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Educating Engineers for the 21st Century: inputs from Industry and Academia

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The Industry Study

- 21 in-depth interviews with major companies
- 13 interviews with SMEs - including 7 high-tech spin-outs
- 3 focus groups with recent graduates
- Questionnaire:
 - changes in the industry
 - current and future skills requirements
 - quality of engineering graduates
 - changes required to engineering education
- Responses from 444 companies
 - 53% SMEs



The University Study

- Questionnaires based on industry conclusions sent out to all University Engineering departments (including Computing), Faculties, Accrediting Bodies
- Replies from all types of University, 60 from Russell Group, around 100 in total
- Questionnaire:
 - responses to ‘industry conclusions’
 - agree/disagree
 - examples of best practice
 - related questions



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Conclusions 1

A worsening shortage of high calibre UK engineering graduates

Universities: 91% agree

- 70% not increasing provision
- 19% see a drop in proportion of grads entering industry
- What would make students stay in engineering?
- Earlier engagement with industry
- More visibility of potential career paths in industry



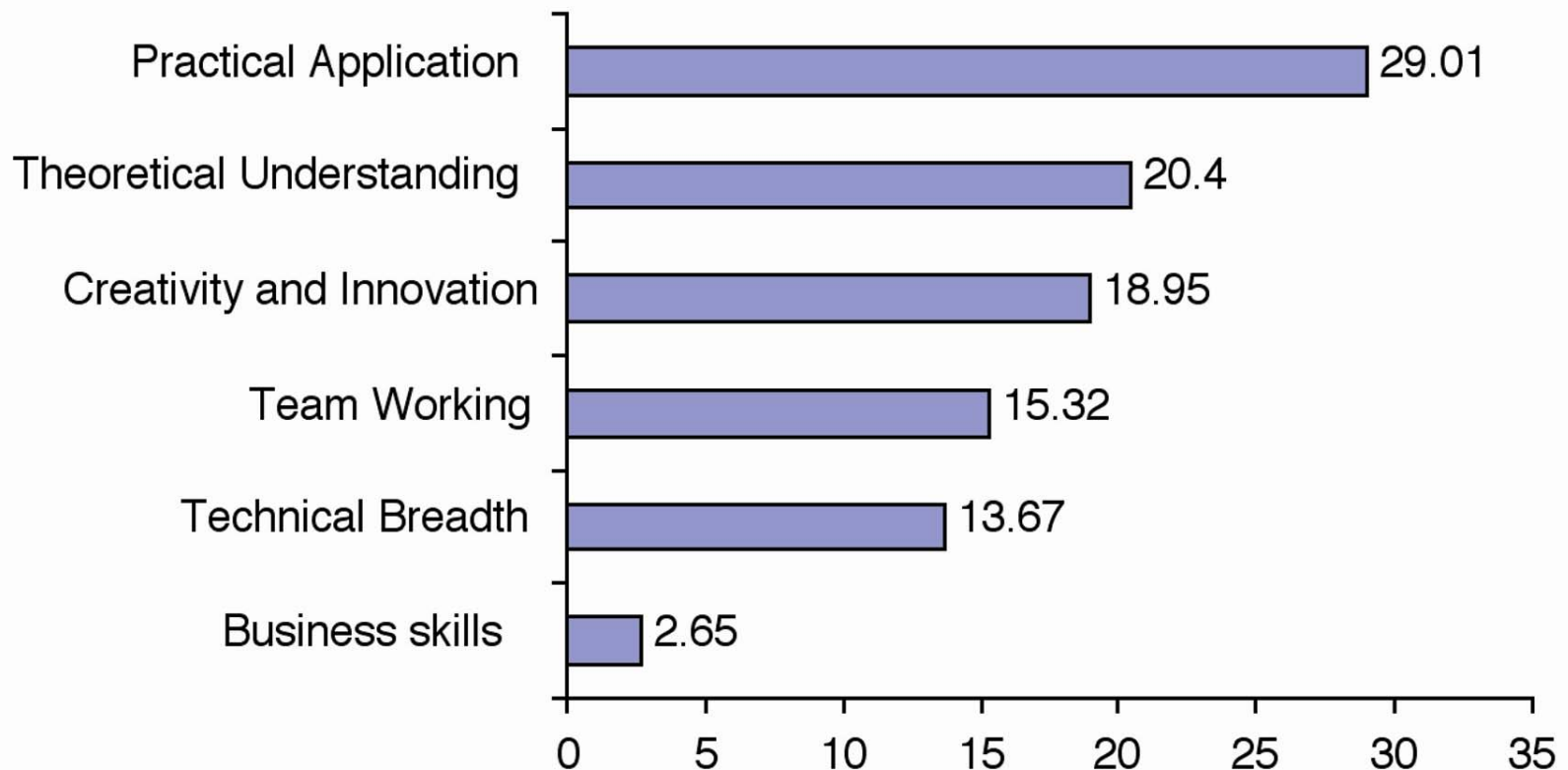
Conclusions 2

Graduates need more experience of
applying theory to real problems

Universities: 91% agree

- Needs more industry involvement
- More staff with direct experience in industry
- Projects, placements, design/make, interesting problems...
- The right facilities for students to actually design and make things that work

Industry priorities for engineering graduates





Conclusions 3

The best UK graduates are competitive
with their peers in Europe

Universities: 50% agree

- UK – comparatively weak in maths
- Still querying whether Bologna compliance is important
- Less than half are aligning their degrees
- Waiting for guidance!
- Quality of advice on Bologna - poor



Interim Recommendations 1

Engineering courses for the 21st Century

- More real-life, open-ended problems & experience
yes 91%
- Appealing and motivating to enrolled and potential students **yes 81%**
- Higher profile and status for innovative teaching **yes**
– *impact of RAE*
- More industry engagement **yes 88%**
- Recognition of cost and time **yes - around 25 – 30%**



Interim Recommendations 2

- Creativity, technology and business teaching *yes - but how?*
- Filling the 'pipeline' *yes – desperately!*
- Graduate training schemes for SMEs *less than 50% felt there was a role*



Academic Survey Conclusions

- 90% want more industrial involvement
 - but - are concerned that industry doesn't think long term about engagement with university education
 - and – very resistant to universities 'doing industry's training'
- Bologna – what is that?
- Only 30% think Systems Engineering should be a stand-alone course
- But - 72% support introduction of new engineering courses
- Developing creativity and innovation – HELP!
- 60% think current assessment and accreditation are an impediment
- 75% think RAE has been detrimental to teaching
 - most have promotion processes which recognise teaching but want it celebrated more visibly
- Over 50% have engaged with Subject Centres and 80% of these are positive
- Less than half have much idea of costs of teaching students
 - most estimates £10 - £15k per annum
 - HEFCE allocation £7.5 - £8.5K pa
- Lots of examples of good practice quoted



Thoughts and issues...

- Academics are in pretty strong agreement with industry views
- Are there too many engineering departments – at 240?
 - to increase the funding per student should we have less departments?
- Is Bologna alignment of any importance to industry?
 - should our engineering degrees be longer
 - perhaps just for our best engineers?
- Do all engineers need the highest level of maths skills?
- How can we get industry to make longer term commitments to involvement in engineering degree level education – as has been achieved in research?
 - from your experience, what are the most effective mechanisms?
- How can we get more interchange of staff between industry and academia?
- Developing creativity and innovation – can you offer advice, please!



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