# Software lifecycle standards for very small enterprises

by Marty Sanders and Rory O'Connor

## The extent of small companies

It is widely recognised that Very Small Enterprises (VSEs) - those with 25 or fewer employees - contribute valuable products and services. If your organisation is a VSE, you are not alone. In Europe, for example, 85% of the IT sector's companies have only one to 10 employees. According to a recent survey, 78% of software development enterprises in the Montreal area have fewer than 25 employees, while 50% have fewer than 10. According to the Organisation for Economic Co-operation and Development (OECD) Small and Medium Enterprise (SME) Outlook report [1], enterprises with fewer than 10 employees represent 93% of all companies in Europe and 56% in the US, 66% of total employment.

## Needs of software companies, small and large

In the current economic environment software quality is increasingly being seen as a subject of concern for growth and evolution of software companies in general, no matter what the size or type of products and services. Especially, VSEs have a pressing need to develop their products efficiently, effectively, and with high quality. With the current trend of outsourcing, it is critical for customers to be able to depend on these enterprises to deliver their expected products on time or the business will go elsewhere. It is equally important that the businesses perform well while making a profit. Of course, all companies have these needs but the limited resources of the VSE means even a small problem can have huge repercussions. Thus it is particularly important that management identifies resource issues before they turn into major difficulties and most software development and maintenance time is spent on new product and feature development, not fixing old bugs that were never noticed until they became big problems.

## Contributions of standards

Quality orientated process approaches and standards are maturing and gaining acceptance in many companies. Standards emphasise communication and shared understanding more than anything. Examples are: any documentation is consistent and what is needed to meet the needs of the organisation; all users understand the same meaning of words used—if one person says, 'Testing is completed!', all affected bodies understand what those words mean. This kind of understanding is not only important in a global development environment; even a small group working in the same office might have difficulties in communication and understanding of issues shared by all. Standards can help in these and other areas to make the business more profitable because less time is spent on non-productive work.

However, at a time when software quality is becoming key to competitive advantage, the use of ISO/IEC[1] systems and software engineering standards remains limited to a few of the most popular ones. Studies and surveys confirm that current software engineering standards may not address the needs of these organisations, especially those with a low capability level. Compliance with standards such as those from ISO/IEC and the IEEE[2] can be difficult, if not impossible, for them to achieve. Subsequently, VSEs have no or very limited ways to be recognised as enterprises that produce quality software systems in their domain. Therefore, they are often cut off from some economic activities such as the following situations. Some European countries require certification to a national or international standard for awarding of government work. Some contracts in the United States (and with global businesses based in the United States) require compliance with the Capability Maturity Model Integrated (CMMI) [2] from any bidders.

## Difficulties in use of standards

Research shows that VSEs can find it difficult to relate ISO/IEC standards to their business needs and to justify the application of the standards to their business practices. Most of these VSEs can't afford the resources—in number of employees, cost, and time—or see a net benefit in establishing software life-cycle processes. There is sometimes a disconnect between

[1]ISO/IEC is International Organization for Standardization / International Electrotechnical Commission, located in Geneva Switzerland
[2]Institute of Electrical and Electronics Engineers

the short-term vision of the company, looking at what will keep it in business for another six months or so, and the long-term benefits of gradually improving the ways the company can manage its software development and maintenance. In an Irish context a primary reason cited by many small software companies for this lack of adoption of such ISO standards is the perception that they have been developed for large multi-national software companies and not with the small organisation in mind.

## Help with standards for VSEs

To rectify some of these difficulties, delegates from the 2004 plenary meeting of ISO/IEC JTC1/SC7[3] in Australia reached a consensus regarding the necessity of providing VSEs with standards adapted to their size and particular context, including a set of profiles and guides. They agreed on the following general objectives:

- make the current software engineering standards more accessible to VSEs;
- provide documentation requiring minimal tailoring and adaptation effort;
- provide harmonised documentation integrating available standards such as process standards, work products and deliverables, assessment and quality, and modelling and tools;
- and take into account, if desirable, the notions of capability and maturity levels presented in ISO/IEC 15504 [3] and CMMI.

In 2005 ISO/IEC proposed the creation of a new Working Group (WG24) to meet these objectives. The working group on Software Engineering Lifecycle Profiles for Very Small Enterprises includes representatives from many countries including: Belgium, Canada, Ireland, Italy, Japan, Luxembourg, South Africa, Thailand, the UK and the USA.

A survey was developed by WG24 to sample global industry-wide views on standards related to VSEs. From the 392 respondents, including 228 VSEs, the survey found a marked difference in the percentage of certification to international standards for companies of differing company size: Less than 18% of VSEs are certified[4], while 53% of larger companies (those with more than 25 employees) claim to be certified. Further, among the 82% of VSEs not certified only 25% claim to use standards.

Three primary reasons for the weak use of standards by VSEs were: a lack of resources (28%); standards are not required (2%); and the nature of standards themselves – 15% of the respondents consider that the standards are difficult and bureaucratic and do not provide adequate guidance for use in a small business environment. More than 62% of VSEs stated they would like more guidance with examples, and 55% asked for lightweight and easy-to-understand standards, complete with templates [4]. But one might ask, 'Why bother?'.

## Benefits of using standards

From the VSE perspective, the benefits that certification can provide include: increased competitiveness, greater customer confidence and satisfaction, greater software product quality, increased sponsorship for process improvement, decreased development risk, facilitation of marketing, and higher potential to export. Let's look at each of these claims and see how use of standards can help address them. Good internal software management might help meet the first five claims; the last two can only be the benefits of using formal, wide-recognised standards.

**Increased competitiveness**, known elsewhere as 'more bang for the buck', can only be a result of making sure that time and resources are being spent effectively. What isn't effective is rework over bugs that weren't caught earlier, poor planning so you are constantly apologising for late deliveries and cost overruns and poor customer relations which lead to misunderstandings about what is needed and what is being delivered. All major standards include requirements which should lead to improved product quality, better planning and more effective customer relations.

**Customer confidence and satisfaction** improve when products and services provide what the customer has asked for on time and within budget. One key component of all major standards used in software is better requirements gathering and management. Key practices and milestones are put in place to provide the customer with assurance that the requirements being used are the ones defined by the customer. Another key component is improved project management, again with practices and milestones put in place for reviews between technical, management and customer representatives to ensure problems are minimised and where they exist, they are highlighted early and dealt with so that schedule and cost overruns are no longer the way of doing business.

**Greater software product quality** can be achieved by regular reviews of the software being developed and solving problems at the earliest possible level. Common requirements of standards are for independent reviews to bring the 'eye of the customer' into the organisation. Much better that an internal, independent quality assurance group find the problems before the product reaches the customer. This is a common process in all standards used in software, but one which you may not have implemented or which could be improved using some of the documented processes in the standards.

**Increased sponsorship for process improvement** comes about when success feeds success. Once the individual developer, manager and customer can see improvements from better communication and widely adopted processes, the support for further improvements is likely to follow, making the whole environment more efficient and productive.

**Development risk** has several sources, including: requirements aren't well

[3]ISO/IEC Joint Technical committee 1/Software Committee 7

[4]Certification to a standard for software means that an independent auditor has verified that the company is following the requirements of the standard in developing and maintaining software.

understood, leading at best to extended projects and poorly conceived products and at worst cancellation of the project or product development; resources are underestimated or poorly assigned, leading to overrun of costs and schedules, or again, cancellation of the project; work practices are inefficient, leading to lost time and effort. These are but a few of the risk factors in software. All major standards include processes and practices to help manage and reduce these risks, including the requirement for risk mitigation strategies themselves.

**Facilitation of marketing** leads us into the world of international, and sometimes national, standards. Global economies recognise that certification or compliance to a standard for software means something. In Ireland, we have easily recognisable standards in our hospitality sector from food standards to bed and breakfast certification. If you stay at a *** hotel, you know pretty much what to expect. Software standards are no different. A company which is certified to ISO 9001 [5] or other standard gives potential customers a level of confidence in the quality of products and services to expect. This can be used as part of an improved marketing programme whether you are selling goods and services directly on the market or offering your company for global outsourcing.

**Higher potential to export** derives from this potential customer assurance. The more widely known the standard you are compliant with, the more likely global customers will get on the first rung, getting in touch to talk business. Your web site and advertising will travel further, the more you are seen to speak the same language, have the same interest in high quality and can show you are taking the right steps to meet all customer needs, no matter where that customer is located. Globalisation and standards are advancing together through software and other business economies. According to Altman [6], 'International standards have become, at the same time, the price of admission to the global economy and the glue holding it together. Adherence to standards is a condition of entry to the World Trade Organisation. And as the global economy grows, so do they.' The usage of standards around the world has to contribute to and be at least partly due to the need for subcontractors and partners to 'follow the sun' and take advantage of lower cost in developing countries. In Ireland, we can't ignore this and simply assume it applies to 'them', whoever that is. We also must review our options and look to whatever makes us more competitive and better export/outsourcing material for our potential global customers.

To help VSEs meet their needs in the global economy, ISO/IEC 29110 Software Engineering Lifecycle Profiles for Very Small Enterprises [7], will emerge soon onto the software engineering standards landscape to help these very small organisations to understand and use an appropriate set of the concepts, processes and practices proposed in the international software engineering standards. This new standard is being developed directly for use by VSEs and has the potential to significantly impact on Irish software organisations, which are often small and dedicated to one major product or customer. The National Standards Authority of Ireland (www.nsai.ie) is an active player in the development of this standard, as are Enterprise Ireland, which funds our participation (www.enterprise-ireland.com) and Lero, the Irish Software Engineering Research Centre, which provides expertise (www.lero.ie). All of us recognise the importance of evaluating how international standards can assist Ireland and her businesses. Do you?

## References

[1] Organisation for Economic Co-operation and Development (OECD) Small and Medium Enterprise (SME) Outlook report, 28 June 2000.

[2] Capability Maturity Model Integration (CMMI), Version 1.1, CMMI/SM for Software Engineering. (CMMI-SE, V1.1), Staged Representation (2002) CMU/SEI-2002-TR-029, ESC-TR-2002-029 [online], available at: http://www.sei.cum.edu/cmmi/models/sw-staged.doc.

[3] ISO/IEC 15504 Software Process Assessment (2006) JTC1/SC7/WG10 International Organisation for Standardization, Geneva Switzerland.

[4] Software Life Cycles for Very Small Enterprises, ISO/SC7 Working Group 24, Results of survey, Université du Quebéc, Department of Software and IT Engineering, 28 April 2006.

[5] ISO 9001 : 2000 Quality Management Systems – Requirements (2000) ISO/TC 176/SC 2/N 434 International Organisation for Standardization, Geneva Switzerland.

[6] Altman D (2006) 'You like tomato and I like tomahto', International Herald Tribune, 4 October, p. 14.

[7] ISO/IEC PDTR 29110, WD2 Software Engineering – Lifecycle Profiles for Very Small Enterprises (VSE) (2008) JTC1/SC7/WG10 International Organisation for Standardization, Geneva Switzerland.

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