4.3.1.3 Large sample sizes

The PDF represents something like a spectral view on the data. It answers the question "Which part of the data is related to a dedicated value on the x axis?" and delivers expression of this kind:

$$f(x) = P(x)$$

However, the CDF represents the sum respectively the integral value of a PDF. With this representation, the question "What is the probability that values are smaller than or equal to x_0?" can be answered. In a more formal way it looks like this:

5.1.1.2 Equation:

$$\mathrm{P101[OR]_{Cs}} = \frac{\sum_{\mathrm{i}} \mathrm{OR}_{Cs,\mathrm{i}}(\mathrm{C}) \times \mathrm{p\%}}{\mathrm{N}} + \frac{\sum_{\mathrm{i}} \mathrm{OR}_{Cs,\mathrm{i}}(\mathrm{L}) \times \mathrm{q\%}}{\mathrm{N}} + \frac{\sum_{\mathrm{i}} \mathrm{OR}_{Cs,\mathrm{i}}(\mathrm{S}) \times \mathrm{r\%}}{\mathrm{N}}$$

Where OR is the weighted opinion rating comprising:

i	Index of expert/customer
N	Number of experts/customers in the panel
Cs	Customer segment
p, q, r	Weighting factors
C	Opinion rating for contents
L	Opinion rating for the language
S	Opinion rating for the style

$$\mathrm{P101[OR]} = \frac{\sum_{\mathrm{i}} \mathrm{OR_i}(\mathrm{C}) \times \mathrm{p\%}}{\mathrm{N}} + \frac{\sum_{\mathrm{i}} \mathrm{OR_i}(\mathrm{L}) \times \mathrm{q\%}}{\mathrm{N}} + \frac{\sum_{\mathrm{i}} \mathrm{OR_i}(\mathrm{S}) \times \mathrm{r\%}}{\mathrm{N}}$$

5.1.2.2 Equation

$$P102[\mathrm{OR}] = \frac{\sum_{\mathrm{i}=1}^{\mathrm{N}} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ ORi (*i* = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert/customer
N	Number of experts/customers in the panel.

5.1.3.2 Equation

$$P103\ [\%] = \frac{\sum N_{PI}}{\sum N_R}$$

With

$$N_{PI} = \begin{cases} 1 \text{ if } & t_{PI} \leq \mathrm{T_{11}} \\ 0 \text{ if } & t_{PI} > \mathrm{T_{11}} \end{cases}$$

and

$$N_R = \begin{cases} 1\ if\ PI\ is\ requested \\ 0\ if\ PI\ is\ not\ requested \end{cases}$$

and

$$0 \leq t_R \leq\ t_{PI} \leq t_R + T_{11}$$

where

$\sum N_{PI}$	Number of requests with PI delivery within time period T_{11} after t_R
$\sum N_R$	Number of requests for PI delivery
t_{PI}	Point of time when expected PI delivery period expires (t_3 in fig. 7)
t_R	Point of time when PI is requested (t_1 in fig. 7)
T_{11}	Maximum expected time for PI delivery, timeout (between t_1 and t_3 in fig. 7)

5.1.4.2 Equation

$$P104\ [Time] = \frac{\sum_{i=1}^{N}(t_{2,i} - t_{1,i})}{N}$$

where

N	Number of PI delivery events
i	Index of each PI delivery event
$t_{1,i}$	Point of time when PI delivery request *i* is sent
$t_{2,i}$	Point of time when PI delivery event *i* actually occurs

5.2.1.2 Equation

$$P201[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.2.2.2 Equation

$$\mathrm{P202}\ [\%] = \frac{\sum \mathrm{N_{EF}}}{\sum \mathrm{N_C}}$$

with $$N_{EF} = \begin{cases} 1, & if\ \text{contract is error} - \text{free} \\ 0, & else \end{cases}$$

and $$N_C = \begin{cases} 1, & if\ \text{contract proposal is received} \\ 0, & else \end{cases}$$

where

$\sum N_{EF}$	Number of delivered contract proposals without errors
$\sum N_C$	Number of delivered contract proposals

All measures are related to the reporting period.

5.2.3.2 Equation

$$P203[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert/experienced user
N	Number of experts/experienced users in the panel

5.2.4.2 Equation

$$P204[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert/user
N	Number of experts/users in the panel

5.3.1.2 Equation

$$P301[\%] = \frac{\sum N_P}{\sum N_S} \times 100\%$$

with

$$N_P = \begin{cases} 1, & if\ d_P = d_A \\ 0, & if\ d_P \neq d_A \end{cases}$$

and

$$N_S = \begin{cases} 1, & if\ service\ provisioning\ date\ is\ announced \\ 0, & if\ service\ provisioning\ date\ is\ \text{not}\ announced \end{cases}$$

where:

$\sum N_P$	Number of contracts with successful service provisioning on promised date
$\sum N_S$	Number of signed contracts with announced service provisioning
d_P	Date on which service provisioning event occurs
d_A	Date on which service provisioning is announced to happen

5.3.2.2 Equation

$$P302\ [Time] = \frac{\sum_{i=1}^{N}(t_{3,i} - t_{1,i})}{N}$$

where:

N	Number of service provisioning events
i	Index of each service provisioning event
$t_{1,i}$	Point of time when service provisioning event *i* is announced
$t_{3,i}$	Point of time when service provisioning event *i* actually occurs

5.3.3.1 Definition of Parameter

The parameter "successful provisioning within a specified period" is expressed as the ratio (percentage) of the number of successful service provisioning events to all expected provision events within a pre-defined period of time.

5.3.3.2 Equation

$$P303\ [\%] = \frac{\sum N_P}{\sum N_S}$$

with

$$N_P = \begin{cases} 1\ if\ \ t_P \leq T_{31} \\ 0\ if\ \ t_P > T_{31} \end{cases}$$

and

$$N_S = \begin{cases} 1, & if\ service\ provisioning\ date\ is\ announced \\ 0, & if\ service\ provisioning\ date\ is\ \text{not}\ announced \end{cases}$$

and

$$0 \leq t_A \leq\ t_P \leq t_{A+}T_{31}$$

where:

$\sum N_P$	Number of contracts with successful service provisioning within time period T_{31} after t_A
$\sum N_S$	Number of signed contracts with announced service provisioning
t_P	Point of time when service provisioning event occurs (t_3 in fig. 9b)
t_A	Point of time when service provisioning date is announced (t_1 in fig. 9b)
T_{31}	Specified period of time

All measures are related to the reporting period.

5.3.4.2 Equation

$$P304\ [\%] = \frac{\sum N_C}{\sum N_S} \times 100\%$$

with

$$N_C = \begin{cases} 1, & if\ \text{contract is fulfilled} \\ 0, & if\ \text{contract is permanently not fulfilled} \end{cases}$$

and
$$N_S = \begin{cases} 1, & if \text{ contract is signed} \\ 0, & if \text{ contract is not signed} \end{cases}$$

where:

$\sum N_C$	Number of contracts which are permanently not fulfilled.
$\sum N_S$	Number of signed contracts

5.3.5.2 Equation

$$P305\ [\%] = \frac{\sum N_C}{\sum N_S} \times 100\%$$

with
$$N_C = \begin{cases} 1, & if\ provisioning\ is\ complete \\ 0, & \text{else} \end{cases}$$

and
$$N_s = \begin{cases} 1, & if \text{ contract is signed} \\ 0, & if \text{ contract is not signed} \end{cases}$$

where

$\sum N_C$	Number of contracts which are permanently not fulfilled.
$\sum N_S$	Number of signed contracts

5.3.6.2 Equation

$$P306\ [Time] = \frac{\sum_{i=1}^{N}(t_{2,i} - t_{1,i})}{N}$$

where:

N	Number of service provisioning events
i	Index of each service provisioning event
$t_{1,i}$	Announced service provisioning date for service provisioning event *i*
$t_{2,i}$	Date when the service provisioning event *i* actually occurs

NOTE: If $t_{2,i}$ occurs before the announced provisioning date $t_{1,i}$, P306 generates negative values. This is desired to make provisioning events appearing too early also transparent.

5.3.7.2 Equation

$$P307\ [Time] = \frac{\sum_{i=1}^{N}(t_{2,i} - t_{1,i})}{N}$$

where:

N	Number of equipment delivery events
i	Index of each equipment delivery event
$t_{1,i}$	Announced equipment delivery date for equipment delivery event *i*
$t_{2,i}$	Date when the equipment delivery event *i* actually occurs

NOTE: If $t_{2,i}$ occurs before the announced delivery date $t_{1,i}$, P307 becomes negative. This is a desired situation to make delivery events appearing too early also transparent.

5.3.8.2 Equation

$$P308\ [\%] = \frac{\sum N_I}{\sum N_S} \times 100\%$$

with
$$N_I = \begin{cases} 1, & if\ first\ time\ provisioning\ is\ not\ complete\ or\ not\ correct \\ 0, & else \end{cases}$$

and
$$N_S = \begin{cases} 1, & if\ service\ provisioning\ is\ done \\ 0, & else \end{cases}$$

where:

$\sum N_I$	Number of service provisioning events which are either incomplete or not correct in the first attempt
$\sum N_S$	Number of service provisioning events

All measures are related to the reporting period.

5.4.1.2 Equation

$$P401\ [Time] = \frac{\sum_{i=1}^{N}(t_{3,i} - t_{1,i})}{N}$$

Where:

N	Number of service alteration events
i	Index of each service alteration event
$t_{1,i}$	Date when the alteration event *i* is proposed
$t_{3,i}$	Date when the alteration event *i* actually occurs

5.4.2.2 Equation

$$\mathrm{P402}\ [\%] = \frac{\sum N_D}{\sum N_S} \times 100\%$$

with

$$N_D = \begin{cases} 1\ if & t_D \leq T_{41} \\ 0\ if & t_D > T_{41} \end{cases}$$

and

$$N_S = \begin{cases} 1\ if\ alteration\ date\ is\ announced \\ 0\ if\ alteration\ date\ is\ not\ announced \end{cases}$$

and

$$0 \leq t_A \leq\ t_D \leq t_A + T_{41}$$

where:

$\sum N_D$	Number of contracts with successful service alteration within time period T_{41} after t_A (compare to t4 in fig. 11)
$\sum N_S$	Number of contracts with announced service alteration
t_D	Point of time when service alteration event occurs (compare to t3 in fig. 11)
t_A	Point of time when service alteration date is announced (compare to t1 in fig. 11)
T_{41}	Period of time specified by the SP

5.4.3.2 Equation

$$P403\ [\%] = \frac{\sum N_C}{\sum N_S} \times 100\%$$

with

$$N_C = \begin{cases} 1,\ if\ complete\ alteration \\ 0,\ else \end{cases}$$

and

$$N_S = \begin{cases} 1,\ if\ alteration\ is\ announced \\ 0,\ if\ alteration\ is\ \mathrm{not}\ announced \end{cases}$$

where:

$\sum N_C$	Number of contracts with completely fulfilled service alteration
$\sum N_S$	Number of contracts with announced alteration

5.4.4.2 Equation

$$P404\ [Time] = \frac{\sum_{i=1}^{N}(t_{3,i} - t_{2,i})}{N}$$

Where:

N	Number of service alteration events
i	Index of each service alteration event
$t_{2,i}$	Announced service alteration date for service alteration event *i*
$t_{3,i}$	Date when the service alteration event *i* actually occurs

NOTE: If $t_{3,i}$ occurs before the announced alteration date $t_{2,i}$, P404 generates negative values. This is desired to make alteration events appearing too early also transparent.

5.4.5.2 Equation

$$P405\ [Time] = \frac{\sum_{i=1}^{N}(t_{2,i} - t_{1,i})}{N}$$

where

N	Number of equipment delivery events
i	Index of each equipment delivery event
$t_{1,i}$	Announced equipment delivery date for service alteration event *i*
$t_{2,i}$	Date when the equipment delivery event *i* actually occurs

NOTE: If $t_{2,i}$ occurs before the announced equipment delivery date $t_{1,i}$, P405 generates negative values. This is desired to make equipment delivery events appearing too early also transparent.

5.4.6.2 Equation

$$P406\ [\%] = \frac{\sum N_I}{\sum N_S} \times 100\%$$

with $$N_I = \begin{cases} 1, & if\ first\ time\ alteration\ is\ not\ complete\ or\ not\ correct \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ service\ alteration\ is\ done \\ 0, & else \end{cases}$$

where:

$\sum N_I$	Number of service alteration events which are either incomplete or not correct in the first try
$\sum N_S$	Number of service alteration events

5.4.7.2 Equation

$$P407\ [\%] = P402\ [\%] \times P403\ [\%]$$

5.4.8.2 Equation

$$P408\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

where:

N_R	Number of observation phases after service alteration without any limitation
N_S	Number of service alteration events

5.4.12.2 Equation

$$P412[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{N}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.5.1.2 Equation

$$P501\ [Time] = \frac{\sum_{i=1}^{N}(t_{3,i} - t_{1,i})}{N}$$

Where:

N	Number of technical upgrade events
i	Index of each technical upgrade event
$t_{1,i}$	Date when the technical upgrade event *i* is announced
$t_{3,i}$	Date when the technical upgrade event *i* actually occurs

5.5.2.2 Equation

$$P502\ [\%] = \frac{\sum N_D}{\sum N_S} \times 100\%$$

with

$$N_D = \begin{cases} 1\ if & t_D \leq T_{51} \\ 0\ if & t_D > T_{51} \end{cases}$$

and

$$N_S = \begin{cases} 1\ if\ technical\ upgrade\ date\ is\ announced \\ 0\ if\ technical\ upgrade\ date\ is\ not\ announced \end{cases}$$

and

$$0 \leq t_A \leq\ t_D \leq t_A + T_{51}$$

where:

$\sum N_D$	Number of contracts with successful technical upgrade within time period T_{51} after t_A (compare to t_4 in fig. 13)
$\sum N_S$	Number of contracts with announced technical upgrade
t_P	Point of time when technical upgrade event occurs (compare to t_3 in fig. 13)
t_A	Point of time when technical upgrade date is announced (compare to t_1 in fig. 13)
T_{51}	Specified observation period

5.5.3.2 Equation

$$P503\ [\%] = \frac{\sum N_C}{\sum N_S} \times 100\%$$

with

$$N_C = \begin{cases} 1, & if\ complete\ technical\ upgrade \\ 0, & else \end{cases}$$

and

$$N_S = \begin{cases} 1\ if\ upgrade\ is\ announced \\ 0\ if\ upgrade\ is\ not\ announced \end{cases}$$

where

$\sum N_C$	Number of contracts with completely fulfilled technical upgrade
$\sum N_S$	Number of contracts with announced technical upgrade

5.5.4.2 Equation

$$P504\ [Time] = \frac{\sum_{i=1}^{N}(t_{3,i} - t_{2,i})}{N}$$

where:

N	Number of service technical upgrade events
i	Index of each service technical upgrade event
$t_{2,i}$	Announced service technical upgrade date for service technical upgrade event *i*
$t_{3,i}$	Date when the service technical upgrade event *i* actually occurs

NOTE: If $t_{3,i}$ occurs before the announced technical upgrade date $t_{2,i}$, P504 generates negative values. This is desired to make technical upgrade events appearing too early also transparent.

5.5.5.2 Equation

$$P505\ [Time] = \frac{\sum_{i=1}^{N}(t_{5,i} - t_{3,i})}{N}$$

where:

N	Number of technical upgrade events
i	Index of each technical upgrade event
$t_{3,i}$	Time when the outage start event *i* occurs
$t_{5,i}$	Time when the outage end event *i* occurs

5.5.6.2 Equation

$$P506\ [\%] = \frac{\sum N_I}{\sum N_S} \times 100\%$$

with $$N_I = \begin{cases} 1, & if\ first\ time\ upgrade\ is\ not\ complete\ or\ not\ correct \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ upgrade\ is\ done \\ 0, & else \end{cases}$$

where:

$\sum N_I$	Number of upgrade events which are either incomplete or not correct in the first try
$\sum N_S$	Number of upgrade events

5.5.8.2 Equation

$$P508\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ no\ usage\ restrictions\ were\ observed\ in\ the\ reliability\ period \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ upgrade\ is\ done \\ 0, & else \end{cases}$$

where:

$\sum N_C$	Number of upgrade events with are followed by an unrestricted reliability period
$\sum N_C$	Number of upgrade events

5.5.12.2 Equation

$$\mathrm{P512[OR]} = \frac{\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.5.13.2 Equation

$$P513\ [OR] = \frac{OR(C)+OR(W)}{2}$$

with

$OR(C)$	Opinion Rating for competence of SP to deploy upcoming technology developments
$OR(W)$	Opinion Rating for willingness of SP to deploy upcoming technology developments

5.6.1.1.2 Equation

$$\mathrm{P611\ [Time]} = \frac{\sum_{i=1}^{N}(t_{2,i}-t_{1,i})}{N}$$

where

N	Number of documentation delivery events
i	Index of each documentation delivery event
$t_{1,i}$	Point of time when service portfolio change event *i* occurs
$t_{2,i}$	Point of time when documentation delivery event *i* actually occurs

5.6.1.2.2 Equation

$$\mathrm{P612\ [\%]} = \frac{\sum N_D}{\sum N_C} \times 100\%$$

with

$$N_D = \begin{cases} 1 \text{ if } & t_D \le T_{61} \\ 0 \text{ if } & t_D > T_{61} \end{cases}$$

and

$$N_C = \begin{cases} 1, & if \text{ service portfolio is changed} \\ 0, & else \end{cases}$$

and

$$0 \le t_C \le t_D \le t_C + T_{61}$$

where

$\sum N_D$	Number of documentation delivery events within time period T_{61} after t_C
$\sum N_C$	Number of changes in service portfolio
t_D	Point of time when expected period for documentation delivery expires (t_3 in fig. 15)
t_C	Point of time when service portfolio is changed (t_1 in fig. 15)
T_{61}	Maximum expected time for documentation delivery, timeout (t_3 in fig. 15)

5.6.1.3.2 Equation

Opinion rating scores expressed as mean with the standard deviation.

$$P613[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR}_i}{N}$$

where OR is the mean opinion rating, with OR_i (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.6.1.4.2 Equation

$$\mathrm{P614} = \sum_{i=1}^{N} m_i$$

with $$m_i = \begin{cases} 1, & if\ mode\ i\ is\ available \\ 0, & if\ mode\ i\ is\ not\ available \end{cases}$$

where

N	Number of potentially available modes of documentation
i	Index of each documentation mode
$\sum m_i$	Number of actually available documentation modes

5.6.1.5.2 Equation

$$P615[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.6.1.6.2 Equation

$$P616[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.6.2.1.2 Equation

$$\mathrm{P621}\ [\%] = \frac{\sum \mathrm{N_R}}{\sum \mathrm{N_S}} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ event\ of\ access\ to\ technical\ support\ is\ successful \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ access\ event\ to\ technical\ support\ is\ started \\ 0, & else \end{cases}$$

where

$\sum N_R$	Number of successful access events to technical support
$\sum N_S$	Number of started access events to technical support

5.6.2.2.2 Equation

$$P622\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ solution\ proposal\ has\ been\ applied\ successfully \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ problem\ description\ is\ given\ to\ SP \\ 0, & else \end{cases}$$

where:

$\sum N_R$	Number of resolved problems due to successful application of solution proposal
$\sum N_S$	Number of valid problems addressed to technical support

5.6.2.3.2 Equation

$$\mathrm{P623}\ [\mathrm{Number}] = \sum_{\mathrm{i=1}} m_i$$

with $$m_i = \begin{cases} 1, & if \text{ attempt i is not successful} \\ 0, & if \text{ attempt i is successful} \end{cases}$$

where

i	Index of each attempts
m	Attempt actually made to resolve problem

5.6.2.4.2 Equation

$$P624[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (*i = 1…N*) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert/customer
N	Number of experts/customers in the panel

5.6.2.5.2 Equation

$$P625\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ no\ usage\ restriction\ was\ observed\ in\ reliability\ period \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ customer\ complaint\ is\ resolved\ successfully \\ 0, & else \end{cases}$$

where:

$\sum N_R$	Number of resolved customer's request for technical support events with are followed by an unrestricted reliability period
$\sum N_s$	Number of resolved customer's request for technical support events

5.6.2.6.2 Equation

$$P626[\mathrm{Number}] = \sum_{i=1}^{N} m_i$$

with $$m_i = \begin{cases} 1, & if\ mode\ i\ is\ available \\ 0, & if\ mode\ i\ is\ not\ available \end{cases}$$

where

N	Number of potentially available modes of technical support
i	Index of each technical support mode
$\sum m_i$	Number of actually available technical support modes

5.6.3.1.2 Equation

$$\mathrm{P641}\ [\%] = \frac{\sum \mathrm{N_R}}{\sum \mathrm{N_S}} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ event\ of\ access\ to\ commercial\ support\ is\ successful \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ access\ event\ to\ commercial\ support\ is\ started \\ 0, & else \end{cases}$$

where:

$\sum N_R$	Number of successful access events to commercial support
$\sum N_S$	Number of started access events to commercial support

5.6.3.2.2 Equation

$$\mathrm{P642\ [Time]} = \frac{\sum_{i=1}^{N}(t_{4,i} - t_{3,i})}{N}$$

where

N	Number of needs of change given to commercial support
i	Index of each need for change event
$t_{3,i}$	Point of time when need for change *i* is given to commercial support
$t_{4,i}$	Point of time when solution proposal *i* actually is received

5.6.3.3.2 Equation

$$P643\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

with $N_R = \begin{cases} 1, & if\ solution\ to\ commercial\ support\ request\ is\ delivered\ within\ predefined\ period \\ 0, & else \end{cases}$

and $N_S = \begin{cases} 1, & if\ comercial\ support\ request\ is\ accepted \\ 0, & else \end{cases}$

where:

$\sum N_R$	Number of solutions to commercial support request events
$\sum N_S$	Number of commercial support events

5.6.3.4.2 Equation

$$P644[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{N}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.6.3.5.2 Equation

$$P645\ [\mathrm{Number}] = \sum_{i=1}^{N} m_i$$

with $m_i = \begin{cases} 1, & if\ mode\ i\ is\ available \\ 0, & if\ mode\ i\ is\ not\ available \end{cases}$

where

N	Number of potentially available modes of commercial support
i	Index of each commercial support mode

5.6.3.12.2 Equation

$$P652[\mathrm{OR}] = \frac{\sum_{i=1}^{N} \mathrm{OR_i}}{N}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.6.4.1.2 Equation

$$\mathrm{P661\ [\%]} = \frac{\sum N_R}{\sum N_S}$$

with $N_R = \begin{cases} 1, & if\ event\ of\ access\ to\ complaint\ management\ desk\ is\ successful \\ 0, & else \end{cases}$

and $N_S = \begin{cases} 1, & if\ access\ event\ to\ complaint\ management\ desk\ is\ started \\ 0, & else \end{cases}$

where:

$\sum N_R$	Number of successful access events to complaint management desk
$\sum N_S$	Number of started access events to complaint management desk

5.6.4.2.2 Equation

$$P662\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

with $N_R = \begin{cases} 1, & if\ customer\ claim\ is\ recognized\ by\ the\ SP \\ 0, & else \end{cases}$

and $N_S = \begin{cases} 1, & if\ customer\ claim\ is\ reported \\ 0, & else \end{cases}$

where:

$\sum N_R$	Number of recognized customer claim events
$\sum N_S$	Number of customer claim events

5.6.4.3.2 Equation

$$P663\ [\%] = \frac{\sum N_I}{\sum N_S}$$

with $N_I = \begin{cases} 1, & if\ first\ time\ resolution\ is\ not\ complete\ or\ not\ correct \\ 0, & else \end{cases}$

and $N_S = \begin{cases} 1, & if\ \text{customer complaint is resolved} \\ 0, & else \end{cases}$

where:

$\sum N_I$	Number of customer complaint events which are either incomplete or not correct in the first attempt
$\sum N_S$	Number of customer complaint events

5.6.4.4.2 Equation

$$P665\ [\%] = \frac{N_R}{N_S} \times 100\%$$

where:

N_R	Number of successful solutions provided by SP within specified period
N_S	Number of accepted user complaints received

5.6.4.5.2 Equation

$$P666\ [\mathrm{OR}] = \frac{\sum_i \mathrm{OR_i(A)} \times \mathrm{p\%}}{\mathrm{N}} + \frac{\sum_i \mathrm{OR_i(E)} \times \mathrm{q\%}}{\mathrm{N}} + \frac{\sum_i \mathrm{OR_i(R)} \times \mathrm{r\%}}{\mathrm{N}}$$

where

i	Index of expert
N	Number of experts in the panel
p, q, r	Weighting factors (defined by stakeholders)
A	Opinion rating for assurance
E	Opinion rating for empathy
R	Opinion rating for responsiveness

5.6.4.6.2 Equation

$$P667[\mathrm{OR}] = \frac{\sum_{\mathrm{i}=1}^{\mathrm{N}} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.6.4.11.2 Equation

$$P672[\mathrm{OR}] = \frac{\sum_{\mathrm{i}=1}^{\mathrm{N}} \mathrm{OR_i}}{\mathrm{N}}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (*i = 1…N*) being the individual opinion ratings for the N members of the audit panel.

i	Index of expert
N	Number of experts in the panel

5.7.1.2 Equation

$$P701\ [\%] = \frac{N_R}{N_S} \times 100\%$$

where:

N_R	Number of repair requests successful
N_S	Total number of repair requests

5.7.2.2 Equation

$$P702\ [\%] = \frac{N_R}{N_S} \times 100\%$$

where:

N_R	Number of repair requests carried out successfully within a specified period of time T_{72}+T_{73}
N_S	Number of repair requests

5.7.3.2 Equation

$$P703\ [\%] = \frac{\sum N_I}{\sum N_S} \times 100\%$$

with $$N_I = \begin{cases} 1, & if\ first\ time\ repair\ is\ not\ complete\ or\ not\ correct \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ \mathrm{repair\ is\ done} \\ 0, & else \end{cases}$$

where:

$\sum N_I$	Number of repairs which are either incomplete or not correct in the first attempt
$\sum N_S$	Number of repairs carried out

5.7.4.2 Equation

$$P704a[\mathrm{OR}] = \frac{\sum_{\mathrm{i}=1}^{\mathrm{N}} OR_i}{N}$$

where *OR* is the mean opinion rating, with OR_i (*i = 1…N*) being the individual opinion ratings for the *N* members of the audit panel.

i	Index of expert
N	Number of experts in the panel

$$P704b[\text{Time}] = \frac{\sum_{i=1}^{N}(t_{4,i}-t_{5,i})}{N}$$

where:

i	Index of each service repair event
N	Number of repair events
$t_{4,i}$	Announced service repair time for repair event *i*
$t_{5,i}$	Time when the service repair event *i* actually occurs

NOTE: If $t_{4,i}$ occurs before the announced end of the repair period $t_{5,i}$, P704b generates negative values. This is desired to make repair events appearing too early also transparent.

5.7.5.2 Equation

$$P705[\text{OR}] = \frac{\sum_{i=1}^{N}\text{OR}_i}{N}$$

where OR is the mean opinion rating, with OR_i (i = 1…N) being the individual opinion ratings for the N members of the panel.

i	Index of customer
N	Number of customers in the panel

5.7.11.2 Equation

$$P711[\text{OR}] = \frac{\sum_{i=1}^{N} OR_i}{N}$$

where OR is the mean opinion rating, with OR_i (i = 1…N) being the individual opinion ratings for the N members of the panel.

i	Index of customer
N	Number of customers in the panel

5.8.1.2 Equation

$$P801\ [\%] = \frac{N_S}{N_A}$$

where

N_S	Number of successful access attempts to tariff information
N_A	Number of access events to tariff information

5.8.2.2 Equation

$$P802\ [\%] = \frac{\sum \text{N}_\text{R}}{\sum \text{N}_\text{S}} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ SP's\ notification\ is\ received\ by\ customer \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ customer\ exceeds\ his\ billing\ budget \\ 0, & else \end{cases}$$

where:

$\sum N_R$	Number of successful notifications for exceeding customer's billing budget received by customer from SP
$\sum N_S$	Number of exceeding customer's billing budget events

5.8.3.2 Equation

$$P803\ [\text{Time}] = \frac{\sum_{i=1}^{N}(t_{4,i}-t_{3,i})}{N}$$

where

N	Number of billing budget overrun events
i	Index of each billing budget overrun event
$t_{3,i}$	Point of time when billing budget *i* is overrun
$t_{4,i}$	Point of time when billing budget notification *i* actually occurs

5.8.4.2 Equation

Definition for event ratio:

$$P804\ [\%] = \frac{\sum \mathrm{N_x}}{\sum \mathrm{N_y}} \times 100\%$$

where

N_x	Number of successful access attempts to the account management
N_y	Number of access events to the account management

5.8.5.2 Equation

$$P805\ [\mathrm{Time}] = \frac{\sum_{\mathrm{i}=1}^{\mathrm{N}}(t_{6,\mathrm{i}} - t_{5,\mathrm{i}})}{N}$$

where

N	Number of access to account information events
i	Index of each access event
$t_{5,i}$	Point of time when access i is made
$t_{6,i}$	Point of time when account information i actually occurs

5.8.6.2 Equation

$$P806\ [\%] = \frac{N_{BR}}{N_{BE}}$$

where

N_{BR}	Number of bills delivered
N_{BE}	Number of bills expected

5.8.7.2 Equation

$$P807\ [\mathrm{Time}] = \frac{\sum_{\mathrm{i}=1}^{\mathrm{N}}(t_{8,i} - t_{7,i})}{N}$$

where

N	Number of bill reception events
i	Index of each bill reception event
$t_{8,i}$	Point of time when bill *i* is received
$t_{7,i}$	Point of time when bill *i* is expected

5.8.8.2 Equation

$$P808\ [\%] = \frac{\sum N_{ADD}}{\sum N_{BDD}}$$

where

N_{ADD}	Number of advice of direct debit received after direct debit
N_{BDD}	Number of advice of direct debit expected before direct debit

5.8.9.2 Equation

$$P809 = \sum_{i=1}^{N} m_i$$

with $$m_i = \begin{cases} 1, & if\ mode\ i\ is\ available \\ 0, & if\ mode\ i\ is\ not\ available \end{cases}$$

where

N	Number of potentially available modes of billing information transfer
i	Index of each billing information transfer mode
$\sum m_i$	Number of actually available billing information transfer modes

5.8.15.2 Equation

$$P815[OR] = \frac{\sum_{i=1}^{N} OR_i}{N}$$

where OR is the mean opinion rating, with $\mathrm{OR_i}$ (i = 1…N) being the individual opinion ratings for the N members of the panel.

i	Index of expert/customer
N	Number of experts/customer in the panel

5.9.1.2 Equation

$$P901[\mathrm{Time}] = \frac{\sum_{\mathrm{i}}^{\mathrm{n}} (tout_{n+1} - tout_n)}{t_2 - t_1}$$

where (see fig. 21a):

i	First outage in time period $[t_1, t_2]$
n	Last outage in time period $[t_1, t_2]$

5.9.2.2 Equation

Numerical count of the number of access unavailability commencement characterised by the number of t1 in 19.

$$P902[\mathrm{Number/Time}] = \frac{N_{outages}}{t_2 - t_1}$$

where (see fig. 21a):

$N_{outages}$	Number of outage periods in time period $[t_1, t_2]$
t_1	Start of observation period
t_2	End of observation period

5.9.3.2 Equation

$$P903\ [Time] = \frac{\sum_{i=1}^{N} (t_{3,i} - t_{1,i})}{N}$$

where (see fig. 21b):

N	Number of Network/Service Management access requests
i	Index of each N/S Management request
$t_{1,i}$	Instant when access request was made
$t_{3,i}$	Instant when actions associated with the request was completed

5.9.4.2 Equation

$$P904[\%] = \frac{\sum_{t1}^{t2} n}{N} \times 100$$

Where (see figure 21b)

t_1	Commencement period of the specified period of observation,
t_2	End time of the period of observation
n	Number of successful implementations of customer's request for N/S management, and
N	Total number of requests within the specified period

5.9.5.2 Equation

$$P905[OR] = \frac{\sum_{i=1}^{N} OR_i}{N}$$

Where OR is the mean opinion rating, with OR_i (*i = 1…N*) being the individual opinion ratings for the N members of the panel.

i	Index of expert/customer
N	Number of experts/customers in the panel.

5.9.13.2 Equation

Opinion rating scores expressed as a mean value with an indication of the standard deviation.

$$P913[OR] = \frac{\sum_{i=1}^{N} OR_i}{N}$$

Where *OR* is the mean opinion rating, with *ORi* (*i = 1…N*) being the individual opinion ratings for the *N* members of the panel.

i	Index of expert/customer
N	Number of experts/customers.

A similar equation may be used for the panel members' opinion rating.

5.10.1.2 Equation

$$P1001\ [\mathrm{Time}] = \frac{\sum_{i=1}^{N} (t_{2,i} - t_{1,i})}{N}$$

where

N	Number of cessation requests
i	Index of each cessation request
$t_{1,i}$	Point of time when cessation request i is sent
$t_{2,i}$	Point of time when cessation acknowledgement i is actually received

5.10.2.2 Equation

$$P1002\ [\%] = \frac{N_A}{N_S}$$

where

N_A	Number of acknowledged cessation requests
N_S	Number of sent cessation requests

5.10.3.2 Equation

$$P1003\ [\%] = \frac{\sum N_R}{\sum N_S} \times 100\%$$

with $$N_R = \begin{cases} 1, & if\ event\ of\ access\ to\ cessation\ facility\ is\ successful \\ 0, & else \end{cases}$$

and $$N_S = \begin{cases} 1, & if\ access\ event\ to\ cessation\ facility\ is\ started \\ 0, & else \end{cases}$$

where:

$\sum N_R$	Number of successful access events to cessation facility
$\sum N_S$	Number of started access events to cessation facility

5.10.4.2 Equation

$$P1004\ [\%] = \frac{N_{CA}}{N_{CR}} \times 100\%$$

where

N_{CA} Number of cessation requests achieved
N_{CR} Number of cessation requests

The audit results based on expert knowledge should be adjusted to the customers' expectations.

6.3.6.1 Evaluation specific description

This parameter can be deployed in both scenarios: the one for a fixed provisioning date and the one for a provisioning period. In the former case the time difference between $t_{1,i}\ and\ t_{2,i}$ is relevant, whereas in the latter case the time difference between $t_{2,i}$ and $t_{3,i}$ is the correct one.

A.2 Description

Equation for the aggregate rating:

$$AR = w_1 \times p_1 + w_2 \times p_2 + w_3 \times p_3 + \cdots + w_n \times p_n = \sum_{i=1}^{n} w_i \times p_i$$

where:

p_i is the performance parameter result with index i

w_i is the weight of the performance parameter result p_i, expressed as percentage

n is the number of assessed performance parameters in this category

i is the index of the assessed performance parameter

The weighting is expressed as a percentage and will add up to 100%:

$$\sum_{i=1}^{n} w_i = 100\%$$

Step 5: The two seven point scores from Step 1, the transformed seven point scores from Steps 2 and 3 and weighting are inserted into the equation for AR. The resulting value is reconverted into bipolar 7 point scale.

EXAMPLE: $AR = \sum_{i=1}^{n} w_i \times p_i = 0.25 \times 1 + 0.4 \times 4 + 0.2 \times 3.7 + 0.15 \times 3 = 3.04$