The Emerging ISO International Standard for Certification of Software Engineering Professionals

Juan Garbajosa

Universidad Politécnica de Madrid - Technical University of Madrid (UPM).
E.U. Informática. Cra. Valencia Km. 7 E-28031 Madrid. Spain.
E-mail: juan.garbajosa --at-- upm.es

Abstract: The emerging standard ISO/IEC 24773, Software Engineering – Certification of Software Engineering Professionals – Comparison Framework, is at its final stage of development. The coming International Standard will establish a framework for comparison of schemes for certifying software engineering professionals. It is expected that ISO/IEC 24773 will facilitate the portability of software engineering professional certifications between different countries or organizations. At present, different countries and organizations have adopted different approaches that are implemented by means of regulations and bylaws. The intention of this International Standard is to be open to these individual approaches by providing a framework for expressing them in a common scheme that can lead to understanding.

1. Introduction

Software intensive systems are becoming, more and more, critical components of most aspects of our life. This phenomenon started a few decades ago but it is unmistakably clear at present. Cell phones, automotive industry or medical systems are everyday examples of the ever increasing role of software. At the same time, these systems have become increasingly complex. Similarly to other engineering disciplines, and partly as a reaction of the relevance of software in everyday life, the recognition and codification of effective practices software development processes and products started a few years ago in the field of software engineering. This effort has led to the development of systems and software engineering standards by ISO and IEC [1], by professional societies [2],

and by national standards bodies. It has also led to the definition of an internationally recognized body of knowledge for software engineering [3].

A concern that has been coming up for years is related to the identification of the required competences and qualifications of the professionals who develop software intensive systems. This has included the establishment of software engineering degrees at Universities, extension of professional engineering qualifications, e.g. licensed or chartered status, to software engineers and the creation of qualification and certification schemes for software engineering professionals. Certifications schemes have different mechanisms to assess candidates' competences. Most usually it is either by examination, or review of a candidate's competences, including education, experience, and mastery of specific skills.

The increasing globalization of the software industry implies that a software engineering professional is likely to work in different countries over the course of a career. It is therefore important to develop ways to increase the portability of professional certifications in this domain.

ISO/IEC JTC1 SC7 subcommittee agreed to establish a Study Group to consider the subject of standards and/or technical reports for certifications of software engineers. As a result of the study group job, a report was produced [4].

This report analyzed the fundamental principles of certification, described in ISO/IEC 17024 [5], went into studying, available at the time, approaches to certification of software engineers. One of the conclusions was that an international standard for the professional software engineering certification process would make mutual recognition of professional credentials much easier, enabling professionals to move easily within an increasingly global software industry. At the time the report was produced recognition could only be achieved by bilateral negotiations. Despite some regional successes, such as in the case of Japan, bilateral approaches would not be able to scale to the entire world. It was also concluded that it would be the easiest to begin by developing a standard that would provide a reference model for the technical bases. That is the standard would not describe an exam or the technical issues themselves but would provide a framework for mutual comparison of schemes. SC7 submitted a new work item project for ballot. The project started by the end of 2005. It received project number 24773. At the time of producing this paper the project is under Final Draft International Standard Ballot (FDIS ballot).

The rest of the paper presents the structure of the future standard, and the design guidelines. At the end of the paper a number of conclusions are included and some ideas for future work are provided.

2. Overview of *Software Engineering — Certification of Software Engineering Professionals — Comparison Framework*

ISO/IEC FDIS 24773:2007 (in short FDIS 24773) refines and supplements the processes for certification of individuals included in ISO/IEC 17024 [5], *Conformity Assessment – General requirements for bodies operating certification of persons*. The management and implementation of the Scheme developed under this International Standard can also take into account the processes and definitions of ISO/IEC 17024.

In some countries, governments and other bodies assess the qualifications of software engineering professionals by evaluating candidates' knowledge, skills and job experience and issuing certificates of qualification to those demonstrating competence as defined by an assessing organization. Such an organization is defined as qualification body in FDIS 24773. A qualification body will be able to use appropriate components of the future standard document for comparison with other such schemes or as a delegated qualification body. Educational organisations will be also able to use a Scheme developed under FDIS 24773 for comparison purposes.

The Guide to the body of knowledge ISO/IEC TR 19759:2005, Software Engineering – Guide to the Software Engineering Body of Knowledge [3] is utilized in FDIS 24773 for comparison of software engineering bodies of knowledge. Education bodies, qualification or examination bodies and certification bodies are not required to use, or comply with, SWEBOK, but are required to map a software engineering body of knowledge to SWEBOK.

FDIS 24773 This International Standard is not intended to discourage or diminish the role of universities in developing and offering diverse and innovative software engineering programs. Rather, it encourages universities to participate in the initial and continuing development of software engineering professionals. At the same time, certification bodies are encouraged to consult with and work with universities in establishing schemes under this standard.

FDIS 24773 contents basically include, as well as introductory stuff, the following sections:
a.   Requirements for a Certification Scheme
b.   Knowledge and skills
c.   Evaluation of competence
d.   Codes of ethics and professional practice
e.   Maintenance of certification

2.1 Requirements for a Certification Scheme

The certification body shall produce a certification scheme that contains a description of the software engineering professionals to be certified. The Scheme

shall include a title, a list of the tasks that the software engineering professional described in the title would be expected to undertake; a description of characteristics of the work associated with the title, a description of the competences, and how these competences will be evaluated.

An important issue is that any minimum educational qualification or experience should be also explicitly stated. That is, a university degree could be either required or not. Additionally, details of any delegations to a qualification body, codes of ethics and professional practices required, and how the certification is maintained should be described.

2.2 Knowledge and skills

The evaluation component of the scheme shall be based on a body of knowledge. At this stage FDIS 24773 does not enforce or preclude the use of any specific body of knowledge. ISO/IEC TR 19759 [3] is only used as a reference. That is, the only condition requested is that the body of knowledge used is to be mapped onto [3]. The use of [3] is included only to provide a common reference point for comparison.

For each component of this body of knowledge, the scheme shall state the cognitive level expected of a successful candidate for certification. This is an important issue. The objective is that the required knowledge is associated to a cognitive level, e.g. description or evaluation. Actually the expected professional performance will be determined by this cognitive level. Additionally, other technical knowledge requirements, e.g. information systems, could be considered. Knowledge of appropriate standards should be included. Finally it is possible to include knowledge on a specific domain.

Concerning skills both software engineering and generic skills, such as the ability to apply knowledge or the ability to communicate should be included.

2.3 Evaluation of competence

The certification body shall consolidate the information described in section 2.2 into a set of competences. It is required to explain how each competence can be attained or mastered, i.e. training, education and/or experience. It is also necessary to describe how competences will be evaluated.

2.4 Code of Ethics

Code of ethics is always potentially subject to dispute, and varies between cultures. FDIS 24773 provides a specific set of matters that should be included in

any code of ethics for software engineering professionals. These include descriptions of the minimum standards of conduct and occupational ideals that guide the actions of software engineering professionals, the goals of the software engineering profession, and the rights and duties of software engineering professionals with respect to the public, employers, peers, and clients. However, no specific item is specifically enforced.

2.3 Maintenance of certification

Requirements for maintaining and renewing certification should be considered. This includes clauses for renewal of certification, and continuing professional development.

3. Conclusions

This paper has highlighted the main guidelines for FDIS 24773; hopefully the current draft will become International Standard ISO/IEC 24773 in a short future. FDIS 24773 has been depicted to respond to the needs of national and multi-national organizations or suppliers for developing software in an ever growing global market.

The coming International Standard 24773 will facilitate the portability of software engineering professional certifications between different countries. At present, different countries have adopted different approaches on the topic that are implemented by means of regulations and bylaws. The intention of the future International Standard 24773 is to be open to these national approaches by providing a framework for expressing them in a common scheme that can lead to understanding between different countries.

Important to underscore, the editorial team has always intended to reach the highest level of consensus. This has always been considered essential for the success of the coming standard.

It is expected that, as soon as the development of the standard is finalised, its deployment will start. As most of the standards, the International Standard 24773 will not contain details on usage or application. However, a document intended as a guide for usage, containing examples, will be started, hopefully very soon.

References

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Acknowledgements