



EVALUATING THE EFFECTIVENESS OF TEACHING IN CORE CE KNOWLEDGE AND COMPETENCIES IN HE

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Education and Culture DG

Lifelong Learning Programme



Outline

- Project overview
- Preliminary survey data analysis
- Next steps
- Concluding remarks

Consortium partners



Eric Schaer



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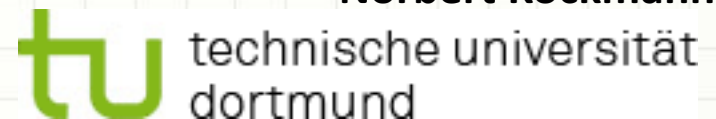
Luis Miguel Madeira



Milan Polakovic



Norbert Kockmann



16 associate partners formally signed up, representing professional institutions, employers, HEIs

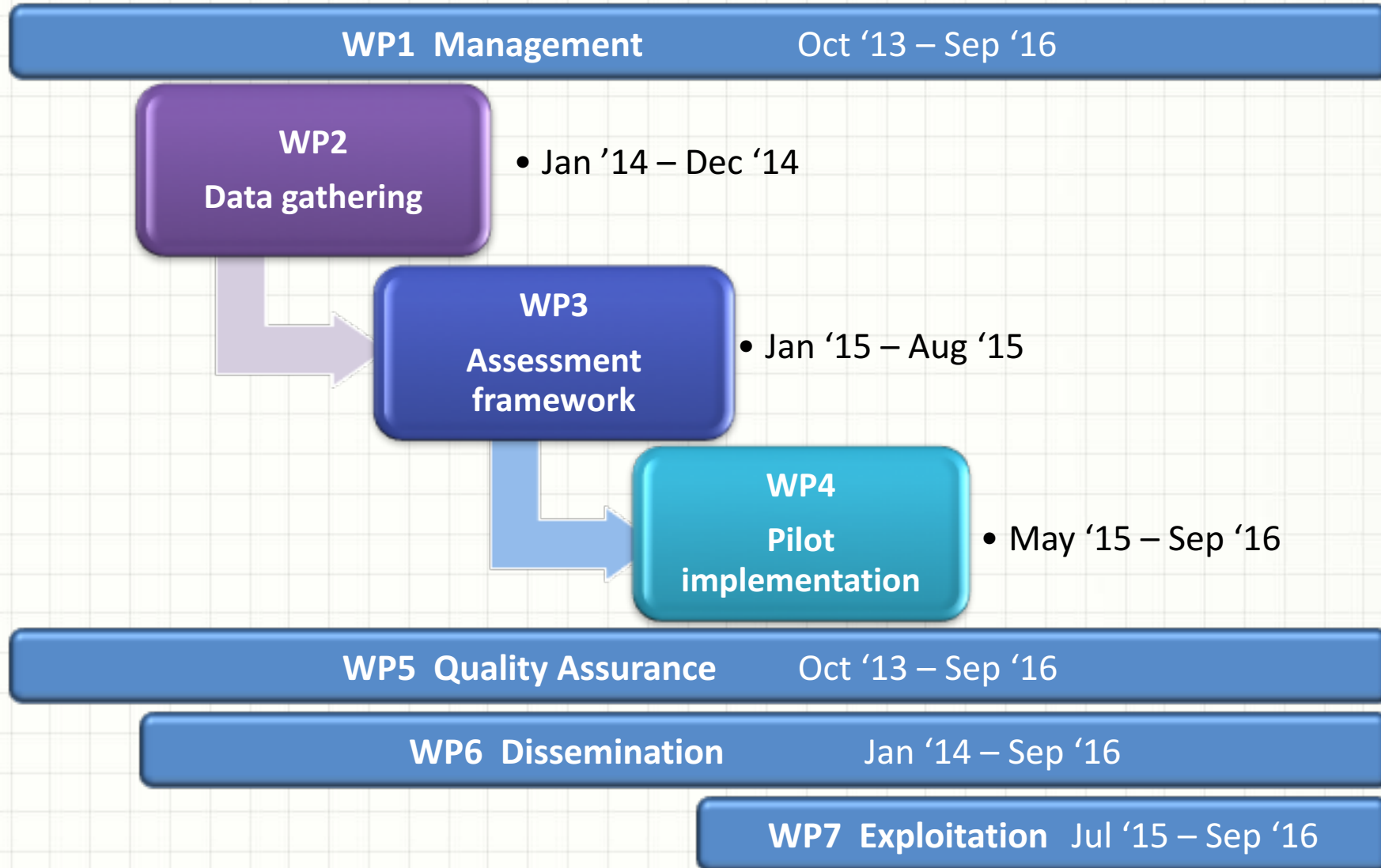
The team



Project aim

- develop a framework which will support the assessment of teaching effectiveness in delivering not only core chemical engineering knowledge, but also core employability competencies.
- More detail on www.iteach-chemeng.eu

Project overview



Objectives

- Review the learning outcomes of a chemical engineering higher education formation in consultation with industrial and academic partners. (WP2)
- Promote closer involvement of employer organisations in chemical engineering curriculum formation - focus groups, questionnaires to identify the skill gaps and requirements. (WP2)
- Establish state-of-the art in assessing the effectiveness of teaching of core (chemical) engineering knowledge and of the development of professional skills and competencies required to increase the employability of the graduates. (WP2)

Objectives

- Define various indicators of the effectiveness of teaching in chemical engineering higher education. (WP3)
- Investigate in more depth methods of effectively acquiring employability competencies, using psychometric approaches amongst others. (WP3)
- Use decision making technology and multi-objective optimisation to identify the most appropriate evaluation methods and develop a robust framework. (WP3)
- Test the framework at partner institutions focusing on various pedagogic methodologies in each geographical area to enable the investigation of dependencies between educational systems and the effectiveness of pedagogic methodologies. (WP4)

Survey

- Survey sent out by all partners in May 2014 to academic, industrial and graduate contacts as detailed in the iTeach database
- Further requests sent to EC2E2N network contacts and through associate members
- Responses were 'cleaned' by removing incomplete entries and duplicates (checked by IP address)
- 97 academic, 97 employer and 70 graduate responses
- Open ended responses to questions have been uploaded into [NVivo](#) software
- Looking for themes/patterns and frequencies of occurrence
- Quantitative analysis of the data also carried out

Quantitative data analysis

- Measures of central tendency (M, SD, Min, Max) and frequency counts were calculated for all Likert-scale type questions.
- Frequency counts were conducted for single-choice answers.
- Group comparison was carried out after classifying the responses geographically using United Nations Geoscheme for Europe, created by the UN Statistics Division
<http://millenniumindicators.un.org/unsd/methods/m49/m49regin.htm>
- Independent-samples t-tests conducted for all Likert-scale type questions - differences between geographical regions , position and company size.

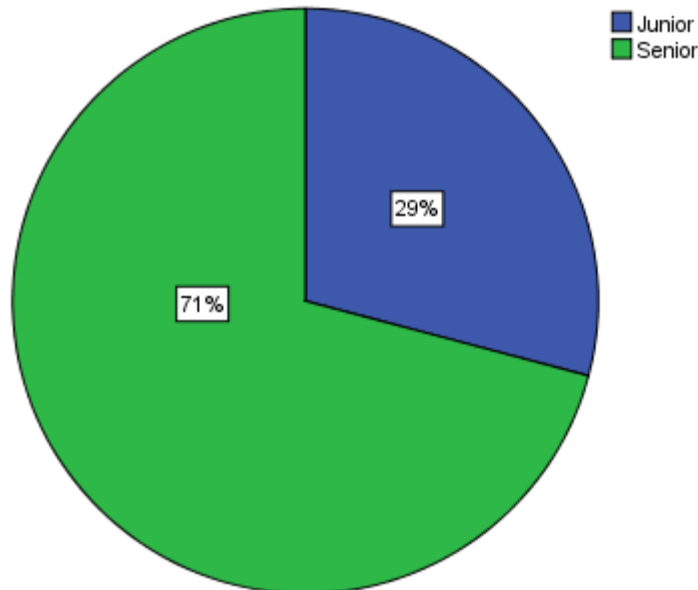
Highlights of the preliminary results

Academic survey

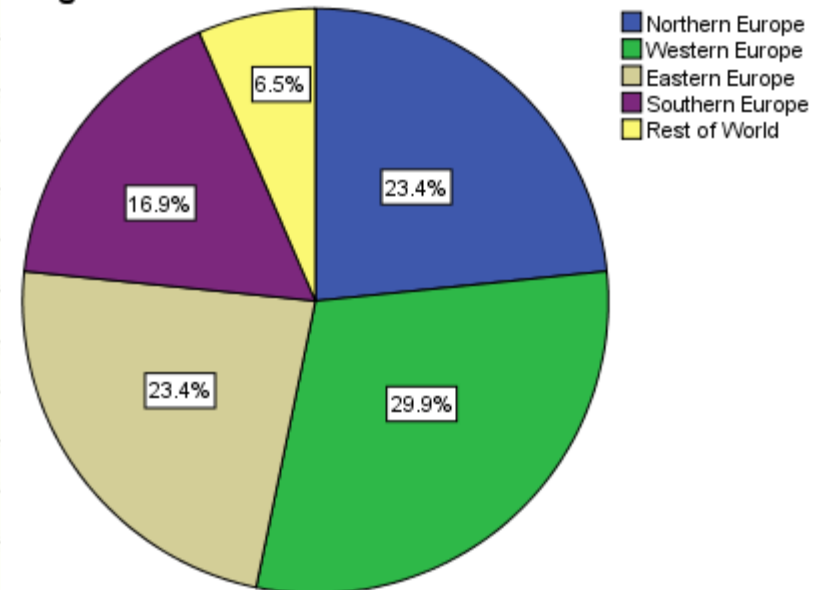
Disclaimer: all results presented are based on the preliminary analysis of the survey responses available to date. Final report will be available in Dec 2014

- Importance of knowledge and skills – as expected, most fundamental knowledge classed as very important
- There are some geographical group differences, although caution should be exercised due to small sample sizes

Position



Region

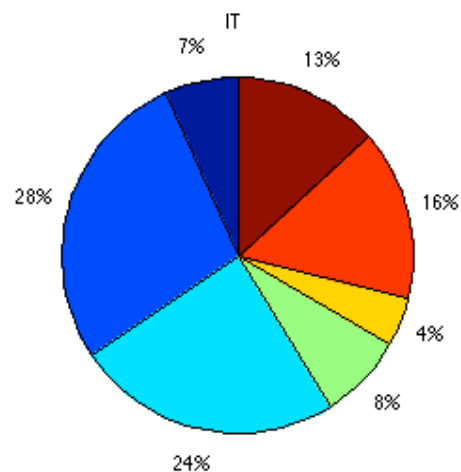
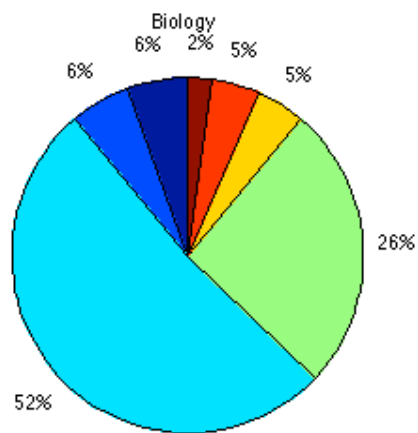
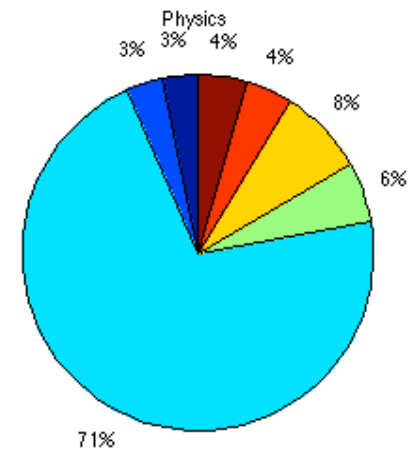
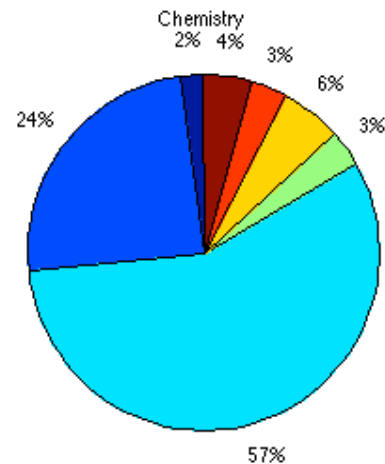
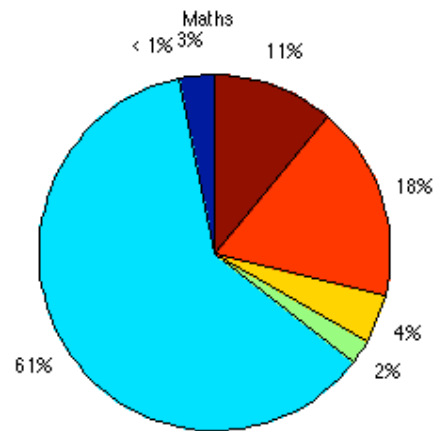


Highlights of the results

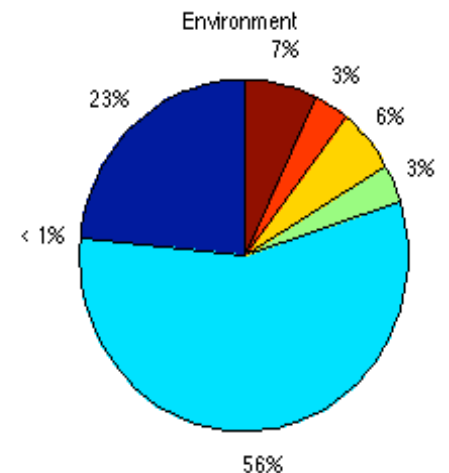
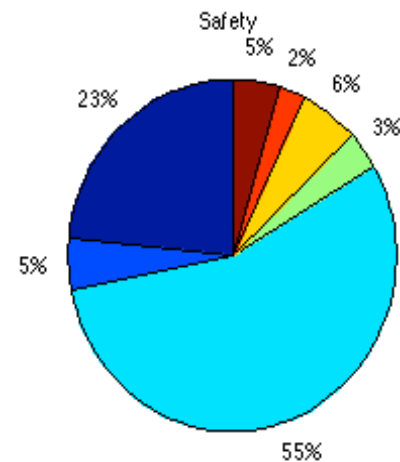
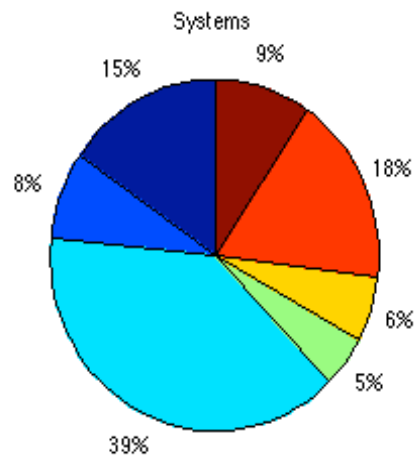
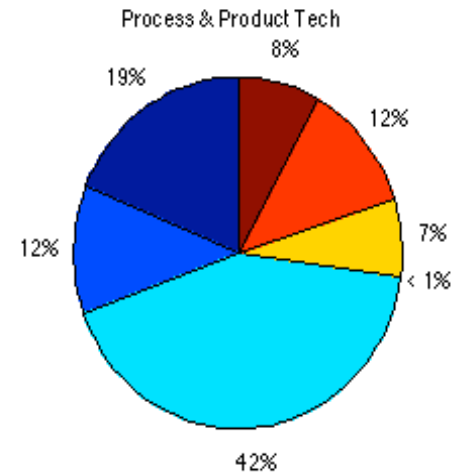
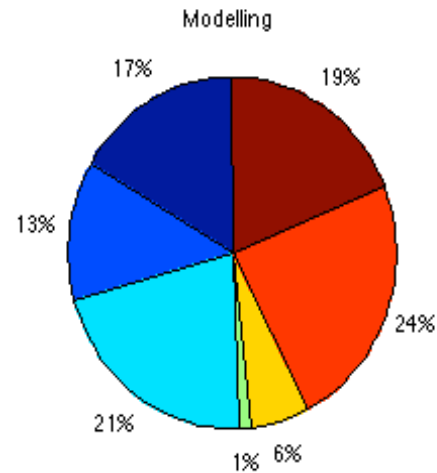
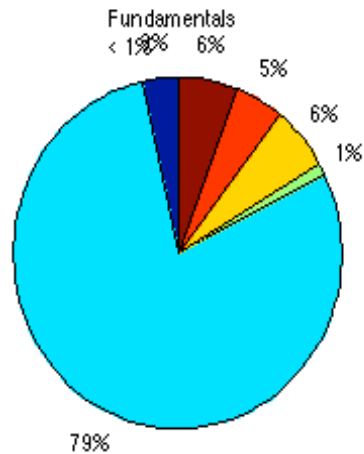
Academic survey

- No stat. significant differences in the responses of S and E European academics in terms of the significance of knowledge and skills
- Chemistry, Biology, Process & Product Eng., Data analysis and QA rated more highly by S and E European than W and N European
- Innovative design and problem based skills more highly rated by E than N European
- IT and its effective use rated more highly by N than W European

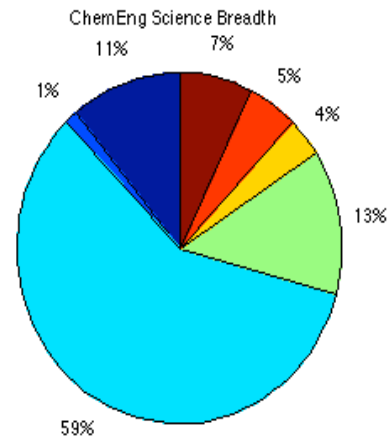
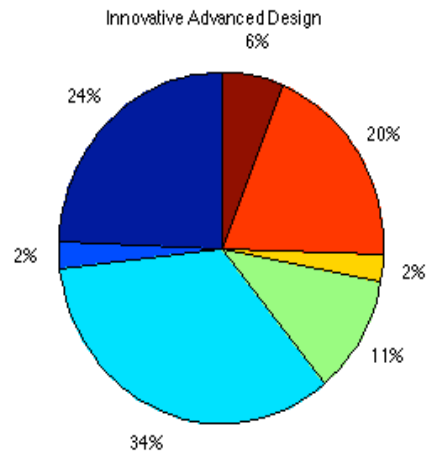
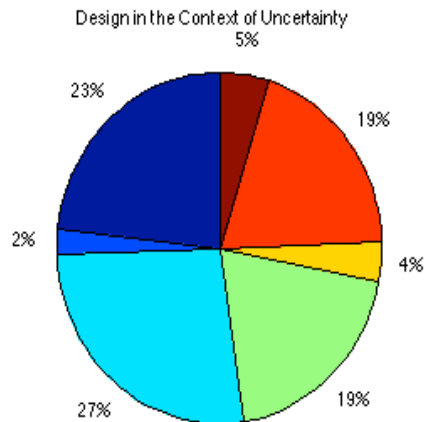
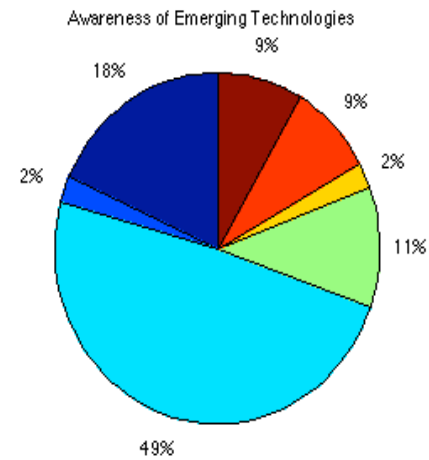
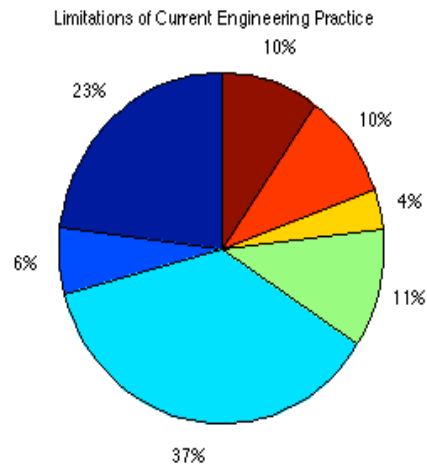
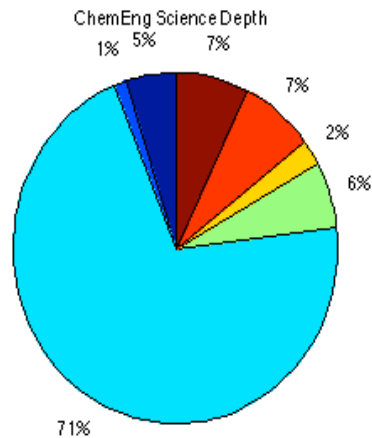
Methods of delivery



Methods of delivery



Methods of delivery

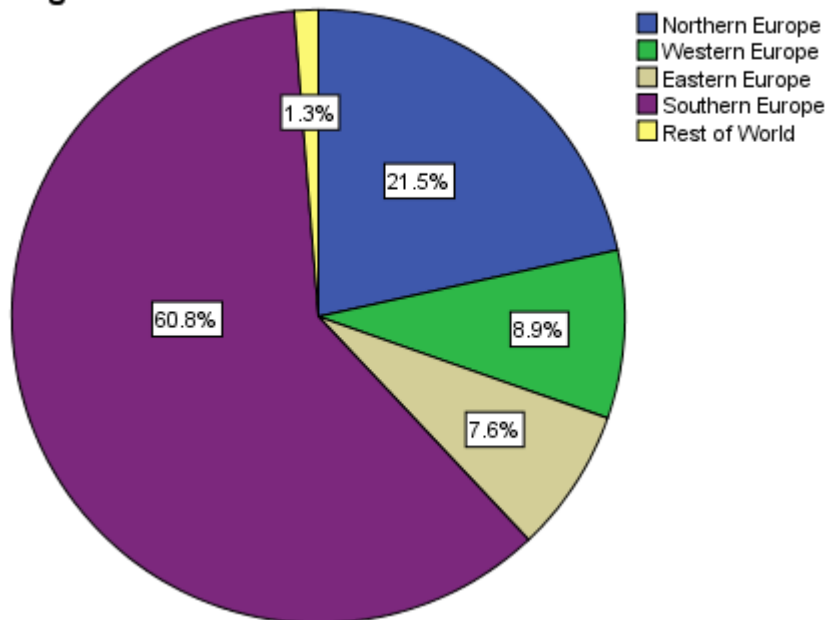


Highlights of the results

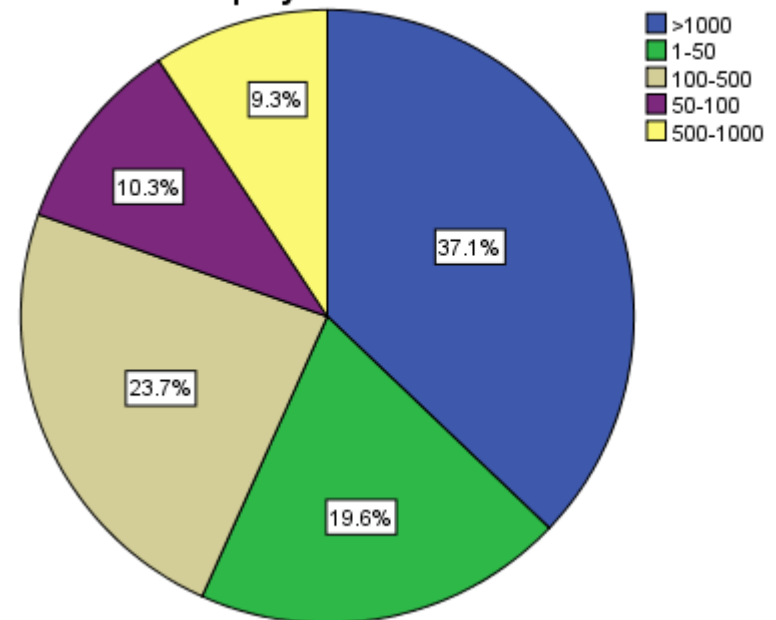
Employer survey

- Group comparisons based on the size of the company rather than geographical region, responses predominantly from technical part of the company (not HR)
- Wide range of sectors with relatively low percentages of responses from each so no comparison possible

Region



Number of Employees



Highlights of the results

Employer survey

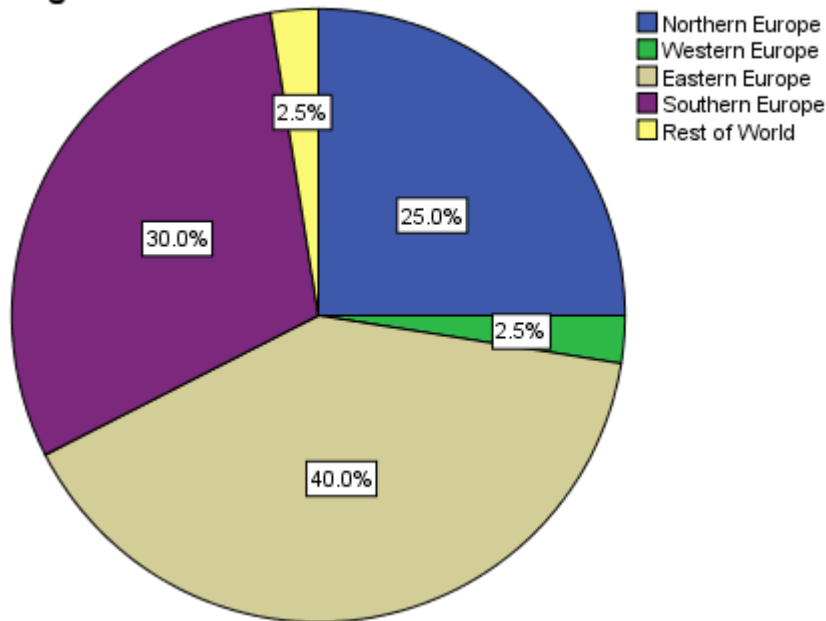
- Small company (S, 1-100, N = 29), medium-sized company (M, 100-1000, N = 32), large company (L, >1,000, N = 36)
- very few statistically significant group differences between companies of different sizes
- S and L rated Physics higher than M
- L rated communications skills higher than M and S
- M rated Safety more important than S
- Competency of graduates in Chemistry, Sustainability and Practical skills rated higher by M than by S companies

Highlights of the results

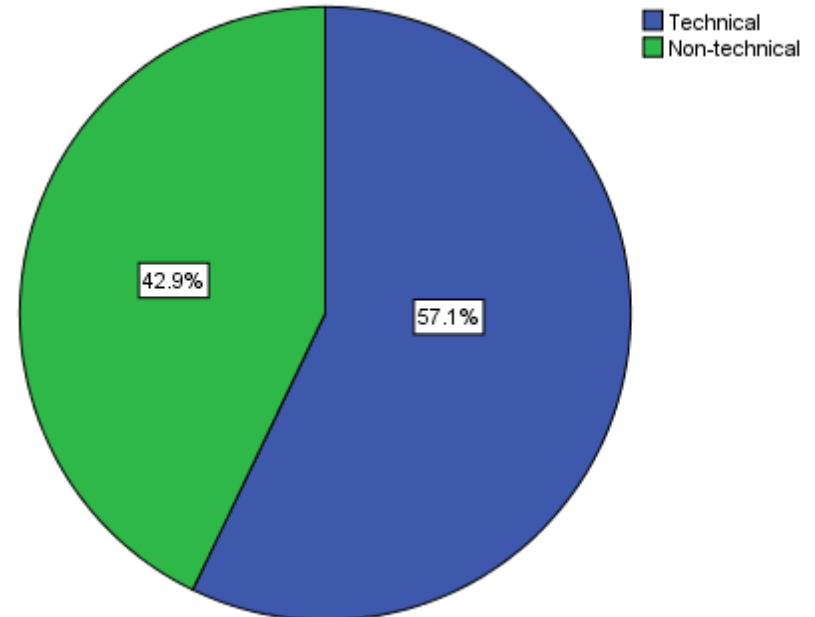
Graduate survey

- Group comparisons based on the geographical region and on the size of the company and graduate position were carried out
- Wide range of sectors with relatively low percentages of responses from each so no comparison possible

Region



Position



Qualitative data analysis

- Nvivo analysis of free text response
predominant themes in each question



Academics

- predominant means of assessing
teaching CE knowledge and skills
assessment
- The second major theme emerging was student
questionnaire evaluation, although this was less dominant in
eng. practice & design and employability skills
- Detailed analysis of 'Other' theme is currently identifying
any additional emerging themes to drive the framework
development



Qualitative data analysis

Employers

- Predominant means of evaluation of competencies in all respects currently are
 - internal evaluation forms during interviews
 - CV and University references
 - Upon appointment through training centres/on the job evaluations during probation
- Project partners currently sourcing copies of evaluation forms from companies to drive framework development



Qualitative data analysis

Graduates

- Asked what methods of delivery were used predominantly in their studies to deliver the core knowledge and competencies
- Asked to suggest alternative methods for each that would be effective in their view
- Detailed analysis of any emerging trends in these suggestions still on-going and will be part of the consideration for WP3 and WP4

Concluding remarks

- Data on the perception of the importance of chemical engineering knowledge and skills/competencies collected across Europe
- Current methods of delivery and evaluation of the effectiveness also reviewed, together with pedagogical literature sources
- Basis for the draft of the framework, which will be developed in early 2015
- The framework to be piloted in late 2015-2016 (WP4)
- Anyone interested in being involved contact us

ACKNOWLEDGEMENTS

- Education, Audiovisual and Culture Executive Agency, Project No. 539959-LLP-1-2013-UK_ERASMUS-EQR
- All project full and associate partners, particularly Dr Alina Schartner and Dr Chris O'Malley for help in designing, implementing and analysing the questionnaires
- All colleagues contributing to the project (responding to the surveys, providing comments, suggestions...)

QUESTIONS?

