# Quality Assurance Practices in Ireland
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## 1 Introduction

This report presents the results a survey conducted in Ireland on behalf of Enterprise Ireland in early-2006. This was carried out to gain an understanding of the Quality Assurance (QA) practices within small to medium sized enterprises (SMEs) in the software industry in Ireland.

While the authors recognise that this survey cannot claim to be representative of the views on Quality Assurance within the SME software sector in Ireland, they provide an interesting overview of attitudes towards this topic. The data is sometimes contradictory and unclear but we use it to explore the issues concerning QA practices in which we and others, including Enterprise Ireland, have an interest. Initially, we examine the data concerning the attitudes towards and perceptions of Quality Assurance by the SMEs surveyed. We then discuss the use of specific QA techniques including testing, reviews and implementation of coding standards.

Keane and Richardson (2005) previously published an analysis concerning attitudes in the Irish Software industry towards Quality. The data discussed in this technical report sheds some new light on this topic.

## 2 Quality Assurance

Software Quality Assurance is an important area of the Software development process. It is defined by IEEE Standard 12207 as:

> "The quality assurance process is a process for providing adequate assurance that the software products and processes in the product lifecycle conform to their specific requirements and adhere to their established plans." (Fledman, 2005)

It is an area of established importance in the software industry and is part of both the Capability Maturity Model (CMM) and Software Process Improvement and Capability dEtermination Model (SPICE/ ISO 15504).

The purpose of Software QA is to deliver improved product quality. In software development this is important for economic, business and, depending on the product, safety reasons. Problems arise in software development which can have enormous costs in terms of time and money and sometimes human life. The purpose of QA is to prevent this by monitoring our code and our process thus preventing problems from

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arising and identifying and dealing with those that do. If problems are found at later stages in the development lifecycle, the more difficult and expensive it is to deal with them. Consequently, effective QA processes are vital for successful software development. A wide range of QA techniques have been developed including software testing, metrics, standards and code reviews and inspections (Galin, 2004).

## 3 Survey design

The results presented in this report summarise the data collected in a survey conducted on behalf of Enterprise Ireland. This survey questioned company representatives about topics relating to software process improvement and quality practices in their companies. Twenty-nine companies participated, ranging in size from 4 to 170 employees.

## 4 Attitudes and Perceptions

The survey asked respondents to identify "key issues for developed software products in your company", selecting five options from a list of ten and numbering then 1 to 5 in order of importance. Eighteen of the 29 respondents picked quality as a key area, 9 of them as the most important. This is by far the most popular choice as the number 1 issue. Some respondents added notes such as "quality by far most important". However, this demonstrates that eleven of the respondents did not think quality was a key issue for them at all. This is a polarised sample given the size of the set involved. It might be expected that the sector in which the companies worked would influence this but there is no evidence of correlation between sectors and selecting quality as a key issue. The only possible exception to this is that the three companies who listed 'consultancy' as the sector that they worked in all gave quality as their number 1 key issue.

Respondents were also asked: "Do you have a quality system in place?" Seventeen of the respondents answered 'Yes', twelve of them 'No'. Curiously only 10 of the 'Yes' answers belong to the eighteen companies that listed quality as a key issue. Seven companies that don't regard quality as a key issue have quality systems in place and eight companies who do regard it as a key issue, including four who gave it as the number 1 key issue, do not have a quality system in place. When asked what type of system many of the respondents who answered 'Yes' described their system as either in-house or ad hoc. Only four of the 'Yes' respondents describe their quality system as being related to a Software Process Improvement (SPI) system such as CMMI or ISO, which are the internationally recognised certification standards associated with software.

As a follow up to asking whether there is a quality system in place, respondents were asked "To what extent does your quality system address the needs of your software development activities?" Of the 29 respondents, five left the answer blank or gave it as 'Not Applicable', seven gave positive responses about their systems, six gave negative responses about their system and eight gave ambiguous responses. The negative answers tended to mention specific difficulties that they had with the quality system and improvements that they would like to make such as "still have bottle neck with testing", "would like more formal process" or "would like to see more unit testing and automation. But tools expensive."

There is a certain amount of contradiction and confusion in these answers. To further understand what respondents are saying, examining the answers given to the question "Do you think the processes in your business have an impact on your business potential?" was useful. Twenty-four of the respondents answered 'Yes', the remainder leaving the question blank. There were no 'No' answers to this question. Six of the respondents mention quality specifically when expanding on their answers to this question. This suggests that no respondent does not believe in the value, or in the impact, of their processes. However a large part of the respondent group appears to be completely unconcerned with quality – while they believe in the value of having the right processes in general, their disregard of quality appears to be a choice rather than an oversight. We have not studied why this should happen, but discussions suggest that it may be due to the market forces within which the SME sector operate i.e. that they need to produce and sell product, and therefore do not have time to implement improvement. It should be noted that this apparent lack of concern is contradicted to some extent by respondents indicating awareness and concern with their quality processes, although this could be taken to simply mean that their processes are sufficient for their purposes rather than that they are effective and efficient.

Respondents were asked about the size of the QA team at each of the companies. This information is more difficult to interpret as the size of the QA team is inevitably relative to the size of the company. However, six of the respondents list the size of the QA team as zero, with four of them saying that 100% of people are in the QA team. The most common answer was 1 which was given by 7 of the respondents, the companies in question varying in size between 10 and 75 employees. Again this data would indicate highly differentiated set of attitudes towards QA.

The combination of all of these points would appear to paint a picture of an industry with a heavily polarised viewpoint on software quality and software quality assurance. Many of the respondents feel it to be a vital area, e.g. "The people are very aware of the QA processes. They consider them to be of vital importance.", and many appear to ignore it completely. Given the growing importance of quality as a marketing tool in an increasingly competitive market this situation should be of concern, particularly when we consider the growth and competitiveness of the global software development market.

## 5 Testing

The area of quality assurance on which companies appear to be most focused is testing. When asked about testing under the heading of "principal techniques" the vast majority of the respondents gave details of exact testing processes used - most often unit tests, regression tests and acceptance tests. Only two respondents answered 'No' about using testing. The most detailed responses were given to questions on testing. Respondents felt that testing was the most effective process and gives "probably the best ROI [Return On Investment] amongst QA processes". The degree of formality with which the testing is carried out varies greatly between companies, some describe themselves as using an ad hoc method as part of an agile method development approach and others specify a formal process as part of a lifecycle model. Answers in the survey also mention defect and bug tracking when discussing testing.

When asked “What tools or processes does your company use to support Software Quality Assurance?” more than a third of the respondents just talked about their testing process. This is in fact more than half of those who actually gave detailed answers to the question as opposed to just answering ‘Yes’, ‘No’ or leaving it blank. From those surveyed, the implication is that for a majority of them, QA means testing. Testing is either the only QA activity that many companies do or the only activity that they consider to be a QA activity.

Again there would appear to be a certain amount of confusion here between the answers to different questions. The data would appear to indicate that many of those who answered ‘Yes’ to having a quality system in place were simply referring to their testing procedure although this cannot be borne out definitively.

**6 Code Reviews**

Another area which respondents to the surveys mention, although much less regularly than testing, is that of code reviews. There are several references to reviews of various types in the answers to the questions concerning processes supporting QA. Various approaches are mentioned including peer reviews and that more senior engineering staff review the work junior staff. The degree of formality with which the reviews are carried out varies from company to company, some are structured but several respondents characterise their processes as informal or ad hoc. Others mention the reviews in context of mentoring new recruits within the company.

Code reviews are an important quality assurance technique so the level of use which is indicated by the data is disappointing. Although some respondents used code reviews extensively many did not use them at all. This again shows the polarised nature of practices in this area.

**7 Coding Standards**

Coding standards were explicitly asked about in the survey: “Do you use coding standards?” Sixteen of the 29 respondents said that they do, five said that they do not and eight did not answer the question. While they were asked what standard they used if answered ‘Yes’, few respondents provided this information. Several of those that did described their standards as informal or in house.

Although the majority of the responding companies used coding standards, none of them chose to list them when asked about the techniques they used for QA. This indicates that coding standards are not regarded as a QA technique by the respondents and that there is ambiguity in many people’s views as to what constitutes QA.

**8 Metrics**

Little useful data was gathered about metrics. They are mentioned by three of the respondents as a process used to support estimation. It is possible that a similar phenomenon as observed with coding standards exists, and that metrics are in use but are simply not considered to be a QA tool or process and as such are not mentioned as a specific question was not asked.

**9 Conclusion**

The emergence of developing economies such as India and China as major players on the world’s technological stage has given the Irish software community cause for

concern. These nations and others like them can provide an abundant, well-educated workforce for their ICT sectors. Estimates predict a workforce of almost 17 million available to the ICT sector in India by 2008 (Accenture, 2005). This workforce can be delivered at a much lower cost. There also appears to be a higher focus on quality and quality processes within Indian organizations as they seek to surpass their own domestic, continental and western competitors in their bid to secure foreign investment deals.

The survey analysed in this report indicates that the Irish Software community has not embraced Quality Assurance in the way that their global competitors appear to have done. Of course it is for individual companies to decide their strategy for long-term development and growth, but we suggest that a greater focus on Quality Assurance by the Irish SME could become a decisive factor in the sustainability of individual organizations.

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