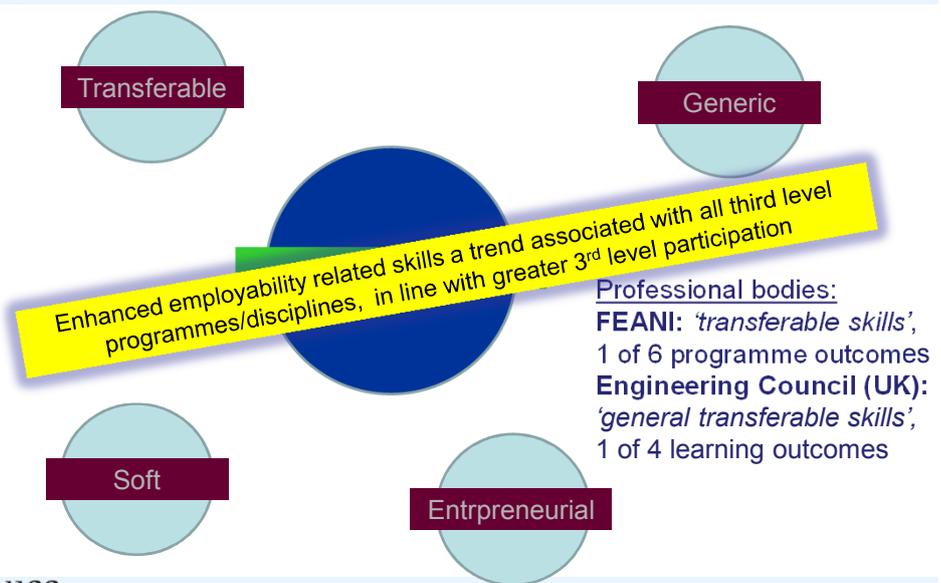


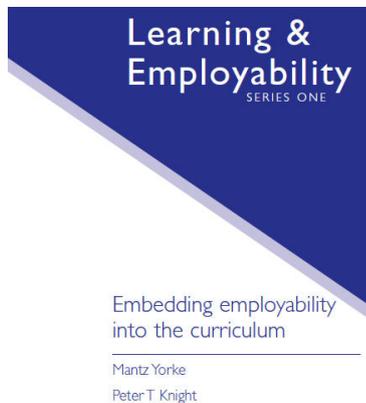


Enhancing engineering employability in the 21st C; handling uncertainty and complexity through 'new entrepreneurship'



Dr Edmond Byrne
Dept. of Process & Chemical Engineering
University College Cork, Ireland





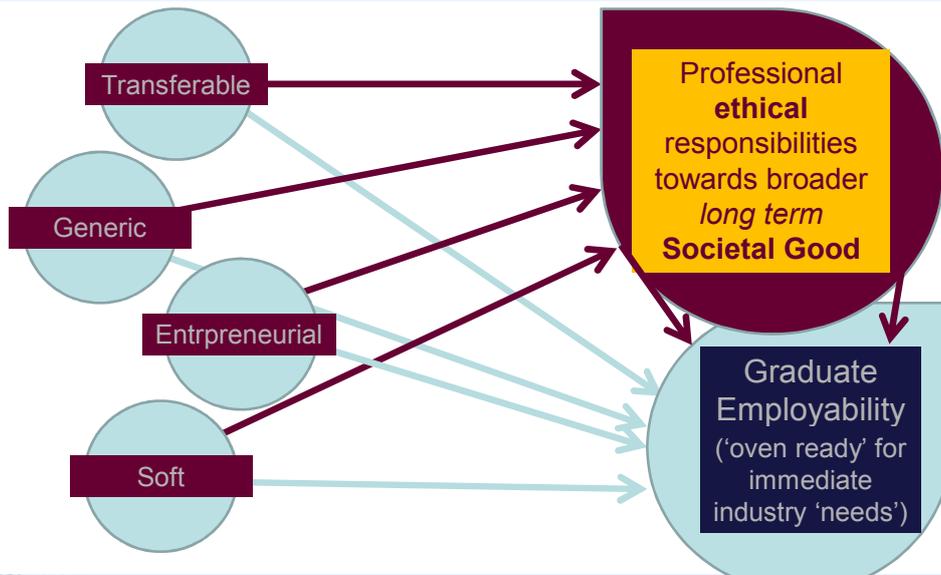
List of 39 'aspects of employability' designed to assist in the 'examination of curricula from their point of view of employability'

Grouped under three clusters:

- 'personal qualities'
- 'core skills'
- 'process skills'



Yorke & Knight, HEA (2006)





W
prc

al C
eder



Engineering
(2008)

..rather than one which considers engineers' role merely as '**value neutral**' '**guns for hire**'.

Bucciarelli (2008): *'If we, as engineering faculty, still claim that it is our job and responsibility to teach 'the fundamentals', it's time explicitly to recognise that what is fundamental to engineering practice goes beyond scientific, instrumental rationality.'*



UCC

4th ISEE, The University of Sheffield

E.P. Byrne

19-20 July 2012



Working Towards Societal Good particularly important for contemporary **21st C Engineering**:

1. Addressing **grand societal challenges** of energy, water, food provision as well as effects of accelerated climate change in the face finite resource and ecological limits.
2. **'Making a difference to the world'**: Key aspiration and No. 1 among female engineering students (Alpay et al, 2008)



UCC

4th ISEE, The University of Sheffield

E.P. Byrne

19-20 July 2012



A new conception of Entrepreneurship

Gibb (2002):

Entrepreneurship: Traditionally a 'narrow business orientation' e.g. heroic figure, owner of start up fast growing tech business.

UCC: In pursuit of a new enterprise and **UCC:** this conception 'does not have full empirical or conceptual underpinning'.

Do not organisations facing decline or fighting to retain market positions require even *more* entrepreneurship?

Gibb brings this new conception of entrepreneurship' : that which can face **'uncertainty and complexity in the task and broader environment'**.



Thus necessity for this new entrepreneurship extends right across society *for example, priests, doctors, teachers, policemen, pensioners and community workers and indeed, potentially everyone in the community.'*



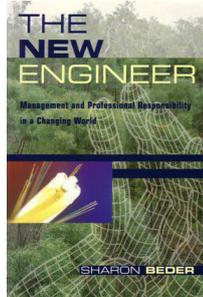
Entrepreneurship: facing 'uncertainty and complexity in the task and broader environment''.



With increasing uncertainty and complexity across society and through engineering practice in the 21st century, and the consequent need for critical thought, humility and openness to adopting and integrating new perspectives, the need for such an entrepreneurialism has never been stronger.



Entrepreneurship: facing 'uncertainty and complexity in the task and broader environment'.



The New Engineer (Beder, 1998)



Post Normal Science (Funtowicz & Ravetz, 1994)

Wicked Problems (Rittel & Webber, 1973)

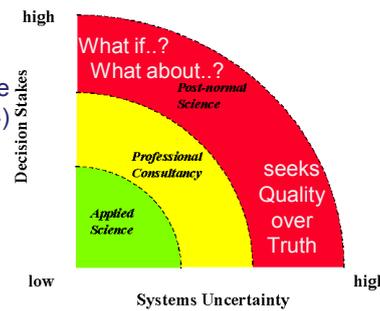


New American University (Crow, 2002-)

Organizing Teaching and Research to Address the Grand Challenges of Sustainable Development



Building an Entrepreneurial University



4th ISEE, The University of Sheffield

E.P. Byrne

19-20 July 2012



CASE STUDY: PE1006: Professional Engineering Communication and Ethics

Objectives include 'developing [students'] appreciation of professional ethics through application in complex problems and case studies.'

132 students; formal lectures plus tutorial/facilitation group sessions.

Assessment includes wicked problem assignment, group report and presentation to peers/lecturing team.

A key aim in designing the module was to:

- aid understanding of the context, nature and prevalence of uncertainty and complexity as these relate to engineers/ engineering practice
- develop students' critical thinking and openness to new and challenging perspectives

..essentially promoting Gibbs 'new entrepreneurship'.



4th ISEE, The University of Sheffield

E.P. Byrne

19-20 July 2012



Students surveyed on 39 UK HEA employability attributes (39 resp)

<i>How well developed in PE1006/important for employability is (quite + very):</i>	PE1006 (%)	Employ. (%)
Adaptability	64	86
Stress tolerance	49	86
Creativity	67	91
Commercial awareness	34	57
Ethical sensitivity	75	81
Coping with complexity	68	78
Problem solving	70	83
Influencing	47	58
Arguing/justifying point of view/course of action	46	74
Comfortable with uncertainty	62	81
Context	71	81
Breadth of knowledge	49	73



CONCLUSIONS

- The key role/reponsibility for engineers should be to serve societal good.
- The required attributes required to serve societal good in the face of 21st century 'grand challenges' tally well with employability traits, particularly those associated with Gibb's 'new entrepreneurship'; i.e. successfully facing uncertainty and complexity across engineering practice and broader society.
- A first year professional introductory module has been developed at UCC aimed at developing these skills.
- Students appear to recognise value in this approach.





Enhancing engineering employability in the 21st C;
handling uncertainty and complexity through
'new entrepreneurship'

Thank you!

Dr Edmond Byrne
Dept. of Process & Chemical Engineering
University College Cork, Ireland