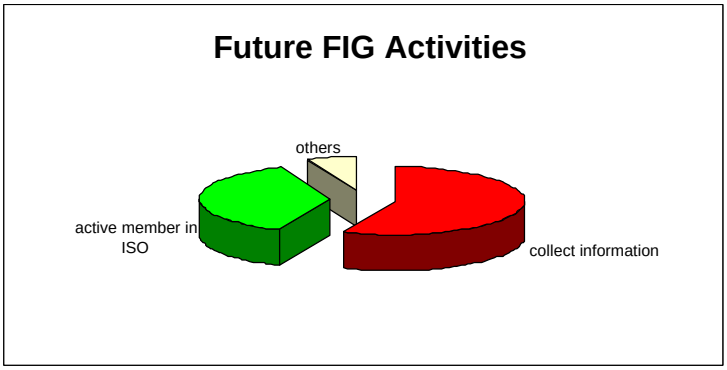
De facto standards

De facto standards in form of national laws, codes and regulations are found in almost all countries to organise the work of surveying and registration of cadastral data. F. e. in Germany the basic cadastral and topographical data bases ATKIS, ALK, ALB etc. are good examples of de facto-standards. Industry data exchange formats became de facto standards because they are widely used like DXF, TIFF and some others. The Microsoft products can be defined as a de facto standards because they are used from a big number of users. This can be said as well from the data transfer protocols like TCP/IP which is used all over the world in the Internet.

Further standardisation activities

Further activities are not very clearly defined. Most answers were positive but did not give a clear comment which activities in their country are in planning or discussion. Some keywords here are geodetic standards, implementation of ISO TC 211 results and OGC.

Results required from FIG Task Force on Standards



The results of the evaluation to these three questions are shown in Figure 3. The majority of answers to this questionnaire asks for an information network which should be able to collect more information about what is going on in ISO. Another problem for most people is to get understandable publications about standardisation work in ISO. Standards should be more driven by end-users than from a more theoretical point of view far away from practical work.

Figure 6: Requirement for future activities of FIG

A significant number of answers require a more important role to be played by FIG in standardisation work. They hope that FIG will get more influence in ISO/TC 211.

Surveyors shall be more aware of standards, in order to use the world wide efficiency of official standards, to avoid double work to save time and money.

Most of the people answering this questionnaire want to get information about the results of the Task Force's work and want to be on the mailing list for any news about future activities.

5. REFERENCES

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