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Survey on the Use of Test Specifications produced by ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Methods for Testing and Specification (MTS).

1   Scope

The present document gives the result of a survey conducted by the ETSI Project Team 77V. The objective of this survey has been to provide ETSI and the European Commission with a "photograph" concerning the use in Europe of the testing methodologies and the test specifications developed by ETSI. It has consisted in identifying the "users" of testing products, in collecting data, appraisals, opinions. Such an inventory of use and appraisal of the ETSI testing products have necessitated a survey based on questionnaires, followed by a statistical analysis and a reporting.

1.1   Structure of the present document

The analysis of results in the present document is structured in four main parts, progressively ranging from the main conclusions to full details:

-    an executive summary (clause 2);

-    a commented analysis (clause 3);

-    the analysis of free comments (clause 4).

Annex A accounts for the methodology used.

2   Executive summary

	For details, refer to…
A large majority of providers consider that testing is an activity that comes as **a useful support to the marketing of products and services** but is a **minimal requirement**, that can hardly help distinguishing a product from the competition.	**3.2.1, page 13**
It is important to remark the **low figure related to influencing procurement. This confirms that conformance testing in support of marking or certification has a very limited marketing interest.**	**3.2.1, page 13**
ETSI test suites are used for **development and validation** testing. ETSI test suites account for a higher proportion of the suites used for development testing than for validation testing.	**3.1.4, page 10**
Publicizing test results is generally linked with **conformance to standards,** or with the **compatibility with the network.**	**3.2.3, page 14**
Most of the time, suppliers inform their customers by a **simple declaration,** that is **very seldom formal** in the sense of EN 45014 (General criteria for suppliers' declaration of conformity).	**3.2.2, page 14**
The trade fairs, shows, etc. do not seem to be a place where testing results are put forward. Even when interoperability exhibitions are organized between different vendors.	**3.2.2, page 14**
There is a clear lack of maturity of actual collaboration for testing. **More collaboration seems to be favoured, and does not take place.** A commonly expressed opinion is that ETSI could play the role of a facilitator in that domain.	**3.2.4, page 14**
More than 80 % of the polled providers declare that Conformance testing is an essential issue for them. This corresponds to the high demand of customers for conformant products.	**3.1.6, page 11**
There is a strong demand of **interoperability** testing from **service providers (92 %)**. It should be noted that interoperability testing and conformance testing correspond to two different type of requirements and are considered here complementary.	**3.1.6, page 12**
In a context where **customers' specificity is high**, the **use of ETSI test suites is directly related to the customers' requirement concerning the use of standards** themselves.	**3.1.1, page 7**

The general opinion is that ETSI test suites provide a good coverage, but with a **late availability**. This point of view is rather homogenous over types of companies and technical domains.

3.1.2, page 8

Concerning the requirements on ETSI test suites the survey shows that **alignment of the test suite on the base standard** and **early availability** are essential. Then comes the need for **maintenance of the test suites, validation** and **freedom from errors.**
The **availability of test cases** (in TTCN, as opposed as only test purposes) is considered as essential by 50 % of the companies.
The **cost of implementation** is scarcely mentioned as essential.

3.1.3, page 8

Modification of ETSI test suites seems a **common practice for both validation and development testing**, even though most test specifications for development testing are still developed internally.

3.1.4, page 10

It should be noted as well that ETSI is largely the first provider of test suites developed in a collaborative manner.

3.1.4, page 10

The testing is generally performed **internally**.

3.1.7, page 12

Generally, the tests are performed by a **dedicated validation team** or laboratory, rather than by the team in charge of the products/services.

3.1.7, page 12

From the total population having been asked questions about the use of test tools (technical persons, except tool providers):

3.1.5, page 10

76 % declare that **they use test tools developed internally;**

74 % declare that **they use test tools available on the market.**

It is also interesting to note that proprietary test tools represent a significant part of the market, but that customized test tools do not seem to be so frequent a practice.

Concerning the availability of ETSI test suites on the tools: **50 %** declare that **ETSI test suites are available on the test tools they use.**
This rate should be considered in a context were:

3.1.5, page 10

- there is a high percentage of proprietary tools that, generally, do not support ETSI test suites;

- the survey covers all the testing and technical domains, including those for which no test suites are used (e.g. physical measurements) and those for which there is no ETSI test specification available.

The use of **third party laboratories** is limited.

3.1.7, page 12

The justification of the use of **third party laboratories** seems to be mainly economical.

3.3.1, page 16

Most of the laboratories perform both voluntary and regulatory tests.

3.3.1, page 15

The perception of the of the **market maturity** regarding testing varies strongly among the different technical domains.

3.3.1, page 15

More than 90 % of the test suites used by test laboratories originate in ETSI or in CTS programmes. The use of standardized test suites with or without modification or addition is more frequent that the use of proprietary test suites. The implementation of the test suites is generally done by the tool provider or by the laboratory.

3.3.2, page 16

Few laboratories are **accredited.** This relatively low penetration of accreditation reflects the present situation, and not necessarily a trend.

3.3.1, page 15

3   Commented analysis

3.1   Testing practices on the market

The results analysed in this clause aim at establishing a better understanding of the testing practices, and of the **positioning of the ETSI test specifications** in these practices.

Testing practices are analysed from the point of view of their **relationships** with:

-   the **customers'** influence;

-   **test tools** and their origins;

-   **test suites** and their origins;

-   **standardization** activities.

This clause is largely based on the responses obtained from providers of products (equipment or services).

Six types of responding companies (mainly providers) and 5 different technical domains have been considered here:

types of companies:

-   providers (of all kind);

-   providers of equipment;

-   providers of service;

-   providers of equipment or service to operators or public institutions;

-   providers of equipment or service to private companies;

-   providers of equipment or service to end users;

-   purchaser (when applicable);

technical domains:

-   terminal equipment;

-   wireless communication (e.g. DECT, CT2);

-   mobile communication (e.g. GSM, DCS, TETRA);

-   corporate networking (e.g. Q-SIG);

-   network infrastructure (e.g. X.25, ATM, IN, TMN, SDH, ISDN, B-ISDN).

3.1.1   Use of ETSI test suites

Both standardization and specific customer requirements determine testing practices according to providers.

From the following figures, it appears that, in a general context where **customers' specificity is high**, the **limit to the use of ETSI test specifications** on products (equipment + services) is just below the limit of the required **conformance to standards.** In simplified words, that the limit of use of standardized testing is related to the limit of use of standards.

customers' specificity: 81 % of providers declare that different customers have different requirements on products;

customers and standards: 67 % of providers declare that customers express a requirement of conformance of products/services to the relevant European or International standards;

standards and test specifications: 62 % of providers declare that the test specifications produced by ETSI are effectively used to test their products;

customers and test specifications: only 36 % of providers declare that their customers impose on them the use of specific test specifications.

The distribution of these figures by type of responding company is as follows:

profile (type)	different customers have different requirements	customers require conformance to standards	customers impose the use of specific test specifications	**ETSI test suites are used to test products**
providers	81 %	67 %	36 %	**62 %**
providers of equipment	86 %	73 %	41 %	**65 %**
providers of service	74 %	61 %	35 %	**61 %**
providers of equipment or service to operators and public institutions	86 %	80 %	46 %	**68 %**
providers of equipment or service to private companies	85 %	75 %	38 %	**60 %**
providers of equipment or service to end users	79 %	58 %	25 %	**54 %**

3.1.2   Availability of ETSI test suites

availability: 65 % of polled persons declare that ETSI test suites are available that cover their domain;

timely availability: only 36 % of polled persons declare that ETSI test suites were available when they started their testing programme.

This view of a good coverage by ETSI test suites, but of a late availability, is rather homogenous over types of companies and technical domains.

3.1.3   Requirements on ETSI test suites

The following criteria were concerning the user requirements on ETSI test suites in the questionnaire:

-   available early;

-   low cost of implementation;

-   aligned on the base standard;

-   error free;

-   validated;

-   maintained;

-   limited to test purposes.

From the total population having been asked to qualify these criteria:

74 % declare that **alignment on the base standard** is essential;

72 % declare that **early availability** is essential;

61 % declare that **maintenance of the test suites** is essential;

51 % declare that **freedom from errors** is essential;

51 % declare that **validation of the test suites** is essential;

49 % declare that **containing detailed test cases (not only test purposes)** is essential;

28 % declare that **low cost of implementation** is essential.

The following tables provide the details.

profile (type)	alignment on base standard		early available		maintenance		error free		validation		detailed test cases (not only TP)		low implement-ation cost	
(e: essential u: useful)	e	u	e	u	e	u	e	u	e	u	e	u	e	u
providers	**74**	13	65	21	61	26	61	26	52	35	44	39	30	17
providers of equipment	**76**	14	62	24	62	24	62	24	52	33	48	33	29	48
providers of service	**67**	17	58	25	67	17	75	18	67	17	33	50	50	42
providers of equipment or service to operators or public institutions	**82**	6	65	24	71	24	65	24	59	35	47	41	24	53
providers of equipment or service to private companies	**91**	9	55	27	55	36	64	18	45	45	46	36	36	36
providers of equipment or service to end users	75	25	**88**	13	50	38	63	38	50	38	50	38	50	50

profile (technical domain)	alignment on base standard		early available		maintenance		error free		validation		detailed test cases (not only TP)		low implement-ation cost	
(e: essential u: useful)	e	u	e	u	e	u	e	u	e	u	e	u	e	u
terminal	**73**	18	68	23	55	36	36	50	36	55	55	32	23	55
wireless	67	27	**80**	13	73	13	53	33	47	40	53	27	27	60
mobile	**77**	18	64	32	73	18	64	27	55	36	41	46	23	59
corporate network	**77**	23	**77**	23	69	31	39	54	46	54	**77**	15	15	69
network infrastructure	**78**	19	75	19	63	31	53	38	56	38	53	38	28	60

The **test tool providers** have the following answers:

80 % declare that **alignment on the base standard** is essential;

80 % declare that **maintenance of the test suites** is essential;

60 % declare that **early availability** is essential;

40 % declare that **freedom from errors** is essential;

40 % declare that **validation of the test suites** is essential;

40 % declare that **containing detailed test cases (not only test purposes)** is essential;

20 % declare that **low cost of implementation** is essential.

It is interesting to note that the tool providers:

- stress the question of maintenance (it can be assumed that they could participate actively);

- are less interested by the availability of detailed test cases (60 % declare it useful, though) -but this depends on whether they have TTCN compiling facilities;

- do not insist on low cost of implementation.

It seems logical that they are less concerned by the early availability, since the early availability of the test suites is not a distinguishing factor of competition to them.

3.1.4   Origin of test suites used

Most polled persons are concerned with development or validation testing.

Excluding the persons that do not declare that they perform development or validation testing, the following results are obtained.

Modification of existing test suites seems a common practice for **validation testing (63 %)** in addition to test suites **developed internally (63 %)**. For **development testing**, most test specifications are **developed internally (69 %)**, but modification of existing test suites also represents **62 %**.

ETSI test suites account for a higher proportion of the suites used for development testing (62 %) than for validation testing (53 %).

ETSI remains largely the first provider of test suites developed in a collaborative manner.

type of testing	test suites developed internally	test suites developed in collaboration with other companies	pre-existing test suites, used without modification	derived from existing test suites (modification)	derived from existing test suites (additional)	ETSI test suites	a standardi-zation body other than ETSI	a European or interna-tional orga-nization, e.g. NM Forum	EC-funded CTS programme
validation	**63 %**	32 %	37 %	**63 %**	47 %	53 %	0 %	21 %	0 %
development	**69 %**	39 %	31 %	**62 %**	46 %	**62 %**	0 %	15 %	0 %

3.1.5   Origin of test tools used

From the total population having been asked questions about the use of test tools (technical persons, except tool providers):

76 % declare that **they use test tools developed internally;**

74 % declare that **they use test tools available on the market;**

63 % declare that **they use off-the-shelf test tools;**

45 % declare that **they use customized test tools.**

It is interesting to note that proprietary test tools represent a significant part of the market, but that customized test tools do not seem to be so frequent a practice.

Concerning the availability of ETSI **test suites** on the tools:

63 % declare that **test tools are available that implement ETSI test suites;**

50 % declare that **ETSI test suites are available on the test tools they use.**

The apparent contradiction between these two figures (the fact that the ETSI test suites are implemented only on few tools) can be easily explained by:

- the high percentage of proprietary tools that, generally, do not support ETSI test suites;

- the fact that these figures cover all the testing and technical domains, including those for which no test suites are used (e.g. physical measurements) and those for which there is no ETSI test specification available.

It is known that the domain covered by ETSI test suites does not represent all the testing needs (see subclause 3.1.6). The availability of test tools that implement ETSI test suites (63 %) is consistent with the products effectively tested using ETSI test suites (62 % - see subclause 3.1.1).

The following tables provide the detail by profiles.

It is interesting to note that **service providers** are developing **less proprietary tools** and use principally commercially available ones.

profile (type)	proprietary test tools	commercially available test tools	off the shelf test tools	customized test tools	test tools exist that implement ETSI test suites	ETSI test suites available on the test tool used
providers	74 %	74 %	61 %	48 %	57 %	35 %
providers of equipment	76 %	76 %	62 %	48 %	52 %	33 %
providers of service	58 %	83 %	67 %	42 %	58 %	42 %
providers of equipment or service to operators or public institutions	70 %	70 %	64 %	35 %	59 %	29 %
providers of equipment or service to private companies	64 %	82 %	64 %	46 %	46 %	36 %
providers of equipment or service to end users	75 %	75 %	50 %	75 %	63 %	38 %

profile (domain)	proprietary test tools	commercially available test tools	off the shelf test tools	customized test tools	test tools exist that implement ETSI test suites	ETSI test suites available on the test tool used
terminal	82 %	73 %	64 %	46 %	68 %	64 %
wireless	86 %	86 %	71 %	43 %	64 %	64 %
mobile	85 %	70 %	60 %	40 %	55 %	50 %
corporate network	70 %	90 %	80 %	50 %	70 %	50 %
network infrastructure	74 %	78 %	63 %	41 %	67 %	56 %

3.1.6   Nature of the tests

From the total population of providers (except tool providers, to whom the question was not posed):

87 % are concerned with testing **conformance to standards;**

83 % are concerned with testing **conformance to specifications or de facto standards;**

87 % are concerned with testing **interoperability;**

56 % are concerned with **end-to-end** testing;

83 % are concerned with **functional** testing;

83 % are concerned with **performance** testing;

70 % are concerned with **robustness** testing;

26 % are concerned with testing **objects;**

48 % are concerned with testing **protocol mapping**.

These figures, detailed in the following table, confirm that ETSI test suites produced today cover a limited subset only of the requirements concerning the test.

There is a strong demand of **interoperability** testing from **service providers (92 %)**. Surprisingly, service providers expressed a limited involvement in end-to-end testing according to those figures. It is probable that in reality, these figures are influenced by the fact that end-to-end testing is not as well spread as interoperability testing, and in addition the end-to-end methodologies and tools are just emerging (in particular allowing end-to-end testing of a service provided by a *set* of networks operated separately). The interest in end-to-end testing is higher than the present involvement in such activities.

profile	conformance to standards	conformance to de facto standards	interoperability	end to end	functional
providers	87 %	83 %	87 %	57 %	83 %
providers of equipment	86 %	86 %	86 %	57 %	81 %
providers of service	83 %	75 %	**92 %**	58 %	92 %
providers of equipment or service to operators or public institutions	94 %	82 %	82 %	59 %	82 %
providers of equipment or service to private companies	91 %	91 %	82 %	45 %	91 %
providers of equipment or service to end users	87 %	87 %	87 %	75 %	87 %

profile	performance	robustness	objects	protocol mapping	physical characteristics
providers	83 %	70 %	26 %	48 %	61 %
providers of equipment	86 %	71 %	29 %	52 %	62 %
providers of service	75 %	75 %	33 %	58 %	58 %
providers of equipment or service to operators or public institutions	82 %	71 %	29 %	53 %	59 %
providers of equipment or service to private companies	91 %	82 %	36 %	55 %	82 %
providers of equipment or service to end users	87 %	75 %	38 %	50 %	75 %

3.1.7   Who performs the tests

The following table shows that the testing is **generally performed internally**.

Most internal testing is performed by a **dedicated validation team** or laboratory, rather than by the team in charge of the products/services. This is particularly true in the case of **service providers**.

The use of **third party laboratories is quite low**.

profile	test performed internally (internal validation team or laboratory)	tests performed internally (same team that is responsible of prod/serv)	test performed by third party lab paid by you	test performed by third party lab **not** paid by you
all providers	79 %	33 %	26 %	14 %
providers of equipment	80 %	37 %	29 %	12 %
providers of service	81 %	19 %	19 %	13 %
providers of equipment or service to operators or public institutions	73 %	41 %	30 %	11 %
providers of equipment or service to private companies	80 %	33 %	30 %	18 %
providers of equipment or service to end users	88 %	30 %	38 %	17 %

3.2   Testing and the marketing of products

The results analysed in this subclause aim at establishing a better understanding of the role that testing, in particular standardized, may play in the marketing of products.

The relationship between testing and marketing of products is analysed from the providers' point of view, according to 5 types of questions:

-    the **marketing use of testing** (is testing important to marketing and how);

-    **how the results of testing are publicized**;

-    **what message is conveyed by the publicizing of test results**;

-    **what collaboration with other actors is possible or expected** for testing products.

3.2.1   The marketing use of testing (is testing important to marketing and how)

From the total population of polled providers:

77 % consider that testing is **a minimal and basic requirement**;

69 % consider that testing is **a valuable marketing argument to sell the product/service**;

49 % consider that testing is **a way to distinguish your product/service from the competition**;

43 % consider that testing is **an explicit requirement from your customer**;

40 % consider that testing is **a way to promote a technology, by showing that this technology works**;

34 % consider that testing is **a requirement that your customer will verify**;

31 % consider that testing is **a way to influence procurement**.

These figures show that testing is an activity that comes as **a useful support to the marketing of products and services** (a valuable marketing argument… 69 %) but is a **minimal requirement (77 %)**, that can hardly help distinguishing a product from the competition (49 %).

It is important to remark the **low figure related to influencing procurement (31 %)**. **This confirms that conformance testing in support of marking or certification has a very limited marketing interest.**

It is also important to note that **these conclusions are even more manifested in the case of providers of terminal equipment**, for whom:

81 % consider that testing is **a minimal and basic requirement**;

52 % consider that testing is **a valuable marketing argument to sell the product/service**;

43 % consider that testing is **a way to distinguish your product/service from the competition**;

14 % consider that testing is **a way to influence procurement**.

3.2.2   How the results of testing are publicized

Providers were asked how they publicized the fact that their products had passed tests:

51 % by **declaring to customers that the products have passed the relevant tests**;

46 % by **providing on request test reports**;

34 % by **demonstrating some of these tests at trade fairs, shows, etc.**;

31 % by **showing a certificate issued by an official and accredited certification body**;

20 % by issuing **a formal supplier's declaration of conformity to standards (EN 45014)**;

20 % do not publicize that products or services have passed tests.

These figures show that, most of the time, suppliers inform their customers by a **simple declaration** (51 %), that is **very seldom formal** in the sense of EN 45014 (only 20 %).

The trade fairs, shows, etc. do not seem to be a place where testing matters are put forward. Even when interoperability exhibitions are organized between different vendors, they generally aim at showing the workability of a technology, and the synergy between market actors around this technology, but they do not intend to prove anything: the products concerned may be prototypes and the "tests" are generally limited to exercising the main functions in a simplified network environment.

3.2.3   What message is conveyed by the publicizing of test results

Providers were asked what message is conveyed by the publicizing of test results:

69 % "my product/service conforms with the relevant European or International standard";

54 % "my product is compatible with the network" (62 % in the case of terminal providers);

49 % "my company's image is that of technical competence, professionalism, quality";

43 % "my product/service is compatible, interoperates with those from other suppliers";

43 % "my product/service works, i.e. provides its customer with the expected function, service, level of quality".

These figures show that **publicizing test results is generally linked with conformance to standards**, or with the **compatibility with the network**.

Beyond a general message on the quality of the company's image, **publicizing test results does neither really account for the actual provision of expected functions, nor for the capability to interwork with products from other suppliers**. This is consistent with the previous conclusion that **testing is not a way to influence procurement** (see subclause 3.2.1).

3.2.4   What collaboration with other actors is possible or expected for testing products

From the total population of polled providers:

50 %   favour collaboration with competitors in testing the compatibility - interoperability - with the products/services of the competitors;

38 %   favour collaboration with competitors in sharing the cost of test tool, or test service development.

But when facts are considered:

only 5 %   declare that their company is involved in programmes for testing interoperability with products/services of competitors;

only 5 %   declare that their company is involved together with other companies in programmes for collaborative testing.

These figures show that there is a clear lack of maturity of actual collaboration for testing. **More collaboration seems to be favoured, and does not take place.** A commonly expressed opinion is that ETSI could play the role of a facilitator, since it is a place where the different actors of a technology meet at a technical level, and where test tool providers have an opportunity to show them their tools and identify potential markets.

3.3   Analysis of answers from testing laboratories

3.3.1   Generalities

The answers concerning the laboratories have been analysed considering 5 profiles, based on 5 different technical domains:

- laboratories concerned with terminal equipment;

- laboratories concerned with wireless communication (e.g. DECT, CT2);

- laboratories concerned with mobile communication (e.g. GSM, DCS, TETRA);

- laboratories concerned with corporate networking aspects (e.g. Q-SIG);

- laboratories concerned with network infrastructure aspects (e.g. X.25, ATM, IN, TMN, SDH, ISDN, B-ISDN).

75 % of the polled laboratories are third party ones (i.e. independent organization) and only 25 % are first party one (i.e. belong to a manufacturer or to a service provider).

In general, few laboratories are **accredited** (approximately 15 %). However, this average value corresponds to situations that strongly differ according to the technical domain. The laboratories concerned with terminal present a number of accredited labs that corresponds to the average value. Laboratories working in the network infrastructure domain are below the average value (10 %) when those working in the corporate network domain are just above (20 %). On the other hand, 50 % of the laboratories involved in the mobile domain and 30 % of the laboratories involved in the wireless domain are accredited.

This relatively low penetration of accreditation reflects the present situation, and not necessarily a trend. The interest in being accredited may change for a laboratory, mainly due to three (interrelated) factors:

- an increase of competition, including in the regulatory (type approval) domain, where the "incumbent" laboratories loose their de facto monopoly;

- the forthcoming regulations, that will relate the market of laboratories to the (legal) liability of vendors concerning the quality of their products;

- the trend in European member states to base the designation of laboratories upon their accreditation (making these two concepts equivalent).

More than **90 %** of the laboratories perform **voluntary and regulatory** tests. Generally (above 80 %), the laboratories are organized by type of testing and not by category of tests. That means that the same teams are in charge of the voluntary and of the regulatory testing. This rule is applicable to all the technical domains.

The perception of the **market maturity** regarding testing varies strongly among the different technical domains. The following figures indicate by technical domain the point of view of the laboratories concerning the existence of "a critical mass of customers":

terminals	60 %
wireless	70 %
mobile	50 %
corporate networks	80 %
network infrastructure	50 %

Independently of the technical domain, the laboratories do not consider the technical complexity as a major issue.

On the other hand the **number of competitors is always seen as a major problem**. The following table presents the viewpoint of the laboratories based on the technical domain:

terminals	75 %
wireless	85 %
mobile	100 %
corporate networks	60 %
network infrastructure	70 %

Answers concerning the **existence of "reference" test tool** as well as answers related to the availability of tools are generally heterogeneous. This heterogeneity is due to the difference of strategy concerning tool acquisition among the laboratory.

Concerning the **justification of the use of third party laboratory** the main reason is economical, as can be seen in the following figures:

reason for using:	economical	technical reason	independence
a 3py REG service	**75 %**	**67 %**	**50 %**
a 3py VOL service	**58 %**	**50 %**	**50 %**

Concerning the **test suites**, 92 % originate in ETSI or in CTS programmes (see subclause 3.3.2). The **implementation of the test suites** is generally done by the tool provider or by the laboratory. The use of a third party for this type of task is not frequent (8 %).

3.3.2   Origin of test suites used in laboratories

The results concerning the origin of test suites are presented by technical domains. Two tables are used. The first one deals with the nature of the test suite and the second one details its origin when pre-existing test suites are used (as such, modified or extended).

profile	proprietary test suites developed internally	proprietary test suites developed in collaboration	standard test suites without modification	standard test suites with modification	standard test suites with addition
terminals	40 %	58 %	83 %	75 %	75 %
wireless	14 %	70 %	70 %	70 %	70 %
mobile	25 %	75 %	75 %	75 %	75 %
corporate networks	40 %	80 %	60 %	60 %	60 %
network infrastructure	30 %	60 %	90 %	80 %	80 %

Except in the case of the "corporate networks", the use of standardized test suites with or without modification or addition is more frequent that the use of proprietary test suites.

The case of "corporate Network" shall be considered with caution since it corresponds to a technical domain where the specifications are often at least partially proprietary.

If pre-existing test specifications are used (as such, modified, or extended), their more precise origin is shown in the following table:

profile	ETSI test suites	standardization body (ETSI excluded)	European or international organization	CTS
terminals	92 %	50 %	25 %	92 %
wireless	100 %	43 %	28 %	100 %
mobile	100 %	50 %	25 %	100 %
corporate networks	80 %	40 %	20 %	80 %
network infrastructure	90 %	60 %	30 %	90 %

These figures clearly show that independently of the technical domain, almost all laboratories are using ETSI and CTS originated test suites.

4 Analysis of free comments

This clause deals with the free comments that polled persons were invited to provide in addition to answering the pre-defined questions.

Most of the free comments obtained during the survey concern the ETSI test suites and the validation of standards.

A comment is generally "unique", or appears a few times; however, no statistical analysis - and therefore no generalization - is possible on the basis of these qualitative comments.

4.1 ETSI test suites

4.1.1 Coverage

Concerning the coverage of the test suites, several organizations (operators or manufacturers) have criticized the "poor coverage" of the test suites. The comment has been subsequently compared with the answers provided by the same organization to other questions, such as their expectations from testing, the type of testing they use or perform or consider essential.

This comparison highlights the fact that this "lack of coverage" concerns type of testing such as validation or interoperability and not the conformance testing. **Therefore, those comments should be regarded as the expression of a strong demand concerning the involvement of ETSI in new testing domains and not as a criticism concerning the coverage of the conformance test suites produced by ETSI.**

It shall be noted that this interpretation is fully consistent with the results of the survey concerning the nature of the testing where (see subclause 3.1.6):

   87 % of the polled population is concerned with interoperability testing;

   56 % of the polled population is concerned with end-to-end testing;

   83 % of the polled population is concerned with functional testing;

   83 % of the polled population is concerned with performance testing;

   70 % of the polled population is concerned with robustness testing.

4.1.2 Quality

Several organizations (operators or manufacturers) have expressed a strong criticism concerning the quality of the ETSI test suites. On the other hand, a significant part of the polled population consider the current quality as satisfactory.

This apparent contradiction can be explained by the difference of testing environments:

- the organizations that are using the ETSI test suites directly in TTCN require:

  - a better quality (less bugs);

  - the validation of the test suites by ETSI;

  - the maintenance of the test suites by ETSI.

- the organizations that do not use a TTCN compiler in their environment require only test purposes, and not TTCN test suites; hence they do not care about the technical quality of the TTCN.

4.1.3   Conclusion

In conclusion, the main concerns that appear in the free comments concerning directly the ETSI test suites are:

1) the involvement of ETSI is desired as a support to emergent testing practices such as interoperability, performance, robustness, etc.;

2) the organizations that are using the TTCN version of the ETSI test suites insist on a better technical quality and the implementation of a maintenance mechanism.

4.2   Requirements related to validation of standards

Another strong requirement that has been noticed concerns the implementation of a validation scheme for the standards themselves. For several large organizations (operators or manufacturers), the question of the testing methodology shall be considered in the more general framework of validation in general.

This means that the question of the alignment of the test suites on the base standard should be considered after the issue of the correctness of the standard itself. In this context, the generalization of the use of SDL is seen as a key issue.

Users of standards do not consider SDL as a miraculous solution that solves any type of problem. On the other hand, they request a structured approach of the standard validation were SDL is only a technical tool contributing to a better quality of standards.

4.3   Position of the tool providers

4.3.1   Test tool market: size and requirements

The market size is a rather important problem for mobile market segment as well as for the network infrastructure one. For the corporate network domain this point seems not so important. However, this difference may be due to the importance of proprietary specifications in corporate networking domain. On the other hand, the number of competitors compared with the market size is seen as critical for wireless and mobile domain. This view point is not shared by the tool providers of other domains.

The heterogeneity of the requirements is considered as problematic for all the domains. However, this point seems less important for the network infrastructure domain than for the other ones.

The unavailability of test specifications in time is viewed as a major problem by the tool providers of all the technical domains. However, the sensitivity of the tool providers involved in network infrastructure appear lower on that question than of the tool providers of the other domains**.**

The alignment on base standards and the maintenance of the tool in case of evolution of the standardized test suite is considered as mandatory by the tool's provider.

4.3.2   Customers requirements on testing tools

For all the technical domains concerned, the customers express precise technical requirements. Except for the wireless domain, the customers have a dedicated use of the tools purchased. This is particularly sensitive in the domain of corporate network (80 % of the customers have a dedicated use of the tools) and in the domain of the network infrastructure (67 % of the customers have a dedicated use of the tools).

The customers of tool providers are systematically using the support of consultancy companies in the domain of wireless and mobile. In the domains of corporate network or network infrastructure, the proportion of customers using the support of consultancy companies is respectively of 33 % and 40 %.

The customers of tool providers are systematically validating the tools in the domain of wireless and mobile. In the domains of corporate network or network infrastructure, the proportion of customers that perform a validation of the tools is respectively of 67 % and 80 %.

The customers' requirements are totally heterogeneous for wireless communication and corporate networking domains. For the mobile domain, 50 % of the requirement are homogeneous and for the network infrastructure domain, 80 % of the requirements are heterogeneous.

Annex A:
Methodological aspects

A.1 How the study was conducted

A.1.1 Generalities

The work of the PT has been focusing on an analysis of the actual use of ETSI standardization products by the different types of actors (6 different questionnaires have been distributed):

- the test laboratories;

- the test tools developers;

- the providers (technical level);

- the providers (marketing/strategy level);

- the purchasers (technical level);

- the purchasers (marketing/strategy level).

The survey has assessed the use of ETSI test specifications in several European organizations; it has considered organizations that are not using ETSI tools and methodology or that have developed proprietary implementations and/or improved the ETSI specifications, without contributing feedback to the ETSI community.

The rationale for using/not using the ETSI methodologies (in general or for specific products) has been explored, in relation with parameters like, time-to-market of the ETSI test specifications.

The balance between the different technical domains, between the different types of actors and between the different geographical areas has been considered with a special care.

The questionnaires were addressed to persons rather than to organizations. The purpose of this survey was not to gather consolidated company positions (with all the biases induced by company strategies) but to gather opinions of relevant persons directly in contact with the testing matters. Although the name and references of the persons were asked in the questionnaires (to facilitate the second step of telephone interviews), it was possible to answer anonymously, and this fact was made very clear in the covering letter.

On the basis of the sample of population defined and of the answer to the questionnaires, the second step of the survey, based on telephone interviews, has been carried out. Its main objective has been to clarify the points that were not consistent according to the answers to the questionnaire.

A.1.2 Definitions

validation tests: Tests run at the end of the development cycle of the product/service, for the final validation before placing the product/service on the market.

development tests: Tests run during the development cycle of the product/service, e.g. for debugging purposes.

> NOTE: The above definitions of "validation tests" and of "development tests" were provided in the questionnaires where these terms were used.

technical domain: A technology or a set of technologies covered by an organization responding to the survey, used in the definition of a profile (see subclause A.1.5.2).

type of actor: The position as a market actor of an organization responding to the survey, used in the definition of a profile (see subclause A.1.5.2).

A.1.3   Method used for the definition of the sample

Two major types of methods are generally available for the definition of samples:

-    methods based on the use of random samples;

-    methods based on samples defined by quota.

In the context of this survey the sample had to be structured so that it would respect the proportional representation in the ETSI membership of:

a) technical domains;

b) type of companies;

c) countries, or at least regions.

NOTE: The concepts of "technical domains" and "types of companies" are explained in subclause 3.1.

In order to satisfy those constraints, it was much more easy to a method based on quota rather than a method based on random selection.

A.1.4   Representativeness of the sample

The sample has been based on the users of European or International standards for the different technical domains. The spreading of the sample by region has been performed on the basis of the economical importance of that region.

The spreading of the sample by technical domain has been performed on the basis of the size of the population of users of ETSI standard for that technical domain.

It should be noted that the size of the sample per technical domain and by region will not be sufficient to allow cross analysis of results by technical domain and by region (for instance: analysis of the difference between Belgium and Netherlands concerning GSM technical domain). For instance the confidence threshold for cross analysis by countries is below fifty percents even for the countries with the largest samples (i.e. France, Germany and UK).

The size of the samples for the spreading by type of actors, independently of any regional variation provides an average confidence threshold of ninety percents with an uncertainty threshold on this confidence threshold lesser than ten percents.

The size of the samples for the spreading by technical domain, independently of any regional variation provides an average confidence threshold of eighty percents with an uncertainty threshold on this confidence threshold lesser than ten percents.

A.1.5   Profiles of respondents used in the analysis

A.1.5.1   Principle

Profiles have been defined based on:

1) the type of questionnaire sent, such as: marketing provider (m0), marketing purchaser (m1), technical provider (t0), etc.;

2) the answers to "classifying questions", such as "are you concerned with GSM", "are you selling to public companies or operators", etc. (These "classifying questions" are marked Qi in figure 1).

In other words, the answers have been used in two possible ways: either to decide whether a respondent belongs to a profile, or as a result relevant to the study.

The figure 1 summarizes this principle used during the analysis (the matrix, containing more than 27 000 entries, exists as an Excel ™ worksheet, and is designed to allow the dynamic creation of 25 profiles).
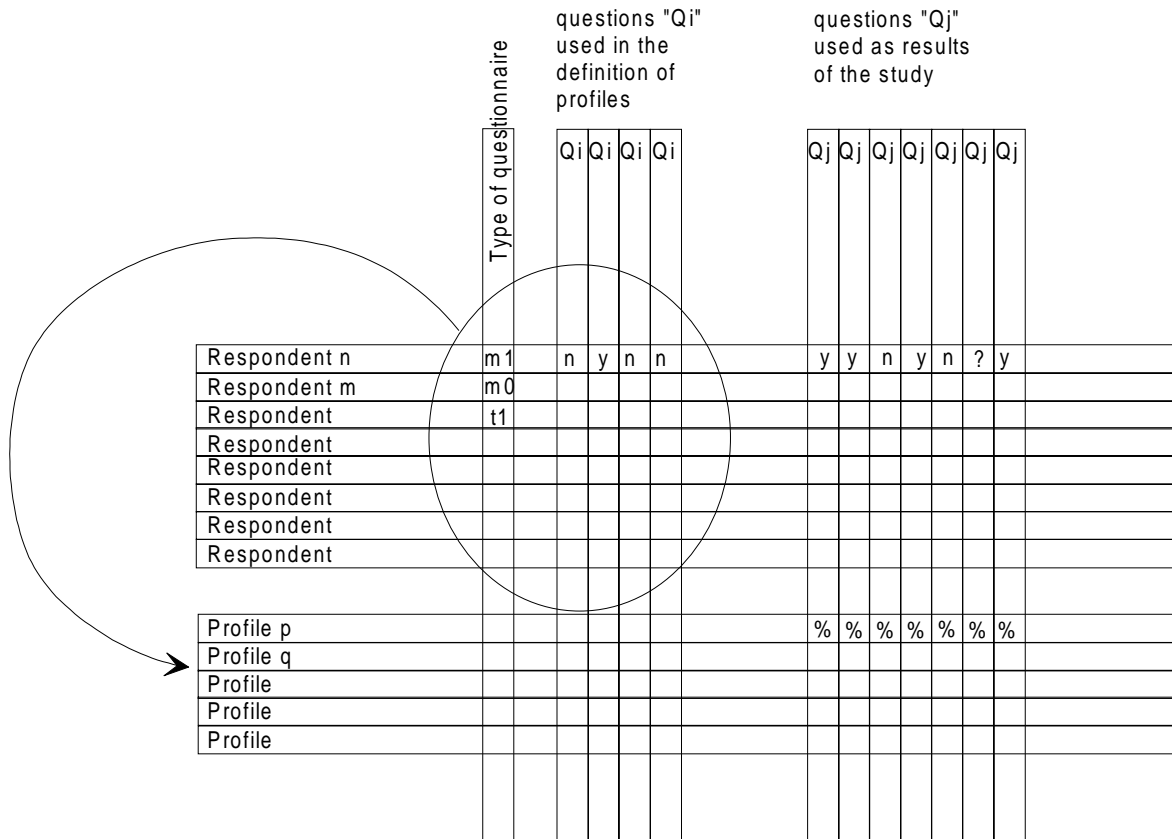
	Type of questionnaire	questions "Qi" used in the definition of profiles				questions "Qj" used as results of the study						
		Qi	Qi	Qi	Qi	Qj	Qj	Qj	Qj	Qj	Qj	Qj
Respondent n	m1	n	y	n	n	y	y	n	y	n	?	y
Respondent m	m0											
Respondent	t1												
Respondent													
Respondent													
Respondent													
Respondent													
Respondent													
Profile p						%	%	%	%	%	%	%
Profile q												
Profile													
Profile													
Profile													

Figure 1: Principle of profile definition based on the type of questionnaire and on the answers to "classifying questions"

A.1.5.2   Profiles actually defined and used

Two kinds of profiles have been considered:

Type 1: Profiles per type of actors

PROV	provider (M0 orT0) and (at least 1 yes in YP)
PURCH	purchaser (M1 or T1) and (at least 1 yes in YP)
EQUI	provider of equipment (provider) and (at least 1 yes in YP 01, 02, 03, 05)
SERV	provider of service (provider) and (at least 1 yes in YP 04,05, 06, 07)
TER	concerned with terminals yes in YP 01
NOTER	not concerned with terminals (no YP01) and (at least 1 yes in YP 01 to 07)
PROPUB	provider of equipment or service to operators or public institutions (CN01 or 03)
PROPRI	provider of equipment or service to companies (CN04 or 05)
PROUSE	Provider of equipment or service to end-users (CN06)

Type 2: Profiles per technical domain

wireless	DECT, CT2 (TD01, TD13)
mobile	GSM, DCS1800, TETRA, TFTS (TD02, 03, 04, 05)
corporate	business in TD16 or Q-SIG (TD14)
network	infrastructure or "network" in TD16, or X.25,ATM,IN,TMN, SDH,B-ISDN,ISDN
services	service in TD16

NOTE 1: The references, such as "TD16", "YP01",… are the references of the questions in the questionnaires.

NOTE 2:   The list of profiles above is not an exhaustive one. Other criteria may be retained for the analysis of the results. The authors of the present document have tried to build homogeneous categories, but any suggestion is welcome concerning the definition of other profiles. Once again, the Excel ™ worksheet, is designed to allow the dynamic creation of 25 profiles, and the raw material, with statistical information by profile and type of questions is available upon request.

A.1.6   Rate of answers

509 questionnaires have been sent and 97 have been answered. This lead to an answer rate of roughly 20 %. This rate is quite high for this type of survey, but is fully explained by the motivation of people belonging to the sample and by the active follow up made by the contractor.

The quite high rate of answer is as well due to the interest of the questionnaire recipients for the matters. This point has been taken into account for the interpretation of figures.

The different thresholds and rate below and above have been calculated on the basis of the answered questionnaires and not on the basis of the sent ones.

A.1.7   Confidence thresholds and error rates

Since the size of the global sample and the size of the samples per technical domains are limited, the statistical analysis has been performed with the objective of a confidence threshold of 80 % in order to keep the average error rate at 10 % with an uncertainty threshold on the error rate lower than 10 %.

In the case of analysis based on cross results between different kind of samples (for instance analysis of the difference of behaviour concerning the testing policy between the mobile sector and the network one), the representativeness of the results depends on the size of the sample as well on the variance between the rate of answer to a given question among the different samples. The rule that has been applied in the frame of this survey is to seek results with a confidence threshold of at least 90 %.

However, in certain cases, results with a very high interest for the conclusion of the survey had to be calculated with a lower confidence threshold.

Differences between percentages may be due either to actual differences in the sample or to sample errors. In the presentation of the results of this survey, the objective has been to present comparison of percentage with a confidence ratio greater than 90 % and therefore to suppress results above this limit.

A.2   Statistical rules and formulae

A.2.1   Confidence threshold and error rate

In the following ε_a represents the error rate for a confidence ratio of eighty percent. This error rate depends on the related sample size, (n). The following equation gives the values of n.

$$n = \frac{0,65}{\varepsilon_a^2}$$

For instance, the minimum value of n for a confidence threshold of eighty percent, an error rate of ten percents and an uncertainty threshold on error rate of 10 % is 53.

Rather 50 % of the results provided in this survey have been produced with a confidence threshold of 80 %, an error rate of 10 % and an uncertainty threshold on error rate of 10 %.

However, due to sample constraints certain results have been calculated on different bases. The following notes provide details about this cases:

NOTE 1: These references results produced with a confidence rate of 80 % error rate of 13 % and an uncertainty threshold on error rate of 10 %.

NOTE 2: These references results produced with a confidence rate of 80 % error rate of 16 % and an uncertainty threshold on error rate of 10 %.

NOTE 3: These references results produced with a confidence rate of 70 % error rate of 20 % and an uncertainty threshold on error rate of 10 %.

A.2.2   Uncertainty threshold on the error rate

In the following ε_{min} represents the minimum error and ε_{max} represents the maximum error with a confidence ratio of 80 %. These two error rate depends on two parameters that are the related sample size, respectively n_{min} and n_{max}. The following equations constrain the values of n_{min} and n_{max} in the case of an uncertainty threshold lower than 10 %.

$$\varepsilon_{min} = \sqrt{\frac{0,65}{n_{min}}} \quad \varepsilon_{max} = \sqrt{\frac{0,65}{n_{max}}}$$

$$\varepsilon_a - \varepsilon_{min} \in \left[0,10^{-2}\right] \quad \varepsilon_{max} - \varepsilon_a \in \left[0,10^{-2}\right]$$

$$\frac{n_{min} - n}{n_{min} * n} \leq 14 * 10^{-4}$$

A.2.3   Representativeness of cross results

$$\chi = \frac{n * (ad - bc)^2}{n1 * n2 * m1 * m2}$$

Were χ is the confidence ratio, n is the size of the global sample, n_1 is the size of the subset 1 of the sample, n_2 is the size of the subset 2 of the sample, a is the number of answer to question 1 by subset 1, b is the number of answer to question 1 by subset 2, c is the number of answer to question 2 by subset 1, d is the number of answer to question 2 by subset 2, m_1 is the total number of answer to question 1 and m_2 is the total number of answer to question 2.

The relationships between the confidence ratio and the confidence threshold obey to the following:

$\chi < 1,4$ ==> Confidence threshold < 90 %;

$\chi < 3,84$ ==> Confidence threshold < 95 %;

$\chi < 6,64$ ==> Confidence threshold < 99 %;

$\chi < 10,83$ ==> Confidence threshold < 99,9 %.

EXAMPLE:

Question	Mobile Sample	Network Sample	Total
Do you test according to pre-existing test specifications	3	7	10
Do you test according to non pre-existing test specifications	7	4	11
Total	10	11	21

In the example above a=3, b=7, c=7, d=4, n_1=10, n_2=11, n=21, m_1=10, m_2=11.

$$\chi = \frac{21*(12-49)^2}{10*11*10*11} = \frac{28749}{12101} = 2,38 \in [1,4;3,84] \Rightarrow Confidence - threshold \in [90\%,95\%]$$

History

Document history		
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