EuroGeographics

www.eurogeographics.org

CONNECTING YOU TO THE
AUTHORITATIVE GEO-INFORMATION
FRAMEWORK FOR EUROPE

Quality Management Practices in European National Mapping and Cadastral Authorities

Carol Agius

SDMQ2015: INTERNATIONAL WORKSHOP ON SPATIAL DATA AND MAP QUALITY

Changes in Geospatial Industry

- Although there has been an increase of competition from private sector providers, geospatial data remain expensive to collect, manage, and to maintain on a national scale. And since ultimately private sector providers are driven by return on investment, it is likely that government will remain the sole provider of trusted, quality, authoritative reference data at national levels.

Future trends geospatial information management in the next decade

- The United Nations Initiative on Global Geospatial Information Management (UN-GGIM) has recently published a vision document expressing expert views of the future trends of geospatial information management in the next five to ten years. The document states that there will be an increase in the use of, and reliance on, geospatial information. There will be changes in the traditional funding model of governmental bodies involved with managing geospatial data which will force NMCAs to implement cost efficiency measures by out-sourcing primary data collection.
- However NMCAs will still be bound to provide quality assured geospatial data to their customers, especially if the reference data are increasingly used in critical decisions. The UN-GGIM expresses the opinion that the role of NMCAs will transform from one of primary data collection to defining and maintaining quality standards together with managing the delivery and integration of geospatial data from various external sources.

Quality in NMCAs

- Traditionally product driven:
  - Conformance to specification
  - Standards driven
  - Quality elements:
    - Completeness
    - Logical Consistency
    - Topological Consistency
    - Positional Accuracy
    - Temporal Accuracy
    - Thematic Accuracy

Previous Studies

- Over the past 12 years EuroGeographics carried out three surveys to gauge the level of adoption and implementation of QMS amongst the member organisations.
- The surveys were conducted in 1998/1999, 2005 and 2012.
- The results show that implementation of quality management systems increased over the survey period
- In 1999, half the respondents confirmed that they had implemented a QMS; by 2012, two thirds of the organisations responded that they had already implemented or were developing a QMS.
- The same surveys indicate that, while in the first survey 80% of the NMCAs implementing a quality management system adopted the ISO9000 standards, this had dropped slightly to 67% by the third survey in 2012
- Only approximately 20% of respondents of the 2012 questionnaire indicated that they were using Lean or 6 Sigma tools, and none were implementing TQM principles

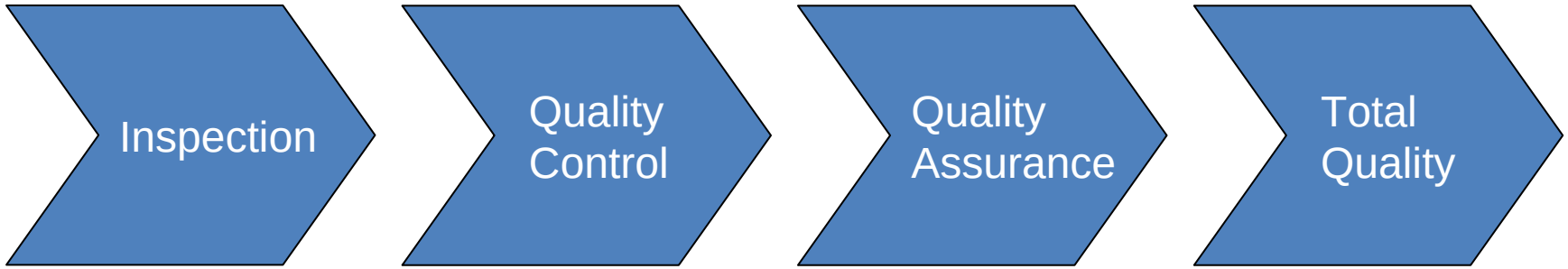
Benefits of implementing QMS

- Academic literature suggests there is documentary evidence of a positive link between the implementation of QM practices and improvements in organisational performance and innovation.

Implementation of Quality Management System

- Many consider ISO9001 a quality management initiative that focuses on the hard, more technical aspects of quality management practice.
- ISO9001 is viewed as the first step towards implementing a more holistic quality management practice that includes both soft and hard factors.

Four Levels in the evolution of quality management



Reactive corrective action

Prevention based systems

Quality management initiatives

- Standards and awards:
  - ISO9001
  - EFQM Excellence Awards
- Initiatives:
  - TQM
  - Lean
  - Six Sigma

Holistic QMS

- The concept of quality has to include the entire organisation
- to reap the benefits of organisational performance improvement and innovation it is necessary to adopt all the aspects of TQM; the factors are interdependent and should all be implemented together as a system

Critical Factors important for implementing a total quality management initiative:

- top management commitment
- supplier management
- employee involvement
- quality information
- continuous improvement
- customer focus
- process management
- training and education

These eight critical QM factors can be categorised as:

- hard factors - dealing with the more technical aspects of quality management: continuous improvement, quality information, and process management;
- soft factors - more people focused: top management commitment, customer focus, employee empowerment, training and education, and supplier management.

Top Management Commitment

- Total quality can only be initiated by the top executive and will not succeed if top management do not personally believe in it
- The vision and quality values are conceived and developed by top management, but it is through their demonstrated commitment, actions and involvement that this vision will "transcend" and inspire the entire organisation

Supplier Management

- Managing and building relationships with suppliers is a key factor in QM practice, associated with increased organisational competitiveness
- Dealing with fewer dependable and trusted suppliers allows faster information sharing, stable deliveries
- the possibility to rely on supplier end quality control, and the opportunity to develop products together with suppliers
- Supplier management relationships help to instil quality improvements at the onset of the production or service chain, ultimately culminating in customer satisfaction

Employee Involvement

- Employee involvement is the central concept in involving all the organisation's human resources, skills and talents towards striving to satisfy the customer
- an innovative workforce that is continuously questioning the status quo and striving to improve, and which is given the responsibility to make decisions.
- Empowerment is a motivator; allowing the employees to align their growth, personal development and aspirations with those of the organisation will ultimately improve performance, productivity and quality

Quality Information

- An organisation that is committed to continuous improvement needs to actively measure, collect and analyse information from all aspects of the business.
- Customer information assists in the understanding of the market and customer expectations, providing the basis for innovation
- Adoption of statistical process control provides information that can improve and reduce process variability
- The communication and feedback of the quality data to the appropriate levels of the organisation are key factors in the continuous improvement loop that culminates in improved organisation performance.

Continuous Improvement

- Continuous improvement comes from awareness that mistakes are an opportunity to improve and innovate, by developing the organisational ability of learning from mistakes and corrective action
- five activities for continuous improvement: sharing information by constant communication, identifying and correcting obvious problems, looking for causes of problems upstream, documenting the problem and solution, and monitoring the process after changes are implemented.
- Continuous improvement encourages change which, in turn, prompts the development of new products and services

Customer Focus

- it is necessary to identify who the customers are, and to proactively seek and determine their expectations.
- Knowledge of the customer needs and expectations is the initial step in the innovation process , as well as a strategic competitive advantage
- the driver for innovation necessary in order to keep abreast of the market's ever evolving needs.

Process Management

- Process management and improvement results in efficient productivity
- establish process owners, who have clear boundaries and an understanding of the process flow and steps
- Being closest to the actual process, process owners are best positioned, and should be empowered, to suggest change, improvements and innovations
- Process innovation will increase productivity and product quality through less reliance on inspection, elimination of waste, and increased efficiency

Training and Education

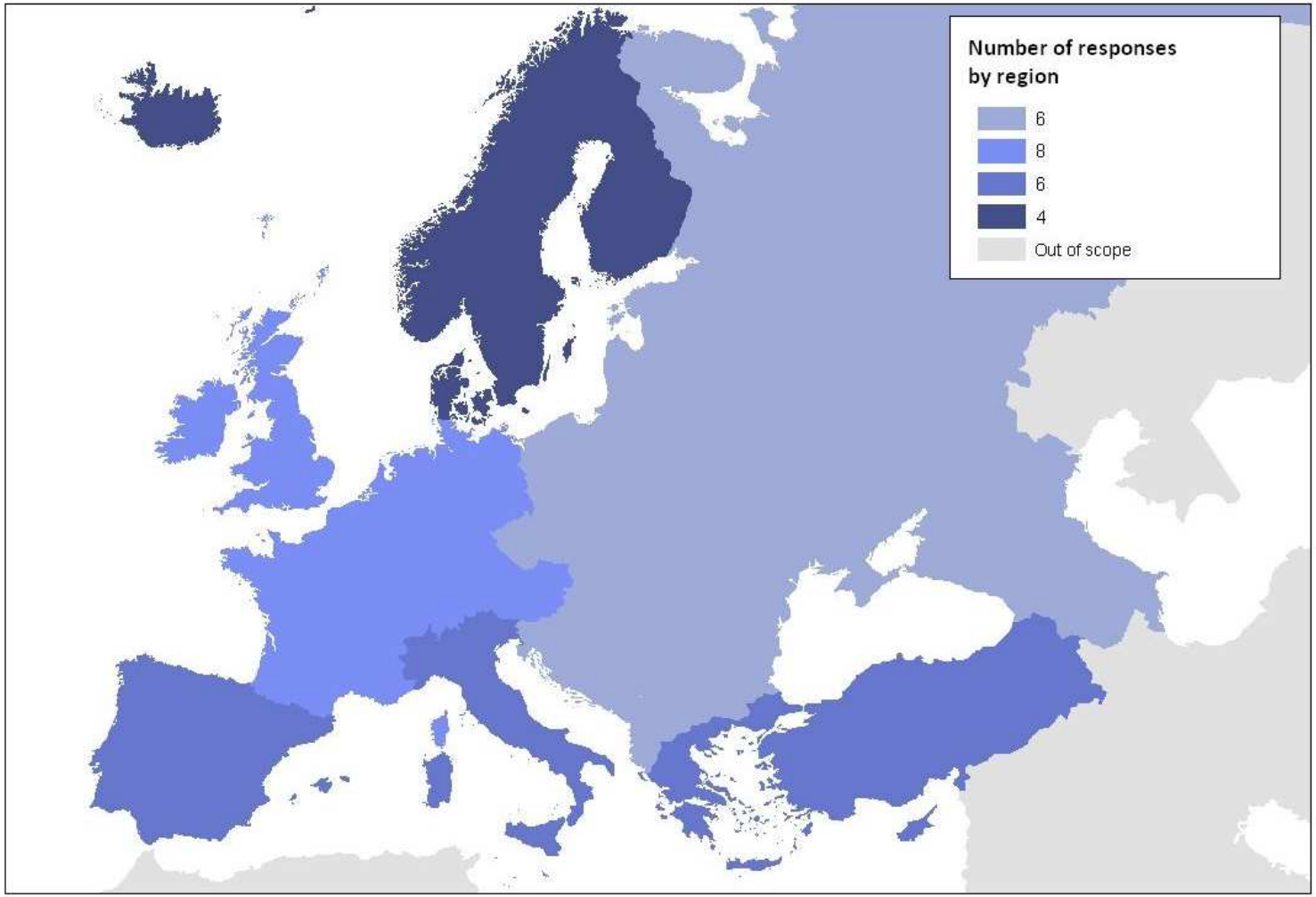
- Employees are expected and encouraged to search for and implement improvements and innovations
- In order to do so, the entire workforce should receive training and knowledge in the right skills to not only develop personally but also participate in the continuous improvement activities of the organisation

Research Aim

- To what extent are European NMCAs implementing quality management practices?
- Can these practices be improved upon to reap more benefits from QMS?

Methodology

- Self-completion questionnaire sent to EuroGeographics members
- On-line survey, in English, closed questions
- 25 complete responses out of the total number of 61 European NMCAs
- response rate of the survey was 41%.



Response rate by geographic region

Questionnaire design and aims:

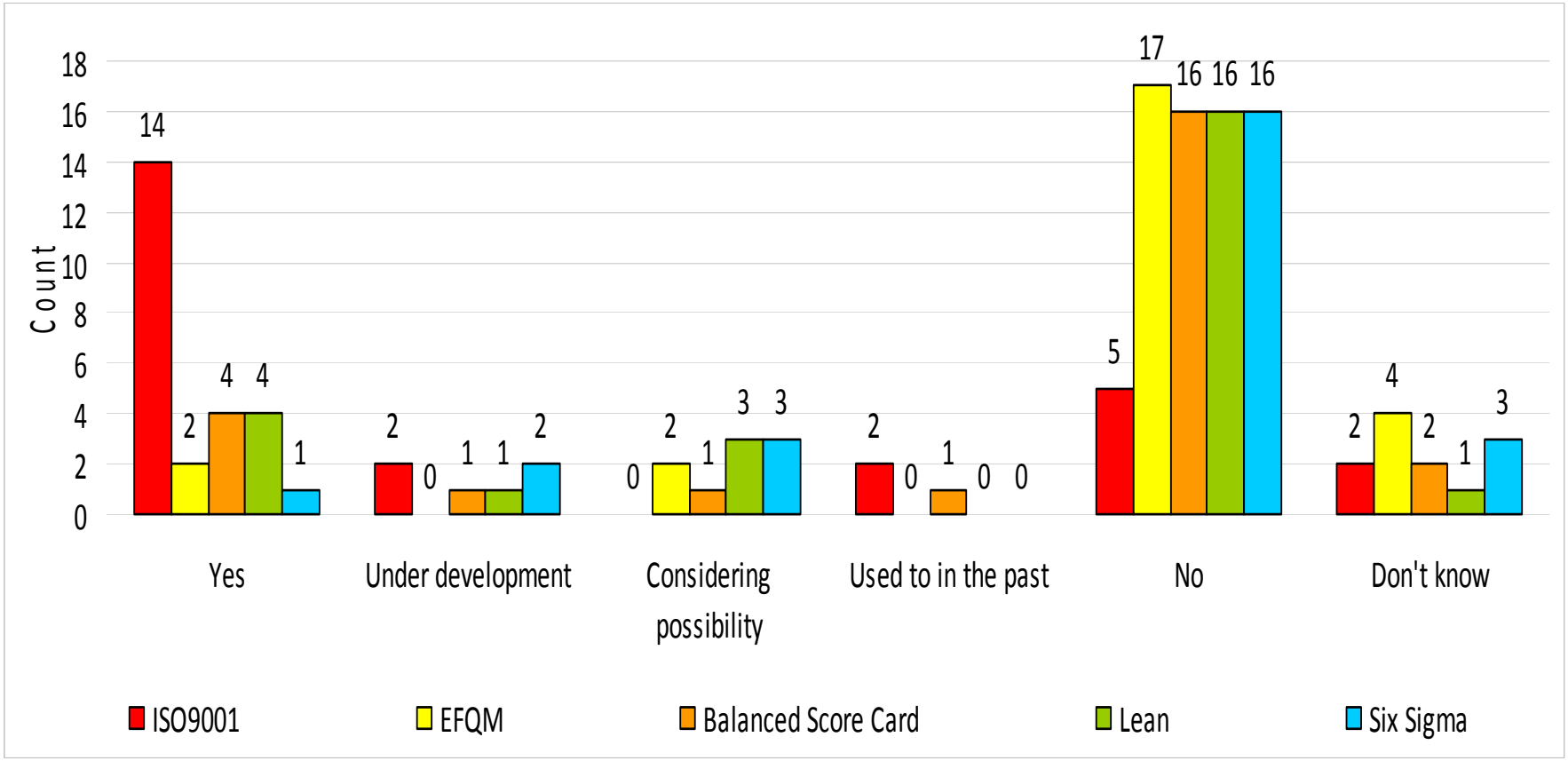
- The first section of the questionnaire was designed to discover whether European NMCAs implement a QMS, to what extent the QMS covers the functions of the organisation, and whether the QMS is modelled within a formal or standard framework, such as ISO9001, EFQM, or other quality management principles.

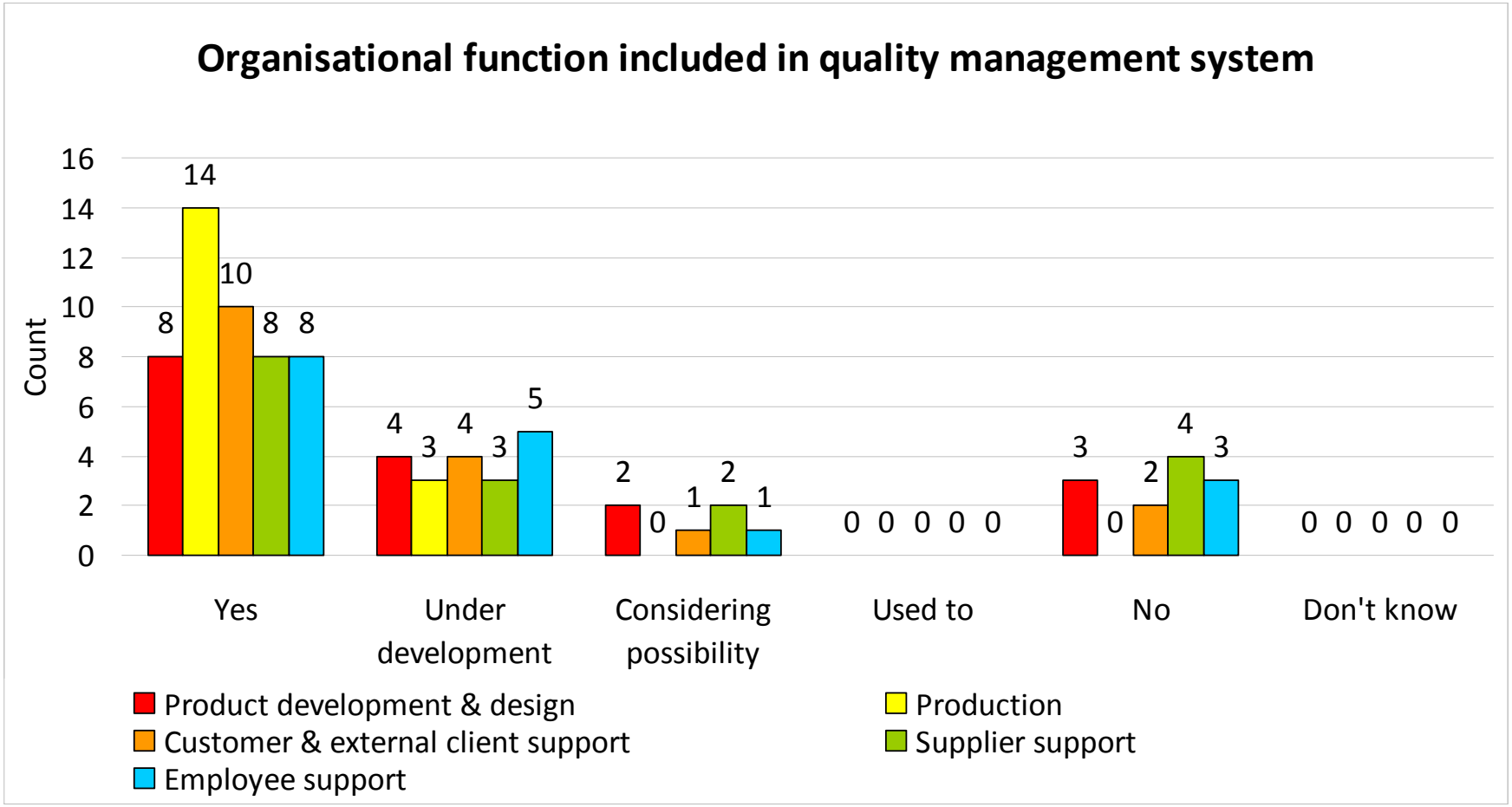
- The second section of the questionnaire was designed to examine the importance the respondents placed on the eight quality management critical factors identified in the literature review. This section of the questionnaire also sought to discover to what extent these eight quality management factors are being applied in practice in the respondents' organisations.

Do NMCAs implement a QMS?

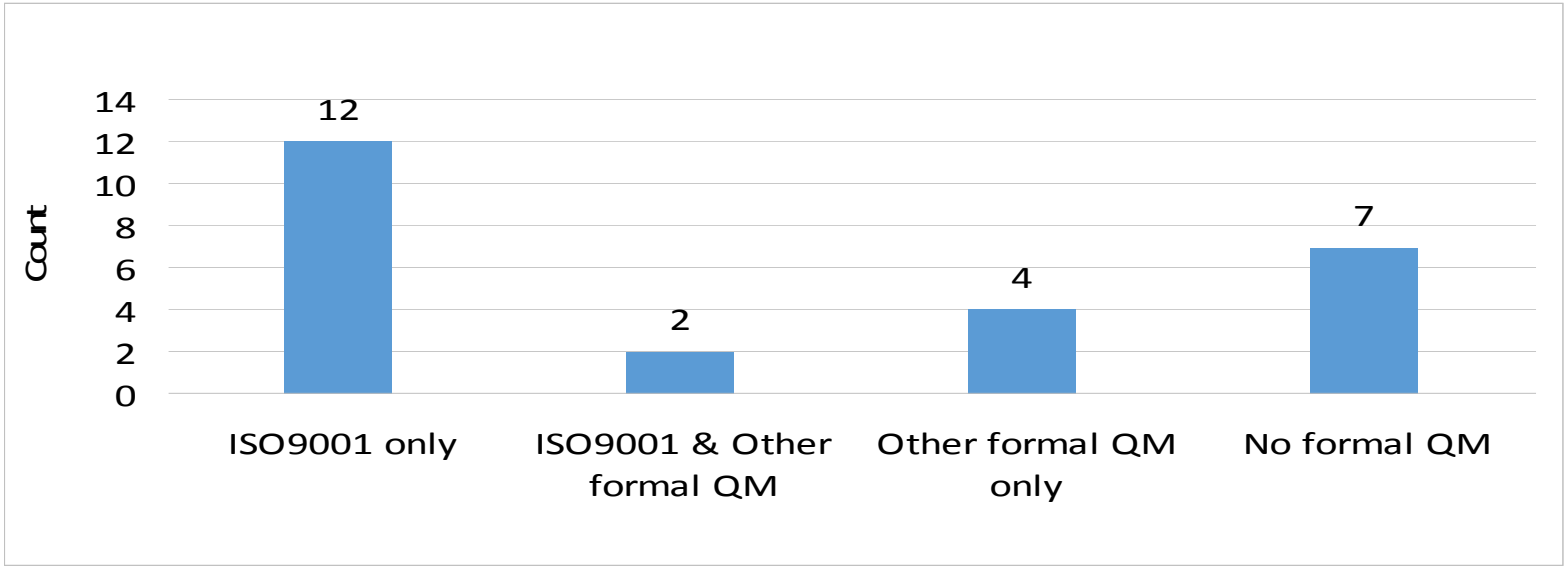
- 17 of the respondents (68%) do

Quality management practices implemented in European NMCAs




Organisational function included in quality management system
Count
16
14
12
10
8
6
4
2
0
8 14 10 8 8
4 3 4 3 5
2 0 1 2 1
0 0 0 0 0
3 0 2 4 3
0 0 0 0 0
Yes
Under development
Considering possibility
Used to
No
Don't know
Product development & design
Production
Customer & external client support
Supplier support
Employee support

Organisations apply more than one quality management initiative at the same time



Just under half of the 25 respondents implement ISO9001 to the exclusion of any other QMS. Two respondents that implement ISO9001 concurrently apply other quality management initiatives, namely EFQM, Balanced Score Card or Lean. Four other respondents exclusively implement quality management initiatives that do not include ISO9001.

Critical factors ranked by importance to survey participants			
Rank	**Factor**	**Mean**	**Standard Deviation**
1	Top management commitment	4.28	0.94
2	Continuous improvement	4.20	0.96
3	Customer focus	4.20	1.00
4	Quality information	4.00	1.04
5	Process management	3.96	1.06
6	Employee involvement	3.88	1.01
7	Training and education	3.80	1.08
8	Supplier management	3.52	0.96

Results: Application of Hard Factors

- quality information for production and product quality are collected and communicated most frequently to supervisor level. However, quality information on the functions outside production, such as human resources and supplier management, is gathered less than half the time

Results: Application of Hard Factors

- process management; the respondents indicated that their organisations focus on identifying, documenting and assigning process ownership of the production processes more than on processes in other organisational functions

Results: Application of Hard Factors

- Continuous improvement was the quality management factor that ranked the second highest in importance for the research participants. However, the respondents indicated that, in practice, continuous improvement actions are implemented in approximately half of the instances when problems are identified

Results: Application of Hard Factors

- The respondents did indicate that quality information collected for production and product is used for direct action and improvements. In addition, the results indicate that processes are periodically reviewed and updated. These actions contribute towards continuous improvement.

Results: Application of Hard Factors

- It can be implied from these results that the European NMCAs that participated in this survey implement the hard quality factors with a bias towards production and product quality.

Results: Application of Soft Factors

- Top management commitment was the factor that was ranked as being the most important quality management factor by the respondents
- The responses suggest that while top management develop the organisational values and mission in the majority of the respondent organisations, they fall short in not communicating and actively participating in the implementation of the quality initiatives
- it seems that those organisations only implementing ISO9001 have a higher perception that quality is the responsibility of the quality department rather than the entire organisation.

Results: Application of Soft Factors

- more inclined to passively receive volunteered customer feedback rather than proactively seek out what the customer needs are and develop products and services based on these requirements
- When proactive customer feedback is solicited, this is more likely to be on existing products, or prior to the launch of new products.
- The implication of not consulting with and involving the customer in the earlier stages of the product development stage is that the NMCAs risk not providing innovative products that meet the changing needs of the customer.
- Non-ISO9001 respondent organisations seem to display a higher inclination to involve the customer in all the stages of the product life-cycle.

Results: Application of Soft factors

- Non-ISO9001 respondent organisations tend to show a preference for building relationships with their suppliers, being more inclined to work with a small number of pre-approved and accredited suppliers, and providing them with quality assessment tools
- Conversely those respondents that only implement ISO9001 are more likely to issue fresh procurement calls, select the lower bidder, and perform thorough quality control checks of deliveries, suggesting that their dealings with the suppliers are not based on relationships or trust.
- This implies that the opportunity to develop products in conjunction with suppliers is lost.

Results: Application of Soft factors

- Skilled and empowered employees are a key prerequisite for innovation; the results from the survey suggest boundaries for empowered decision-taking are not in place in the respondent organisations
- This is suggested by respondents indicating that the ability to take decisions decreases further down the organisation hierarchy.
- Quality should be the responsibility of the entire organisation, and providing decision-making opportunities to employees of all levels of the organisation, about the process and business functions they are responsible for, can improve those functions.

Results: Application of Soft factors

- the respondents indicated that general training and education are provided both at organisation and individual levels in their organisations.
- however, quality-related training is limited in scope, being offered to those closer to the production and quality management functions
- This suggests that, while the personal development of staff is valued by European NMCAs, training in quality-related issues is not viewed as an organisational-wide necessity, thereby excluding the contribution to quality improvements of a portion of the employees.
- There was no significant difference in the responses of the organisations implementing ISO9001 and those adopting holistic QM practices, with regard to employee involvement, and training and education.

Conclusions from survey results (1)

- The results from the survey suggest that the hard factors - continuous improvement, process management and quality information - are implemented in the majority of the participant NMCAs, regardless of the quality management initiative(s) adopted.
- However, it seems that the factors are employed predominantly in relation to the production and product development functions of the organisations, largely ignoring the human resources and supplier management functions of the organisations.

Conclusions from Survey results (2)

- Regarding to the soft factors - top management commitment, customer focus, employee involvement, supplier management, and training and education - the survey results suggest that the respondent organisations tend to implement these factors to a lesser extent.
- The organisations that implement holistic quality management initiatives, like EFQM, Six Sigma and Lean, seem to implement the factors of top management commitment, customer focus and supplier management to a greater extent than those organisations that have adopted ISO9001.

Recommendations

In order to survive the changes that are currently taking place in the geospatial industry, it is suggested that NMCAs face the future by:

- becoming less product driven and more customer focussed;
- establishing collaborative partnerships with external suppliers; and
- improving organisational and innovation performance

- It is suggested that by implementing the eight critical QM factors European NMCAs might address the issues listed above.

- The collaborative practice could be extended to building trusted relationships with suppliers, a practice that is currently little implemented by NMCAs implementing ISO9001
- This not only allows for more efficient procurement, but by collaborating with external suppliers products can be developed faster, using tools and resources of external suppliers, together with internal ones.
- External suppliers could be better attuned to technological advances, allowing European NMCAs to develop innovative products and services,

- Empowering and training the employees will ensure that they have the skills, knowledge and ability to improve the processes and services within their area of responsibility
- This will ensure more efficient performance and allow scope for improvement and innovation.
- Collecting quality information from all functions, not just production, and communicating this beyond supervisor level to all levels of the organisation, allows for process improvement.

- Employees who have been given the skills and responsibility to understand quality information can use their expertise to improve processes
- This feeds into the continuous improvement loop, which leads to innovation and improved organisational performance.
- Top management commitment is required to develop, implement and sustain the vision; the commitment is the foundation of shaping the quality focus of an organisation

- Based on the survey findings, the majority of NMCAs seem to have boxed quality management as relating only to the production and quality department
- This seems to limit the perspective to providing the customer with a 'quality product'. Delegating the responsibility of quality across the entire organisation, while collaborating with customers and suppliers, could provide European NMCAs with the opportunity to improve their innovation and organisational performance.
- Current predominance of ISO9001 seems to be hindering NMCAs from making the transition from production focus to a more customer, and innovative, point of view. Some European NMCAs have already taken the leap, and are implementing a more holistic QM initiative. These organisations indicate a more holistic implementation of some of the eight QM factors.
- However, it should be recalled that the interdependent nature of the eight critical factors warrants their implementation at the same time, in order to reap the full benefits of a holistic quality management system.
- The need to remain relevant in the changing geospatial industry might suggest that European NMCAs investigate the innovation and performance benefits that come with TQM.