Object Oriented Quality Management (OQM)

A management model for quality

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Explanation of symbols

.	= data not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil or less than half of unit concerned
–	= (between two figures) inclusive
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2007–2008	= 2007 to 2008 inclusive
2007/2008	= average of 2007 up to and including 2008
2007/'08	= crop year, financial year, school year etc. beginning in 2007 and ending in 2008
2005/'06–2007/'08	= crop year, financial year, etc. 2005/'06 to 2007/'08 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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Abstract*:* CBS is looking for a suitable model for quality management. One reason is that CBS wants to manage quality in a systematic way to meet the European Statistics Code of Practice and the Quality Declaration of the European Statistical System. Existing quality systems do not fully meet CBS requirements, so a model was developed that would comply. One of the requirements is that the new model should combine with the EFQM Excellence Model. The OQM model is composed of components of well-known quality management models. This model is applicable to all areas of quality assurance and all types of organizations. It is called an object-oriented model, because objects play a central role in it.

Keywords: management model, quality, quality assurance.

Content

1. Preface

The Object Oriented Quality Model was created during the search for a CBS quality model. One reason for this search was that CBS wants to manage quality in a systematic way to meet the Code of Practice and the Quality Declaration of the European Statistical System.

In the search for a quality model for CBS we looked at the quality models EFQM (2003), ISO 9001:2000, the Balanced Scorecard (Kaplan, 1996), COSO ERM (2004) and the Dependency and Vulnerability Analysis (A&K, 1998), a Dutch model. The latter model is applied at CBS in the context of the Regulation for Information Security for Government (VIR, 2007).

These existing models turned out to have one or more of the following drawbacks:

1. Complexity of the model
2. The administrative burden that the model entails in-house
3. The model contains content, which makes it only applicable in specific situations
4. A limited scope of the model
5. A rough or no delineation of areas where measures are required to control quality
6. A limited number of approaches being considered. Several models lack for example a risk analysis.
7. No explanation why certain requirement or measures are needed

This gave us reason to see if a new model could be created from the components of the existing models without these disadvantages. This consideration led to the Object Oriented Quality Management model (OQM model).

Annex 4 shows how the steps in the OQM model relate to the existing models.

Some statistical institutes of European countries use EFQM or ISO 9001:2000. It is not known how they deal with these disadvantages.

The OQM model could be developed due to the capacity the sector Process development and quality has been able to spend on it. Also, the application of the model at CBS led to improvement of the model. The model has been applied at CBS in three cases so far.

The OQM model was reviewed by Peter Struijs, sector manager of Process development and quality, Jim Frenken and Henny Swaans, both officers of the same sector. Their reviews led to a thorough revision of the text. The text has been translated by the author and corrected by Rita Gircour, translator at the Publishing department of Statistics Netherlands.

The Hague, 18 August 2008

Peter van Nederpelt

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2. Introduction

This report describes the model for Object Oriented Quality Management (OQM). The OQM model is about managing the quality of objects that are relevant to an organization.

This report does not describe how the implementation of the model can or should be managed. The OQM model is not a model for managing a quality project.

The report targets directors, managers, staff and employees engaged in quality. This means that the report may be relevant to anyone dealing with quality.

Guide for readers

The outlines of the report are explained in chapter 3. Chapter 4 forms the core of the report, and details the model. Users who want to quick scan can just read chapter 4. Chapter 5 describes who can apply the model, under what conditions, and at which stage of a change process. Finally, two tools that can be used to apply the OQM model are explained. Chapter 6 is an afterthought. This chapter 'proves' why the OQM model does not have the above mentioned disadvantages.

Annex 1 provides an example of the application of the model. Annex 2 lists all relevant literature. In annex 3 terms and abbreviations are explained. Annex 4 describes the relationship between the steps of the OQM model and other quality models. In annex 5 lists a large number of characteristics that may assist in identifying the characteristics of a specific object.

3. Explanation of the OQM model

In this chapter we will explain a number of characteristics of the model, such as its purpose, scope of application, the principles and concepts used.

3.1 Purpose of the model

Purpose of the model is to determine a set of measures for one or more areas requiring attention in order to control these areas for quality. The users select which areas require attention.

3.2 Scope of the model

The model is meant for organizations. In particular, for organizations that want to focus on quality in a systematic way. The model can be applied in any type or organization: large and small, profit and non-profit, local and international.

3.3 Objects

The metaphor or paradigm that the OQM model uses is that an organization and its environment can be seen as a collection of objects in relation. That is why the term 'object oriented' is in the name of the model.

Examples of 'objects' are customers, products, processes, employees, machines, information systems. Each noun where the words "the quality of …" can be added can be seen as an object in our model.

Objects can be concrete objects as well as abstractions: people, things, events and actions. These objects can be both inside and outside the organization. Objects are certainly not limited to the final products of an organization.

To see an organization and its environment as a collection of objects is obviously a simplification of reality. The question is whether this simplification of reality is too restrictive within the field of quality assurance. Because the concept of object is used in its widest sense, there seem to be no great restrictions.

We would even consider abstract concepts such as culture, beliefs, ideas, thoughts, hidden rules, attitudes, values, norms, traditions, symbols and morality as objects. These objects certainly play a role within an organization. The question is, of course, whether the quality of these objects can be managed or whether an organization wants to manage or influence these objects. The OQM model, however, does not exclude this option.

Objects are actually object *types* in the OQM model. Quality assurance is in general not about individual objects but usually about a species or type of object. For easy reading we use always object rather than object type.

3.4 Characteristics

Another assumption is that all objects have characteristics. These characteristics are specific to the object. The object employee, for example, has different characteristics than the object information system.

In our model we define requirements for these characteristics. These requirements need not necessarily be quantifiable. A qualitative description of the requirements can be sufficient.

A few examples of characteristics: The characteristics of the object employee are *competence, availability, integrity and mobility*. The object housing has characteristics like *accessibility, capacity and safety*. The object customer has the characteristic *satisfaction*.

An organization can only achieve its objectives if employees are sufficiently competent, accessible, available, honest and mobile. Housing must be sufficiently accessible, safe and have sufficient capacity. And last but not least customers should be sufficiently satisfied. What is sufficient will depend on the choices made by the users of the model.

3.5 Quality areas

A combination of an object and a related characteristic is called a quality area. So the *competence of an employee* is a quality area. The *employee* is the object and *competence* the characteristic.

Other examples of quality areas are:

- the *availability* of an *employee*
- the *safety* of *housing*
- the *satisfaction* of *customers*

The term quality area is central to the model. Within a quality area we are looking for measures to control quality in the area. How can we manage the availability of employees?

Furthermore, the users of the model are free to choose the level of detail of the quality area. For example, it can distinguish between the level of internal customer satisfaction and external customer satisfaction. The users may choose the quality area satisfaction of customers in general, or the satisfaction of customers about a specific service. The breakdown of quality areas is relevant if this leads to different answers to questions like these in the next chapter.

The OQM model assumes that quality areas promote an optimal choice of measures. This can be explained as follows:

- The scope is clear. The users have an accurate overview of the areas that they want to control.
- The users can focus on one quality area at a time when determining the right measures.

- The users look at each quality area from various angles before they determine the measures within this quality area.

Quality areas are in line with language of management. In the boardroom and in the communication of management to staff and the outside world one often speaks of certain quality areas. Of course the word quality area is not literally used.

3.6 No domain knowledge

An important concept of the model is that the model contains no substantive rules. The model is empty, it contains no content or knowledge of a domain. The users of the model will add the content. It is a thinking model. It is an empty frame, which has yet to be completed.

The idea behind this concept is that the users of the model are best able to provide the content. The users know their organization best and are also able to determine the best measures ultimately wanted for the organization. The model is only a tool.

A second reason is that the model becomes generic. The model can be applied to all quality areas one can think of, and so it is widely applicable.

The model is based on the insights from 'knowledge science' (Nijssen, 2001). In knowledge science rules has to be stripped of the domain-specific knowledge. The results of this exercise are knowledge independent rules. These rules are better to learn, to remember and to apply than knowledge-based rules according to knowledge science.

3.7 First overview than insight

The OQM model assumes that first a list of all quality areas is created. These are the quality areas that organization wants to control. This list can contain organization-wide quality areas, but this list can also contain only one quality area. Then, an analysis is performed for each quality area.

3.8 Requirements regarding quality areas

Another premise of the model is that it should be clear what the requirements for the quality areas are. These requirements should be clear before adopting measures to be taken. Requirements can also be standards, regulations, rules, conditions, decisions, etc.

For the quality area *availability of employees* it could be the rule that employees must be in the office between 9 and 4.

3.9 Risk analyses

One concept of the OQM model is that a risk analysis should be carried out for each quality area. The purpose of the risk analysis is to get a clear picture of the causes and effects of problems with the quality area.

What are the causes and effects of problems with the availability of employees, for example? If causes and effects are known, it is possible to adopt measures to control the quality area.

3.10 Indicators and measures

The model is aimed at determining an appropriate set of quality indicators and measures in order to control a quality area.

3.11 Restrictions of the model

Of course the model also has its limitations. Users get no licenses or quality prizes when using this model. No organization promotes the model. The model therefore has limited PR value.

Also the OQM model does not describe how the implementation of the model can or should be managed. The term management in the name of the OQM model regards the quality areas and not the management of the people who will apply the model.

4. Elaboration of the OQM model

In this section the OQM will be explained. The model is divided into twelve steps. We will list all the steps first and then discuss each step individually.

Overview of the steps of the OQM model	
No	**Step**
1	Selection of quality areas
2	Definition of each quality area
3	Relations with other quality areas
4	Importance of the quality area for the realization of the objectives of the organization
5	Requirements for each quality area
6	Effects of problems with each quality area for the organization en his environment
7	Causes of problems with each quality area
8	Chances for the organization
9	Indicators to make the status of each quality area visible
10	Measures to assure that the requirements are met and the risks are acceptable
11	Distribution of responsibilities regarding the quality area
12	Optimization of measures

End result of step 1 is a list of quality areas that the users want to control.

The steps 2 through 11 are executed for each quality area. These steps are shaded grey.

In step 12 all quality areas are considered again.

When the first step is taken, the remaining steps need not necessarily be carried out in a fixed sequence. For example after step 1 the next step may be step 11.

The depth of the elaboration of a step depends on the importance and the complexity of the quality area. This depth can be determined by the users.

4.1 Step 1: Selection of the quality area

In the first step of the model the quality areas the users want to control are determined. The selection of quality areas will take place in three sub-steps:

a. Determining selection criteria

b. Selecting objects

c. Selecting related characteristics

We will elaborate on these three steps below.

Determining selection criteria

In this step it is determined which selection criteria the users will apply to the choice of the quality areas. The selection criteria will of course fully determine which and how many quality areas will be found. Below we will mention a few criteria as examples:

- It should cover all quality areas around one object.
- It should be the most important quality areas for achieving a certain objective or set of objectives.
- It should be all quality areas that are important for realizing the objectives of the entire organization.

It is also possible that the selection criteria are not explicitly formulated and a set of quality areas is selected anyway.

Objects

First of all objects are identified within the previously established criteria. One could think of:

- Staff
- Production machines
- Information systems
- Data
- Commodities
- Intermediate and end products
- Customers
- Suppliers
- Workplaces
- Housing

But also

- Strategy
- Policy
- Partnerships
- Agreements
- Culture
- Internal and external reports

- Etc.

If the words “the quality of …”can be added to a noun this noun can be seen as an object in the framework of the OQM model. The level of detail of the object can and may vary.

Characteristics

In this sub-step the related characteristics of the selected objects are selected.

A characteristic can often be identified as an adjective transformed in a noun. We will give a few examples.

Adjective	**Adjective transformed in a noun**
Available	Availability
Sound	Soundness
Honest	Honesty
Safe	Safety

An adjective is not sufficient. Phrases like *an available employee* and *the availability of an employee* for example have a different meaning. The phrase *available employee* implies that the employee must be or is available. *The availability of an employee* is more neutral wording. All options are still open. Availability of zero per cent is also a possibility.

Annex 5 shows a list of characteristics that can be found in management literature.

A combination of an object and a characteristic is in our model a *quality area*. Step 1 in our model provides a list of quality areas that meet the criteria of the users of the model.

4.2 Step 2: Definition of the quality area

This step defines what is meant by the quality area. This is especially important if it is not obvious what the meaning of the quality area is, or if several interpretations of the quality area are possible.

For example, what is meant by the *integrity of staff*? Different views are possible about the meaning of this quality area. However, it should be clear what the users mean by integrity of staff when defining measures to control this quality area.

4.3 Step 3: Relationship with other quality areas

Relationships between quality areas may exist. For example, there could be a relationship between *customer satisfaction* and the *functionality of a product or service* of an organization.

Relationships between quality areas can be of a different nature. The relationship may be a positive or negative. There may be cause and effect or a goal-means relationships. All types of relationships may be relevant, but there is no need to strive for completeness. It is only relevant to get a picture of the quality areas with strong relationships to each other.

The aim of this step it to determine if quality areas that have a relationship with the quality area at hand need to be elaborated.

4.4 Step 4: Importance of the quality area for the realization of the objectives of the organization

This step defines the importance of the quality area for achieving the objectives of the organization. How dependent is the organization of controlling the quality area? What is the relationship with the objectives of the organization? We can call this step the dependency analysis in our model.

The aim of this step is to determine how much attention should be paid to the quality area at hand. This is relevant for determining the measures to control this quality area.

The purpose of this part of the model is to set priorities among the quality areas. The set of quality areas that is very important for achieving the goals of the organization can be addressed first.

4.5 Step 5: Requirements for the quality area

It is possible that requirements for the quality area are already set by the outside world, by laws or regulations.

Within the organization decisions could be taken, policies could be established, frameworks developed that relate to the quality area.

The question is which requirements there are and whether all these requirements are met in the current situation. If the organization does not meet the requirements it seems logical that the set of measures is adjusted, or that attention is paid to the implementation of existing measures.

Requirements that can be quantified can be called indicators. Indicators are discussed in step 9 too.

4.6 Step 6: Effects of problems with the quality area for the organization and its environment

In this step it is investigated what the possible effects are of problems with the quality area for the organization and its environment. In other words, which risks are there for the quality area? What are the risks of problems with *the availability of staff*?

When determining corrective measures within the quality area, the risks can be taken into account.

In this step the gross risk (= inherent risk) and the net risk (= residual risk) can be distinguished. When determining the net risk, the measures already taken are taken into account. The gross risk is determined when no measures are taken.

It may turn out that the net risk is greater than is acceptable. The net risk exceeds the risk appetite of the organization with regard to the quality area at hand. This indicates problems with the quality area.

The gross risk is generally hypothetical, because measures are usually already taken. However, the gross risk can play a role in creating an idea. What can happen in worst case?

4.7 Step 7: Causes of problems with the quality area

In this step it is investigated what the possible causes are of the problems with the quality area. What are, for example, the causes of problems with the *availability of information systems*? This regards the same problems as mentioned in step 6.

When determining curative and preventive measures within a quality area, one may take into account the causes of problems with the quality area.

Possible causes of problems are also known as threats or vulnerabilities.

4.8 Step 8: Chances for the organization

In this step it is investigated which chances, opportunities, possibilities there are for achieving the objectives of the organization if there are no problems with the quality area or if performance is above standard. What are the positive effects of the quality area for the organization?

4.9 Step 9: Indicators to make the state of the quality area visible

In this step it is determined which indicators within the quality area could be used by distinguishing:

- Possible indicators (best practices)
- Indicators already implemented in the organization
- Indicators that still have to be implemented

For indicators that are already been used within the organization the question is what standard applies. If these indicators are below standard there is a problem with the quality area.

One can in this step elaborate on the units of measurements and measurement of the indicators. This is only recommended for key quality areas.

4.10 Step 10: Measures to assures that the requirements are met and risks are acceptable

In this step it is determined which measures are necessary to control the quality area. In this step the objectives of the model are achieved.

Which measures are, for example, necessary to control the *competence of staff*? Which measures are necessary to meet the requirements of the *safety of a building*? Which measures are necessary to run only acceptable risks with the *continuity of the data centre*?

This step distinguishes:

- Possible measures (best practices)
- Measures already implemented in the organization
- Measures that still have to be implemented

It is necessary to implement extra measures if requirements are not met and/or the net risk is not acceptable in the present situation. Then the quality area is not sufficiently under control.

The set of measures within a quality can eventually be chosen in such a way that costs are minimal while the requirements are met and the risks are acceptable. In that case the measures are optimized within the quality area.

4.11 Step 11: Distribution of responsibilities for the quality area

Somebody must always be responsible for a quality area. In this step it is determined how the responsibilities for the quality area are distributed.

Who is responsible for the implementation of the measures and when will they take place? What is the implementation plan? There must at least be an owner of the quality area.

4.12 Step 12: Optimization of the measures

In this step measures are optimized in all quality areas. Each quality area may well be under control but the measures may have to be combined. This could reduce costs without reducing the control over the quality areas.

5. Application of the OQM model

In this section we will discuss some aspect of the application of the OQM model. We will answer the following questions:

- Who can apply the model?
- Under which conditions is the model applicable?
- In what stage of the process of change can the model be applied?
- Which tools are available?

5.1 Who can apply the model

Two target groups can be distinguished as able to use the model:

- The users with a coordinating role who implement the model in the organizations. This may be quality managers, a quality department or a quality officer.
- The users who will apply the model in their work area. We will call this the end users.

The first target group must be able to distinguish certain concepts like object, characteristic, definition, requirements, effects, causes, indicators and measures. The users must also be able to link characteristics to objects.

The end users must have the business insight or management experience to come up with the right measures within a quality area.

5.2 Applicable under what conditions?

The model can be applied within each organization that wants to take measures to control quality.

Furthermore it is important that the organizations want to determine the contents of the quality policy in an independent way, considering themselves in a position to select quality areas and to analyze them and to consider which measures are necessary in these quality areas. As expected the model will be useful for organizations in particular those where many professionals work.

Each organization that considers using models like EFQM, ISO 9001:2000, COSO ERM or the Balanced Scorecard can consider the OQM model too.

The OQM model can also serve as a quality framework for the whole organization. It is also possible to use the OQM model on a limited scale. For example one can apply the model to a limited number of quality areas or even just one quality area.

5.3 Stages of the process of change

The development, implementation and maintenance of a quality management system can be seen as a process of change. De Leeuw (1986) distinguishes four stages in a process of change:

1. Diagnosis
2. Design of the future situation
3. Change or transition
4. Implementation

In our view the model can be applied in the first two stages of the process of change. The current situation can be diagnosed by using the model. Next, measures can be designed to control quality in the organization.

More is needed to apply the model. One could think of aspects like change management, leadership, culture and communication. These aspects are outside the scope of the model.

5.4 Tools

The model employs two tools namely the matrix and the questionnaire. The matrix as well as the questionnaire will be explained in this chapter.

5.4.1 Matrix

The aim of the matrix is to give an overview of the entire quality system of the organization that uses the OQM model. The matrix has all quality areas in its rows. The columns show all the steps of the model.

Matrix										
Quality areas	Definition	Relationships	Interest	Requirements	Effects	Causes	Chances	Indicators	Measures	Responsibilities
Customer satisfaction										
Staff satisfaction										
Reliability of the delivery of the organization										
Turnover growth										
Efficiency of processes										
Veracity of the accounts										
Security of the office										

The matrix can be filled in stages. However, the logical first step is to fill in the first column with the selected quality areas.

There are many options for the sequence of filling the matrix. One possibility is to fill the column Measures with measures already implemented. This already gives a first impression if there are measures missing.

5.4.2 Questionnaire per quality area

The second tool – the questionnaire – is meant to capture the result of the steps taken for each quality area as extensively or as detailed as desired.

Questionnaire per quality area		
No	**Question**	**Answer**
1	**Quality area**	
	Which quality area is the subject of this questionnaire?	
2.	**Definition**	
	What is the definition of the quality area?	
3	**Relationships** with other quality areas	
	What are the relationships with other quality areas?	
4	**Interest**	
	What is the interest of the quality area for realizing the objectives of the organization?	
5	**Requirements**	
A	Which requirements are set by the outside world to the quality area, for example by means of laws and regulations?	
B	Which requirements are set by the organization itself to the quality area? What decisions are already taken about the quality area?	
C	Are all requirements met?	
6	**Effects** of problems with the quality area	
A	What are the negative effects of problems with the quality area if no measures are taken? What is the gross or inherent risk (= chance x impact).	
B	What are the negative effects of problems with the quality area taking into account the measures taken? What is the net risk or residual risk (= chance x impact)?	
C	Is the residual risk acceptable?	
7	**Causes** of problems with the quality area	

Questionnaire per quality area		
No	**Question**	**Answer**
A	What are possible causes of problems with the quality area? What are the threats? What are the vulnerabilities?	
B	What is already going wrong?	
8	**Chances** for the organization	
	What are the chances for the organization if there are no problems with the organization and if the organization performs above standard?	
9	**Indicators**	
A	Which indicators can help measure the quality area? What are the best practices regarding indicators?	
B	Which indicators are already used?	
C	Which indicators are needed?	
D	Within which standard does the indicator have to be?	
E	What are the most recent values of the indicators? Are they above standard?	
10	**Measures**	
A	Which measures can help control the quality area? What can be found in literature? What measures do competitors take? What are best practices in the industry?	
B	Which measures are already taken?	
C	**Which measures are needed to control the quality areas?** **This is the key question of the OQM model!!**	
11	Distribution of **responsibilities**	

Questionnaire per quality area		
No	**Question**	**Answer**
	How do responsibilities have to be distributed regarding the quality area? Who is the owner of the quality area? Who is implementing the points of improvement?	

Annex 1 contains an example of a filled in questionnaire for the quality area *satisfaction of customers.*

6. Afterthought

In this afterthought we will check what the added value is of the OQM model compared to a number of existing models. After all, there must be a reason to introduce a new model.

In the introduction we said that the existing models have a number of disadvantages. The question is if OQM does not have these drawbacks. We will answer this question by looking at all these drawbacks.

We are well aware that the disadvantages of the other quality models are considered facts. This report does not analyze each quality model. This report is focused on describing the OQM model.

1. *Complexity of the model*

   Whether the model is perceived as complex or not we would like to leave to the discretion of the reader. In any case the users have the freedom to choose which steps they want to take and which not. They determine to a large extent how complex the OQM model gets.

2. *The internal administrative burden of the model*

   The users have full control of the burden that applying the OQM model entails.

3. *Content in the model. Therefore the model is only applicable in specific situations.*

   The OQM model contains no content or knowledge of any quality area.

4. *A limited scope*

   The scope of the OQM model is unlimited. The users determine the scope in the first step of the model.

5. *A rough delineation or no delineation of areas where measures are required to control quality*

   The users define the scope of the areas by defining the quality areas. This is an important distinctive feature of the model in our view.

6. *A limited number of approaches being considered. Several models lack a risk analysis for example.*

   Within each quality area the model offers the possibility to use ten different angles (steps 1 to 11). Step 6 and 7 together are the risk analysis.

5. *No explanation why certain requirements or measures are needed*

   The model does not define requirements but asks the users of the model which requirements are applicable. We assume that the users know why certain requirements are present and what the sources of these requirements are. The model does not demand any measure and does not make any recommendation.

The model aims at a thorough analysis of a quality area. The users determine which measure they will take after this analysis of the quality area.

We may conclude that the OQM model does not have any of the disadvantages mentioned. The model therefore may exist among other well-known models for quality assurance.

1 Annex: Example of an application of the OQM Model.

In this annex an example is given of the application of the OQM Model. As an example the quality area customer satisfaction is chosen.

Questionnaire		
No	**Question**	**Answer**
1	**Quality area**	
	Which quality is the subject in this questionnaire?	Customer satisfaction
2.	**Definition**	
	What is the definition of the quality area?	Customer satisfaction is the degree to which the customer is satisfied about the product or service delivered.
3	**Relationship** with other quality areas	
	What relationships are there with other quality areas?	Customer satisfaction is promoted by de *kindness of the staff*, the *reliability of the delivery by the organization* and *clarity of the administrative procedures*.
4	**Importance**	
	What is the importance of the quality area for realizing the objectives of the organization?	Customer satisfaction is very important for the organization. It is one of the objectives of the organization itself.
5	**Requirements**	
A	Which requirements are demanded by the outside world of the quality area, for example by laws and regulations	There are no external requirements for customer satisfaction.
B	Which requirements are set by de organization itself? Or which decision has been made about the quality area?	All requirements are quantified. See step 7.
C	Are the requirements being met?	See step 7.
6	**Effects** of problems with the quality area	

A	What are the negative effects of problems with the quality area if no measures are taken? What is the gross or inherent risk (= chance x impact).	There is a great chance that a customer is dissatisfied because there is a great chance of threats occurring. The impact of dissatisfied customers is also great. Therefore the risk of dissatisfied customers is great. Negative effects of dissatisfied customers are a damaged image and loss of turnover.
B	What are the negative effects of problems with the quality area taking the measures taken into account? What is the net risk or residual risk (= chance x impact).	The risk of dissatisfied customers is high: ▪ The chance of dissatisfied customers is high because of uncertain delivery times. ▪ The impact of dissatisfied customers is high too. Negative effects of dissatisfied customers are a damaged image and loss of turnover.
C	Is the residual risk acceptable?	The residual risk is not acceptable. Extra measures have to be taken.
7	**Causes** of problems with the quality area	
A	What are possible causes of problems with the quality area? What are the threats? What are the vulnerabilities?	• Unfriendly staff • Products not delivered in time • Products doesn't comply specifications • Invoices are not clear to the customer
B	What is already going wrong?	• Products are not delivered in time
8	**Chances** for the organization	
	What are the chances for the organization if there are no problems with the quality area and if the organization performs above standard?	Increasing turnover
9	**Indicators**	
A	What are the possible indicators to measure the quality area? What are the best practices regarding indicators?	▪ Rate of customer satisfaction ▪ Percentage of satisfied customers ▪ Percentage of customer complaints of all deliveries ▪ Percentage of customers that leave within one year

B	Which indicators are already used?	Percentage of satisfied customers
C	Which indicators are needed?	Percentage of satisfied customers for each product type
D	Within which standard do the indicators have to stay?	95% of the customers must have a score above 8 out of 10
E	What are the most recent values of the indicators?	80% of the customers have scores above 8.
10	**Measures**	
A	Which measures are possible to control the quality area? What can be found in literature? What measures do competitors take? What are best practices in the industry?	▪ Improve friendliness of staff to customers ▪ Improve the reliability of the product delivery ▪ Improve the quality of the product ▪ Improve the administrative procedure from proposal to invoice
B	Which measures are already taken?	Training of staff in friendliness to customers
C	**Which measures are needed to control the quality areas? This is the key question of the OQM model.**	**Maintain the present measures and improve as an extra measure the delivery reliability of the product.** NB: The reliability of delivery of the product can be considered as a separate quality area.
11	Distribution of **responsibilities**	
	How do responsibilities have to be distributed regarding the quality area? Who is the owner of the quality area? Who is implementing the points of improvement?	The director is owner of the quality area. Head of production is project manager of the improvement measures. Head of sales is cooperating with head of production.

2 Annex: References

This annex contains a list of literature that has been used when composing this report.

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3 Annex: Glossary and abbreviations

Term or abbreviation	Definition or description
Quality area	Combination of an **object** and an associated **characteristic**.
Balanced Scorecard	**Method** to control an organization by indicators divided in four areas (Kaplan, 1996)
CBS	Centraal Bureau voor de Statistiek. Statistics Netherlands.
COSO	Committee of Sponsoring Organizations of the Treadway Commission (COSO ERM, 2004).
Requirement	Need or expectation that is stated, generally implied or obligatory (ISO 9000:2005). A requirement does not to be quantifiable.
EFQM	European Foundation for Quality Management (EFQM, 2003).
ERM	Enterprise Risk Management
Indicator	Quantifiable of descriptive variable that indicates or directly measures a **characteristic** of an **object**.
INK	Instituut Nederlandse Kwaliteit (INK, 2004).
ISO	International Organization for Standardization
Characteristic	Distinguishing feature (ISO 9000:2005).
Quality	Degree to which a set of inherent **characteristics** fulfils **requirement** (ISO 9000:2005)
Quality policy	Overall intentions and directions of an organization related to quality as formally expressed by top management (ISO 9000:2005).
Quality assurance	The aspect of the management function that determines and executes the quality policy (Cannegieter, 2001).
Measure	Decision or act through which one governs something (Van Dale). Decision or act that ensures that an organization will behave in a desired way.
Method	Process to reach a certain goal (Van Dale). Prescription for an approach (De Leeuw, 2003).
Model	Representation of a system of classes of systems and thus a system by itself (De Leeuw, 2003).

Object	Natural person, independent existing thing, event or action. Bearer of properties.
OQM	Object Oriented Quality Management
VIR	Voorschrift voor Informatiebeveiliging Rijksoverheid (VIR, 2007). Prescription for Governmental Information Security.

4 Annex: How the OQM model relates to other models

The OQM model was created by first analyzing existing models. Below for each step of the OQM model is explained which relationship exists with these existing models.

Step 1: Quality areas

- The term quality area is identical to the term scope as used in the auditing domain. The scope of an audit consists of an *object* of assessment plus an associated *aspect*. In OQM the same term object is used, with the same meaning. Instead of an aspect in the OQM model the term characteristic is used.
- EFQM (2003) uses the term *criteria*. This term resemble slightly the term quality area. However a criterium in EFQM consists only of an object without aspects. The EFQM criteria are: 1) leadership, 2) people, 3) policy & strategy, 4) partnerships & resources, 5) processes, 6) people results, 7) customer results and 8) society results and 9) key performance results. These criteria has the same function as the quality areas in the OQM model.
- The Balanced Scorecard (Kaplan, 1996) has four areas of strategic objectives: *financial, customer, internal en learning*. These areas in this model has the same function as the quality areas in the OQM model.
- In ISO 9001:2000 the sections of the description of the ISO standard has the function of quality areas.
- The A&K analyses (1998) distinguish a fixed set of components: People, Hardware, Software, Data, Organization, Environment and Services. To all these component the characteristics availability, confidentiality and integrity linked. The A&K analyses has standardized the quality areas.

Step 2: Definition

- Defining terms is derived from literature about data (especially from Eurostat). In this literature for example the expression *accuracy of data* is defined.

Step 3: Relationships with other quality areas

- Relationships between quality areas are found in literature about quality of data. A relationship that is often mentioned in this domain is the relationship between *accuracy of data* and *timeliness of data*. Composing accurate data detriment the timeliness of data visa versa. There is an interaction between these two quality areas.
- A&K analyses (1998) suggests that the *reliability of an information system* is dependent on the reliability of all seven components of A&K.

Step 4: Importance of the quality area for the organization

- The term *importance* is also used in the A&K analyses (1996). The *confidentiality of data* is for example important for the *reliability of an information system*.

Step 5: Requirements

- The term requirement is also used in the A&K analyses (1996). Especially there are requirements for the reliability of information systems.
- EFQM (2003) mentions global requirement on the level of the *criteria* and *subcriteria*. For example: "Policy and strategy has to be communicated an executed by a framework of key processes (subcriterium 2d)".
- ISO 9001:2000 mentions also requirements. These requirements regards the measures that has to be taken. For example: "The organization must determine the sequence and interaction of processes (4.1.b)".

Step 6: Effects of problems with the quality area

- The term *effects* is also used in the A&K analysis (1996). If something is going wrong with one of the seven components, what are the negative effects? What is the impact?
- COSO-ERM (2004) uses the term *risk assessment*. Risk assessment is one of the eight component of COSO-ERM.

Step 7: Causes of problems with the quality area

- In the A&K analyses (1996) the terms *threats* and *vulnerabilities* are used.
- COSO-ERM (2004) calls one of its eight components *event identification* which is similar to step 7.

Step 8: Chances

- The term chances is submitted from the SWOT analyses: strength, weakness, *opportunities* and threats. Opportunities are identical to chances.
- One of the components of COSO-ERM (2004) is *seizing opportunities*.

Step 9: Indicators

- *Indicators* are addressed in the Balanced Scorecard (Kaplan et al., 1996).
- EFQM uses at criteria 6 until 9 the terms *perception measurements, performance indicators and performance results*. In all cases these are quantifiable variables.

Step 10: Measures

- The term measures or controls are widely known in management literature. COSO-ERM (2004) uses the term management controls.
- The A&K analyses (1998) gives much attention to determine measures, judging measures and confronting new measures with existing measures.

Step 11: Distribution of responsibilities

- The term responsibilities is commonly know in management literature. Often this term is used in combination with the terms tasks and competences.

Step 12: Optimization of measures

- Finally optimization of measures while minimizing costs is a well known concept in management literature.

5 Annex: Examples of characteristics of objects

In this annex examples of characteristics of object are mentioned.

Reason for mentioning characteristics without the associated objects is, that it is not so difficult to remember objects that are relevant to the organization. It is more difficult to remember characteristics that are associated to objects. This annex is meant to help to find the right characteristic to an object.

The characteristics mentioned below are largely found in management literature.

Ability
Acceptance
Accessibility
Accountability
Accuracy
Adaptability
Adaptively
Adequacy
Advisability
Ambiguity
Applicability
Appreciably
Attractiveness
Authenticity
Availability
Awareness
Balance
Beauty
Benevolence
Brightness
Capacity
Care
Change Capacity
Clarity
Colour
Comparability
Competence
Competitiveness
Completeness
Complexity
Comprehensibility
Concentration Power
Confidentiality
Consistency
Contestability
Continuity
Convenience
Correctness
Coverage
Creativity
Credibility
Creditworthiness
Degree of filling
Delivery reliability
Dependence
Diversity
Docility
Dynamics
Ease of use
Effectiveness
Efficiency
Eligibility
Employability
Empowerment
Enforceability
Enthusiasm
Environment friendliness
Equivalence
Evenness
Exclusivity
Existence
Expertise
Extensibility
Fairness
Familiarity
Feasibility
Find ability
Flexibility
Friendliness
Functionality
Growth
Health
Height
Helpfulness
Impartiality
Importance
Independence
Innovativeness
Integrity
Intensity
Interoperability
Inventiveness
Involvement
Legality
Legitimacy
Length
Level
Loyalty
Maintainability
Market orientation

Measurability
Mobility
Mutation rate
Necessity
Objectivity
Openness
Operability
Orientation to…
Passion
Performance
Plausibility
Portability
Power to ...
Predictability
Presence
Productivity
Professionalism
Profitability
Proportionality
Prudence
Punctuality
Purchasing power
Purity
Readability
Reasonableness
Redundancy
Relevance
Reliability
Repeatability
Reproducibility
Response
Response Time
Responsibility
Responsiveness
Result orientation
Re-usability
Robustness
Safety
Satisfaction
Scope
Selectivity
Sensitivity
Severity
Shape
Size
Soundness
Speed
Stability
Stress resistance
Structure
Substitutability
Suitability
Sustainability
Tenacity
Thoroughness
Timeliness
Traceability
Transferability
Transparency
Turnaround
Uniformity
Uniqueness
Usability
Usefulness
Validity
Visibility
Voluntariness
Vulnerability
Weight
Wholeness
Width
Willingness to ...