

Applying software engineering standards in very small enterprises

At a time when software quality is increasingly becoming a subject of concern, and process approaches are maturing and gaining acceptance in companies, the use of ISO systems and software engineering standards remains limited to a few of the most popular ones. However, these standards were not written for enterprises with fewer than 25 employees in mind. As they are difficult to apply in such settings, a new international standardization project has been mandated to address some of those difficulties by developing profiles and by providing guidance for compliance with ISO software engineering standards in very small enterprises.

A survey was conducted to ask very small enterprises about their utilization of ISO and the International Electrotechnical Commission (IEC) Joint Technical Committee JTC 1, *Information technology*, subcommittee SC 7, *Software and system engineering*, standards and to collect data to identify problems and potential solutions to help them apply standards.

In Europe, 85 % of IT sector companies have between 1 and 10 employees. A survey of the Montréal area in



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Canada has revealed that close to 80 % of companies that develop software have fewer than 25 employees. Over 50 % have fewer than 10 employees. There is a need to help these organizations, which are defined as very small enterprises (VSEs), to understand and use the concepts, processes and practices proposed by international software engineering standards.

Historical Perspectives

At the meeting in Brisbane, Australia, of ISO/IEC JTC 1/SC 7 in 2004, Canada raised the issue of small enterprises requiring standards adapted to their size and maturity level. A meeting of interested parties was held with delegates from five national standards bodies, at which a consensus was reached on the general objectives:

- Make the current software engineering standards more accessible to very small enterprises.
- Provide documentation requiring minimal tailoring and adaptation effort.
- Provide harmonized documentation integrating available standards.
- Align profiles with the notions of maturity levels presented in ISO/IEC 15504, *Information technology – Process assessment*.

It was also decided that a special interest group be created to validate these objectives, as well as to assign priorities and develop a project plan.

In March 2005, the Thailand Industrial Standards Institute (TISI) invited a number of software experts to advance the work items defined at the Brisbane meeting. A key topic of discussion was to clearly define the size

of a very small enterprise that would be targeted by a future ISO/IEC JTC 1/SC 7 working group. A consensus was reached on the definition as being IT services, organizations and projects with between 1 and 25 employees. The major output of this meeting was a draft of a new work item (NWI) that would be discussed at the next subcommittee plenary meeting. A list of actions that could be undertaken by a future ISO/IEC JTC 1/SC 7 working group was also developed.

“Managing resources is vital for very small enterprises.”

In May 2005, at the ISO/IEC JTC 1/SC 7 Plenary meeting in Finland, a resolution was approved to ballot a proposal for the development of software life cycle profiles and guidelines for use in very small enterprises. The text below describes the mandate.

- Provide VSEs with a way to be recognized as producing quality software systems, which would lessen the effort required to implement and maintain the entire suite of software engineering standards.
- Produce guides that are easy to understand, short, simple and readily usable by VSEs.
- Produce a set of profiles and provide guidance to VSEs in establishing selected processes.
- Address the market needs of VSEs by allowing for domain-specific profiles and levels.
- Provide examples of use.
- Provide a baseline for how multiple VSEs can work together or



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be assessed as a project team on projects that may be more complex than can be performed by any one VSE.

- Develop scalable profiles and guides so that compliance with ISO/IEC 12207 for software life cycle processes and/or ISO 9001:2000 and ISO/IEC 15504 for process assessment becomes possible with a minimum impact on VSE processes.

Software engineering require tailoring to fit very small enterprises

Applying software engineering standards to an information technology (IT) VSE is like asking a two-year-old child to stop playing and come into the house to eat vegetables with dinner; we know it is good for them, but getting them eat those vegetables requires a different approach than convincing an adult to do so. For most VSEs, it is presumed that many individuals will be responsible for multiple roles (e.g. marketing and sales, finance and accounting, architect and team leader), so that adding to this the responsibility of ensuring compliance with a standard makes it harder for VSEs to cope with day-to-day operations. Quality advocates may argue that quality cannot be sacrificed if VSEs are to survive. Most VSE owners will say that complying with existing standards requires too

much effort in terms of time, human resources and cost (e.g. purchasing of existing standards, consultants, etc.). Successful human resources management is one of the most critical requirements for VSEs to meet if they are to stay in business. This is especially true in the IT sector, where highly skilled software developers are hard to find and retain. The fact that most software developers do not like to create documentation further decreases the likelihood that VSEs will comply with a software engineering standard.

Convincing young children to stop playing outside and come in and eat healthy foods requires compassion and understanding. Likewise, it requires compassion and understanding to ask VSEs currently developing software in their comfortable environment of coding with minimal documentation to comply with an engineering standard that includes adherence to policies and guidelines. Software engineering standards not written specifically for VSEs require tailoring to fit VSE needs. Thus, the task of achieving full compliance with existing software engineering standards may have to be broken down into phases, with each phase being allotted a maximum of six months of concerted effort, in order to avoid the slow dissipation of enthusiasm and momentum. Also, since most VSE staff are presumed to be responsible for multiple roles, it is wise to rotate the accountability of each compliance phase among different individuals or groups of individuals. This will mitigate the risk of reliance on specific individuals or groups of individuals who understand how to comply with an engineering standard.

Since managing resources is vital for VSEs, doing so to ensure quality and maintain objectivity according to an engineering standard is a daunting task. In a team of fewer than 10 people, it is possible to imagine that some members are software developers, some are designers and some are team leaders/project managers, with the remaining members being configuration

Survey responses

The survey questionnaire was translated into nine languages. In addition, a Web site was developed to maximize the number of responses, which were collected between 20 February and 12 May, 2006.

In May 2006, WG 24 members met at the ISO/IEC JTC 1/SC 7 plenary meeting in Thailand. Two new countries, India and Mexico, sent delegates to WG 24. The main results of the meeting were:

Analysis of the survey responses:

- Over 400 responses were collected, in nine languages (English, French, German, Korean, Portuguese, Thai, Turkish, Russian and Spanish), from 30 countries;
 - 219 responses were received from enterprises with 25 employees or less;
 - Over 67 % indicated that it was important to be either recognized or certified (e.g. ISO, market);
- WG 24 decided to prioritize the development of profiles and guides for organizations with 25 employees or fewer (total staff). These profiles and guides should also be usable for projects and departments of fewer than 25 employees;
- WG 24 decided to propose separate profiles for:
 - Enterprises with fewer than 10 employees;
 - Enterprises with 10 to 25 employees;
- WG 24 decided to focus first on enterprises with fewer than 10 employees;
- Evaluation of documents tabled by national delegations;
- Selection of the Mexican standard as an input document for the development of profiles and guides.



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specialists, testers and quality assurance specialists.

Moreover, the team may be running a couple of projects simultaneously and possibly some back-to-back projects as well. In such conditions, the difficulty in complying with an engineering standard is for the individual playing a particular role to maintain his objectivity; however, the degree of difficulty depends on the roles involved. For instance, if that individual is playing the role of project manager and configuration specialist, then, assuming that he is qualified, his objectiv-

ity vis-à-vis each of the roles may be acceptable. By contrast, if the roles are those of project manager and quality assurance specialist, then that objectivity may be compromised.

There are a few schools of thought regarding quality, such as:

- quality is a never-ending cycle of process improvement,
- quality is more than product realization; it is good governance,
- quality is not only important within the organization, but outside the organization as well (e.g. supplier).

For most VSEs developing software, software engineering standards should be applied in moderation, in order to lessen an already confusing array of roles played by any one individual. With existing software engineering standards, the maxim regarding quality for a VSE should be: "Quality can be achieved, one step at a time." Motivation is the most important factor in achieving quality and should be used as a tool to entice staff to be accountable for additional responsibilities. Until a software engineering standard is available to VSEs, their target should be to master one process at a time, starting with engineering processes related to software, continuing with management processes related to delivering the project and concluding with organizational processes relevant to the organization.

In conclusion, applying existing software engineering standards to VSEs is possible with a sound motivational programme for staff to accept additional responsibilities. VSEs must set an achievable target of process improvement involving no more than six months of human resources effort. Once this target has been achieved, staff responsible for the next target of process improvement should be rotated. That two-year-old child will stop playing outside if he knows that eating vegetables with dinner will be rewarded with a chocolate sundae for dessert.

The next WG 24 meeting will be held in Luxemburg in October 2006. Other countries, such as Colombia, have manifested their interest to join WG 24.

Additional information about ISO/IEC JTC 1/SC7 can be found at: www.jtc1-sc7.org.

An English public site of WG 24 can be found at: <http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html> and a French site at: <http://profs.logti.etsmtl.ca/claporte/> ■

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