

BS EN 15221-3:2011



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# Facility Management

## Part 3: Guidance on quality in Facility Management

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## Facility Management - Part 3: Guidance on quality in Facility Management

Facilities management - Partie 3: Guide relatif à la qualité  
en Facilities Management

Facility Management - Teil 3: Leitfaden für Qualität im  
Facility Management

This European Standard was approved by CEN on 8 July 2011.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: Avenue Marnix 17, B-1000 Brussels**



## Contents

Page

Foreword.....	4
Common Introduction for the European Standards EN 15221-3, EN 15221-4, EN 15221-5 and EN 15221-6.....	5
0 Introduction to Guidance on quality in Facility Management .....	7
0.1 General.....	7
0.2 Terms product and service – general and in facility management context .....	8
1 Scope .....	9
2 Normative references .....	9
3 Terms, definitions and abbreviations .....	9
3.1 Terms and definitions .....	9
3.2 Abbreviations .....	12
4 Basics of quality management .....	12
4.1 Importance of quality in FM .....	12
4.2 Criteria, background, elements and influences to quality .....	13
4.3 Type of Characteristics .....	13
4.3.1 General.....	13
4.3.2 Objective (hard) characteristic .....	13
4.3.3 Subjective (soft) characteristic .....	14
4.4 Pathway from needs to experiencing delivery .....	15
4.4.1 Expectations.....	15
4.4.2 Defined requirement in SL/SLA.....	15
4.4.3 Delivery .....	16
4.4.4 Perception .....	16
4.5 Quality Management.....	17
4.5.1 General.....	17
4.5.2 Existing QMS at client organization.....	17
5 Process of quality management.....	18
5.1 General introduction .....	18
5.1.1 The quality management process.....	18
5.1.2 Ensuring quality within FM agreement lifecycle .....	19
5.2 Analyze needs and demand.....	19
5.3 Specify requirements .....	20
5.3.1 Objectives.....	20
5.3.2 Possible techniques to determine client's organization needs:.....	20
5.3.3 Requirements from primary activity .....	20
5.4 Elaborate Service Level .....	21
5.4.1 General.....	21
5.4.2 Transfer requirements into facility products .....	21
5.4.3 Elements of a Service Level .....	21
5.4.4 Principle and approaches of defining Service Levels .....	22
5.4.5 Types and classification of Service Level.....	23
5.4.6 Service Level life cycle.....	23
5.5 Developing measurement metrics (hierarchy of indicators).....	24
5.5.1 Purposes of developing metrics (structured indicators).....	24
5.5.2 Various types of indicators.....	24
5.5.3 Recommendation for measurement metrics .....	26
5.6 Quality aspects in organizing delivery of facility products.....	27
5.7 Quality aspects in delivering facility products .....	28

<b>5.8</b>	<b>Measurement and calculation .....</b>	<b>28</b>
<b>5.9</b>	<b>Analyze deviation .....</b>	<b>29</b>
<b>5.10</b>	<b>Actions based on deviation.....</b>	<b>29</b>
<b>5.11</b>	<b>Control and improvement cycles.....</b>	<b>30</b>
<b>Annex A</b>	<b>(informative) GAP-Model .....</b>	<b>32</b>
<b>Annex B</b>	<b>(informative) Additional information and recommendation for measurement metrics .....</b>	<b>35</b>
<b>B.1</b>	<b>Recommendation for designing a metric system .....</b>	<b>35</b>
<b>B.2</b>	<b>Attributes of indicators .....</b>	<b>36</b>
<b>B.3</b>	<b>Indicators selection criteria.....</b>	<b>37</b>
<b>B.4</b>	<b>Required properties of indicators.....</b>	<b>37</b>
<b>B.5</b>	<b>Data gathering techniques: .....</b>	<b>38</b>
<b>B.6</b>	<b>Domains and categories on indicators .....</b>	<b>39</b>
<b>Bibliography</b>	<b>.....</b>	<b>44</b>



## Foreword

This document (EN 15221-3:2011) has been prepared by Technical Committee CEN/TC 348 "Facility Management", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This European Standard is one of the series EN 15221 "*Facility Management*" which consists of the following parts:

- *Part 1: Terms and definitions*
- *Part 2: Guidance on how to prepare Facility Management agreements*
- *Part 3: Guidance on quality in Facility Management*
- *Part 4: Taxonomy, Classification and Structures in Facility Management*
- *Part 5: Guidance on Facility Management processes*
- *Part 6: Area and Space Measurement in Facility Management*
- *Part 7: Performance Benchmarking*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

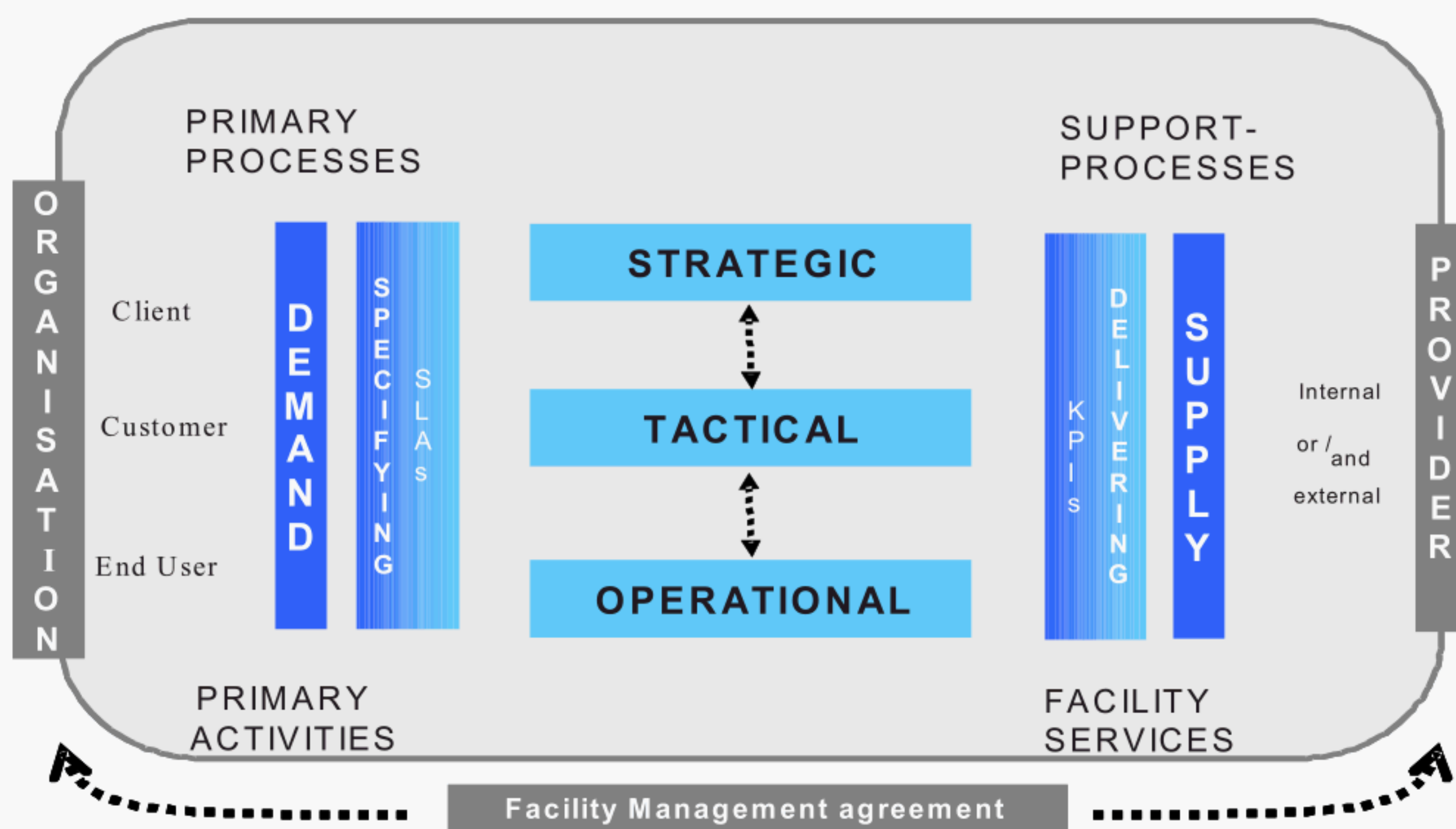
## Common Introduction for the European Standards EN 15221-3, EN 15221-4, EN 15221-5 and EN 15221-6

In 2002 the initiative was taken to establish a European Standard for Facility Management benchmarking purposes. It was soon recognized that to reach this objective, preliminary standards had to be elaborated and published. The first result of that process was the standards EN 15221-1:2006 and EN 15221-2:2006. Based on the discussions in the development of those two standards the decision was made to develop four new European Standards for Quality, Taxonomy, Processes and Measurement.

After the realization of those six standards it was possible to pursue developing a European Standard for Benchmarking prEN 15221-7

The standards, EN 15221-3, EN 15221-4, EN 15221-5 and EN 15221-6 have been developed, adopted and agreed as a set of principles, underlying the Facility Management approach on EN 15221-1, to ensure consistency. These are incorporated in the basic principles of a process-based management system, upon which these standards are founded.

The FM-model of EN 15221-1 is shown below.



Model EN 15221-1:2006

These standards also build on widely accepted management principles, in particular value chain (Porter, M E, (1985), "Competitive Advantage: creating and sustaining superior performance", Free Press, New York) and quality control (PDCA (Plan, Do, Check, Act). Deming, W E (1986), "Out of the Crisis", MIT, Cambridge). Reference to ISO 10014:2006, *Quality management – Guidelines for realizing financial and economic benefits*.



The principles of the Deming cycle (PDCA) underpin all of the standards but are applied to a different extent and depth in each. In fact there are different types of PDCA cycles depending of the term (e.g. long-term, short-term).

These standards align to EN ISO 9000 family of standards for Quality Management Systems and applies specific guidance on the concepts and use of a process-based approach to management systems to the field of Facility Management.

The term "facility services" is used as a generic description in the standards. The term "standardized facility products" refers to the "standardized facility services" defined and described in EN 15221-4, *Facility Management — Part 4: Taxonomy, Classification and Structures in Facility Management*.

Countries can decide to substitute the term "product" into "service", when they consider that it is important for a good acceptance and use of the standards in their own country.

The aim of all the standards is to provide guidance to Facility Management (FM) organizations on the development and improvement of their FM processes to support the primary activities. This will support organizational development, innovation and improvement and will form a foundation for the further professional development of FM and its advancement in Europe. Therefore generic examples are provided in the standard to assist organizations.

These standards lay the foundation of the work that has to be done further more in developing Facility Management, for e.g. benchmark standards prEN 15221-7.

## 0 Introduction to Guidance on quality in Facility Management

### 0.1 General

Effective FM brings value to an organization and all associated stakeholders. The objective of this European Standard is to provide guidance how to achieve, improve and measure quality in FM.

This European Standard is primarily written for organizations that adopt quality improvement procedures together with SL definition and the use of metrics. In addition, as technical developments and requirements of organizations increase and economic systems mature, the demand for this type of FM specific quality management will develop.

This standard is for use by management, consultants and practitioners in both client and service provider organisations.

- This standard is based on: the existing FM standards EN 15221-1 and EN 15221-2 which define FM and FM agreements;
- the EN ISO 9000 Quality standards.

The purpose of this standard is to provide guidelines on how to:

- clarify and understand quality issues;
- define quality criteria's and indicators;
- elaborate and perform the measurements (hard and soft facts) of FM performance and quality;
- describe soft factors;
- clarify expectation and perception;
- assist in the development of metrics and selection of indicators;
- obtain information and knowledge on metrics and service levels;
- measure efficiency of FM processes and effectivity of their output;
- improve processes to achieve quality on strategic, tactical and operational levels;
- improve quality management processes and assure their continuous improvement;
- improve communication between stakeholders;
- improve effectiveness of the FM processes;
- and other aspects related to quality in FM.

The understanding and application of this standard will support the creation of metrics which will enable measurement and assessment of quality of FM and FM Services and the added value to the primary activities.

- facilitate the management of primary activities;
- increase of productivity (efficiency effectiveness);



- reach financial targets;
- improve the client image;
- enable corporate social responsibility / sustainability;
- measure congruence between needs/demands and delivery of customer, client and end-user.

## 0.2 Terms product and service – general and in facility management context

The terms product, service, facility product and facility service is used in this standard and the interrelationship need to be explained:

"Product" is used in the general EN ISO 9000 context of quality management in the sense of hardware, software, service. This use should help to provide the connection to established existing principles and methods of quality management in EN ISO 9000 context.

"Service" as part of the definition 'product' is used in the general quality management context as a time-perishable, intangible experience performed for a customer acting as co-producer.

"Facility services" is defined in EN 15221-1:2006 and is the support provision to the primary activities of an organization, delivered by an internal or external provider. Facility services are services related to "space and infrastructure" and to "people and organization".

According to the existing FM model in standard EN 15221-1 is decided that facility services are only used on operational level. The terms "facility services" and "classified facility products" are not used on tactical and strategic level.

"facility product" is one of a defined set of hierarchically organized classified facility services - only the term "(classified) facility products" is used in that context only.

In EN 15221-4 and EN 15221-5 facility services have been classified. These "classified facility services" will be called '(classified) facility products' or 'simply facility products'. When referring or using the term facility product, they will refer to EN 15221-4.

The classification of "facility services" to "classified facility products" is described in 5.4.2. After this subclause, the terms "facility services" and "classified facility products" are used in this standard.

## 1 Scope

This European Standard provides a guideline how to measure, achieve and improve quality in FM. It gives complementary guidelines to EN ISO 9000, EN ISO 9001 and EN 15221-2 within the framework of EN 15221-1. The standard provides a link into management methods and management theories.

This European Standard is applicable to:

- FM in public and private organizations;
- client organization and service provider relationships;
- full range of facility products or facility services;
- both types of service providers in FM (internal and external);
- all types of working environments (e.g. industrial, commercial, administration, military, healthcare etc.).

This European Standard is applicable to business services (not consumer oriented).

This European Standard does not:

- replace the quality management systems of the client organization;
- provide standard forms:
  - for performance and quality management systems (delivering a quality management system);
  - for defining requirements;
  - for a measurement tool;
  - for service level;
- apply to the certification of the quality system of Facility Management (covered by EN ISO 9001).

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15221-1:2006, *Facility Management — Part 1: Terms and definitions*

EN 15221-2:2006, *Facility Management — Guidance on how to prepare facility management agreements*

EN 15221-4, *Facility Management — Part 4: Taxonomy, Classification and Structures in Facility Management*

## 3 Terms, definitions and abbreviations

### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.



### 3.1.1

#### **quality**

degree to which a set of inherent characteristics fulfils requirements

[EN ISO 9000:2005]

### 3.1.2

#### **requirement**

need or expectation that is stated, generally implied or obligatory

[EN ISO 9000:2005]

### 3.1.3

#### **characteristic**

distinguishing feature:

- physical (e.g. mechanical, electrical, chemical or biological characteristics);
- sensory (e.g. related to smell, touch, taste, sight, hearing);
- behavioural (e.g. courtesy, honesty, veracity);
- temporal (e.g. punctuality, reliability, availability);
- ergonomic (e.g. physiological characteristic, or related to human safety);
- functional (e.g. maximum speed of an aircraft)

[EN ISO 9000:2005]

### 3.1.4

#### **product**

result of a process

product categories, as follows:

- services (e.g. transport);
- software (e.g. computer program, dictionary);
- hardware (e.g. engine mechanical part)

[EN ISO 9000:2005]

### 3.1.5

#### **service**

time-perishable, intangible experience performed for a customer acting as co-producer

### 3.1.6

#### **facility services**

support provision to the primary activities of an organization, delivered by an internal or external provider

NOTE Facility services are services related to "space and infrastructure" and to "people and organization".

[EN 15221-1:2006]

### 3.1.7

#### **facility product**

one of a defined set of hierarchically organized (classified) and standardised facility services

NOTE The term product is used in accordance with EN ISO 9000 being the output of a (facility) process which can be a single or a package of material (hardware) or immaterial provisions (software), supplies or services which support the primary activity of the organization and its properties.

[EN 15221-1:2006]

### 3.1.8

#### **process**

set of interrelated or interacting activities which transforms inputs into outputs

[EN ISO 9000:2005]

### 3.1.9

#### **system**

set of interrelated or interacting elements

[EN ISO 9000:2005]

### 3.1.10

#### **grade**

category or rank given to different quality requirements for products, processes or systems having the same functional use

[EN ISO 9000:2005]

### 3.1.11

#### **service level**

complete description of requirements of a product, process or system with their characteristics

NOTE The described set of characteristics in the SL can be graded within boundaries suitable for measurement and analysis.

### 3.1.12

#### **indicator**

measured or calculated characteristic (or a set of characteristics) of a product according to a given formula, which assess the status or level of performance at defined time

### 3.1.13

#### **key performance indicator (KPI)**

measure that provides essential information about performance of facility services delivery

[EN 15221-1:2006]

### 3.1.14

#### **client key performance indicator**

indicator that provides essential information about performance of the client organization

NOTE The client key performance indicators have to be given by the client organization, based on its strategic goals pursuing the development of the primary activities.

### 3.1.15

#### **FM-indicator**

indicator that measures the quality of facility products

NOTE They are used on different levels (e.g. strategic, tactical or operational Level) see Figure 6.

### 3.1.16

#### **FM-key performance indicator (FM-KPI)**

FM-indicator influencing the primary activities of the organization by feeding client key performance indicators

NOTE FM-indicator linked to client's organization objectives and related facility product which directly impacts the primary activities.

### 3.1.17

#### **FM-top indicator**

indicator important for the FM activities without being FM-KPI



NOTE Not directly linked to the client organization objective.

### 3.1.18

#### **sustainability**

ability of system to be maintained for the present and future generations

NOTE In this context "system" comprises environmental, social and economic aspects.

[EN 15643-2:2011]

## 3.2 Abbreviations

FM – facility management

SL – service level

SLA – service level agreement

KPI – key performance indicator

PDCA – plan, do, check, act

QM – quality management

QMS – quality management system

## 4 Basics of quality management

### 4.1 Importance of quality in FM

For the client organization the quality of the services delivered is fundamental, since the quality of the support processes may influence the primary activities and organizations objectives of the client considerably.

Consequently the client should have all necessary means (knowledge, processes, tools, etc.) to define the quality of the services and ensure that the quality delivered will fulfil the requirements, meet the demands and satisfy needs within the clients' organization.

In order to achieve this goal the client should have also the means:

- to obtain the quality of the services;
- to permanently control the quality of services delivered (results).

The client should define:

- the services which are needed, preferably in the form of classified facility products;
- the SL to be fulfilled;
- the indicators and processes to measure the quality;
- the action in case of quality discrepancies.

The challenges are

- to determine the "right" level of quality in the SL/SLA, and



- then to provide it within the delivery process.

## 4.2 Criteria, background, elements and influences to quality

Quality is the degree in which a set of characteristics fulfils requirements. In the context of FM, requirements have to be fulfilled for the client organization including the client, customer, end user and society.

In the process of defining the characteristics of the product that are defined in the SL/SLA the following aspects for an organization shall be thoroughly considered:

- the **needs** (e.g. subsistence, protection, affection, understanding, participation, leisure, creation, identity, freedom, etc.) which are physiological or psychological requisite for their well-being;
- the **expectation** or belief (projection into the future) which may be expressed precisely, explicitly, fussily or implied;
- the **perception** (process of interpretation and organization of the stimulation of the humans sensory receptors to produce an experience) within the context of the society, culture, traditions; etc. The perception of quality is strongly influenced by the needs, expectations and constraints of the recipient of the product at the time of delivery;
- client, customer and end user **perceived value** as ratio of satisfaction and/or experience over perception of the fairness of the price;
- the various **constraints** (e.g. financial, resources, legal, etc) resulting in selection, filtering, prioritising within the clients organization and related market.

It is important to note, that needs, expectations, perceptions are different for all individuals as well as part of organizations and clients management have to be used to select and prioritise the various performance/quality criteria considering various constraints within the organization and the market.

In the process of delivering the product as well as in the process of receiving/consuming the product the same as above mentioned aspects apply and shall be considered.

In the life cycle the changes of above aspects shall be considered as well as changes of knowledge and changing of awareness.

## 4.3 Type of Characteristics

### 4.3.1 General

In order to define the quality of a product, indicators for appropriate characteristics shall be used. They may be defined as objective (hard) and/or subjective (soft) characteristic. Indicators for subjective characteristics are mostly not clearly expressed/described since they are related to client, customer and end user's needs, expectations and perceptions and they are often generally implied.

### 4.3.2 Objective (hard) characteristic

- physical  
(e.g. mechanical, electrical characteristics)
- temporal  
(e.g. punctuality, reliability, availability)
- functional  
(e.g. availability of an technical equipment)



- financial  
(e.g. cost, price)

Measurement of objective (hard) characteristics can be made objectively with metering / measurement instruments and are not subject to interpretation within given measurement conditions (method, timing, area, etc.) and they do not depend on individuals interpretation.

"Hard measures" of customers satisfaction shall measure and reflect customer's actual doing and buying behaviour (gains and losses of customer, market share relative to competitors, repeated business, etc.).

#### 4.3.3 Subjective (soft) characteristic

- sensory  
(e.g. related to smell, touch, taste, sight, hearing);
- behavioural  
(e.g. courtesy, honesty, veracity)
- ergonomic (e.g. physiological characteristic, or related to human safety)

These characteristics are strongly influenced by the perception of e.g. an individual, a segment/group/part of client organization (e.g. department), an organization as a whole.

Measurement of subjective (soft) characteristic e.g. client, customer and end user's satisfaction, experience and perception are referred usually as "soft measures" and are usually a result of surveys. They are measures of customer opinion, perceptions and feelings and these indicators may be used to predict customer's behaviour, satisfaction and perceived values. They also help to identify problems early so they can be corrected.

The interaction of elements and influences to quality in Facility Management is shown in Figure 1:

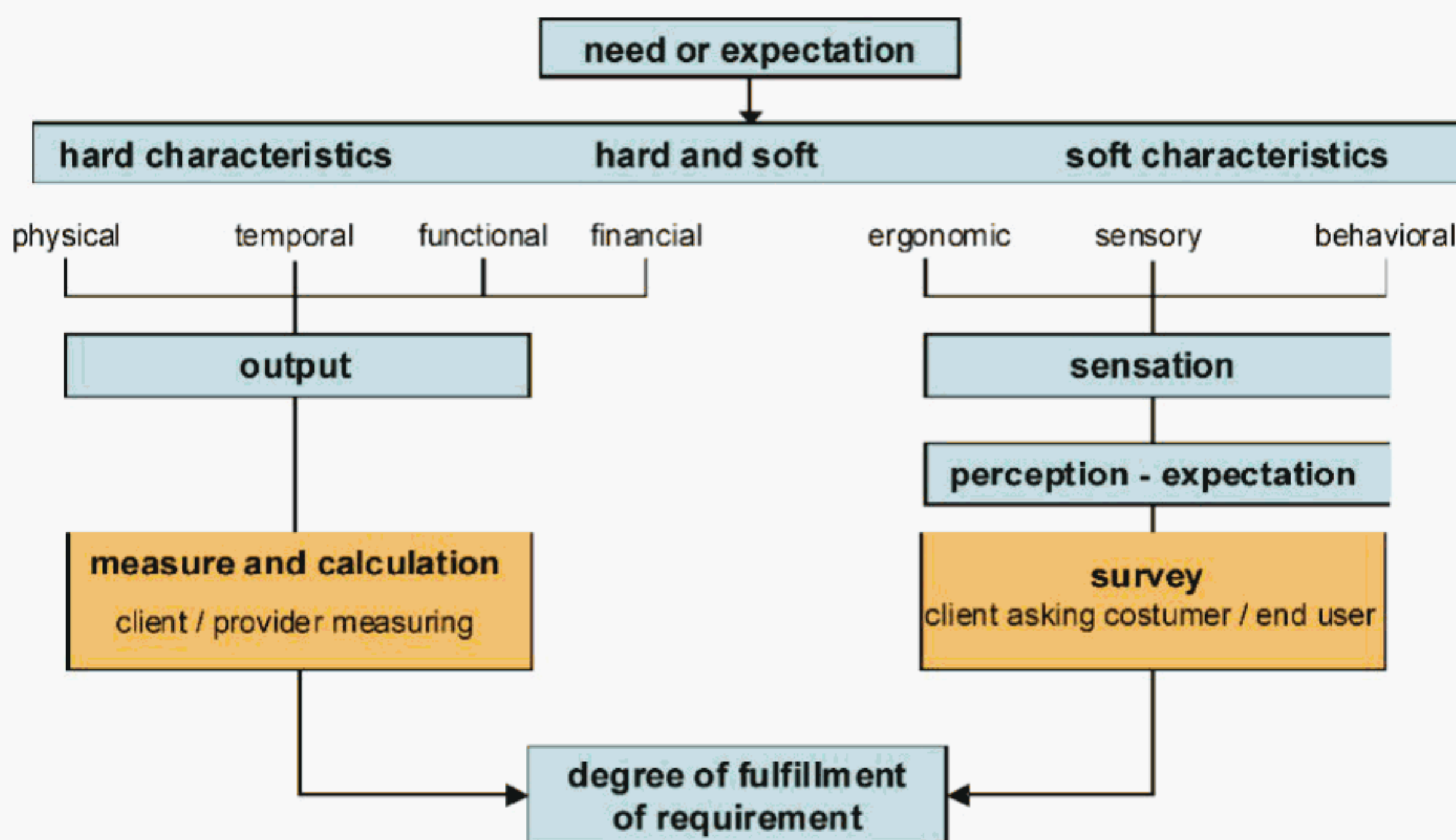


Figure 1 — Elements and influences to quality in Facility Management



NOTE According to EN ISO 9000:2005 is a proposal of classification:  
quality - Quality is the degree in which a set of characteristics fulfils requirements.  
requirement - need or expectation that is stated, generally implied or obligatory  
characteristics - distinguishing feature (physical, sensory, behavioural, temporal, ergonomic, functional)

## 4.4 Pathway from needs to experiencing delivery

### 4.4.1 Expectations

Parts of an organization or the whole organization have underlying needs which may be explicit. These may also be unstated or implied from other needs which may also be expressed precisely or in vague terms.

The challenge is to define and to provide services and products that will maximise the congruence and conformity between the needs and expectations of / with services. This will trigger satisfaction and excitement in the client organization (client, customer and end user).

### 4.4.2 Defined requirement in SL/SLA

— Translate needs into corresponding demand:  
In an internal process the organization has to define (translate /convert) their demands which should meet the needs at its best. Usually there is a gap between the often higher expressed expectations and the "right" demand.

— Translate demand into specific requirements  
Since demands do not specify explicitly the requirements for corresponding services they have to be formulated.

Requirements are prerequisites for the specification of the SL either described in a tender offer and/or negotiated in a process with the service provider.

The above translations processes inherits deviations from the needs to be met, due to:

- Only a subset (part) of the needs are formulated explicitly.
- The fussy and implicit expectations are often not expressed respectively since client organization is not aware of their existence.
- They are furthermore altered and/of filtered due to constraints within clients organization like: culture, financial, importance to hierarchies, temporal (time pressure), knowledge, and there like, as well as Insufficient communication
- Faulty and/or incomplete translation process.

As a consequence thereof the SL description (defined requirement) inherits a non-compliance with the needs and therefore leads to a gap between the expected (often not clearly expressed) requirement defined requirement (see Figure 2).



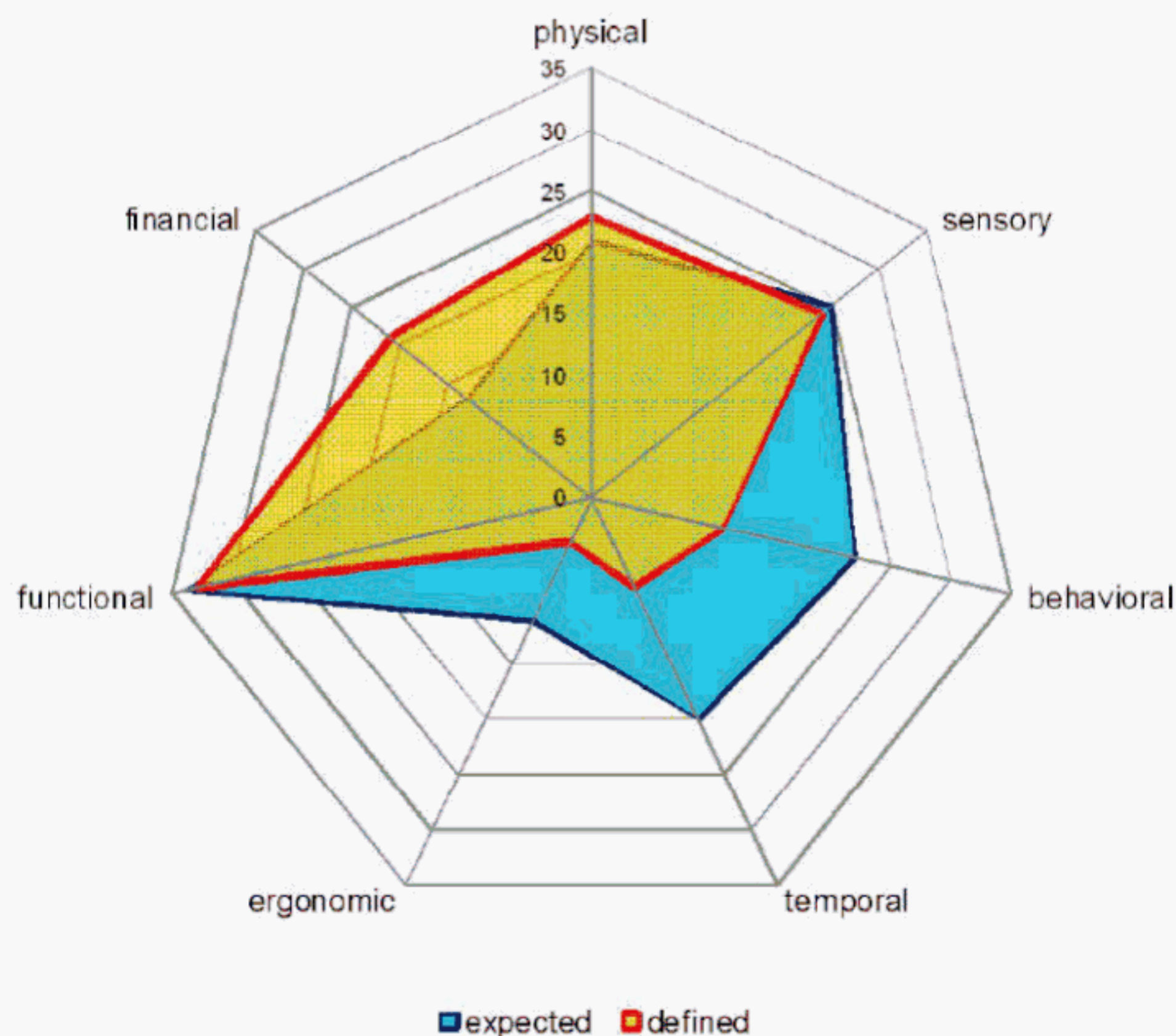


Figure 2 — Gap between expected and defined requirement

#### 4.4.3 Delivery

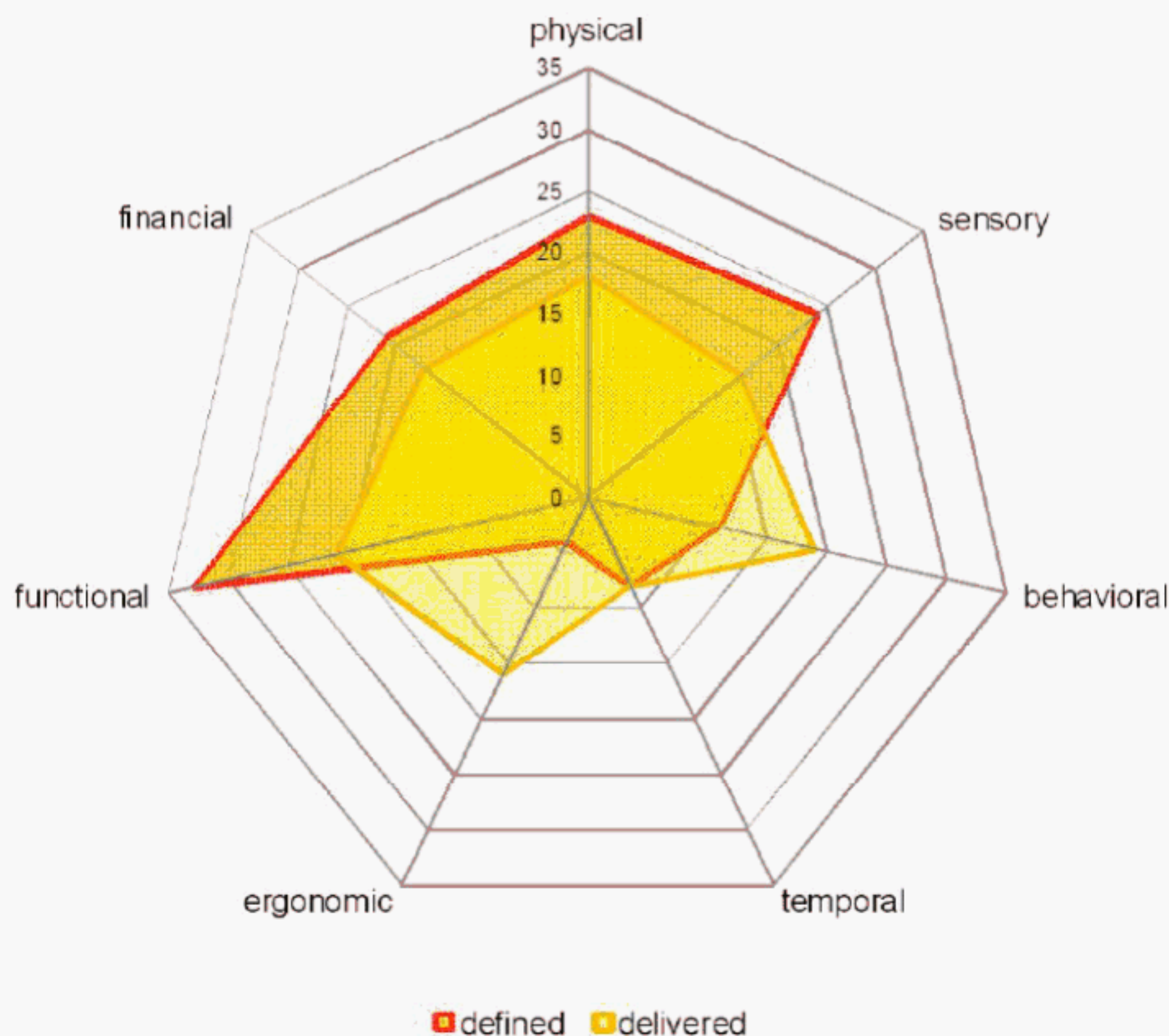
Due to constraints and deviation of providers performance and eventually different providers interpretation and perception of specified characteristics and related indicators in the service level agreement a deviation may accrue (gap between delivery and defined requirements – see Figure 3).

#### 4.4.4 Perception

At the time of service delivery the characteristic of the product may be perceived / experienced differently (gap) by the client organization then intended and communicated / defined in the above described process.

All above described deviations (gaps) may become evident and shall be subject to quality assurance and the continuous improvement process.





**Figure 3 — Gap between delivery and defined requirements**

Under-fulfilment (low quality) of the requirements may have an impact on the primary activities and consequently client customer and end user's satisfaction as well as success of the primary activities.

Over-fulfilment is usually ineffective and implies higher cost for the provider and client prices, leading to economic disadvantages.

## 4.5 Quality Management

### 4.5.1 General

The quality management goal is to ensure that delivery meets demand, processes are optimised and that continuous quality improvements are in place. For this it is important to use metrics to measure the results in the development over time to improve service delivery and processes.

Various QMS approaches exist, the main one being based on EN ISO 9000. Other approaches proposed on the market are more specialized (e.g. oriented towards the provider or for perception/expectation orientated systems). In any case the present standard does not intend to replace theses systems.

### 4.5.2 Existing QMS at client organization

Within the client's organization very often QMS already exists. The purpose of the clients QMS is to improve the effectiveness of the client primary activities. This existing QMS should be adapted to the use for quality management in the FM processes and need to be synchronized at the relevant quality indicators.

The QMS of the primary activities will have requirements to the primary and support processes. These metric-systems should fit in the QMS which are measured and determined by the client. The output of the FM



systems shall contribute the client performance objectives, so the metrics should be elaborate in order to fit to the QMS of the client organization. This standard provides guidance for methods and tools.

## 5 Process of quality management

### 5.1 General introduction

#### 5.1.1 The quality management process

The quality management process is a process within an FM organization (FM performance and quality management process – see Figure 4). The processes concerned are strongly interdependent and impact directly the efficiency and productivity of activities (FM activities as well as primary ones). The process consists of activities at the three levels of the organization:

- strategic level (the processes partly aimed at controlling that the client's need are met and partly aimed at measuring that the goals of the facility organization will be reached);
- tactical level (the processes partly aimed at controlling that the customer's needs are met and partly aimed on controlling that the indicators of the management of services are reached);
- operational level (the processes partly aimed at meeting the end user's needs and partly aimed at controlling that the indicators on the operational tasks are met).

Development and elaboration of quality criteria, quality measurement and indicator in process are presented in Figure 4.

The figure below shows the application of the FM quality management processes within the FM processes.

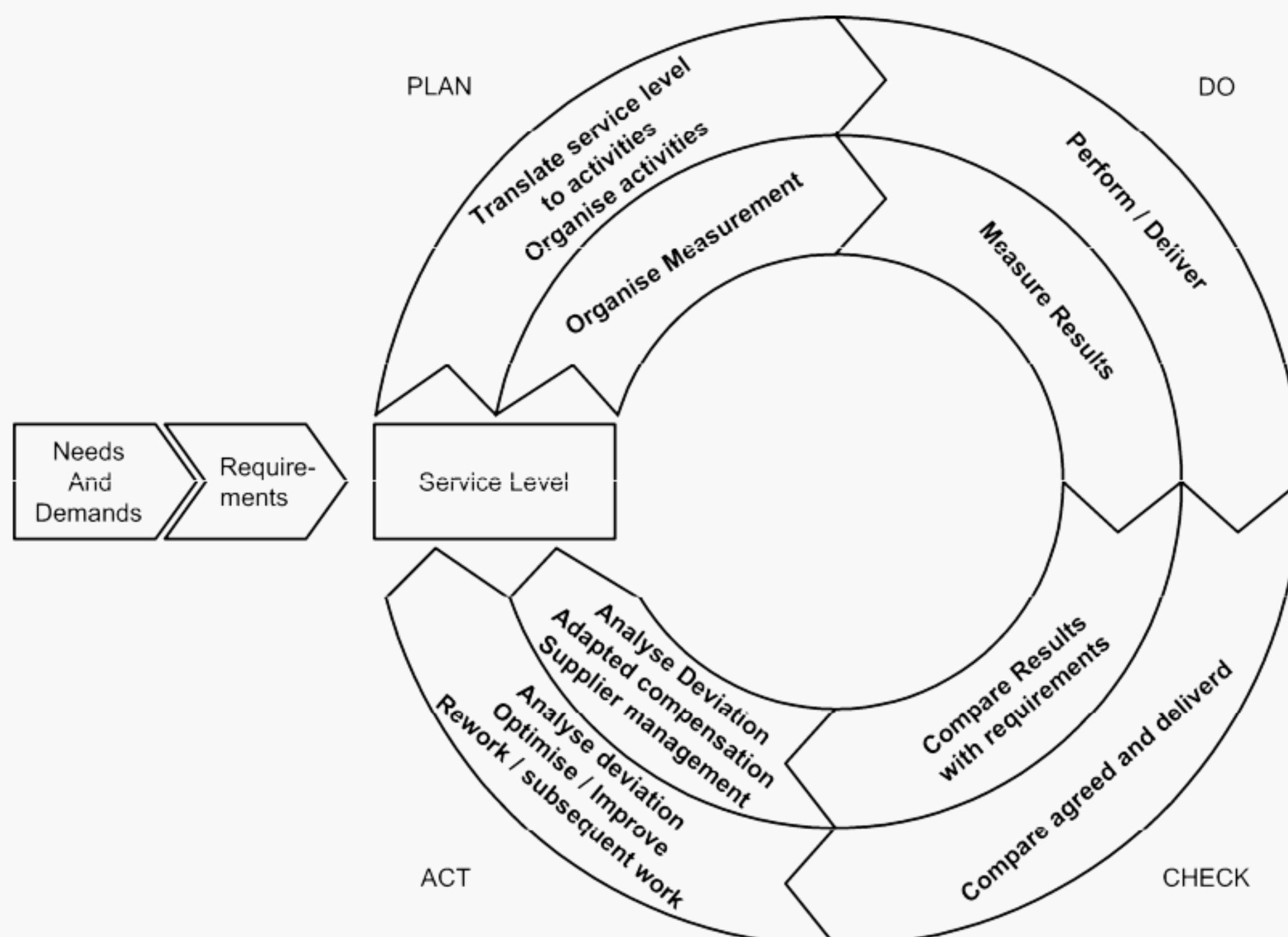


Figure 4 — quality management cycle within FM processes



The description FM service delivery process and the FM quality management processes as an interactive iteration:

- needs and demands are converted to requirements. Requirements lead to Service Level;
- the outside cycle describes the FM service delivery process;
- the inside cycle describes the FM quality management processes.

### 5.1.2 Ensuring quality within FM agreement lifecycle

Within the FM agreements according to EN 15221-2, the following main actions (in parenthesis) should be performed related to KPI and SLA:

- preparation of FM agreements
  - client preparation phase  
(how facility services quality may impact primary activities);
  - pre-qualification and selection phase  
(how the providers understand client quality of services importance, what do the providers propose);
- tender/negotiation phase  
(dialog on defining adequate FM Key Performance Indicator and agreed values for them);
- FM agreement preparation phase  
(refining proposed FM Indicators both KPI and FM KPI, and their value);
- signature phase  
(final formal set up of FM Indicators and corresponding SLA);
- mobilisation phase  
(finalisation of the procedures to measure the values of agreed Indicators and their value and to define actions to be performed after measurement);
- validation phase, including due diligence if not performed before  
(validation of agreed values for indicators and corresponding procedures);
- operational phase  
(using SLA to follow-up the facility services and improve their quality)
  - implementation and stabilisation;
  - optimization (Some quality indicators and their value may be revisited);
- ending phase  
(finding out which improvements for FM Performance Indicators and their values can be included within the new agreements).

## 5.2 Analyze needs and demand

In general terms, EN 15221-2 explains how, the client by himself, eventually with the help of outside consulting, should define his demand. This demand (requirements) consist of the description of the requested facility services and their specifications including performance and quality (see 8.2.5.2 of EN 15221-1:2006). The elaboration of this client demand continues through the whole process leading to SLA.



Consequently the methods to elaborate this demand, i.e. requirements, are similar to the ones described in the following EN 15221-2:2006, 5.3 and are not repeated here.

Along the whole process ending with a SLA, the demand is refined by more and more precise elements and through back and forth discussions with the clients, customers and end-users as well as the service provider.

### 5.3 Specify requirements

#### 5.3.1 Objectives

The objective of determining requirements is to obtain the requirements which will be part of the specifications of the facility services incorporated within the SLA. These specifications are presented within 8.2.4.1 and 8.2.5.2 of EN 15221-2:2006, including performance and quality aspects and are presented in a simplified way within 7.4.2.

#### 5.3.2 Possible techniques to determine client's organization needs:

- specification of the organization;
- conduct customer requirement research;
- ask what the customer wants and why (meetings, surveys, studies, etc.);
- determine requirements through customer feedback/complaints;
- quality function deployment for new products and functions (based on customers "wish list");
- perform due diligence of the client existing services and organization / analysis of present status;
- with client/customers/end users representatives perform benchmarking including sites visits/comparisons with other organizations (similar or not);
- assume that what you already know is what customer wants and verify understanding so that an awareness is obtained.

#### 5.3.3 Requirements from primary activity

To elaborate the requirements coming from the organizations primary activity following steps have to be performed:

1. understand the primary activities and get information about the organizations objectives (requirements) of the primary activities themselves.

##### a) client

communication with management of the client, get the global organization objectives  
check corporate guidelines, policies (environmental, ethic, etc.), internal rules;

##### b) customer

communication with business units, key customer groups (varying according to each organization) in order to obtain their requirements;



c) end user

obtain their expectation directly or through customer (internal and external);

d) society

rules and regulations, corporate engagement and strategy;

2. identify the objectives of organizations primary activity which may be impacted by FM;
3. translate corporate strategic objectives to FM strategies and objectives;
4. identify the contribution/impact and added value of the product delivery to primary activities and client organization (e.g. efficiency, effectiveness, image, human resource support);
5. identify and analyze the potential risks / criticality (in the scope of corporate risk management) of the product delivery to the primary activities in case of non-availability or non-performance of it;

## 5.4 Elaborate Service Level

### 5.4.1 General

A Service Level (SL) is a complete description of requirements of a product, process or system with their characteristics. The described set of characteristics in the SL can be graded within boundaries suitable for measurement and analysis (EN ISO 9000).

SL is set by the client and may be a single party description. It can be described without having another party or through interaction with service providers.

A SLA in FM is an agreement between the client/customer and the service provider on performance and conditions of facility service or facility product delivery. The structure of a SLA is described in 8.2 of EN 15221-2:2006.

### 5.4.2 Transfer requirements into facility products

To define a SL each requirement, as much as possible, has to be mapped to a (classified) facility product (see EN 15221-4). One way to do this mapping systematically is to utilize the facility product map in EN 15221-4 to determine which facility products should be selected to fulfil the requirement. Use classified facility product categories if possible. If needed add individual aspects to an existing product or combine aspects of different products thus creating individual / specific facility services.

### 5.4.3 Elements of a Service Level

Take a (classified) facility product or create a new (individual) facility service and develop, based on the requirements, the SL.

Elements of a SL could be:

- specification e.g.:
  - extension (included items / not included items);
  - volume and quantities;
  - applicable standards and specific needed techniques;



- timing, time frame or dates; duration, intervals, milestones, due time, frequencies;
- requested personal/requested competencies;
- reporting requirements;
- procedures that have to been followed.

Elements of the service level are recognized on strategic, tactical and operational level. These elements will be described in a SMART (Significant, Measurable, Achievable, Responsible and Time Scale) way in service level agreements with indicators on strategic, tactical and operational level.

EXAMPLES:

- strategic level: key performance indicators as "flexibility of the facility organization" or the "added value to the primary process" or the cost of FM per square meter, etc.;
- tactical level: indicators as "square meters per workplace per office building", "opening hours per service", etc.;
- operational level: indicators as "time that service is out of order", "response time", "end-user satisfaction", etc.

Following the process described in 5.5 elaborate on the specification for performance and quality measurement metrics i.e. objectives and added value that should be reached / achieved.

#### 5.4.4 Principle and approaches of defining Service Levels

Defining a SL is an iterative Process. Usually it starts with a general concept / idea of the clients' organization with a few strategic targets. Through the step by step process clear and precise description are generated. During the iterative process the interfaces to primary activities, responsibilities (internal and external), roles, and targets etc. has to be defined and agreed within the client organization.

With regards to risk management and its importance for the organization, the consequences and interactions shall be analyzed in terms of impact and potential degradation of the service within the primary activities. Service levels that are elements of a larger management system shall be analyzed towards risk transfer.

Regarding adding value, service levels had to bring value in the means for the client organization image, transformation/changes, Human Resource Support, efficiency, effectiveness, value for money cost/quality ratio's, etc.

The creating process should follow a ranking of importance of the facility products according to these considerations.

This interactive and iterative process enables:

- client organization is aware of:
  - its real needs;
  - best practices and experiences, benchmark;
  - ideas or criteria not yet considered;
- services provider to understand clients organization needs.



## **5.4.5 Types and classification of Service Level**

### **5.4.5.1 General**

SL can be related to all three levels (strategic, tactical, operational).

SL can be classified into two main categories: Input orientated and output orientated (see EN 15221-2).

That means that SL can be (more) input or output oriented and can be defined on one, two or all three levels (a strategic and/or tactical and/or operational level).

### **5.4.5.2 Input oriented SL**

A SL is considered input orientated when the characteristics or aspects (set of characteristics) that compound its definition are somehow based on theoretical or imposed means, not necessarily the best, but based on client's own reasoning, i.e. past experience, knowledge, standards, procedures, internal politics, etc.

The level of risk transferred/managed is limited, since the service provider has no flexibility in the level of resources and the described manner.

### **5.4.5.3 Output oriented SL**

The output oriented SL is mainly requirement driven (What to achieve - not how to achieve).

The activities of the service provider should be driven by the goal to reduce deviation between the actual observed situation and the specified requirements. Specific tasks or specifications are not given ("the how" is not defined).

High level of flexibility in the level of resources and the described manner exists.

Usually a service level will be somewhere between input and output orientation. It is rare to find a Service Level with all its characteristics 100 % within either input or output orientation.

Service Levels on a more strategic level are usually more output orientated. Services Levels on a more operational level are more input orientated.

Output oriented SL should be the standard. Input oriented SL should be the exception and only be used if output oriented SL can not be used (e.g. security).

## **5.4.6 Service Level life cycle**

### **5.4.6.1 General**

A SL has to be actualized and optimized periodically over time.

### **5.4.6.2 Preparation phase**

In the preparation phase (see 5.4.3) the service levels are created on a more theoretical description coming from the best available information.

### **5.4.6.3 Start-up phase**

In the Start-up phase there is a higher effort to reach the agreed service level. At the end of the start-up phase the defined service levels have to be reached with the planed manners and resources or agreed changes have to be introduced.



#### 5.4.6.4 Continues improvement / Optimization phase

A service level as a part of a quality management system shall have the capability of assuring continuous improvement. A measurement methodology shall be in place. Development and changes have to introduced and be tracked.

#### 5.4.6.5 Changes

Over time of a service level changes have to be introduced due to various reason e.g.:

- change of needs and requirements of the client organization over time (e.g. mergers or acquisition);
- external influence (e.g. competition / law an legislation);
- change of manner, technologies or organization by the service provider.

### 5.5 Developing measurement metrics (hierarchy of indicators)

#### 5.5.1 Purposes of developing metrics (structured indicators)

This subclause suggest how to elaborate appropriate metrics (i.e. set of indicators and the structure of them), that will ensure FM performance and quality now and in the future and will enable tracking the progress towards future targets.

Good metrics with a solid set of coherent/updated (for all type of changes e.g. in processes, targets, values) metrics will:

- allow to control process to produce reliable and consistent facility products;
- allow to recognize cost;
- allow to recognize early problems and predict outcomes, before they escalate or fail;
- enable to better meet the demand of customer organization;
- allow improved decisions making, leading to improved facility product and organizational performance (continues improvement);
- improved benchmarking;
- deliver the right quality (characteristics that matters) at a fair price (perceived value);
- provide a control / management tool which will contribute to efficient operation (saving meetings, reviewing and analyzing statistics and reports, etc.).

#### 5.5.2 Various types of indicators

Types of indicators (defined in 3.1.11 – 3.1.16) as:

- indicator;
- client key performance indicator;
- FM-indicator;
- FM-key performance indicator (FM KPI);



— FM-top indicator.

can be presented according to the below graph (see Figure 5):

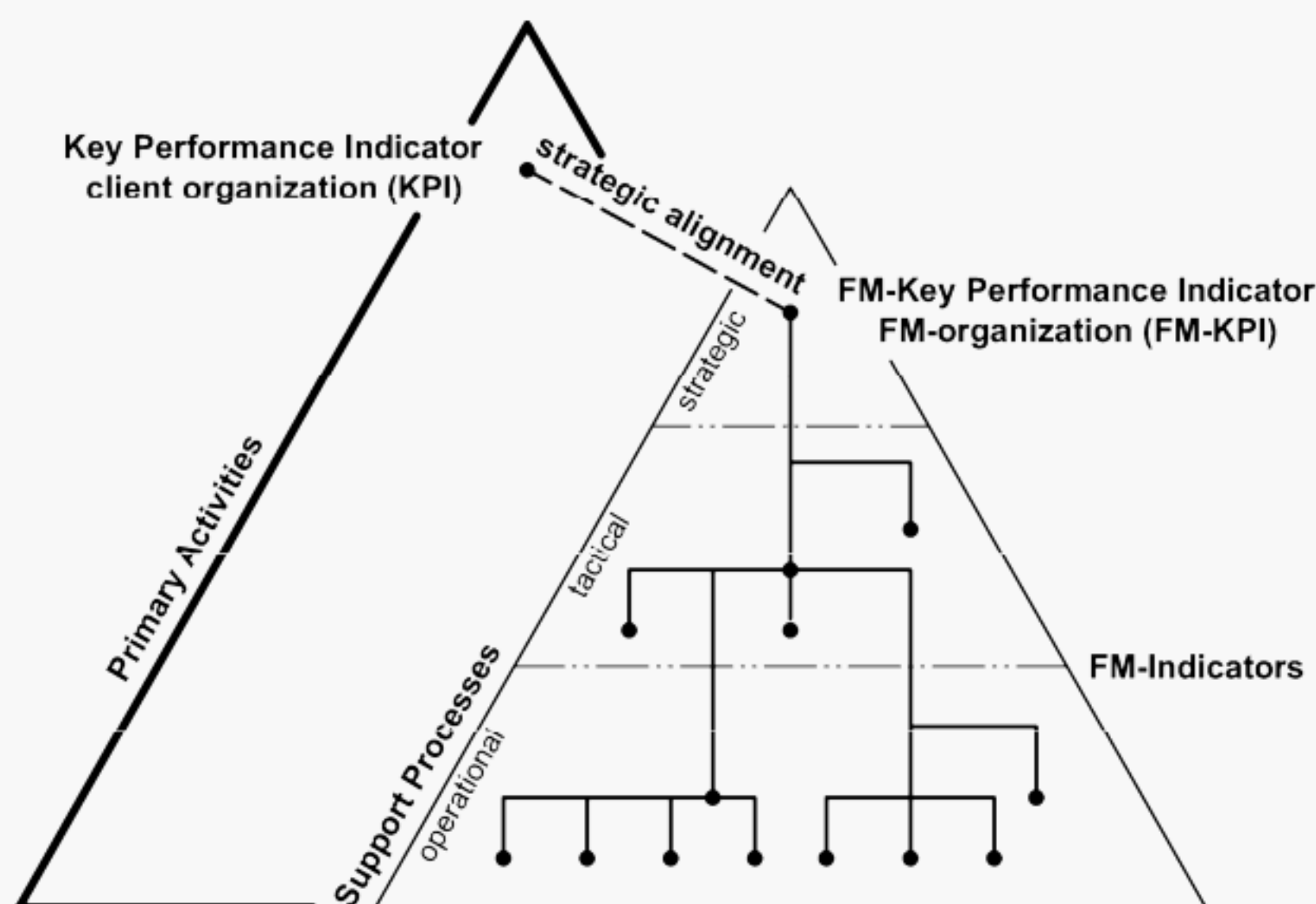


Figure 5 — Types of indicators

In Figure 5 is shown that the indicators have different levels and have a relation with each other from strategic level to tactic and operational level. The Key Performance Indicator of the primary activities are linked to the facility organization and their strategy. For the FM organization the Key Performance Indicator of the primary organization and FM-Key Performance Indicator (of the FM organization) are relevant to manage the processes. All indicators need to be connected to indicators on "lower levels" in the metric system.

Another classification of Indicators is:

— Single measurement indicators

qualify a characteristic (or a set of characteristics) of a product / service and provides information about their performance e.g. units sold, m<sup>2</sup> cleaned, number of guests or calls to helpdesk, etc.;

— Aggregated indicators (e.g. ratio) on various levels for overall / condensed view of performance/quality along a defined structure e.g. CO (carbon monoxide) reduced, cost per work place, mean time for repair.



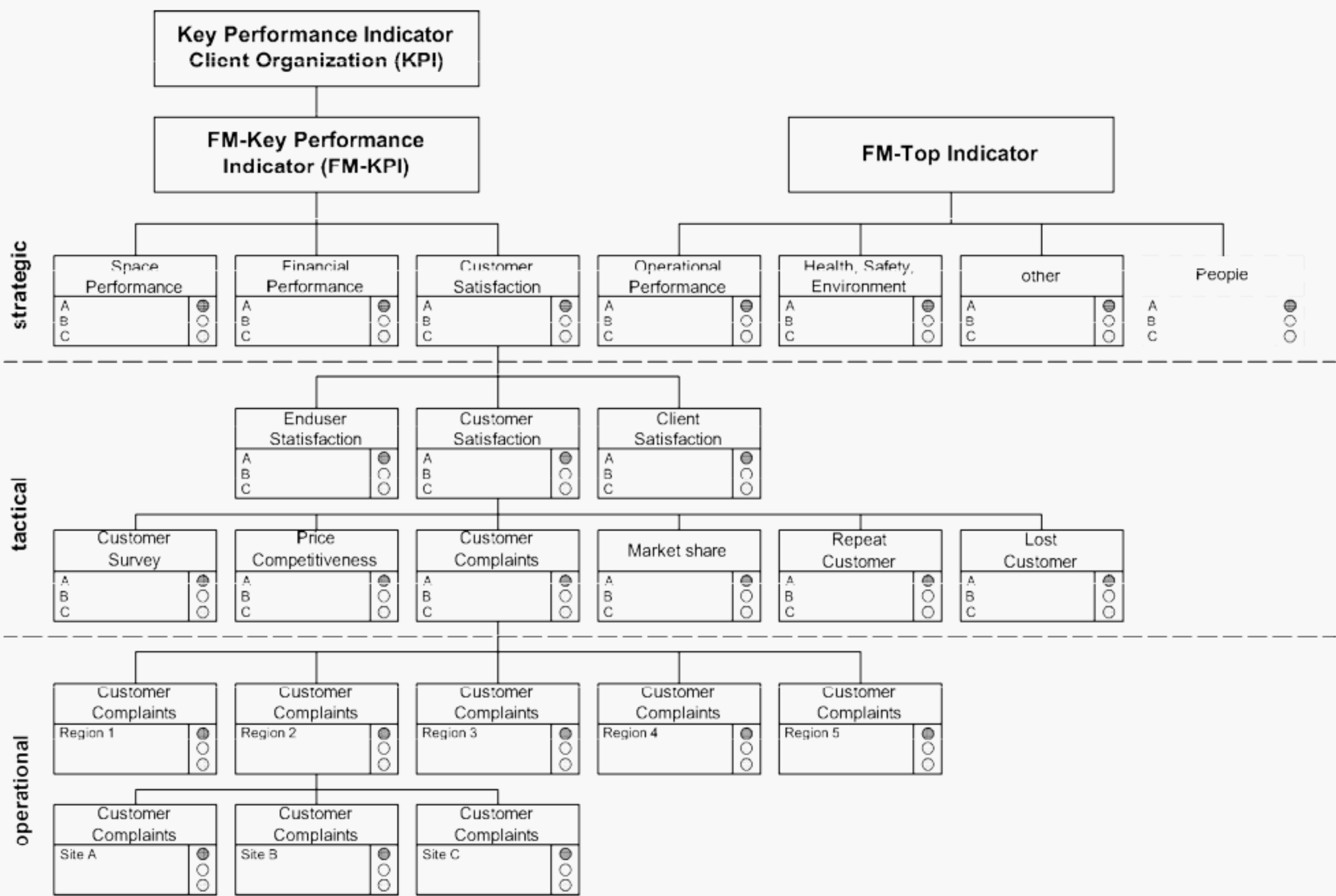


Figure 6 — Example of hierarchy and aggregation of indicators

5.5.3 Recommendation for measurement metrics

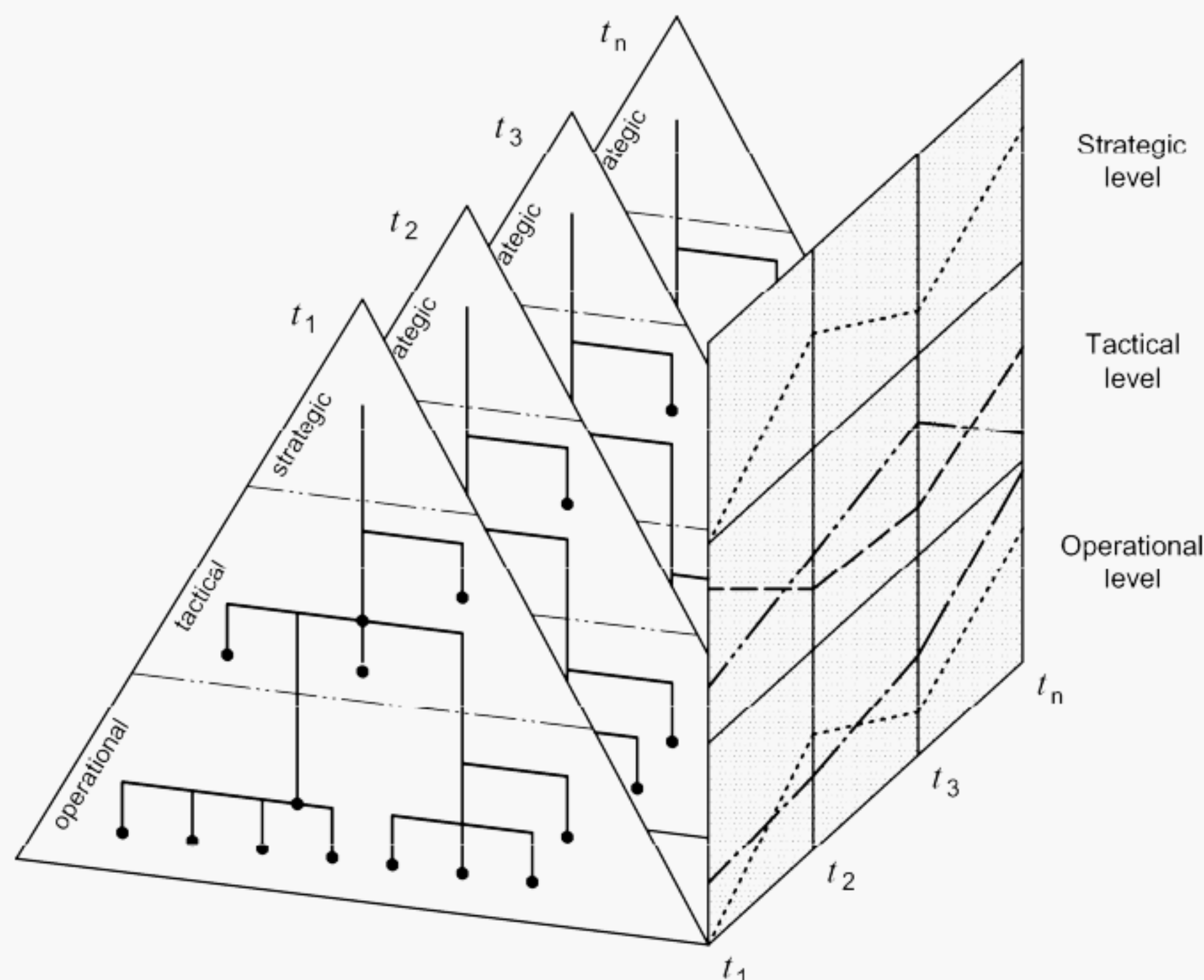
The metric system with its indicators shall be developed and defined top down based on

- mission vision values (see Figure 5); then
- key success factors and business fundamentals (see Figure 6); then
- performance metrics in past, present and future (see Figure 7).

Additional information and recommendation for measurement metrics to Annex B.

- recommendation for designing a metric system (B.1);
- attributes of indicators (B.2);
- indicators selection criteria (B.3);
- required properties of indicators (B.4);
- data gathering techniques (B.5);
- domains and categories on indicators (B.6).





**Figure 7 — Indicators histogram**

In Figure 7 is shown that single measurement indicators and/or aggregated indicators may be measured/calculated at a certain point in time or aggregated over a period of time.

## 5.6 Quality aspects in organizing delivery of facility products

Without well-organized delivery it is challenging to achieve quality. Organizing delivery focuses on the strategic, tactic and operational processes. Organizing includes the:

- Development of facility processes, focusing on policy and strategy.

Organization of delivery should consider the mobilization, validation and operation phase as mentioned in EN 15221-2.

- Management of processes on leadership, people, partnership and resources, e.g.:
  - organizational structure;
  - tasks, responsibilities and competences (e.g. in job descriptions);
  - choices in resources and requirements like: internal/external labour, financial resources, information;
  - planning/appointing work items/work program including:
    - tools, means, techniques that have to be applied (the minimum compulsory level);
    - training identify specialist and industry training requirements;
    - materials and consumable items;
    - standards of equipment and workmanship;



- safety requirements that have to be complied with.
- planning communication (how/where/when);
- implementation activities (projects);
- controlling implementation activities;
- processes and workflow including:
  - interface between primary process and support activities;
  - parties involved;
  - process owner;
  - flow of information;
  - flow of material (resources);
  - flow of documents;
  - flow of financial means;
  - interaction and interfaces from/to other processes.
- Renewal of processes, focusing on innovation and learning from indicators and reactions (or actions) on project control from:
  - people results;
  - end-user/customer/client results and;
  - society results.

## 5.7 Quality aspects in delivering facility products

The delivery facility products by the provider should be done according to SLA. The client may control the delivery of the facility products. Client and provider should follow the role according to the agreement.

Training of people in the use of the defined various tools is necessary along the lifetime of the agreement.

If the defined targets are not reached, immediate reaction of both parties is necessary.

If changes with the SLA have to be introduced, a defined formal way to perform it shall be followed.

NOTE See 7.2.3 of EN 15221-2:2006.

## 5.8 Measurement and calculation

Indicators may be measured during or at the end of the process based on the predefined structure and measurement metrics.

For further information see Annex B, in particular B.5.

Indicators may be calculated with defined algorithms. In order to receive a overall / condensed view of performance/quality along a defined structure (including e.g. the 3 levels strategic, tactical, operational),



values of single measurement indicators may be aggregated through defined algorithms to obtain values of higher hierarchy indicators (see Figure 6).

The structure of indicators shall be systematic and based on vertical and/or horizontal structure enabling aggregation through defined algorithms e.g.:

- over time for a specific indicator (e.g. to trace history, indicate present status and projecting future);
- for same indicator over set of units (e.g. clients, projects, contracts, regions, spaces);
- of different indicators using weighting factors.

For the purpose of finding the variations and failures in the processes and/or product it is necessary that the evolution of the data is traceable and reproducible along the time and hierarchies.

## 5.9 Analyze deviation

The measured and calculated value has to be compared with the targets described in SLA. Deviations have to be reported and analyzed.

The deviations should be evaluated and as a result of the deviation analysis decisions can be made with regards to alterations in the organization, contract, management, measurements, requirements, expectation management, etc.

This will help finding the reason of not meeting the requirements (over/under fulfilment) e.g.:

- variations / failures of the process;
- variations on the constraints (e.g. volume deviation);
- failures or deviation in provided resources;
- failures in client, customer and end user involvement;
- improper organization setups;
- incorrect SL description / value of target indicator and false constraints.

Deviation between planed financial figures (e.g. higher costs for the provider, higher invoices for the client) may occur. These differences should be reported and analyzed.

Example: Writing a periodical executive report on past FM activities

Writing a report is part of Checking of the FM activities. Writing a report is part of a long-term quality cycle around the FM activities. The activities in the workflow within this process could be

## 5.10 Actions based on deviation

Short-term actions of the results of analyzing deviation are e.g.:

- emergency operations;
- short-term correction of defects / remedy of defects;
- procedures for failure to complete work / outstanding work;
- train and educate staff.



Agreement related consequences of deviations:

- apply the procedures contained in the agreement/contract (e.g. reward and penalty).

Non resolved deviation:

In the case of deviation and not meeting the requirements and if the problems can not be resolved (over/under fulfilment) e.g.:

- find out if the requirement is achievable under given conditions. If not, open discussion with the provider (e.g. change the given conditions);
- reconsider the requirements in relationship with the needs and expectations.

Deviation between expectations and customer/end user satisfaction:

- In the case of deviation between expectations and customer/end user satisfaction not been resolved the customer/end user expectations may have not been clear or not properly translated into requirements. Expectations have to be analyzed and reviewed and requirements have to be changed / clarified accordingly to achieve the requested perception.

## 5.11 Control and improvement cycles

Management has to ensure that the facility products are delivered as agreed, with particularly attention to all interfaces and resources.

The aim of continuous improvement process is to match need and supply, insure alignment between client and service provider organizations while optimizing the use of resources. Both should contribute to the control and improvement process (e.g. maximize effectiveness, efficiency, maximize flexibility, avoid double work, double data acquisition, etc.), by regular evaluation and appropriate measures.

The continuous improvement is one of the most important processes, especially because continuous improvement influences the demand specification and the productive processes by giving feedback to the primary process and decision preparation and change management at a strategic level.

For the continuous improvement process there should be a formal procedure to permanently review the results including periodical review meetings (e.g. monthly / quarterly).

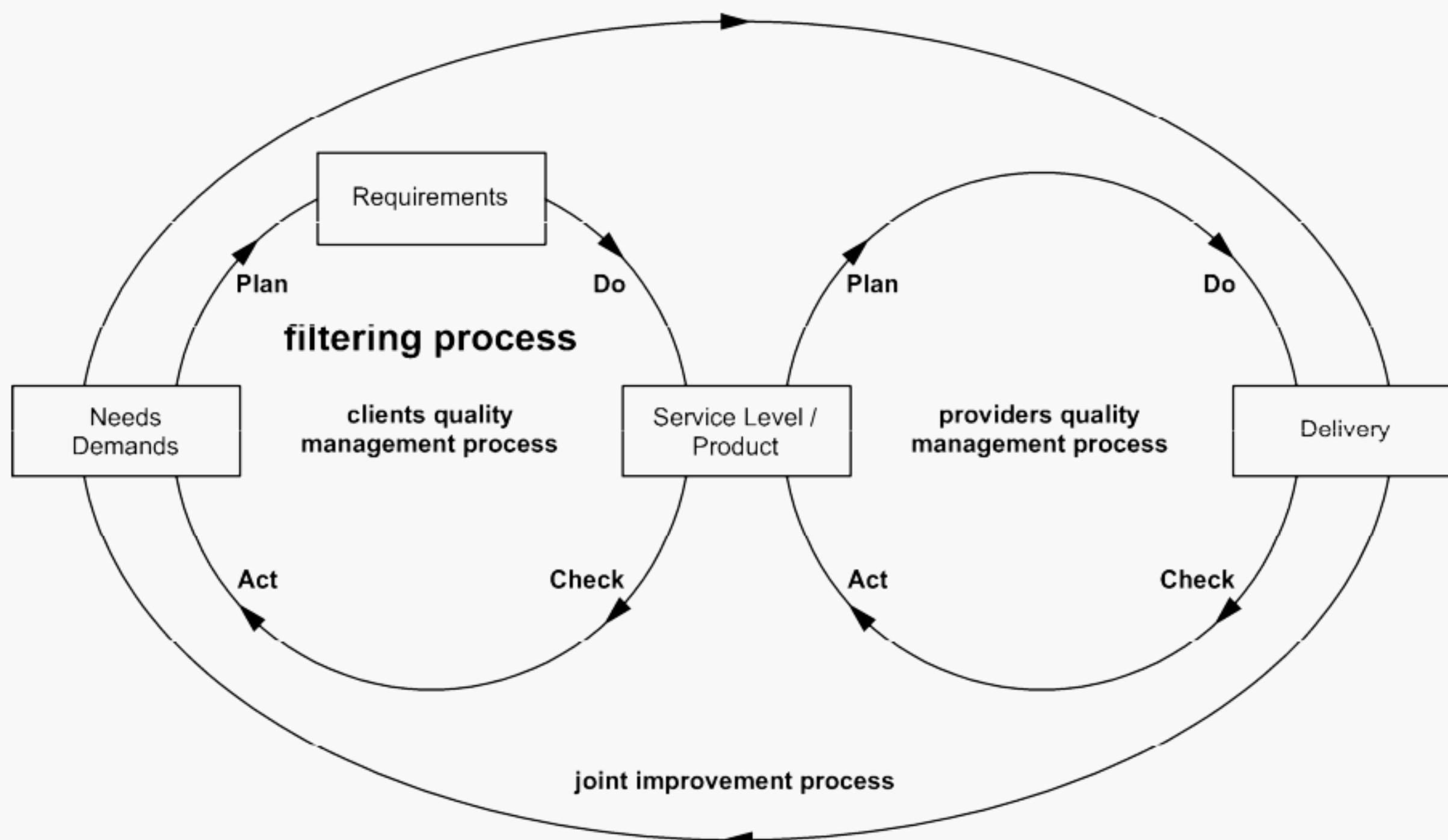
The main principles of continuous improvement are e.g.:

- increase the value of the delivery process output to the customer (effectiveness);
- how much flexibility is valuable in the process to meet changing needs;
- reflection on processes (feedback);
- identification, reduction and elimination of suboptimal processes (efficiency);
- incremental, continuous steps, avoiding quantum leaps (evolution);
- etc.

As described in the previous chapter various deviations / gaps would appear in the process of gathering the needs in clients' organization, their communication and translation into service level, in the delivery process as well as the perception / experiencing of the characteristics of the persons/organizations receiving the facility product (see Figure 8).



The required changes in the facility products life cycle as well as the described deviations /gaps shall be subject to quality assurance and continuous improvement process.



**Figure 8 — Control and improvement cycles**

All cycles (Client, service provider, both together) are PDCA-cycles

For simplicity the figure client- and provider-cycles are presented chronologically one after the other, but in many cases are taking place simultaneously.

Example: FM change management process

The FM processes to be changed and improved need to be planned (Plan), implemented/executed (Do) and controlled (Check) before they can be improved (Act). Change management is a part of short and long-term quality cycle around the FM activities.



## Annex A (informative)

### GAP-Model

In the quality management process, gaps may be identified in and between each stage of the process.

To avoid or at least minimize deviation / losses in this process it is necessary to manage the interface between each task as well to bring the task itself to perfection.

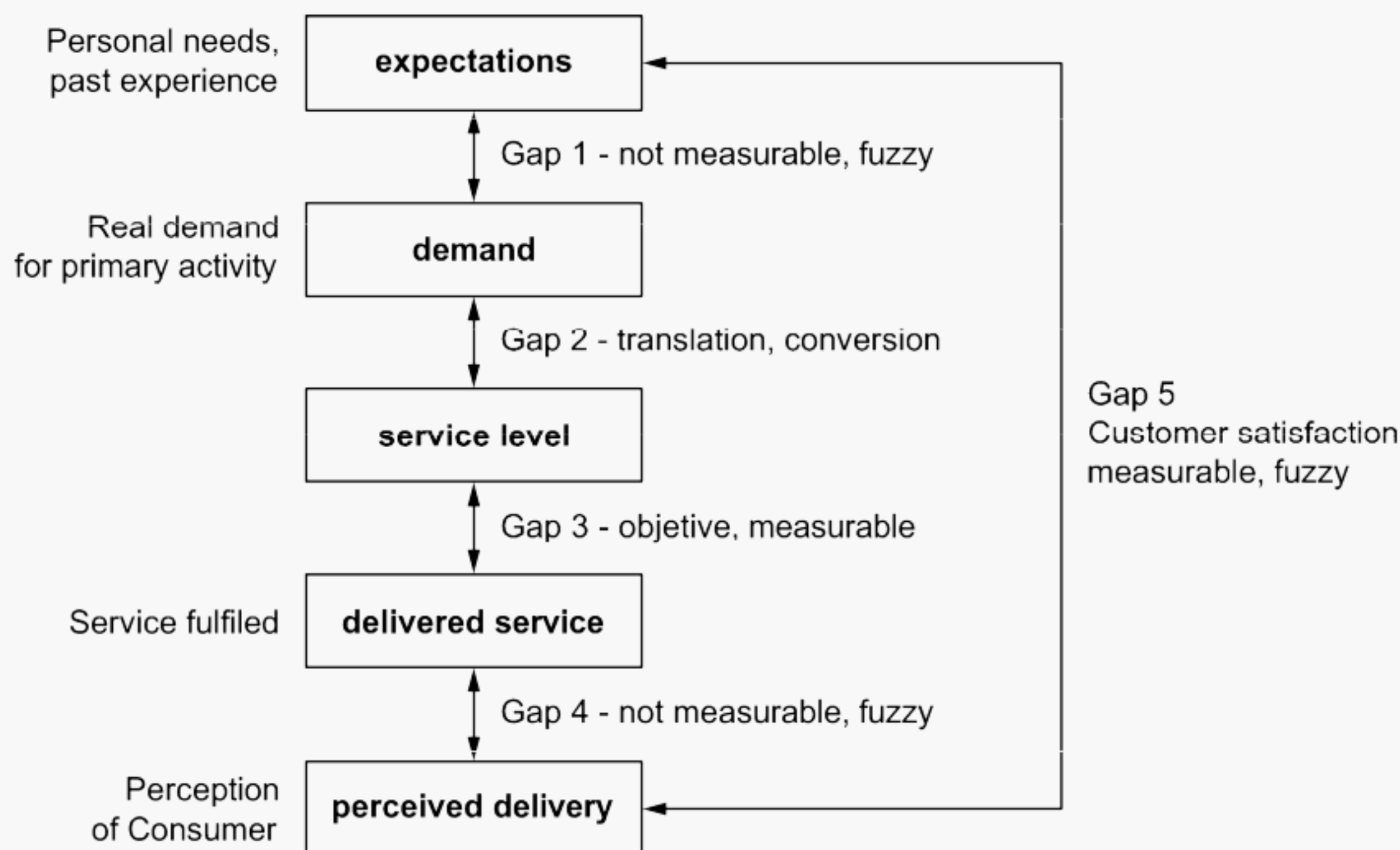


Figure A.1 — Gap-model

The basis for all FM products (services) are the needs (e.g. existing, new, changed) of the Client Organization which include the needs and expectations of the client, the customers and the end users collectively and as individuals. These needs and expectations have to be translated into corresponding demands and thereafter into requirements, which furthermore have to be specified in service levels.

#### Translate needs into corresponding demand - (GAP 1)

- In an internal process the client organization has to define their demands which should meet the needs and expectations at its best.

#### Translate demand into requirements and Service Level - (Gap 2)

- Since demands do not specify explicitly the requirements for corresponding services they have to be formulated.
- Requirements are prerequisites for the specification of the service level either described in a tender offer and/or negotiated in a process with the service provider.



The above described translations processes inherits deviations from the needs to be met by the delivery (GAP 5), due to:

- only a subset (part) of the needs are formulated explicitly;
- the fuzzy and implicit expectations are often not expressed, respectively clients organization is not aware of their existence;
- they are furthermore altered or filtered due to constraints within clients organization like: culture, financial, importance to hierarchies, temporal (time pressure), knowledge, and there like.
- insufficient communication;
- faulty and/or incomplete translation process;
- etc.

Due to above the service level description inherits a non-compliance with the needs and expectations to a certain degree and as a consequence thereof may lead to a non-adequate performance and reduced quality (perception).

#### **Translate from Service Level Agreements into products (services) - (Gap 3)**

In the production process of the Service Providers deviations from the SLA may occur due to:

- lack of knowledge, misinterpretation, etc. of the formulated service level throughout service providers hierarchies;
- fuzzy and implicit expectations of clients organization may be formulated in general / difficult to interpret / measurable criteria, respectively service providers organization is not aware of their existence;
- constraints within service providers organization like: culture, financial, importance to hierarchies, temporal (time pressure), knowledge, motivation and there like;
- insufficient communication;
- faulty and/or incomplete translation process;
- etc.

With the agreed SLA (Service Level Agreement) the Service Provider has to ensure (e.g. with an internal quality assurance program) the fulfilment of the Service Level and therein specified characteristics and related indicators.

#### **Delivery of the products (services) - (Gap 4)**

In the course of the product (service) delivery / consumption the individual and collective experience of the receiving party in the clients' organization may differ from his/its momentarily expectation and perception (GAP 4).

#### **Perception of delivered products (services) - (Gap 5)**

During or after the product (service) delivery the deviations between Clients expectations and experience may become evident and shall be subject to the continuous improvement process.



Due to

- deviations (gap) between the needs / expectations and the delivered service;
- change in the needs / expectations within the clients organization over time;
- faulty and/or incomplete service delivery

may be expected, a delivery acceptance and quality assurance as well as a continuous improvement / change management process shall be established within the clients and providers organization.

This shall leads to a change of expectations in the clients' organization or change of the Service Level Agreement.



## Annex B (informative)

### Additional information and recommendation for measurement metrics

#### B.1 Recommendation for designing a metric system

For designing a metric system complementary to 5.5 there are helpful considerations may be found below:

- Target/goal oriented  
Indicators need to have targets /goals established and to be based on strategies and to be directly related to success factors as well as facility product characteristics that are significant to the client organization. The targets/goals shall be based rather on research than on arbitrary attributes (numbers/fixations). Due to the life cycle of facility products, the requirements, critical success factors and targets/goals are changed over time; the metric system shall be reviewed and adapted frequently.
- Coherent top down approach  
Link measures (and related indicators) consistently from top down throughout all hierarchical levels (strategic, tactical, and operational as well as units, functions, locations, etc.). Measures (and related indicators) at one level should lead to calculated indicator at the next higher level and so forth. This will avoid inconsistencies of what and how measurement is performed. Multiple indicators can be combined to indices (aggregated indicators) at a higher hierarchical level to give a better overall assessment. In addition importance of indicators may be weighted (relative importance) while generating aggregated indicators (e.g. overall quality or satisfaction indicators).
- Simplicity, fewer is better (SMART - Significant, Measurable, Achievable, Responsible and Time Scale)  
Selection and concentration shall only be on few vital (most critical) key measures from a wide array of metrics linked to key success factors, those that are most important and really matter to the particular segment/group of client organization, rather than a multitude of less significant factors. This is the challenging task. Since information is power and many persons are reluctant to trust a few overall ratios or aggregated indices, so they want details which are resource and time consuming. Ensure that the metrics can be populated with real data.
- Balance the set of measures for each category (financial, operational, etc.) as well as "hard" and "soft" measures in order to obtain a overall and harmonious picture.
- Time relation:  
Choice of the Metrics to be used should consider a mix and focus on past, present and future situation.
- Adaptation:  
Metrics should be design to allow for changes in order to meet development and changes of strategy or main processes (core business) and continuous improvement of measures and method to collect and report data.
- Measurement standards:  
In order to obtain as much as possible reliable information and accurate indicators, thorough methods and standard for measurements have to be established.
- Automation:  
Automate measurement where possible (to avoid/minimize errors and cost).
- Control sample:  
If not 100 % of the volume is measured, the control sample has to be large enough to be representative.



- Focus on customer group, market segment:  
Focus on the relevant customer segment/group with similar quality characteristics demand and needs and determine the needs and demands of that particular group for the related facility product.
- Frequency:  
The more often you measure something, the better you can manage it (e.g. like financial performance). Tendency is, that "soft factors" like e.g. customer satisfaction/experience are measured less frequent. The challenge is to find a way to increase the frequency of measure with minimum effort.
- Honesty:  
Do not adjust schedule data to meet current status. When measuring peoples performance there is a tendency for them to either select measures on which they know they can achieve good performance or adjust schedules. This self-serving approach invalidates the process and endangers the ability to meet end dates/final targets/long-term goals.

Approaches for designing a metric system:

- start designing a system with metrics using data which could be gathered clearly, easily and in a short time. Later, when more experienced at metric design and implementation, one may complement with additional measures.
- design an ideal system with metrics reflecting all measures management agree on, but build it up systematically, starting with a few critical/vital measures. This will enable easier adoption to meet changes in core business, challenges, management, needs, market standards, etc.

## B.2 Attributes of indicators

When selecting, defining and using an indicator the following criteria and attributes (elements) shall be considered:

- category;
- code/number/identifier (mainly for information systems);
- name;
- description of characteristic;
- facility product or facility service the indicator is related to;
- area (category, geographical area, level);
- area/region the indicator is related to;
- definition of the indicator;
- measured value and validity/reliability constraints;
- target value, range, tolerance, limit values and validity/reliability constraints;
- measurement method;
- timing;
- frequency of measurement;



- sample size and reliability of measurement;
- for calculated indicator, the calculation algorithms and weighting factors;
- source of data/information (measurement by whom, audit, report, etc.);
- condition when measurement shall or have been made;
- validation process;
- etc.

Furthermore the actions / measures in case of deviations between set value and actual measured value beyond tolerance / limit values have to be defined.

### **B.3 Indicators selection criteria**

When establishing/building up this filtering/weighing process, the metric system and indicators shall be selected in order to enable to:

- define objectives/targets to be reached;
- reflect how well the result meets the demand;
- indicate at which degree it satisfy the needs/demands and values of all part of client organization as well as provider organization;
- indicate the status of tasks, processes, operations or projects;
- compare (internal and external benchmarks);
- diagnose (analysis of strengths and weaknesses);
- plan and monitor improvement/development actions;
- monitor changes/development over time;
- identify factors that influence performance/quality;
- etc.

### **B.4 Required properties of indicators**

When selecting the indicators, the selection process has to be easy understandable and traceable and the following indicators properties have to be met:

- representative;
- adequate to the context (e.g. SL);
- transparent;
- repeatable (reproduce of measurement);



- understandable;
- tractability of aggregation;
- their selection criteria to be understandable and traceable;
- high data quality and knowledge about their uncertainty;
- sensitivity in respect to changes over time;
- suitability for logging of trends;
- suitability for comparison;
- sensitivity in respect to interaction with success factors;
- relevant in respect to success factors;
- influential and controllable;
- availability of data;
- frequently updatable;
- reasonable effort for data gathering;
- etc.

## **B.5 Data gathering techniques:**

To obtain indicators the following data gathering techniques may be used:

- measurements (of all measurable characteristics);
- laboratory testing;
- inspections;
- checklists;
- counting;
- telephone surveys;
- questioners;
- mail surveys;
- research;
- analysis (e.g. complain analysis, gap analysis, etc.);
- observations;
- focus groups surveys;



- work shops;
- purchase from outside source;
- mystery shopper;
- meeting client;
- market research forums;
- interviews;
- third party professional opinion.

## B.6 Domains and categories on indicators

Indicators may be categorized in the following groups.

- end user well being (employee), satisfaction and experience (employee and visitor)

Indicators of this category are mainly proactive approach of input measures and will indicate the level and consistency of organizations performance, efficiency and innovation.

- customer satisfaction/experience, perception, value and delight

Indicators of this category are mainly outcome/reactive measures of client's organizations feedback and results

They can be either:

“Soft measures” which are measuring customer opinion, perceptions and feelings and these indicators may be used to predict customer’s behaviour, satisfaction and perceived values. They also help to identify problems early so they can be corrected.

or

“Hard measures” of customers satisfaction measures and reflect customer’s actual doing and buying behaviour (gains and losses of customer, market share relative to competitors, repeated business)

- process and operational performance

Indicators of this category are mainly proactive / preventive and they focus on the work or behaviour as it occurs. They are required to predict potential problems with the outcome (quality) and to ensure client organization receives the right quality (prior to delivery). The challenge is to select the right process variable which is linked to the characteristics which is important to the Client Organization. Indicators of this category may be input, process oriented, but they are mainly output oriented.

There are further different perspectives and categories of indicators depending on the primary activities of the organization and the objectives of the facility products.

Further samples of categories and perspectives of indicators are:

Employee well being, satisfaction and experience:

- moral survey;

- focus group;
- absenteeism;
- hours work per week;
- turnover / Churn;
- grievances / complaints;
- requests for transfer;
- job stress level;
- stress related illness;
- voluntary turnover;
- health level;
- training and cross training (to perform more jobs);
- competence;
- suggestions;
- suggestions implemented;
- patents;
- innovation related awards;
- growth of competence level;
- safety (finally a question of employee behaviour on workplace);
- payment;
- advancement / growth opportunities;
- overall climate;
- benefits;
- workload;
- openness of communication;
- physical environment / ergonomics;
- leadership (e.g. supervisor competence, values).

Customer satisfaction / experience, value and delight:

- customer satisfaction (opinions);
- customer perceived value;



- customer actual buying behaviour;
- price competitiveness;
- complaints / returns;
- market share;
- repeat and lost customers;
- revenue from existing customers / services;

Process and Operational performance (includes how well facility product meets specification / standard):

- cycle time / processing time for key processes;
- productivity;
- accuracy of process variables;
- completeness;
- conformance;
- tolerances;
- rework time / costs.

Facility service or facility product

- competence;
- communication;
- understanding / knowing the customer;
- physical (e.g. mechanical, electrical, chemical or biological characteristics);
- sensory (e.g. related to smell, touch, taste, sight, hearing);
- behavioural (e.g. courtesy, honesty, veracity);
- temporal (e.g. punctuality, reliability, availability);
- ergonomic (e.g. physiological characteristic, or related to human safety);
- functionality (e.g. maximum speed of an aircraft);
- tolerance / precision;
- free of defects / deficiencies;
- conformity;
- completeness;
- accomplishments;

- innovation / originality;
- novelty;
- class / style, aesthetics, appearance;
- usability;
- maintainability;
- flexibility;
- ergonomically;
- security;
- standard / level;
- delight.

#### Public, safety, environmental responsibility

- behavioural and preventive;
- lost time due to accidents;
- meet / exceed regulatory / mandatory standards;
- community service;
- awards received.

#### Financial performance

- budget performance;
- cost control;
- economic value added (EVA);
- market value added (MVA);
- activity based costing (ABC);
- return of investment (ROI);
- cost of quality (COQ) = cost or rework/repair/correct problems.

#### Supplier performance

- incoming inspections;
- returned / rejected shipments;
- responsiveness;
- flexibility;



- attention to detail;
- follow through;
- courteousness of staff;
- quality of delivery;
- process data;
- self inspection (QC system);
- ease of doing business;
- reliability;
- competence;
- communication;
- credibility;
- security;
- understanding / knowing the customer.

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389 Chiswick High Road London W4 4AL UK

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