
Source: SA5 (Telecom Management)

Title: Rel-5 CR 32.403 (Performance measurements - UMTS and combined UMTS/GSM) Introduction of "Performance Measurements Definition Process" describing the repeatable, top-down process to define measurements for inclusion in future 3GPP Releases

Document for: Decision

Agenda Item: 7.5.3

Doc-1st-Level	Spec	CR	Phase	Subject	Category	Version - Current	Version - New	Doc-2nd-Level	Workitem
SP-020167	32.403	003	Rel-5	Introduction of "Performance Measurements Definition Process" describing the repeatable, top-down process to define measurements for inclusion in future 3GPP Releases	D	4.2.0	5.0.0	S5-020213	OAM-PM

CHANGE REQUEST

⌘ **32.403 CR 003** ⌘ rev **-** ⌘ Current version: **4.2.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘	Introduction of "Performance Measurements Definition Process" describing the repeatable, top-down process to define measurements for inclusion in future 3GPP Releases	
Source:	⌘	SA5	
Work item code:	⌘	OAM-PM	Date: ⌘ 01/03/2002
Category:	⌘	D	Release: ⌘ REL-5
		Use <u>one</u> of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900 .	Use <u>one</u> of the following releases: 2 (GSM Phase 2) R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) REL-4 (Release 4) REL-5 (Release 5)

Reason for change:	⌘	Repeatable process for defining measurements is currently not addressed in TS 32.403.
Summary of change:	⌘	Adding an informative annex containing a description of a performance measurement process. This includes the definitions of performance measurement user communities.
Consequences if not approved:	⌘	Companies will not understand the repeatable, top-down approach to define measurements that can be contributed to SA5 for potential inclusion in future 3GPP Releases.

Clauses affected:	⌘	Introduction, 2, 3.2, Annex B (new), Annex C
Other specs affected:	⌘	<input type="checkbox"/> Other core specifications <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
Other comments:	⌘	

Introduction

The present document is part of a set of specifications, which describe the requirements and information model necessary for the standardised Operation, Administration and Maintenance (OA&M) of a multi-vendor 3G-system.

During the lifetime of a 3G network, its logical and physical configuration will undergo changes of varying degrees and frequencies in order to optimise the utilisation of the network resources. These changes will be executed through network configuration management activities and/or network engineering, see 3GPP TS 32.600 [3].

Many of the activities involved in the daily operation and future network planning of a 3G network require data on which to base decisions. This data refers to the load carried by the network and the grade of service offered. In order to produce this data performance measurements are executed in the NEs, which comprise the network. The data can then be transferred to an external system, e.g. an Operations System (OS) in TMN terminology, for further evaluation. The purpose of the present document is to describe the mechanisms involved in the collection of the data and the definition of the data itself.

[Appendix B has been added to help in the definition of new performance measurements that can be submitted to 3GPP for potential adoption and inclusion in this technical specification. Appendix B discusses a top-down performance measurement definition methodology that focuses on how the end user of performance measurements can use the measurements.](#)

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TS 32.101: "3G Telecom Management: Principles and high level requirements".
- [2] 3GPP TS 32.102: "3G Telecom Management architecture".
- [3] 3GPP TS 32.600: "Telecommunication Management; Configuration Management; 3G configuration management; Concept and main requirements".
- [4] 3GPP TS 25.331: "RRC Protocol Specification".
- [5] 3GPP TS 25.413: "UTRAN Iu Interface RANAP Signalling".
- [6] 3GPP TS 25.423: "UTRAN Iur Interface RNSAP Signalling".
- [7] 3GPP TS 25.433: "UTRAN Iub Interface NBAP Signalling".
- [8] 3GPP TS 23.107: "QoS Concept and Architecture".
- [9] 3GPP TS 32.622: "Telecommunication Management; Configuration Management; Generic network resources IRP: NRM".
- [10] 3GPP TS 32.632: "Telecommunication Management; Configuration Management; Core Network Resources IRP: NRM".
- [11] 3GPP TS 32.642: "Telecommunication Management; Configuration Management; UTRAN network resources IRP: NRM".
- [12] 3GPP TS 32.401: "Telecommunication Management; Performance Management (PM); Concept and Requirements".
- [13] GSM 12.04: "Performance Management and Measurements for a GSM Public Land Mobile Network (PLMN)".
- [14] 3GPP TS 52.402: "Telecommunication Management; Performance Management (PM); Performance Measurements - GSM".
- [15] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".
- [16] GSM 08.18: "Digital cellular telecommunication system (Phase 2) (GSM); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

- [17] 3GPP TS 23.060: "General Packet Radio Service (GPRS) Service description; Stage 2".
- [18] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".
- [19] 3GPP TS 29.060: "General Packet Radio Service (GPRS); GPRS Tunnelling protocol (GTP) across the Gn and Gp interface".
- [20] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) Support on Mobile Radio Interface".
- [21] [Victor R Basili and H. Dieter Rombach: "The TAME project: Towards improvement-oriented software environments", IEEE Transactions of Software Engineering, Vol. 14, No. 6, June 1988.](#)
- [22] [Victor R Basili and David M. Weiss: "A Methodology for Collecting Valid Software Engineering Data", IEEE Transactions of Software Engineering, Vol. SE- 10, No. 6, November 1984.](#)

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3G	3 rd Generation
3GPP	3G Partnership Project
ASN.1	Abstract Syntax Notation 1
BER	Basic Encoding Rules
DTD	Document Type Definition
EGQM	Enhanced Goal, Question, Metric
EM	(Network) Element Manager
ETS	European Telecommunication Standard
FTAM	File Transfer Access and Management
FTP	File Transfer Protocol
GQM	Goal, Question, Metric
IEEE	Institute of Electrical and Electronics Engineers, Inc.
Itf	Interface
ITU-T	International Telecommunication Union - Telecommunications Standardisation Sector
MSC	Mobile Services Switching Centre
NE	Network Element
NM	Network Manager
OA&M	Operation, Administration and Maintenance
OS	Operations System (EM, NM)
OSI	Open Systems Interconnection
PM	Performance Management
QoS	Quality of Service
RNC	Radio Network Controller
TFTP	Trivial FTP
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network

Annex B (Informative): Top-Down Performance Measurement Definition Process

B.1 Scope

Performance measurements within wireless telecommunications networks often fail to meet the needs of the diverse community of end users of those measurements. New features develop, networks evolve and operating conditions change without sufficient consideration given to the measurements needed to keep the network running efficiently. While Equipment Vendors define measurements to satisfy their particular needs, other perspectives, especially the voice of the Network Operator, are often lost during Equipment Vendor development processes. Similarly, Network Operators sometimes request measurements without fully understanding who will be using the data or what actions those people will take based on the data collected. A coherent, simple, top-down methodology for defining performance measurements is lacking in the telecommunications industry.

This annex describes a methodology to handle the problems discussed above. In particular, multiple user communities have been defined representing the end users of system measurements. Performance goals and measurements are defined considering these same user communities. The definition includes identification of specific problem scenarios and corrective actions to be taken by the appropriate user community.

Measurements defined using this methodology can be contributed to 3GPP SA5 for potential adoption and inclusion in this technical specification. It is believed that this methodology will help reduce development costs for the Equipment Vendors and reduce operational costs for the Network Operators.

B.2 Overview

Performance measurements are important to the proper and efficient functioning of wireless telecommunications networks. They have numerous uses related to resource utilization, expansion planning, network optimisation, operating problem diagnosis and network availability monitoring. For the wireless telecommunications world, product performance measurements are necessary to support multiple communities of users.

While most wireless telecommunications networks collect performance measurements, unfortunately, their use doesn't satisfy all communities of users equally. This lack of completeness and correctness results in a host of problems ranging from Network Operator dissatisfaction through poor operating practices to substantial gaps in reporting appropriate data from the wireless telecommunications network.

In addition, once performance measurements are defined for a wireless telecommunication network they must be maintained. The evolution of a wireless telecommunication network for capacity increases and feature extensions leads to the evolution of the collected measurements. Performance measurements need to be added, modified and made obsolete from the overall measurement repository. These changes must be defined completely and accurately to meet the requirements of each community of users.

A development of a performance measurement life cycle process to oversee this need is discussed in this annex. The life cycle process addresses the multiple user communities whose perspectives are needed to supply the requirements for the performance measurements.

The proposed performance measurement life cycle process is a usage-based process. The basic Goal, Question, Metric (GQM) method is enhanced to define problem scenarios and corrective actions. These descriptions are not only used to filter out proposals for performance measurements that provide no defined benefit, but also support user community training in the use of the performance measurements.

The remainder of this annex is organised as follows.

Section B.3 defines Measurement User Communities for wireless telecommunications

[Section B.4 discusses the GQM and the Enhanced GQM methods](#)

[Section B.5 discusses the measurement life cycle process](#)

[Section B.6 provides conclusions](#)

B.3 Measurement User Communities

One objective of Performance Management as a functional subset of operations and maintenance processes is to define sets of measurements. Typical definition criteria revolve around measuring activity within the network in terms of volume, speed and accuracy. While this approach produces measurement data it does not completely address the needs and uses of the multiple consumers of network performance measurement information. The Enhanced GQM methodology extends the measurement definition criteria to better satisfy multiple groups with diverse needs for these measurements.

A qualitative judgement as to the efficacy of a Performance Management subsystem is how well served these different groups are by the measurements provided. To better understand these needs, five generic categories of users, outlined definitions and examples of their needs and requirements for measurements taken from their wireless telecommunications network are defined. These groups are referred to as measurement user communities. These five communities are:

Network Operator's Business Community

Network Operator's Maintenance Community

Network Operator's Traffic Engineering Community

Network Operator's Customer Care Community

Equipment Vendor's Performance Modelling Community

Equipment Vendor's Development Engineering Community

B.3.1 Network Operator Business Community

The first measurement user community is the Network Operator's Business Community. This community is defined under the assumption that the wireless telecommunications network is fully operational, adequately engineered for traffic load per quality of service definitions and in commercial service. The primary objective of this community is to guarantee the financial health and welfare of the Operating Company. They expect a properly configured wireless telecommunications network to supply the revenue per subscriber unit necessary to meet their financial goals.

An understanding of the elasticity of demand can help the Business Community maximize profits within their product pricing strategy as they alter prices according to various mixes of services. Typical measurements of interest to this community are those based on the actual volumes of calls completed by service type. This call volume information can lead to trends of usage over time. Correlation between price mix and call volumes can help to identify pricing strategies geared towards increasing revenue per subscriber unit.

B.3.2 Network Operator Maintenance Community

The second measurement user community is the Network Operator's Maintenance Community. This community is defined under the assumption that the wireless telecommunications network is less than fully operational, adequately engineered for traffic load per quality of service definitions and in commercial service. The primary objective of this community is to reduce Mean Time to Repair faults that occur within the network equipment of the Operating Company.

The baseline metric for this community is the availability of the network equipment, where availability is composed of the sum of scheduled and unscheduled outages to the network equipment. Unscheduled outages are influenced by the inherent hardware and software quality of the products provided to the operating company. While the Maintenance Community has no direct control over that quality, they do have control over the second component of scheduled outage, Mean Time to Repair.

Mean Time to Repair is influenced by the Mean Time to Detect a fault. This community of user's defines measurements that support detecting or predicting faults within the network equipment.

Measurements that support this community can come from places other than the network equipment, itself. Several Operating Companies have been observed building information systems based on the data provided by Call Detail Records and Billing Records. Correlation is sought within these data between call faults and location within the Network. Detection of these faults serves a dual purpose: it allows the Operating Company a view of performance at the level of their Network Operator (the subscriber) and it allows the Maintenance Community to target specific network equipment for repair.

B.3.3 Network Operator Traffic Engineering Community

The third measurement user community is the Network Operator's Traffic Engineering Community. This community is defined under the assumption that the wireless telecommunications network is fully operational, inadequately engineered for current or future traffic load per quality of service definitions and in commercial service. The primary objective of this community is to keep the capacity of the network equipment within 1) the Operating Company's design criteria for the quality of service based on growth of the subscriber base, 2) changes in usage patterns based on pricing strategies and 3) introduction of new services.

The baseline metric for this community is the trend in utilization of the network equipment. A fully instrumented network would allow the Operating Company to understand the trend in performance of their principle capital investment and any leased services. As these trends pass thresholds of performance, purchasing decisions or volume pricing discounts could be triggered.

B.3.4 Network Operator Customer Care Community

The fourth measurement user community is the Network Operator's Customer Care Community. This community is defined under the assumption that the wireless telecommunications network is fully operational, functioning at a less than optimal level resulting in end user dissatisfaction and in commercial service. The primary objective of this community is interfacing with the end-user customers of offered services for the purpose of establishing and maintaining end-user customer satisfaction. This may include customer care responsibilities such as customer relationship management (or CRM), service level agreement (or SLA) management, quality of service (or QoS) management etc.

This community is interested in defining measurements related to the end-user customer experience with the network Operator's offered services in the areas of CRM, SLA, QoS, problem reports, etc. Decisions on how to best handle customer dissatisfaction or how to keep customers from becoming dissatisfied are based on these types of measurements.

B.3.5 Equipment Vendor Performance Modelling Community

The fifth measurement user community is Equipment Vendor's Performance Modelling Community. This community is defined under the assumption that the wireless telecommunications network is fully operational, adequately engineered for traffic load per quality of service definitions and in some level of call capable service. The primary objective of this community is to guarantee that the models used during analysis and design phases conform to real-world observations of the network equipment of the Operating Company.

While this community is not within the Operating Company it still provides beneficial service to the Operating Company by managing the development of subsequent features that are in line with the actual performance characteristics of the network. Many decisions within the development life cycle depend on models developed prior to shipping the product. These models need to be calibrated to network performance once the product is released. Definition of measurements in concert with calibrating these models requires the direct involvement of the people developing the models.

The network that transports Network Management data often is the same network that carries call control traffic. Clearly, the knowledge of volume levels of this traffic during anomalous operating conditions is important in order to understand the total impact to call processing. This community would define measurements to allow the monitoring of this type of phenomena.

B.3.6 Equipment Vendor Development Engineering Community

The sixth measurement user community is Equipment Vendor's Development Engineering Community. This community is also defined under the assumption that the wireless telecommunications network is fully operational, adequately engineered for traffic load per quality of service or service level agreement definitions and in commercial service. The primary objective of this community is to guarantee that the implementations of the designs conform to real- world observations of the network equipment of the Operating Company.

While this community also is not within the Operating Company, it still provides beneficial service to the Operating Company. The implementation of new algorithms carries some finite risk of performance in the Network Operator environment versus the lab environment. Many times simulators of network activity are developed to support the verification of these algorithms. These simulations need to be calibrated to network performance once the product is released. Definition of measurements in concert with calibrating these simulations requires the direct involvement of the people developing the simulations.

B.3.7 User Community Conclusion

The six measurement communities are broken into four Network Operator based groups and two Equipment Vendor groups. However, experience shows that the measurements defined for these groups are not mutually exclusive. Other groups may also use measurements needed by a particular group for the same or different purposes. Thus, the accurate definition of the measurements and how to use them is necessary to allow the Network Operator to properly combine these measurements into more complex analyses.

B.4 Enhanced GQM

The Goal, Question Metric (GQM) method requires measurement user communities to help define goals and metrics. This section first presents the standard GQM method and then presents an enhanced GQM method, which provides the measurement user communities a broader understanding of how metrics are used. Note that the term 'metric' in GQM means the same as 'measurement'.

B.4.1 GQM Methodology

Basili and Weiss [22] and others originally proposed the GQM method. This methodology provides a systematic approach for defining metrics that can be collected and analysed to determine whether or not a goal has been reached. This methodology was originally created for quality assurance of software development processes, but has been applied to other areas. GQM is comprised of the following three steps.

1. Identify and define goals for a particular group
2. Refine goals into quantifiable questions
3. Define metrics that will answer the questions

Goals are defined in terms of a purpose and a perspective. The purpose specifies the object to be analysed and why it will be analysed. The perspective specifies the relevant aspects of the object and which measurement user community is interested in the aspects.

Execution of the GQM methodology results in the formation of a GQM model. A GQM model contains the set of defined goals, questions and metrics. A GQM model provides trace-ability from the goals to the associated metrics. Figure B1 shows an example of a GQM model.

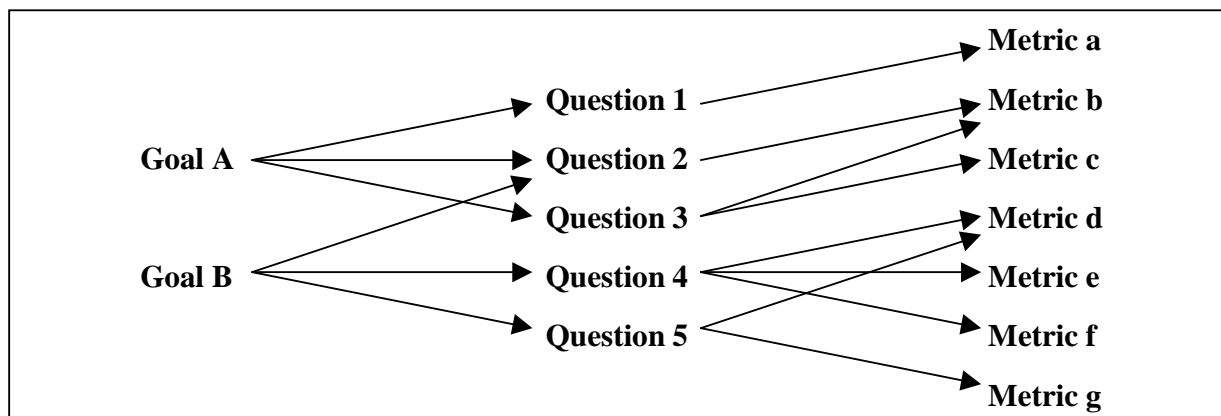


Figure B1: GQM Model

GQM definition templates are often used to help produce consistent goal, question and/or metric definitions. An example of a Goal template is shown below [21]:

Purpose: To (characterize evaluate, predict, motivate, etc.) the (process product model, metric, etc.) in order to (understand, assess, manage, engineer, learn, improve, etc.) it. Example: To evaluate the system testing methodology in order to improve it.

Perspective: Examine the (cost, effectiveness, correctness, defects, changes, product metrics, reliability, etc.) from the point of view of the (developer, manager, Network Operator, corporate perspective, etc.). Example: Examine the effectiveness from the developer's point of view.

B.4.2 Enhanced GQM (EGQM) Methodology

As it stands, the GQM methodology works well for defining metrics, but falls short in several areas. The original GQM methodology was enhanced to better fit within the wireless telecommunications industry for the following reasons.

- Allow wireless measurement user communities to specify their needs at the beginning of the performance measurement life cycle rather than waiting for product to be delivered
- Allow wireless measurement user communities to understand what performance measurements are being designed for them in time to modify the associated collection, analysis and reporting processes
- Allow wireless measurement user communities to understand how they should analyse collected measurement data and what actions they should take when analysis has been completed
- Provide criteria for rejecting unnecessary goals, useless measurements, or measurements that can not be properly collected, analysed or understood
- Provide criteria for architecting metrics into the appropriate wireless network device (based on network traffic capacity, device CPU and memory capacity, data collection capabilities, etc.)
- Allow for consistent measurement definition by providing Enhanced GQM model definition and measurement definition templates
- Help reduce development costs for Equipment Providers and reduce operational costs for the Network Operator

The Enhanced GQM, or EGQM, methodology is comprised of the following four steps.

1. Identify and define measurement goals for a particular measurement user community
2. Refine measurement goals into quantifiable problem scenarios
3. Define measurements that will determine if the goal is being accomplished
4. Define corrective actions

EGQM's first and third steps are similar to GQM's first and third steps. EGQM's second step is different than GQM's second step in that it focuses on problem scenarios associated with the goal rather than on questions associated with the goal. Problem scenarios are descriptions of real world problems the measurement user community has or will experience. Each problem scenario represents a particular aspect of the associated goal. Problem scenarios include definitions of any formulas that will allow the measurement user community to analyse the problem scenario after metric data has been collected from the field. EGQM's fourth step is new. Corrective actions are descriptions of what the measurement user community should do based on analysis of metric data collected from the resulting wireless network.

Execution of the EGQM methodology results in the formation of an EGQM model. An EGQM model contains the set of defined goal, problem scenarios, metrics and corrective actions. An EGQM model also provides trace-ability from the goals to the associated corrective actions. Figure B2 shows an example of an EGQM model.

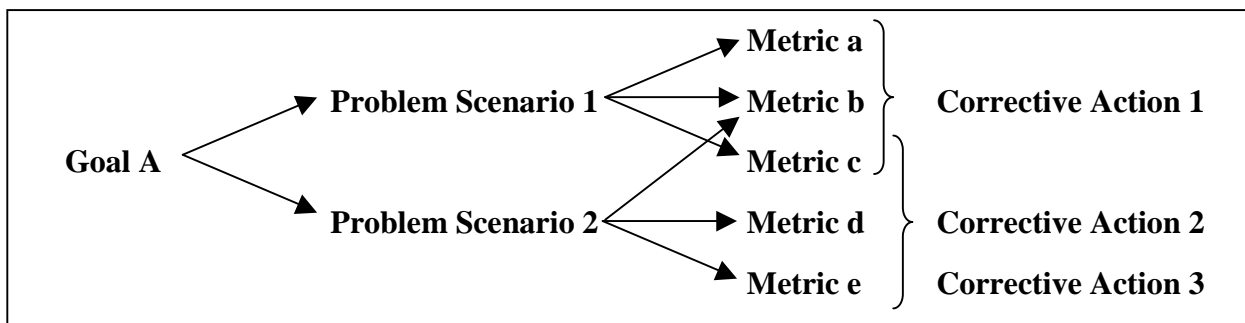


Figure B2: EGQM Model

[EGQM has definition templates for producing an EGQM model and for defining metrics. The EGQM model definition template is shown in Table B1. The EGQM metric definition template that is useful for 3GPP SA5 activities is defined in section 3.3 of this document.](#)

Goal: Provides the name of goal and non-ambiguous definition of what needs to be accomplished. Also provides the measurement user communities the goal is associated with.

Problem Scenario(s): Provides a description of the problem scenario associated with the goal. Contains a description of how performance measurements will be used by the user in order to meet the goal.

Required Metric(s): Provides a list of metrics required to assess the problem scenario to see if the goal is being accomplished.

Corrective Action(s): Provides descriptions of actions the user can execute based on data collected from the wireless network. Contains descriptions of expected metric data values and how those values work with the Problem Scenarios definitions.

Table B1: EGQM Model Definition Template

[As described in section B.3, six measurement user communities have been defined for the wireless telecommunications industries. EGQM supports all six communities. Representatives from each community participate in all four steps of the EGQM methodology. This allows user communities to specify exactly what they need and/or want and to know exactly how they will use the metrics before any software is developed. Participation in the EGQM process increases Network Operator satisfaction through early definition of operational practices \(including corrective actions\) and increases product knowledge within the Network Operator organization.](#)

[The EGQM model definition and metric definition templates provide the mechanism to reject unnecessary goals, useless metrics, or metrics that can't be properly collected or computed. Reasons for the rejection of a goal include the following.](#)

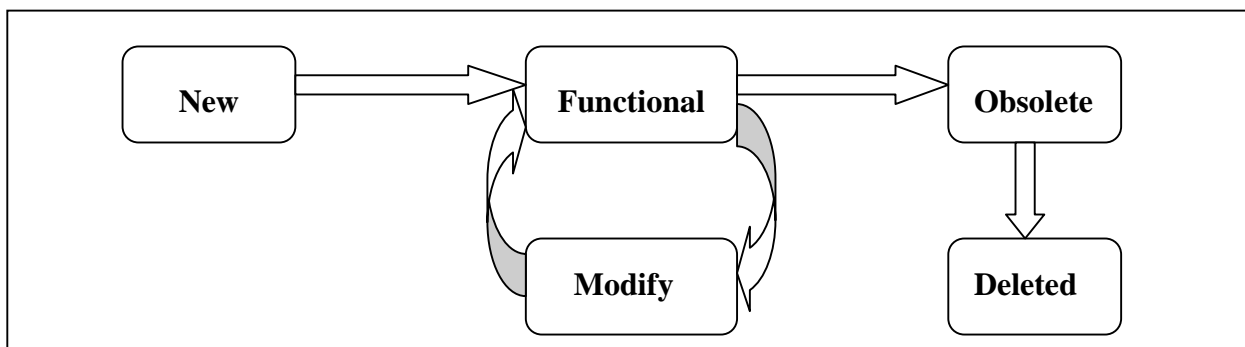
- [Non-ambiguous goal definition could not be determined](#)
- [Problem scenarios could not be determined](#)
- [Definition of how performance measurement will be used within a problem scenario could not be determined](#)
- [Corrective actions could not be determined](#)
- [Metrics could not be defined to support problem scenario definitions](#)
- [Required metrics could not be architected into network devices for any of the following reasons:](#)
 - [Network device could not collect metric due to CPU utilization issues](#)
 - [Network device could not collect and/or store metric due to memory issues](#)
 - [Network could not support the uploading of measurement data from network devices to network manager](#)

- [Network manager could not collect and/or store measurement data due to memory issues](#)

B.5 Measurements Life Cycle Process

[If the uses of performance measurements were confined to feature releases and occasional changes to those features, then EGQM would suffice. However, user community needs evolve, operating conditions change, performance models are validated, new services are introduced, etc. As these conditions change, performance measurements may need to change. Such considerations point to the need for a complete measurements life cycle model.](#)

[A simple life cycle model to handle performance measurement changes is depicted in Figure B3. New performance measurement goal and metric definitions are provided through new features. These are made available with major releases.](#)



[Figure B3: Measurement Life Cycle](#)

[Performance measurements may need to be periodically reviewed. Goal and metric definition updates made during this process are generally instantiated at major releases. When metrics are no longer useful they can be made obsolete and eventually deleted. A waiting period between obsolescence and deletion allows user communities time to implement and test out new metrics and analyses that are meant to replace existing metrics and analyses.](#)

B.6 Conclusion

[In the past, definition of performance measurements of wireless telecommunications networks was focused mainly on satisfying the needs of the Equipment Vendor Performance Modelling and Development Engineering measurement user communities. The needs of the wireless telecommunications Network Operator are not always addressed. The Performance Measurement Definition process described in this paper addresses the needs of all measurements user communities. The process also provides additional benefits, including the following:](#)

- [Allow measurement communities to specify their needs up front](#)
- [Allow measurement communities to prepare for and modify their measurement monitoring and reporting processes before product is released to them](#)
- [Allow measurement communities to know what actions they need to perform when assessing collected measurements](#)
- [Provides method for rejecting unrealistic goals and measurements](#)
- [Provides method for best architecting measurements into network devices](#)
- [Provides method for producing consistent measurement definitions](#)
- [Provides method for managing measurements life cycle including measurement creation, modification and obsolescence](#)

[The EGQM methodology may be used for:](#)

- analyse and assess performance areas that are not well understood or are highly complex
- non-straightforward cases where it is difficult to create useful measurement proposals
- an understanding of real value is required before useful measurement proposals can be created
- mine for missing measurements
- mine for conflicting, overlapping, or existing measurements that are no longer useful

In summary, the EGQM methodology may be used by any company to generate measurement definitions that can then be contributed to 3GPP SA5 for potential inclusion in this specification.

Annex ~~B~~C (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Jun 2001	S_12	SP-010237	--	--	Submitted to TSG SA #12 for Approval.	1.0.2	4.0.0
Sep 2001	S_13	SP-010468	001	--	Corrections on UMTS and combined UMTS/GSM measurements: Addition of family name for CN measurements, addition of the list of families, addition of Annex A: "(n-1) out of n" examples, application of the "(n-1) out of n" approach to all relevant measurements, enhancement of per cause measurements	4.0.0	4.1.0