

Dependability Standards for the World in the Second Millenium

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Summary

The technical Committee TC 56 of the International Electrotechnical Commission produces international standards in the field of reliability, maintainability, maintenance support and technical risk analysis methods. The committee is a so-called "horizontal" committee which means that its standards are applicable to all technological areas, also outside the electrotechnical field. The present paper describes the working method, the working program and the published standards of TC 56. The structure of the standards is presented, the link to the ISO 9000 system and the so-called "toolbox concept". As the US system of MIL-standards no longer are being maintained, the IEC standards are the natural and international recognised alternative. The IEC TC 56 standards cover areas from management of dependability, review technique, FMEA and Fault Tree Analysis, as well as test methods and statistical methods.

Introduction

Standards are an important part of the technical development of the society and have large implications. The present paper covers the standards for the Second Millenium. Standards from the First Millenium, however, still have an important impact on our daily life. Examples are the alphabet and our numerical system. If the roman numerical system had a zero, the New Milenium would have started with year 2000.

Another example is the roman standard for the distance between the wheels of a carriage. Originally the purpose of this standard was to make it possible for pedestrians to cross the dirty street on a row of stones and at the same time allow the carriages to pass unhindered. This standard later determined the distance between the rails on our railways, and therefore today restrict the size of our passenger cars and engines.

Nowadays our society cannot function without standards. We take it for granted that a spare part for our car will fit, that our TV will function, and that our mobile telephone can communicate with the network. New products like digital radios, digital television, video recorders and audio recorders can only be successful if one international standard exists.

Still, there are major unsolved standardisation problems. The SI system is not yet applied in the whole world. In some countries you drive in the left side of the road, in others in the right side. We need a common standard for the voltage and frequency in our electrical supply network. We also need a common european connector standard for the wall electricity outlet. Other challenges are an HDTV standard and a common standard for a global mobile telephone system.

Besides the above mentioned areas we have standardisation problems that are not product specific as for example measurements (calibration), quality and dependability. This paper will discuss the dependability standards.

Dependability

Like Quality, Dependability is a so-called "umbrella term". The concept in itself is qualitative, i.e. it can not be measured directly. The reason for this expression is that it covers a number of sub-terms of which many can be measured. For Quality the measurable terms are for example the number of customer complaints, quality cost, yield, and defects per million (dpm) values. For Dependability the measurable terms are for example Field Failure Rate, hazard rate, failure intensity, MTBF, MTTF, and Availability.

Examples of terms within Dependability that are difficult to measure are for example maintainability and maintenance support. You can also say that Dependability is Quality as a function of the operating time of a product.

Why standardise dependability ?

How often have you searched for a method to solve a practical reliability or safety problem ?

The answer is typically found in an old textbook or in a recent paper.

But are you sure that this method is OK - is it the best method ?

And will your boss or customer accept the result of your analysis ?

A way to solve this problem is to use the international standards within the field.

For many years, the Military Standards and Handbooks of USA were used nearly exclusively, but now they are no longer supported, and will eventually disappear.

Therefore you should be familiar with the standards on Reliability and Risk written and supported by IEC TC 56. The IEC is the oldest international standardisation organisation. Since 1905 it has produced standards within the electrotechnical area while ISO covers all non-electrical fields.

What are the advantages of using an international standard ? First you can be certain that the method has been checked and approved by many experts from all over the world. Therefore your boss, your customer or your supplier will more readily accept your analysis and results. International standards also make communication easier by using a well defined terminology. The standards are hence well suited to be called out in a contract. The legal implications of each standard have been considered by the legal advisory group (LAG) of TC56.

The standards furthermore make it easier for smaller companies to compete, since they are not restricted to use the methods of each large customer. For a small company to build up an expertise within dependability is normally not possible. International standards will through application guides help the non expert user to find the right method and to use it correctly.

In contrast to this textbooks use different terminologies and notations, and naturally express the point of view of the author. Most textbooks will in addition be more oriented towards how to teach the subject than how to apply the methods in practice.

Papers are usually written mainly for the academic credit. Examples and data are usually selected to illustrate the point of view of the authors, and for this reason most methods described in papers cannot be applied in practice without extensive research and adaptation. It is therefore an advantage to use international standards.

The IEC technical committee TC 56 is responsible for standardisation within the field of Dependability and risk, but does not write standards on safety. However, methods like Fault Tree Analysis (FTA), Failure Mode and Effect Analysis (FMEA), Markov chains, and review technique that are used for safety analysis are TC56 standards.

Vertical and horizontal committees

ISO and IEC both have a number of product specific committees as for example Information technology, Electrotechnique, Gas appliances and Automotive. These committees are called the vertical committees. Committees that write standards for all product areas are called the horizontal committees. Examples of horizontal committees are Quality (ISO SC176 - responsible for the ISO 9000 series), Measurement techniques and calibrations, and IEC TC56 Dependability. TC56 has been given the task to write dependability standards for the whole IEC as well as for the non electrotechnical area, i.e. for ISO. The TC 56 will in the following be described in more detail.

IEC Technical Committee 56

The Chairman of Technical Committee 56 (TC56) is Geoff Alstead (UK), and the secretary is Lindy Ellis (UK).

TC56 was extensively restructured during 1999 and now consists of the following working groups:

WG1 Terminology - Convener: Mr.Desborough (UK), Deputy Convener: John Miller (USA)
WG2 Methods - Convener: Mr.Loll (Denmark), Deputy Convener: Mr.Schwarz (Germany)
WG3 Management - Convener: Mr.Holmberg (Sweden), Deputy Convener: Mr. Müller (Germany)
WG4 Systems (incl.SW) - Convener:Mr.Taillifet (France), Deputy Convener: Mr. Kiang (Canada)
SAG Chairman's Strategic Advisory Group
LAG Legal Advisory Group
PAG Publicity Advisory Group

Working groups and project groups

The working groups are responsible for maintenance of the already published standards and has a number of experts that may join project groups together with external experts to write new standards. New work items (NWI) are proposed by the National Committees of IEC and voted upon by the National Committees of all member countries. If a majority accepts the proposal for the new work item, a project group with the purpose of writing a draft for the standard is formed. It is important that the project group has the technical expertise to write the standard, and at the same time is able to build international consensus for the proposed standard. Furthermore, the project group must contain members with very good language skills in English and French.

The project group then writes a committee draft (CD). This CD will be sent to all the National Committees for comments. Based on the comments, the project group modifies the CD. Depending on the content of the comments the revised document will then be sent out again as a CD, or if the comments were favourable as a CDV. The "V" means that the National Committees can now vote yes or no to the CDV, and at the same time comment on it. The project group will again revise the CDV based on the comments. When there is a majority of positive votes and the technical changes are insignificant the revised document will be sent out as a Final Draft International Standard (FDIS). Now only printing errors can be corrected. The National Committees can at this point only vote yes or no. If there is a majority for the FDIS the standard is approved and will be printed as an International Standard. The project group is thereafter dissolved. The maintenance of the standard will be performed by the relevant working group. Each standard will normally be reviewed every fifth year. At this review it is possible to confirm the standard for a new period, amend it, revise it or withdraw it.

The Toolbox principle

At present TC56 has the responsibility for 45 printed standards, and has 15 active projects. The standards of TC56 is structured according to the so called "toolbox principle". The idea is that a number of tools describing methods or procedures will exist. The experienced user can therefore choose the relevant standard (tool) and need only to buy and read that particular one. The less experienced user can find guidance in a number of Application guides, that will guide the user to the relevant standard (tool). This allows us to make a coherent structure that is logical and easy to use for experts as well as for non-experts.

Structure of TC56 international standards

The structure for the WG2 documents are shown on the figure below. The top level document IEC 60300-1 refers to the ISO 9000 series. Since the ISO9000 is updated, a new top document IEC 60300-1 Dependability Programme and Guidelines for its applications will refer to the Year 2000 edition of ISO 9004.

The TC56 series of International Standards will be continuously updated to ensure a good support for the dependability activities of all kinds of businesses within this century. More information about the IEC standards can be found on www.iec.ch where also the IEC standards can be seen and ordered. You can also order the IEC standards through your National Standardisation body.

Short biography of Valter Loll

Valter Loll is Senior Reliability Specialist at the Nokia Mobile Phones in Copenhagen. He is Convener of IEC TC56 Working Group 2 Dependability Techniques as well as member of the Chairman's Strategic Advisory Group. From 1988 until 1998 he was Product manager for Reliability and Certification at the DELTA Institute in Copenhagen. From 1984 until 1988 he worked as Quality Manager for development of large HW-SW systems for military and aerospace applications at TERMA Electronics. From 1975 until 1984 he worked for Bang & Olufsen with Hi-Fi Consumer electronics. 1973-74 he researched at the Von Karman Institute in Bruxelles. Valter Loll teaches at the University for Political and Economic Science in Herning and holds a M.Sc. degree in Engineering and a B(Com) degree in Business Administration. He is Vice President of Scandinavian Reliability Engineers and editor of the magazine "Quality and Reliability Engineering International".

