Analyst Competences – Industry Needs

www.easit2.eu

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A survey of industry needs in engineering analysis and simulation for the EASIT² project was recently completed. As well as influencing the preparation of the project deliverables, the survey results also provided a valuable insight into the current state of the engineering analysis and simulation industry.

EASIT² (Engineering Analysis and Simulation Innovation Transfer) is a research project funded by the European Union Lifelong Learning Programme and the project partners (AMEC, E.ON, EADS, Enginsoft, Geofem, NAFEMS, Nevesbu, NOKIA, Renault, SELEX Galileo, Tetra Pak and University of Strathclyde). Its major goal is to contribute to the competitiveness and quality of engineering, design and manufacturing in Europe. It aims to achieve this by delivering the following:

- Educational Base: a list of generic competences that users of engineering analysis and simulation systems must possess, divided into appropriate modules
- Competency Framework: the Educational Base incorporated into a web-based interface (with the ability to interface with other staff development systems), with links to associated resource material that engineers and analysts can use to develop and track their competencies
- Registered Analyst Scheme: an integrated competency-based version of the existing scheme to provide recognition of achievement of these competencies.

To help ensure that the project deliverables can meet the needs of the engineering analysis and simulation industry, an extensive survey of industry needs was undertaken, both in Europe and worldwide.

Potential respondents to the survey, including NAFEMS members, were invited to participate in the survey by email and via links from the NAFEMS and EASIT² websites. Between December 2010 and February 2011, an impressive total of 1,094 completed surveys were received from around the globe, most particularly from USA, Germany, UK, France and Cyprus.

Respondent Details

The majority of respondents were engineers/analysts (37%) and senior engineers (26%), while Project Managers (14%) and Directors (10%) were also well represented. The educational level of about half the respondents was to Masters Degree level (47%), with 31% reaching Doctorate level and 22% Diploma or Bachelor's Degree level. Respondents were well distributed across all age groups from 20 to 50+, with the most (34%) coming from the 30-39 age group, and were generally well experienced in computer-based engineering analysis with 75% indicating over 5 years of experience.

Over half (58%) of all respondents spent over 50% of their work time in the preceding 6 months involved in computer-based engineering analysis which, like the experience data described above, suggests that the majority of the respondents have a good knowledge of the engineering analysis industry which enhances the value of this survey. Unsurprisingly, the largest organisations (500+ employees) had a greater proportion of near full-time analysts, while smaller companies and small to medium-sized enterprises (SMEs) had a higher proportion of engineers whose time was divided more equally between computer-based analysis and other tasks. This suggests that engineering analysts in small organisations face a greater challenge in developing their skills when they often need to multi-task.

In the first key question for the EASIT² project, respondents were asked how they felt their formal education related to their engineering analysis activity. The majority (52%) responded with "significantly" while about an equal proportion responded with "a little" or "fully" (24% and 21% respectively). Only 2% responded "not at all". The higher the education level of the respondent, the higher it related to their engineering analysis activity, as shown in Figure 1. Nevertheless, among even those holding a Doctorate, only 29% felt that their formal education related fully with their engineering analysis activity, so there is clearly a need for further work-based learning in engineering analysis at all education levels since a large majority of engineers are performing analyses that are not fully related with their formal education.

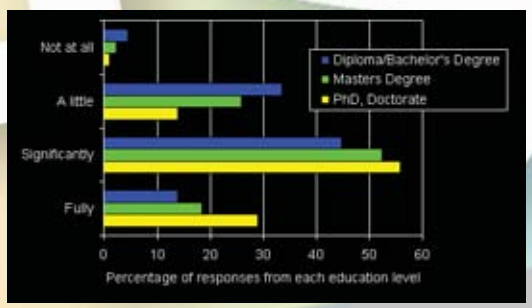

Figure 1: How respondents felt that their formal education related with their engineering analysis activity

Organisation Details

Half of the respondents to the survey worked at large organisations (500+ employees) while a significant proportion (20%) also worked at very small organisations of 1-20 employees. The proportion of respondents working in organisations falling into the SME category (up to 250 employees) was 40%, so both large organisations and SMEs were well represented in the survey.

Respondents were also asked to state the number of engineering analysts working in the organisation. 45% responded with 1-10 analysts, with a significant number (7%) having only a single analyst. 32% had 11-100 analysts while 23% had 100+ analysts. Predictably, the larger the organisation, the larger the number of analysts. The wide distribution of responses suggests that in terms of staff development in engineering analysis there is a need for both a personal approach (where there are a small number of analysts) and a company-wide approach (where there are a large number of analysts).

The industrial sector of respondents' organisations were well distributed among the 9 categories (Energy, Aerospace, Land Transport, Civil & Construction, Consumer Goods, Marine & Offshore, General Industrial Goods, Petrochemical & Process and Defence) with each accounting for between 6% and 15% of all responses. Higher proportions of certain sectors were observed in individual countries, e.g. 28% of responses in Germany were for Land Transport and 20% in USA for Aerospace. Many organisations' activities included Manufacturing (20%), Design/consultancy (27%) and Research and development (28%).

Respondents were asked to indicate the type of engineering analysis software used in their organisations and were free to select multiple categories. The most selections (45%) were for "commercially available" software, then "in-house modified" and "wholly developed in-house" software accounted for 18% and 20% of selections respectively. "Open source" accounted for 10% of selections and "external development/tailoring" for 6%. Notably, lone analysts used more commercially available (72% of responses) and open source (18%) software, reflecting the lack of resources available in such organisations for developing bespoke software.

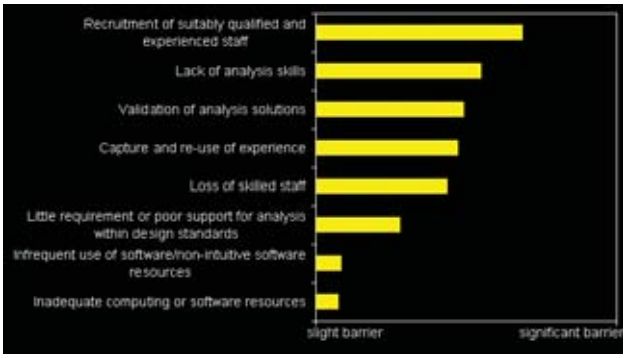

Figure 2: Average rating of barriers to engineering analysis

Respondents were also asked whether their organisation's engineering analyses were performed in-house, out-sourced or whether they acted as subcontractor for other organisations and they were free to select multiple responses. The majority (58%) of the responses were "in-house", while 24% of the responses were "acting as subcontractor" and 18% out-sourced at least some of their analysis work. As would be expected, less out-sourcing was indicated by those employed by software developers and they acted more often (46% of responses) than the other types of organisations as subcontractors. The size of the organisation also had a strong influence on how analysis work is carried out, with larger organisations tending to do more out-sourcing while SMEs tend to act more often as subcontractor.

Respondents were asked to rate a number of issues concerning engineering analysis as to what degree they saw them as a barrier to the use of computer-based engineering analysis or as a reason why they failed to get the most out of such software. Firstly, the average ratings for barriers to engineering analysis are shown in Figure 2. The two barriers with the highest ratings, "recruitment" and "lack of analysis skills", clearly indicate a need for an increase in the pool of competent engineering analysts and improved lifelong learning.

The average ratings for reasons why organisations fail to get the most out of engineering analysis and simulation software are shown in Figure 3. All except "Pressure of work" again show that there is a clear need in industry for the EASIT[2] project deliverables, while the highest rated "pressure of work" shows that work-based learning needs to be fitted around analysts' workload rather than add to it. Later in the survey, respondents expressed a preference for external courses as an effective means of learning, while the rating in this question for "No convenient external training" was significantly higher in small countries and in small organisations. Therefore, training provision needs to address the disparate issues of work pressures, preferred training methods and the local availability of training courses.

Respondents were asked two simple "Yes/No" questions on current practices in their organisations regarding analyst competences. The first asked whether the competences needed to perform analysis tasks are formally defined and the response overall was 57% "No". This shows that there is a significant need for the competency framework being developed in this project. It appeared that organisations with fewer analysts had less formal definition of the skills needed to perform analysis tasks, with 71% of lone analysts responding "No" compared with 50% for organisations with 50+ analysts.

Figure 3: Average rating of reasons why organisations fail to get the most out of engineering analysis and simulation software

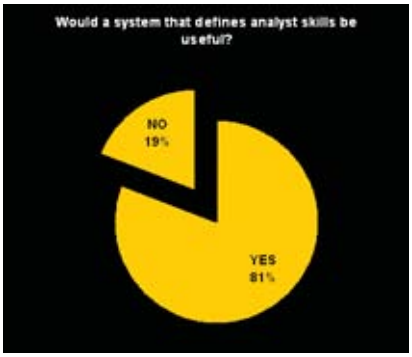

Figure 4: Would a system that defines analyst competences and provides links to appropriate training resources be useful?

The second question asked whether a system to record analyst skills existed in the respondent's organisation. A significant majority (70%) responded "No", which further reinforces the need for the EASIT² project. A higher proportion (76%) of "No" responses was received from SMEs and a similar trend with number of analysts to the previous question was recorded here with 90% of lone analysts responding "No" compared with 60% for organisations with 50+ analysts. Clearly, small organisations, or those with small engineering analysis and simulation departments, are in the greatest need of support in terms defining and recording analyst competences, perhaps because they lack the resources to do this themselves.

Preferred Generic System to Record and Define Analyst Competences

When asked whether a system that defines analyst competences and provides links to appropriate training resources would be useful, a large majority (81%) responded "Yes" (Figure 4) which is a resounding vote in favour of the main objective of the EASIT² project.

To help draw up the list of generic competence modules in the Educational Base, respondents were asked to rate the importance of a list of analysis areas. The average rating of each of these is shown in rank order in Figure 5. Finite element analysis was ranked the highest. The top 7 ranked analysis areas already exist in the CCOPPS Educational Base (see www.ccopps.eu) for the analysis of pressure vessels, and these will be modified and enhanced with additional competences in the generic Educational Base of the EASIT² project. Those shown in Figure 5 that are not already in the CCOPPS Educational Base will be developed from scratch.

Respondents were asked for their preferred medium, number of skill levels and assessment methods for a competency framework. In terms of medium, company intranet was the highest rated, particularly by larger organisations, followed by secure internet. Paper based and standalone software were less popular. In existing systems, company intranet was also the most common medium.

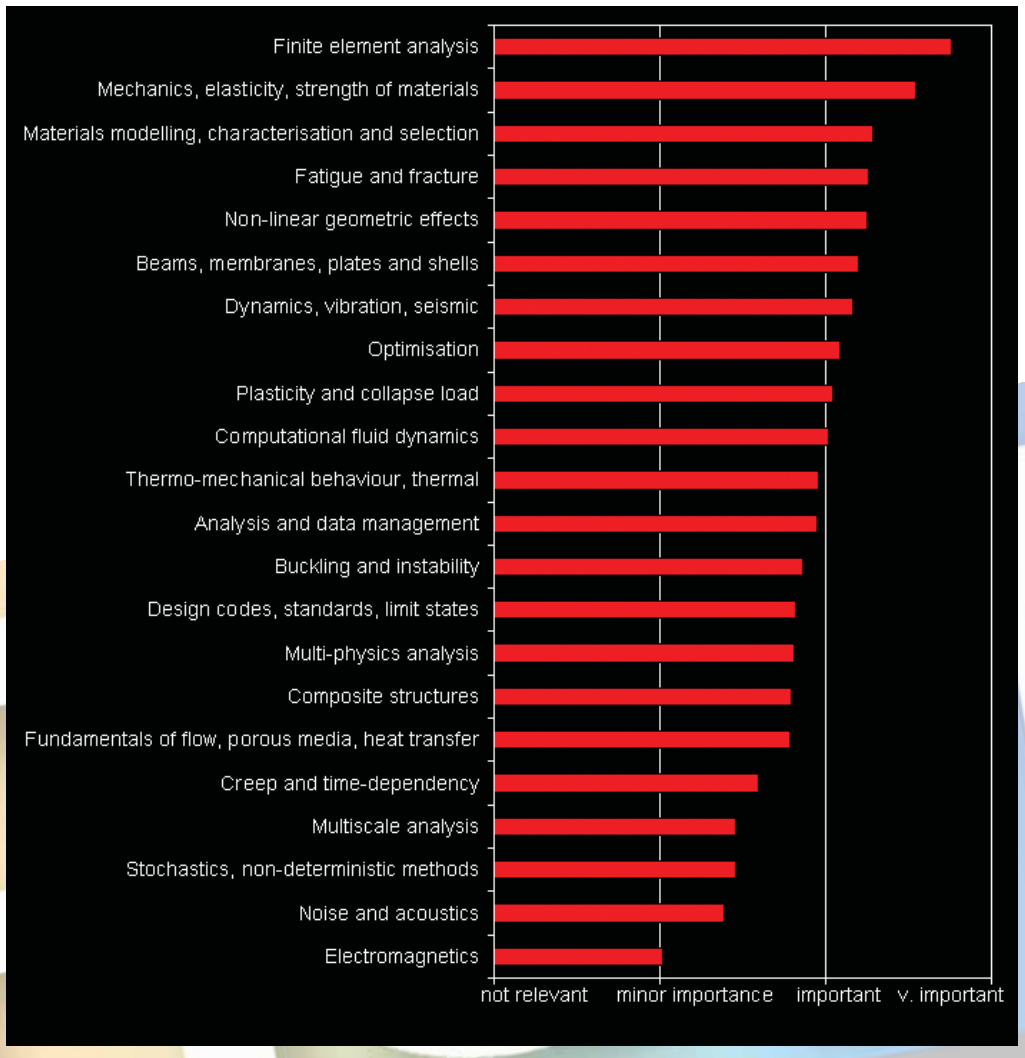

Figure 5: Importance of analysis areas

A three-level system for rating analyst competencies was preferred by 44% of respondents, followed by four levels (28%) and five levels (21%). Surprisingly, one and two-level systems were preferred by only 2% and 6% of respondents respectively.

In order to assess attainment of analyst competences, assessment by manager/mentor was rated as the most useful, which was also the most common method in existing systems. The second most useful was "self-assessment", closely followed in third place by "on-line/computer-based test".

Preferred Registered Analyst Scheme

In the questionnaire the RA scheme was referred to as a "professional qualification" to provide a clear distinction between this and the previous section on recording analyst competences and the existing RA scheme. Respondents were asked whether such a qualification would be useful for themselves or their employer and then they were asked to rate reasons why their organisation would find it useful. In response to the first question, a significant majority (76%) selected "Yes".

In the second question, the following reasons were rated equally highly: Incentive for staff development, Recruitment, Subcontractor qualification, Internal resource management and Marketing. Interestingly, Marketing was rated significantly more highly among SMEs and lone-analyst organisations than larger organisations.

In terms of assessment methods for a professional qualification, professional interview and manager/mentor were overall the most popular, each accounting for about 23% of responses. Less popular were external assessment of submitted work and external examination. There was notable variation in national responses to this question, with Germany favouring the same two most popular methods but significantly more than the other methods. In the UK, respondents favoured the "professional interview" and "external assessment of submitted work" methods, and in the USA, "external examination" was the most popular method which are all in common with the professional engineer assessment methods in these countries.

A monetary fee would be needed to cover the costs of running a professional qualification and respondents were asked to select a maximum amount that they or their organisation would be prepared to pay to be assessed for an RA "qualification". About 25% of respondents selected each of €50, €100 and €200, dropping to 16% for €500 and 8% for €1000, meaning that about a €200 fee should be acceptable to about half the respondents.

Conclusions

The high number of responses (1094) to the industry needs survey confirms that there is strong interest in industry for greater staff development, a competency framework and some form of recognition of achievement in engineering analysis and simulation. The EASIT^2 project partners would like to thank all those who completed the online questionnaire. Readers are encouraged to visit the project website periodically to monitor its progress. In particular, a more detailed report on the results of this Industry Needs Survey will be available for download and any comments are welcome.

Respondents to the survey were invited to declare whether they would be willing to provide feedback on any of the EASIT^2 project deliverables. The response (603 in total) was overwhelming and confirms the high level of interest in industry. Some of these volunteers will be contacted in the coming months to provide such feedback.

AUTHOR INFORMATION

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