



GOOD REASONS FOR IMPLEMENTING a Quality Management System in National Mapping Agencies

CERCO Working Group on Quality

Summary

This paper, produced by the Cerco "Working group on Quality", provides relevant information on questions about implementing a Quality Management System (QMS). Starting point for this document are the answers received by 23 members of the CERCO Working Group on a questionnaire entitled "Good reasons for implementing a Quality Management System in European National Mapping Agencies". This questionnaire has been sent to all Cerco members in December 1998. The original answers are added as an Annex C, a comparative table between benefits and risks when implementing a quality management system is added as Annex B.

Later on, these answers have been discussed in the Working Group and the global result of answers and discussion are in this paper. Further, this document gives general information on the QMS concept and its applicability in a mapping environment. Main benefits and advantages are compared, with the focus on the issues "Management", "Workers", "Quality", "Users/Customers" and "Promotion". On the other hand, risks and disadvantages in implementing a QMS are mentioned, with special attention for "Increase in production costs", "Missatisfaction" and "More rules without results". Consequently, a potential scenario for the implementation of a QMS inside European National Mapping Agencies (ENMAs) is described.

Finally, some conclusions are gathered, which are pointing towards a positive advise for an NMA about its question "Must/can I implement a QMS", with "ISO 9000" as a possible best reference. But there is also a need for exchanging experiences between ENMAs in this field.

0.- Scope

The purpose of this document is to give to the National Mapping Agencies the relevant information to take an appropriate decision on **what** kind of QMS is required, **why** and **when** a QMS is required

to be implemented, and **how** a QMS must be implemented.

1.- Foreword

CERCO (Comité Européen des Responsables de la Cartographie Officielle) gathers participants from National Mapping Agencies. It has created several working groups for exchanging information and for discussing geographical information issues. During its Plenary Assembly in Cyprus (22/23 September 1997), CERCO decided the creation of the Working Group on Quality (WGQ) to study problems and share experiences among National Mapping Agencies (NMAs) about quality aspects of Geographic Information. The WGQ is working on three main issues: "Quality management and ISO 9000", "Data quality issues" and "Standards".

The objectives of the "Quality management and ISO 9000" issue are :

1. To analyse the opportunity of implementing Quality Management Systems (QMS) in NMAs,
2. To develop arguments for justifying the use of QMS and
3. To give arguments for certification.

Special attention is devoted to the Family of standards EN-ISO 9000, as the more widely used QMS normative reference, in particular to the applicability of ISO 9000 standards to Geographic Information.

A Quality Management System (QMS) can be seen as a complex system consisting of all the parts and components of an organisation dealing with the quality of processes and products. QMS can be defined as the managing structure, responsibilities, procedures, processes, and management resources to implement the principles and action lines needed to achieve the quality objectives of an organisation.

During its fourth meeting held in Paris from 25 till 28 May 1998, the CERCO WG on Quality decided, focusing on "Quality Management and ISO 9000", to work on a document entitled "***Good reasons for implementing a QMS***". The objectives of this discussion are:

- to promote QMS implementation within the NMA's,
- to share common knowledge about the reasons,
- to justify the implementation of a QMS and
- to identify interesting subjects and experiences to be discussed in the field of QMS.

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2.- Quality Management: Definitions and concepts

The quality of a product or service is defined (ISO 8402) as "the totality of its features and characteristics that bear on its ability to satisfy stated or implied needs". Stated needs are the needs described explicitly in the product or service specifications while implied needs are those needs not explicitly specified because they are implied by the common understanding of a product or service (e.g. a book must be readable, an engine must work).

Quality is not an intrinsic characteristic, but it is related to a global perception of user's satisfaction. Quality is a result which is observed when using the product. Thus, it is clear that assessing and checking the quality of a product or service only at the final stage of the production line is not enough and also that first approach should be completed by the quality of the production processes, which concerns the whole organisation by the end. Therefore, there are two main approaches to manage the quality of a product or service:

1. Product quality, dealing with the quality assessment of the final product itself. This approach is outside the scope of this paper.
2. Process quality, dealing with the quality of the processes needed to produce goods or a service, and in a wider sense the quality of the producing organisation.

Referring to process quality, the concept of Total Quality (TQ), closely related to the terms Total Quality Control (TQC) and Company-Wide Quality Control (CWQC), was introduced during the 80s.

TQ can be defined as the implementation in a organisation of a policy aiming the permanent mobilisation of all the staff in order to improve:

1. The quality of its products and services,
2. The effectiveness of its functioning,
3. The appropriateness and consistency of its objectives, and
4. The competitiveness of the organisation,

taking into account the evolution of the environment.

ISO 9000 series of 1994

The family of standards ISO 9000 was first published in 1987 and was reviewed in 1994. The aim was to provide a normative framework and methodology to define a QMS in a consistent way, paying special attention to users feedback throughout the consideration of user's satisfaction as a core concept. There are several standards with different scopes: design, production, inspection and delivery (ISO 9001); just production, inspection and delivery (ISO 9002); and final inspection and test procedures (ISO 9003) (see Annex A for references). These three models are to be used in contractual situations, whereas the ISO 9004, which is the widest quality management standard, concerns a volunteer approach from an organisation. All these standards provide quality requirements, explaining what a QMS must contain, without setting how to achieve them. The results of a QMS consist of a lot of quality proves produced all along the production steps, and giving trust to customers, before they use the product.

New ISO 9000 series

ISO 9001, 9002, and 9003 Quality System Standards will be undergoing a major change in the year 2000. At the highest level, the Standards will now focus strongly on customer satisfaction, process management, and continual improvement. Another big change is the elimination of ISO 9002 and ISO 9003 from the Standard set. In 2000, there will only be the ISO 9001.

The new Standard set consists of:

- ISO 9000:2000 - Quality Management Systems - Fundamentals and vocabulary
- ISO 9001:2000 - Quality Management Systems - Requirements
- ISO 9004:2000 - Quality Management Systems - Guidance for performance improvement

The 1987 and 1994 revisions of the Standard contained 20 separate elements with very little connection between them. The new Standard will be converted from 20 discrete elements to a clause structure consistent with other international Standards like ISO 14001. The four main clauses in the new Standard are Management Responsibility, Resource Management, Process Management and Measurement, Analysis and Improvement.

The new Standard requires that companies have procedures that show the evidence of reviewing customer requirements, quality objectives set at the process level, monitoring processes to determine if the objectives are being met, continually improving processes and assessing customer satisfaction.

World-wide acceptance

The family of standards ISO 9000 is applied over most of the world in a wide variety of activities. For instance, the number of delivered certificates has grown from 125 000 in 1995 to 225 000 at the end of 1997 (in 129 countries). ISO 9000 has become the most used reference for QMS. Lately it has been implemented in some areas related with Geographic Information, as topographic instruments, hardware and software production and delivery.

Applicability for geographic information

How to implement the ISO 9000 philosophy to the production of Geographic Information is partly common to other implementations, partly specific for NMAs. ISO 9000 was primarily intended to goods manufacturing and the question is its applicability to Geographic Information.

However, there is a significant number of implementations of QMS in NMAs, some of them based on ISO 9000, resulting in an amount of experience and knowledge. A questionnaire about those experiences has been circulated among NMAs and analysed by CERCO WGQ.

3.- Report on the Questionnaire

(for a full report see Annex C, for a comparative table between benefits and risks see Annex B).

The ISO 9000 initial subject has been extended to QMS in order that every Mapping Agency could answer even if it has implemented another QMS. The questionnaire structure is based on four main sections as presented in figure 1.

Figure 1. Structure of the questionnaire about Quality Management System

The questionnaire has been sent in December 1998 to 32 Mapping Agencies, to the OEEPE, EUROGI and MEGRIN. 23 NMA's answered this questionnaire and it shows a high degree of interest in that new quality management. 50 % of the NMAs that answered have already implemented a QMS, whereas all the others have intention of doing it in the future. This means that Geographic Information is concerned by improving quality processes and organisation as it is mentioned in other industrial fields.

The results

In this chapter only some general results will be highlighted, as a direct extraction of the answers given. In the chapter 4 and 5 the "good reasons" respectively "the risks and disadvantages" for implementing a QMS will be described, both as a compilation of the questionnaire, improved with the results of the discussions within the Working Group.

General results:

- 80 % of the NMAs having a QMS, adopted the ISO 9000 standards as their reference ;
- Half of them selected the ISO 9001 and their QMS covers their whole organisation.
- ISO 9001 seems to be very attractive because of its chapter about design and specification.
- NMAs with no QMS yet declared their intention of adopting ISO 9000 standards at 30 %;
- The extent and the scope mentioned by these NMA's concern different departments: mapmaking, metrology, cadastre, digital geographic information production, data capture and storage. The picture of a QMS is seen at a detailed level and expected benefits are not clearly set up on the global organisation.
- NMAs having already implemented a QMS cope with the fact that a QMS covers the whole of the organisation, even if it is cut and structured into small independent QMS. The choice of the ISO reference is justified by the fact that it is an international existing model, used in industry, answering to customers' demand, with external requirements, with available support and training.
- Since 1974, the trend of NMAs for implementing a QMS is increasing exponential and has doubled since 1995, following the trend concerning industrial ISO 9000 certification. About 70 % of the NMAs that answered the questionnaire have intention of looking for certification, and three of them have already obtained it. Certification is explained as a way for improving reliability, as an official acknowledgement, and also as a way for having a better subcontracting policy and for maintaining the level of quality inside the organisation.

These advantages and benefits given by NMAs already working with a QMS may be arranged into four classes: they expect to get a better management, to satisfy users' demands, to improve quality of products and processes, and then to answer to external requirements

NMAs who don't have yet a QMS, focused on customers' demand (reliability, trust and credibility), interfaces and co-operation with subcontractors and other organisations, promotion of their public

image, improvement of products and processes, but they are also interested in having compatibility with other NMAs, showing by that way the need of a common understanding.

Disadvantages and risks as fears on the long term consist of the increase of production costs, bureaucracy with more papers without actual results, and then less workers' satisfaction. These elements come from the risk of building a very complex system, with too many documents difficult to update together, with strong procedures slowing down and boring the production staff. The difficulties to convince top management has been mentioned, showing the contrast between effort and time required for implementing a QMS and on the other hand benefits wanted by top staff on a short period.

All NMAs explained their interest for exchanging their experience in QMS. The favourite subjects are the application of ISO 9000 to GI, the procedures and process analysis and also the quality management organisation and documentation. Then three other groups of subjects have been mentioned: education and training and subcontractors, users satisfaction and non-quality costs, and at the end quality management terminology. The interest for the applicability of ISO 9000 standards is justified because there is a crucial importance in finding new ways for improving production processes and quality of products. The subjects about processes, procedures, documentation and organisation are introduced then because the implementation of a QMS is a problem of describing responsibilities, production processes, and thus documentation and organisation between the whole staff.

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4.- Synthesis on good reasons for implementing a QMS

The most important advantages and benefits mentioned by all respondents are summarised in the following (for a detailed list of the issues see Annex C, questions 2.8 and 3.8).

1. Better management and a more effective organisation

The idea of a "better management" includes a strong intention of increasing benefits and productivity, by standing the amount of product inspection and cost investments in production control closely related to the level of users' satisfaction. It also includes explicitly a feasible way for solving organisational problems by defining clearly responsibilities and interfaces, for giving transparent rules applicable by every employee and for introducing continuing improvement as a regular part of day-to-day leadership. It is promoting a philosophy of measurement, calibration and accountability every time where it is required, when any risk may occurs. Costs are saved when quality inspection is positioned cautiously where there is a risk of non-quality.

Both managers and workers have more satisfaction because responsibilities are clear. From that organisational point of view, a QMS seems to be a good tool for reducing overlapping work, for protecting know-how and for reducing training costs when staff changes. It also maintains action lines when managing staff changes. Some answers even state that greater employees satisfaction is one of the biggest benefits of a QMS.

It also helps in subcontracting and selecting tenders.

Organisational problems are the most common cause of failure in GIS projects and a QMS is one of the best ways to improve organisation.

2. Workers' satisfaction and more commitment to the organisation

A well implemented QMS gives not only more satisfaction to the management, but also to all the other employees. With a QMS they have a tool to demonstrate they have done 100% of the job. They also know to whom and where to give a direct feedback on (new) methodologies from their own experience. They will have a clear view on the demands of the customers, in terms of quantity as well as quality.

3. Improved quality of products and services

This means to define the product as close as possible to the users' requirements (specifications) and also to reduce non-conformance and to track what happened during the production. It implies to develop a high control on processes, by describing and harmonising them, observing them, simplifying and optimising them. The knowledge on processes gives the possibility to detect errors, to manage them and to avoid repeating the same error. It also provides control and inspection proves to customers, and in this way it gives more information about the products.

4.

5. Better customer satisfaction

Customer satisfaction relates to the intention of fulfilling customers' needs. A QMS gives a framework for having a consistent and improved approach to customers. It may provide a better definition for users' requirements (specifications) as well as a standard process for handling complaints. It also provides a model for customers as well as partners in which it is clear how and where needs have to be explained and who has to translate these needs into specifications, or who is responsible in case of a claim, and how the claim has to be put in.

6. Promotion

One main reason mentioned is that some NMAs just have to satisfy rules or laws of their country, with a compulsory aspect. A QMS may also have to improve the corporate image of the organisation. It eases the co-operation among NMAs, by standardising rules inside the quality management field.

5.- Synthesis on risks and disadvantages in implementing a QMS

Although there are a lot of advantages and benefits in favour of the implementation of a QMS, it is obvious that there are some risks and disadvantages which can be foreseen and prevented when implementing a QMS in a NMA. It has been recognised, as an outcome of the questionnaire performed, that the most important risks are (for a detailed list of the issues see Annex C, question 2.10):

1. Increase in production costs.

This risk seems inevitable in the short time. But to have a balanced analysis the extra cost of implementing a QMS should be compared to non-quality costs, which are not easy to evaluate.

QMS costs must be considered not as an extra cost, but as a way to organise production and thereby to save costs. And anyway, quality investments for quality inspection or quality management have to be related with the level of users' satisfaction. The point is not to do the best, but to do exactly what the user needs. That philosophy implies to be very careful when introducing a quality procedure: its cost has to be justified by its added value.

2. Dissatisfaction of workers because of new methodology.

The implementation of a QMS is an organisational and technological revolution with the same global characteristics as other revolutions, like computer technology, data communications technology, open systems, and so on :

- A qualitatively new situation, not easily comparable with the previous one
- Dramatic changes in the methods applied in daily tasks
- Natural resistance of workers against the changes
- Big effort in education and training needed

The revolution is inevitable and only the organisations succeeding in the process are able to survive on the long term.

To avoid that risk, the best solution is based on the idea of presenting the new methodology as a tool to help people to do their work better. Giving the opportunity to the humanware of defining and describing quality controls can be seen as a way to integrate people in the organisation. If quality controls are fully documented, workers have a way to demonstrate, in the more objective possible way, that they have done their tasks perfectly.

The motivation is the key idea to get a successful implementation of a QMS.

3. Another set of rules and papers without actual results.

This is the wrong effect when implementing another bureaucracy without having a conceptual revolution inside the organisation to change the management paradigm.

That risk may be avoided by writing short procedures, only when needed. Asking the point of view of people who are concerned and who daily apply the procedures is a good mean for fitting the quality documentation system. The continuous process for evaluating the work already done is also a way to be mentioned: little by little the quality system is simplified and becomes more efficient.

4. Other points considered less essential but also mentioned are :

- Decrease in production figures.
- More difficult subcontracting .
- No improvement of the quality level in the final product. This risk is actually not completely true, because a fully documented product is a better product, although its quality remains exactly the same. The basic difference between a production process without a QMS and with a QMS is that :
 - In the first situation something is produced, but nobody knows the final product in deep. Only fuzzy descriptions are available.
 - In the second case, everybody knows sharply the final product, which is identified and described precisely.
- Less user's satisfaction.
- Updating of different quality manuals takes a lot of time.
- Difficulties to convince top management : Implementing a QMS takes a lot of time and effort, whereas top management wants benefits on a short period.

6.- Potential scenario for the implementation of a QMS

The final result of the implementation of a QMS in a NMA depends on a number of factors:

- What are the improvements the organisation is looking for;
- Depending on that: what kind of QMS is applicable, and
- On which department(s) and process(es) this QMS has to be put into practice.

Good answers on these questions, provided with good arguments, are of crucial importance. To that aim this document should foresee how ENMA's will develop in the new century and mainly what the different national governments expect from NMA's.

At the moment, and as a simple conclusion arising from the questionnaire, a National Mapping Agency should, probably, comprise the following tasks in its quality management system :

- Map production.

- Digital geographic information production.
- Cadastre / Real Estate information.
- Commerce and marketing.
- Metrology.

All these tasks are considered more and more from a business approach. This is maybe the main reason for dealing with the implementation of the QMS in our NMA's.

Indeed, previously, the NMA's have been big organisations characterised by:

- Funding/income from governments.
- Performing a public service.
- Great number of workers.
- More technology than business driven.
- Standardised quality of the product (geodetical, network, data, model etc....).

However, since a decade ago, some NMA's have moved to a new approach where optimising the ratio between incomes and expenses becomes the nucleus of the whole activity.

Beside this new approach, the technical evolution in the Geographic Information field provides different tools which enable more various applications, setting then the issue of data to be used for multi-purposes and having to meet very different customers expectations.

The enlargement of the GI market is combined with an increase of customer requirements for the quality of the products. It sets the need for explaining the quality of GI and that need requires to show the way GI is produced, going by this way further than only final quality inspection figures.

If this trend continues, and, as it is expected, geographic information becomes a real need in the European society, the scenario will be as follows :

- Europe will have to converge in cartographic matters.
- NMA's will have to survive via a more effective GI production.
- The NMA's behaviour will not differ too much from any other company in Europe.
- The complexity and the demand of the market will require more transparency on production matters.

Regarding this scenario, all solutions aiming to improve the ratio incomes/expenses are welcome. Therefore quality management appears to be implemented for improving at the same time the organisation of the production lines inside the NMAs' and also for better meeting customers expectations.

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7.- Conclusions

The questionnaire has been a very valuable experience and the participation rate shows that the subject is completely relevant for NMAs. The quality management concept combines a better care of customers and also a continuous improvement of the whole organisation. Quality management appears as a new way for improving the quality of the product.

The following conclusions can be taken:

1. All NMAs answering the Questionnaire and having implemented a QMS valorise at the end the cost/benefits ratio as good.
2. The most mentioned and appreciated benefits identified by NMAs with a QMS are :
 - a. A better management and a more effective organisation
 - b. An increase of workers' satisfaction and more commitment to the organisation
 - c. The improvement of products and services
 - d. A Better users' satisfaction
3. There are some risks in the process of implementing a QMS, especially on the short term, but they are the kind of risks that appear in relation with a technological revolution. These risks may be avoided by prevention.
4. Each Mapping Agency who answered the questionnaire is convinced of implementing a QMS. The best reference according to the answers is ISO 9000. The question pending is which part of the ISO 9000 Family is actually appropriate ; this question may be solved by the new version of the standard. The attitude towards certification is various.
5. In the potential scenario for NMAs in the beginning of the next millennium, a first objective appears: to get the more versatile achievable position regarding QMS. This implies to implement a QMS ISO 9000 – like in order to have the possibility of getting the certification in a short period of time if it is required.
6. NMAs may exchange their experience through interpreting ISO 9000 chapters in the context of Geographic Information. The next step may be to analyse the methods for implementing a QMS, to compare the difficulties and the solutions which have been set within the different NMAs. There may arise a common guideline for implementing a Quality Management System suited to Geographic Information for Mapping Agencies in Europe : an "handbook for implementing a QMS in a mapping agency", including frequently asked questions and practical

keys for the applicability of ISO 9000 to Geographic information.

Annex A.

REFERENCES

ISO 8402:1994 *Quality management and quality assurance — Vocabulary.*

ISO 9000-1: 1994 *Quality management and quality assurance standards. Part 1: Guidelines for selection and use*

ISO 9001: 1994 *Quality systems – Model for quality assurance in design, development, production, installation and servicing*

ISO 9002: 1994 *Quality systems – Model for quality assurance in production, installation and servicing*

ISO 9003: 1994 *Quality systems – Model for quality assurance in inspection and final testing*

ISO 9004-1:1994 *Quality management and quality management system elements*

Annex B.

COMPARATIVE TABLE BETWEEN BENEFITS AND RISKS WHEN IMPLEMENTING A QUALITY MANAGEMENT SYSTEM

CATEGORY	EXPLANATION OF ADVANTAGES	
STUFF		
MANAGEMENT		
COSTS	Decrease in organisational costs but only in the long term. Guarantees cost recovery of non-quality products.	I
BUREAUCRACY	Set of rules to help daily organisational problems.	M
PRODUCTIVITY	Increase of productivity in the long term. Increase of benefits.	I

SATISFACTION	Clarifies tasks, processes, procedures	S
ORGANISATION	Organisation improvement. Increase of effectiveness.	T
SPECIFICATIONS	It is a way to have external feedback to improve management, work, products, etc.	N
TENDERING	Eases the subcontracting due to having a greater knowledge of things wanted.	M
EDUCATION	People may abandon. Organisation and processes will survive.	M I
FUZZINESS	Decreases fuzziness. Helps to identify processes and responsibilities.	X
WORKERS		
SATISFACTION	Clarifies tasks, processes and procedures	C V
ERROR MANAGEMENT	Helps to identify bad habits. Feeds with information to eliminate errors.	C
WORK LOAD	XXX	I
NEW TOOLS	New methodology to help to improve each one tasks.	V a
FUZZINESS	Workers have the means to know how the organisation behaves and how exactly products are.	V
SOFTWARE	Helps to improve tasks and feed internal knowledge about the organisation	N
COMMON LANGUAGE	Improves the understanding among different layers inside organisation	X
QUALITY		
COSTS	XXX	I
ERROR MANAGEMENT	Helps to identify existing errors and misunderstandings.	C
PRODUCTS	Improves quality of products and services. It will probably increase sales and external projection. Helps to exactly produce and service what users want.	T t
USERS/ CUSTOMERS		
EDUCATION	Improves the relationship and eases commercial transactions.	C
SATISFACTION	Improves approach to customers. They notice their requirements being fulfilled.	X
FUZZINESS	Identification of responsibilities. Customers know exactly to whom they must talk to.	X

COMMON LANGUAGE	Helps to avoid incidents, misunderstandings and unexpected events between user/producer.	λ
PROMOTION		
EXTERNAL IMAGE	Raises the image towards users/customers	λ e
COMMUNICATION	Eases co-operation among NMAs by standardising rules to communicate among actors.	λ
CORPORATE IMAGE	Fulfilment of national laws	λ

Annex C.

GOOD REASONS FOR IMPLEMENTING a Quality Management System in National Mapping Agencies

CERCO Working Group on Quality

REPORT on the QUESTIONNAIRE

Answers received: 23 answers from 23 (National or Local) Map Agencies of a total of 31 NMAs consulted (74 %), see Appendix A.

1. Have you implemented a Quality Management System (QMS) in your organisation?

12	YES	11	NO
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2. If the answer to question 1 is YES : 3. If the answer on question 1 is NO :

2.1. Main reasons for implementing a QMS: 3.1. Are you planning the implementation of a QMS?

3.2. What are the main reasons for that decision

(if the answer is YES or NO):

2.2 *Is your QMS based on a reference ?* **3.3.** *Will your QMS be based on a reference ?*

2.3. *If your QMS is based on the family of standards ISO 9000,* **3.4.** *If your QMS will be based on the family of standards ISO 9000,*

which one is it? which one will it be?

If based on an other reference, precise which one. If based on an other reference, precise which one.

2.4. *What is the scope of your QMS (which departments* **3.5.** *What will be the scope of your QMS (which departments or processes in your organisation) ? or processes in your organisation)?*

2.5. *If your QMS is based on a reference (according to 2.2),* **3.6.** *If your QMS will be based on a reference (according*

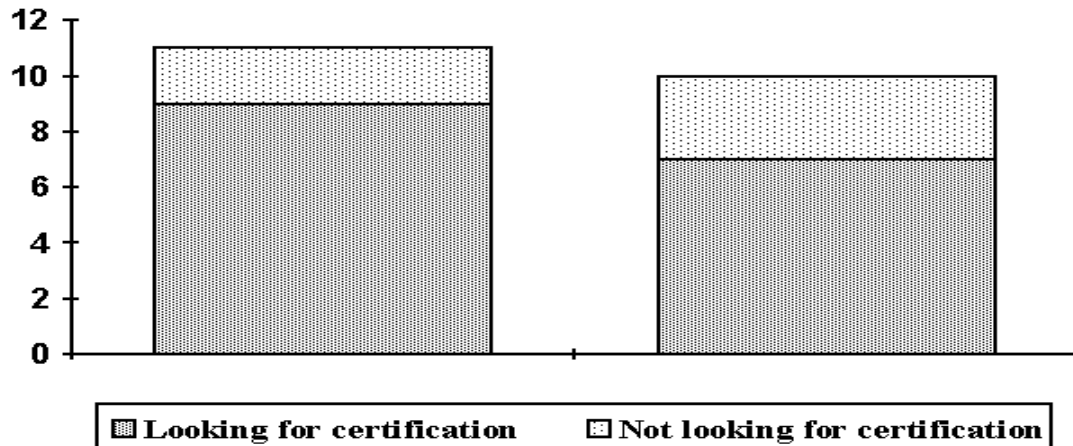
for which reasons have you chosen that reference to 3.2), for which reasons will you choose that

rather than another ? that reference rather than another?

2.6. *When did you start the implementation of your QMS?*

2.7. Do you have any intention to look for certification, or do **3.7.** Do you have any intention to look for certification?

you have already a certification? Reasons for that decision?



Reasons for that decision (if the answer is YES or NO)?

When it is planned to obtain it or when has it been obtained?

1 NMA: still an open question.

There are three NMAs ISO 9000 certified: United Kingdom, When it is planned to obtain it or when has been obtained

Switzerland and Turkey. It ? No answers!!

2.8. Which benefits of the following types have you identified **3.8.** What do you

foresee as the main advantages or benefits,

as a result of the implementation of a QMS ? of each one of the following types, of the implementation

of a QMS?

Type 1 benefits: Quantitative advantages/improvements in existing processes inside the NMA.

Type 2 benefits: Quantitative advantages/improvements in related processes, being those processes existing ones or new ones.

Type 3 benefits: Quantitative advantages/improvements that result from unexpected events.

Type 4 benefits: Intangible benefits, or benefits that produce intangible advantages

2.9. & 3.9. *Please, use the proposed numbering to place the identified benefits in order of decreasing importance (from the most to the less important), from your point of view.*

Note 1: The subdivision in types of benefits where was asked for was in most answers not followed, and therefore skipped from this report.

Note 2: Each paragraph in Appendix C and D corresponds to the benefits identified by a different NMA

Summary		
11	Organisation/efficiency	
7	Avoid/learn from mistakes	
6	Increase/control/assess quality	
4	Achieve confidence by users	
3	Cheaper	
3	Staff	
2	Subcontractors	
2	Quicker	
2	Preserve competence	
1	Usage/income/benefit	
0	Co-operation	

For a total view on all the answers given, see Appendix C

For a total view on all the answers given,

2.10. *Which risks or disadvantages have you identified during
the implementation of the QMS?*

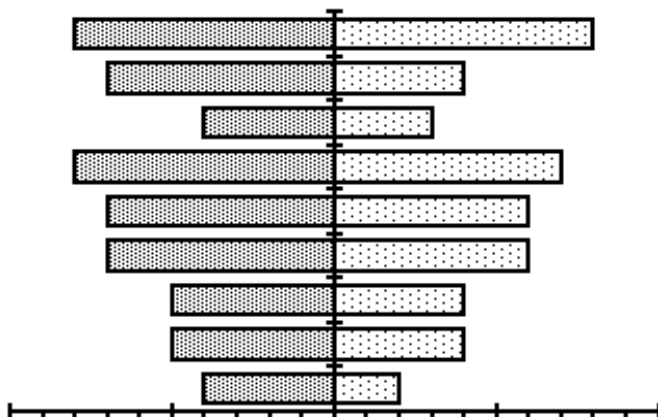
2.11. *Do you think the benefits/costs ratio arising from your
experience with QMS is:*

1	Excellent	1	Poor
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12	Good		Very poor
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2.12. *Comments or any kind of relevant information not 3.10. Comments or any
kind of relevant information not
considered in the items above? **No comments.** considered in the items above?
No comments.*

4. Which kind of experiences or subjects related to QMS implementation would you like to discuss with other members of WGQ ? (especially during the next seminar of the WGQ in June 1999)



Appendix A.

Acknowledgements

CERCO/WGQ expresses its acknowledge for the co-operation and for the information provided by means of answers to the questionnaire to :

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Institut Cartogràfic de Catalunya Spain

Federal Office of Metrology and Surveying Austria

National Survey and Cadastre Denmark

Fömi Hungary

National Land Survey of Finland Finland

Ordnance Survey Ireland Ireland

Institut Géographique National France

Federal Agency for Cartography and Geodesy Germany

Office fédérale de topographie Suisse

Geodesy Cartography and Cadastre Authority Slovak Republic

Surveying and Mapping Authority Republic of Slovenia

Instituto Geográfico Nacional Spain

Istituto Geografico Militare Italy

National Office of Cadastre, Geodesy and Cartography Romania

Topografische Dienst The Netherlands

Hellenic Military Geographic Service Greece

National Land Survey Sweden

List of members of the working group on quality who participated to write, to review or to discuss this paper :

Antonio Rogriguez, IGN-Spain

Joaquin Rodriguez, CNIG-Spain

Laure Dassonville, IGN-France

Toon van Roosmalen, Topografische Dienst-The Netherlands

Hakon Wikstrom, NLS-Sweden

Paola Ahonen, NLS-Finland

Thierry Mercier, IGN-France

Knut Olav Sunde, SK-Norway

Tom Otto Husvik, SK-Norway

Dolors Barrot, ICC-Catalunya

Turgut Kurttekin, GCM-Turkey

Jorgen Giversen, KMS-Denmark

Emo Pogorelcnik, SMRS-Slovenia

Karl Haussteiner, BEV-Austria

Gerry Wade, Ordnance Survey - Ireland

Vaclav Slaboch, CUZK-Czech Republic

Appendix B.

Overview of all the answers given on question 2.1.

- **Increases profit and productivity**
- **Provides an effective management**
- **Provides wide inspect and control on all activities**
- **Is demanded by customers**
- **Is an international model to be applied**
- **Is a model to document the quality system**
- **Reduces dual work and non-conformance: improves quality of products and services**
- **Assignment control and cost effective satisfaction of users needs and expectation (internal and external)**
- **Execute the Act LXXVI of 1996 on the surveying and mapping**
- **To better manage our different processes**
- **For a better control on our products and for improving our global organisation**
- **Own intention and necessity of quality assurance**
- **Customer demands**
- **The implementation of a QMS in our Organisation as model for clients and partners**
- **Writing determined process cycles (mainly Project handling / "Design" and clearly defined responsibilities)**
- **To solve organisational problems**
- **To provide better services to users**
- **To optimize processes, to maintain action lines when staff changes.**
- **Controlling digital data topographic and cadastral map production**
- **Make high quality maps and fulfil the customers´demands.**

Appendix C.

Overview of all the answers given on question 2.8.

- Records of education/training; users' (or customers & rsquo;) satisfaction review of contracts
- Improvements to existing products and services
- Analysis and (some) simplification of technical and business processes
- More consistent, improved approach to customers
- Reduced training costs for new recruits
- Difficult to assess because other initiatives (restructuring of organisation, new pay bands) had an impact
- Accountability, measurement and consequence, but still a long way to go
- Providing constant quality level of surveying and mapping base data on the field of accuracy, attributes and updating, and related process
- The lead-time of the land survey process has decreased
- The production costs of the topographic maps have decreased
- The usage of our datasets has been increased / more income for digital products
-
- To save time and quality by protecting know-how and practices when staff changes
- To save costs by positioning and defining quality controls regarding risks which could appear if there was no control.
- To reduce quality inspection done by internal customers with the quality proofs given by producers
- To avoid overlapping works
- To save time by managing incidents and errors (it avoids to repeat same errors)
- To have a feedback with experience (well done the first time and same error avoided on the second time)
- To know how to manage unexpected events: we know how to deal them methodically and we save time, costs and quality (to reduce risks)
- To have a common language (by quality education and training)
- To get visibility and explanation on organisation and processes
- To get a better organisation : responsibilities are defined more precisely
- To describe relationships between departments
- To improve customers confidence by providing them quality control results
- Better quality assurance
- Defined/descr
- Better relation such organisatio organisations wh the "same langua
- Better relation (improvement/pr
- Optimisation i complaint (after c
- A very good p organisation "ca "federal office of procedures/interl
- More transpa
- Standard
- Identific
- Quality I
- Improve processe
- Improve paper ac
- Standard
- Protectic humanw

Appendix D.

Overview of all the answers given on question 3.8.

- Define Staff responsibility more precisely.
- Improve organization.
- More customers for our data and services
- Easier follow up of production processes and less
- To create easy
- The optimisati

- Optimize processes.
 - Better relation with subcontractors.
 - Own public and corporate image.
 - Reflections on private sector development.

 - Improves working efficiency
 - Identifies duplicated or wasteful practices
 - Clears responsibilities and role for every employee in organisation
 - Improves working processes with subcontractors
 - Improves co-operation with other organisations
 - Improves data integration with other registers
 - Customers are more satisfied and trusting us more
 - Attitude improvement to our organisation
- demanding training and education of new personnel
- Higher credibility and better reputation of the Agency or company with an introduced QMS.
 - To know better limits of processes
 - To detect errors and problems earlier
 - Well documented processes
 - To satisfy users and customers

 - To pave the way for the introduction of management by objectives (which is a precondition for quantifying the QMS's benefits)
 - Improved customer orientation
 - To support the reform-induced workflow management (staff reduction, reorganisation)
 - To ensure that the BEV is capable of fulfilling its tasks with reduced staff (as mentioned before)
 - More transparency across divisions -and departments
 - To promote process ownership (staff's responsibilities)
 - To secure know-how for the BEV through the QMS
- To avoid double
 - To protect know
 - To define the r
 - Easier to connect processes
 - To harmonise i
 - To raise the quality (organisation)
 - To reduce the i from our customers

 - The product conformit
 - The quality
 - We have t knowledg firms
 - To have a standards
 - General a digital sh