# 10 Software Certification

What is software certification? Why should we need it? Who should carry out this activity? When should we do it during SDLC? Where should we do such type of certification? There may be a long list of questions which are questioning the requirements of software certification. There is confusion everywhere. When we wish to go for certification, whom to target? People, process, product or all the three. We have seen many certified developers (like microsoft certified, CISCO certified, JAVA certified etc.), certified processes (like ISO or CMM) and certified products. But there is no clarity about the procedure of software certification. There is also a feeling whether we really require such certifications. Apprehensions are strong that such attempts may create false confidence about the quality of the product.

## 10.1 REQUIREMENT OF CERTIFICATION

Adam Kalawa of Parasoft [ADAM 02] has given his views about certification as : "I strongly oppose certification of software developers. I fear that it will bring more harm than good to the software industry. It may further hurt software quality by shifting the blame for bad software. The campaign for certification assumes that unqualified developers cause software problems and that we can improve software quality by ensuring that all developers have the golden stamp of approval. However, improving quality requires improving the production process and integrating into it practices that reduce the opportunity for introducing defects into the product." The fear is quite reasonable. When we hire certified developers and rely on them without worrying about the project, its processes and resources; the end result may be a less reliable product. Certified developers may also become complacent and this feeling is very dangerous for our live software industry. Some other issues are also relevant for developers. How often will developers require certification to keep pace with new technologies? In this changing scenario we have to run to maintain our place and it is much more significant in software industry where we have to run even faster to maintain place. Complacency cannot be allowed to enter into our fast growing and changing software industry. Certification may also super specialize a developer like in the field of medical science. A microsoft certified developer may be very useful for a particular project but may not be that useful for other projects. Fundamentals of computer science, analytical and logical reasoning, programming aptitude and positive attitude are rather more important for developers. How can any certification address these issues? We do not have such certifications in other science disciplines like physics, mathematics, chemistry, etc. These fields are also advancing continuously by way of inventions and discoveries.





The other popular way to ensure quality is by obtaining process certification [*e.g.* ISO-9000 and SEI-CMM] where we rely on the processes that produce the product. If, processes are of high quality, product should be of high quality and vive versa. However, this alone cannot guarantee a high quality product. As stated by Jeffrey Voas [VOAS 97] very interestingly, "Dirty water can run from clean pipes"; the importance of process certification is in question. Whether we go for certified developers or certified processes; the customer is only interested in the high quality product. Since, customer is the end user of the product, who can trust and rely on a product which may be certified by an independent agency. The independent certification agency may provide a fair playing field for each software industry, assuming that each product under review receives equal treatment. This agency on one side may give confidence to the customer and on the other side may share the liability when certified software product fails in the field.

## 10.2 TYPES OF CERTIFICATION

As discussed earlier, there are three categories of certifications available in the field and are related to persons, processes and products. The first two (*i.e.*, persons and processes) are industry specific and customer may not be directly interested. However, third one (*i.e.*, product) is directly for the customer and helps to select a particular product.

### 10.2.1 Certification of Persons

Certification of persons has become recognized practice worldwide as the standard for software developers. The individual obtaining certification receives the following values :

(*i*) **Recognition by peers:** Peer recognition is a very important reason for such certification. This improves the capabilities in the eyes of peers.

(*ii*) **Increased confidence in personal capabilities:** Many certificants believe that passing the certification examination has increased their confidence to perform their job more effectively. Much of that confidence came from studying for the examination.

(*iii*) **Recognition by software industry for professional achievement:** Software industries are also promoting and relying on certified developers. Sometimes salary increase is offered to certified developers and at least appreciation in all the cases.

(*iv*) **Improvement in processes:** Certified developers may use their knowledge and skills to continuously improve the processes. They know what to measure, how to measure it, and then prepare an analysis as an aid in the decision making process.

(*v*) **Competencies maintained through recertification:** Yesterday's competencies are inadequate for today's challenges. Recertification is a process that helps to assure the certificants skills remain contemporary. The recertification process requires certificants to study hard and undergo training in the topics specified by the certification board.

In general, certification is employees' initiated improvement process which improves competencies in quality assurance methods and techniques. Software industry is becoming more and more competitive day-by-day and forces the management to distinguish professional and skilled individuals in the field. Certification demonstrates a level of understanding in carrying out quality assurance principles and practices. Acquiring the designation of certified

software quality analyst (CSQA), certified software tester (CSTE) or certified software project manager (CSPM) indicates a professional level of competence in the principles and practices of software quality assurance in the software industry. These certifications gain recognition as software quality professional, facilitate more rapid career advancement, and gain greater acceptance in the role as advisor to management.

Some company specific certifications are also very popular like microsoft office specialist (MOS) certifications in word, excel and power point. Many people are doing it to validate that they have a good working knowledge of office software used by approximately 95% of the world's business community. MOS is by far the best known computer skills certification for administration. More than one million people around the world have earned MOS certifications [MART 06]. Many other companies are also offering certifications for their products like CISCO, SUN etc.

### 10.2.2 Certification of Processes

The most popular process certification approaches are ISO-9000 and SEI-CMM. Both the approaches have certified levels and higher levels give high confidence to customer about the software development practices and processes. Whenever, we deal with a CMM level – 5 company unconsciously we are confident about the quality of its product, though this may prove to be an illusion because dirty water can also run from clean pipes. Hence, we should always be suspicious about the quality of end product. However, certification reduces the possibility of poor quality products. We may go for any type of process certification, it helps us to produce good quality and stable software product.

### 10.2.3 Certification of Products

This is what is required for the customer. Although it is also dependent on first two categories of certifications, but this is ultimate indicator of quality and trust for the customer. There is no universally accepted product certification scheme. However, aviation industry has a popular aircraft certification "RTCADO–178B" which has become a defacto standard : This is produced by Radio Technical Commission for aeronautics (RTCA) as the accepted means of certifying all new aviation software. The targeted DO–178 B certification level is either A, B, C, D or E. These levels describe the consequences of a potential failure of the software: catastrophic, hazardous-severe, major, minor or no effect. The following documents and records are required for this certification:

(*a*) **DO–178 B Documents**

(*i*) Software Development Plan

(*ii*) Software Verification Plan

(*iii*) Software Configuration Management Plan

(*iv*) Software Quality Assurance Plan

(*v*) Software Requirements Standards

(*vi*) Software Design Document

(*vii*) Software Verification Test Cases and Procedures



(*b*) **DO–178 B Records**

(*i*) Software Verification Results

(*ii*) Problem Reports

(*iii*) Software Configuration Management Records

(*iv*) Software Quality Assurance Records

The DO–178 B Certification process is most demanding at higher levels. A product certified to DO–178 B level A would have the largest potential market, but it would require thorough labour intensive preparation of most of the items on the DO–178 B support list. Conversely, a product certifying to DO–178 B level E would require fewer support items and be less taxing on company resources. Unfortunately, the product would also have a smaller range of applicability than if certified at a higher level. The certification of Airbus A 380 took five years (2001–2006) which shows the amount of time and effort it takes to take a complex aircraft Airbus A 380 through certification.

We do not have product certification standards in most of the areas. RTOS (Real Time Operating System) is the real time operating system certification and marked as "Lynx OS 178" which is based on open standards. The establishment of independent agencies for product certification may be the viable option. This will only be successful if such agencies are willing to share the responsibility of failures. We can expect good number of such agencies with their certification guidelines and standards in coming years. This will not only help the customer but also the software industries and the atmosphere of mistrust may be reduced if not completely wiped out.

## 10.3 THIRD PARTY CERTIFICATION FOR COMPONENT BASED SOFTWARE ENGINEERING

Weyukar [WEYU 01] has rightly said "For component based software development (CBD) to revolutionize software development, developers must be able to produce software significantly cheaper and faster than they otherwise could, even as the resulting software meets the same sort of high reliability standards while being easy to maintain". Bill council [COUN 01] has also given his views as "currently, there is little evidence that component based software engineering (CBSE) is revolutionizing software development, and lots of reasons are to believe otherwise. I believe the primary reason is that the community is not showing how to develop trusted components".

Component based software engineering may become popular if we develop standards for certification. These standards should be measurable, verifiable and either establish that a product meets the performance specifications or fail in some way to meet the design. Many visible engineering failures result in the call for a third-party certification organization to ensure the welfare of the general public. The software has caused the failures of many businesses, delayed important business plans, and made shareholders and the public lose millions of dollars per year because of poor management techniques.

Some standards are to be adopted by everyone, whether bolt manufacturers or software component producers. Compliance with standards is much easier. Contractor gives the standard,

directs any variations in the specifications, defines patterns and permissible tolerances and also fixes the date of delivery. Contractor may subcontract some of the duties with given standards. However, bolts will have to contend with various forces, such as : high winds, cold weather, warm weather, shifting sand and silt against the truss or stress the girder.

Third party certification is a method to ensure software components conform to well defined standards. Based on this certification, trusted assemblies of components can be constructed. The producer and consumer will require third party certification to establish confidence in the software components. Third party certification for software components is based on UL 1998, 2nd ed., UL standard for safety for software in programmable components [TRAC 01]. UL has also announced that it will expand UL/1998 possibly beyond safety critical components and has formed a new ANSI/UL planning panel for that purpose, as well as to upgrade the existing standard.

## REFERENCES


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## MULTIPLE CHOICE QUESTIONS

**10.1** During software certification, whom to target ?

(*a*) people (*b*) process

(*c*) product (*d*) all of the above.

**10.2** Which one is software process certification ?

(*a*) microsoft certified (*b*) CISCO certified

(*c*) JAVA certified (*d*) ISO-9000.

**10.3** Which one is a standard of aviation industry for aircraft certification ?

(*a*) RTCADO–178B (*b*) RTCADO–160B

(*c*) CTCADO–178B (*d*) KTCADO–160B.

**10.4** Third party certification for software components is pased on :

(*a*) TL 1998, 2nd ed. (*b*) UL 1998, 2nd ed.

(*c*) TL 2007, 2nd ed. (*d*) TL 1996, 2nd ed.



**10.5** RTOS stands for :

(*a*) rational time operating system (*b*) real time operational system.

(*c*) real time operating system (*d*) none of the above.

## EXERCISE

**10.1** What is software certification? Discuss its importance in the changing scenario of software industry.

**10.2** What are different types of certifications? Explain the significance of each type and which one is most important for the end user.

**10.3** What is the role of third party certification in component based software engineering? Why are we not able to stabilize the component based software engineering practices?

**10.4** Name few person specific certification schemes. Which one is most popular and why?

**10.5** Why customer is only interested in product certification? Discuss any product certification techniques with their generic applicability.