

The EPC Engineering Graduate Output Standard

An employer-group interpretation

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Summary

The Employers' Working Group was set up in the summer of 2001 to give a first industrial view of the Output Standard produced by the Engineering Professors' Council.

The Group welcomed the standard as a means of providing recruiters with more detailed information on the individual abilities of engineering graduates to supplement the classification of the degree awarded. The Group found no obvious omissions or irrelevant elements within the standard, however this report details two areas in which it is thought further consideration could be given to make the standard more useful and user friendly for the non-technical recruiter.

Suggestions to strengthen the emphasis on key skills, particularly team working, together with some modifications to the language used to describe the abilities achieved by the graduates, is included in the report. This report also clearly indicates those areas in which it is thought that the standard would be particularly beneficial to employers. The report concludes with recommendations for the promotion and effective communication of the standard as a means of closer co-operation between employers and academia.

1 Introduction

In response to the Dearing Report and other external pressures, the Committee of the Engineering Professors' Council (EPC) set up a working party in 1999 to investigate the establishment of a generic Output Standard for all engineering schemes. Phases I and 2 of the work were completed and published as an Interim Report entitled EPC Occasional Paper Number 10, December 2000. The Standard consists of a framework of twenty six 'Ability to...Statements' expressed in generic non-discipline-specific terms, based upon the procedures adopted in solving an engineering problem. A key principle of the work was that the Output Standard defines an expectation of all the engineering attributes.

In adopting this principle, recognition was given to employers' legitimate requests to know what they might expect of a graduate emerging from a United Kingdom university with an engineering degree. In the age of elite Higher Education this expectation had been met by the degree classification system which was essentially a norm-referenced ranking system. However, in the present mass system of higher education, norm-referenced systems provide insufficient information on individual students' abilities to new employers and in particular to SMEs, who have become significant recruiters of engineering graduates.

Phase 3 of the work was subsequently approved to consist of five linked sub-projects, one of which is concerned with the views and expectations of employers recruiting engineering graduates. The overall aim of this sub-project was to clarify industries' needs and expectations in relation to the EPC Engineering Output Standard and to encourage the use of the standard by employers. This report outlines the main areas discussed by the Employers' Working Group, the outcomes from those discussions and recommendations.

2 Background

The procedure for entry into the engineering industry for graduates is normally one where the individual's A-level grades determine admittance to university and course and where the classification of the degree awarded is a key determinant of employment. In effect, therefore, all the employer gets is a 'rank' with no clear idea as to the achieved abilities of the applicant. The Working Group was unanimous in its view that a move to help address this and to provide more objective information to prospective employers was to be welcomed.

Though all businesses differ, there was a high degree of consensus within the Working Group that in addition to the 'technical' skills acquired by engineering students during their University course there was an increasing need for, and expectation of, other 'key' skills and personal attributes. Today employers need young people with good oral and written communication skills, with the ability to work with others across disciplinary boundaries, to be capable of presenting their 'case' to management and to be willing, able and industrious learners.

Assessing these key skills and personal attributes in addition to technical skills is the responsibility of the 'recruiting' team in a company. Because of the huge variation in size and recruiting needs, the processes employed vary enormously; from a formal 'assessment centre' that may take several days, all the way through to a relatively uninformed personal interview conducted by a person with little knowledge or understanding of engineering. It was clear to the Working Party that whatever the recruiting process, there would be genuine merit in having more objective information about the 'output' from our engineering courses. This information would not only assist selection but would also help identify those gaps that a graduate training programme should address.

Amongst the employing organisations of the Working Group members and other employers which the Working Group consulted, there was an expressed view that there was a gap between the abilities of graduates and the ‘input’ abilities desired (and expected) by employers. In particular, the increasing importance of ‘key skills’ did not appear to be matched by an increased emphasis on developing these abilities during engineering degree programmes.

Members recognised that changes in secondary education, particularly in mathematics and the sciences, has meant that universities have found it necessary to spend time in strengthening these basic requirements for engineering. The additional burden of enhancing graduates’ key skills implies additional resources which university departments may not have at their disposal. Given the importance that industry attaches to these key skills there is a need for a debate on the funding of this work.

3 General Observations

3.1 Initial consultation and modification of Terms of Reference

The Working Group (Annex A) agreed the Terms of Reference (Annex B).

The first task was to establish:

- Whether employers agreed that an ‘output standard’ was beneficial ;
- What utility such a standard would have for employers;
- Whether there were any serious omissions from the standard;
- Whether there were elements of the standard that should be deleted as inappropriate.

The consultation (see Annex C for list of employers consulted) elicited the following broad consensus:

- The Output standard would be beneficial to employers in a number of ways (see below);
- There were no obvious omissions or erroneous inclusions;
- The language in which the output is expressed is less than clear, especially to non-engineers (and recruiters are not usually engineers);
- There was concern that there was much too little attention and emphasis given to the acquisition of key skills and in particular to the growing importance of team-working skills. This is referred to in our recommendations. (Some members expressed the view that a knowledge of another European language would be beneficial).

In the light of these responses, the Working Party modified its Terms of Reference to exclude reference to the development of benchmarks and to focus on assessment of the clarity and inclusiveness of the primary and secondary ‘Ability to...Statements’.

3.2 Benefits to employers of adoption of the EPC Output Standard

It was considered important that the benefits to employers (and to universities) of application of the standard should be made explicit in this report. It is in the application that the end user, the employer, can get an improved return on their investment through a better-targeted and more-focused recruiting process and through the in-company training that should be complementary to the work students have done at university. These benefits were:

- In recruitment processes – to have confidence that those universities that have adopted the standard will provide students with the stated abilities;
- Being able to use the ‘Ability to...Statements’ during ‘technical’ interviews in the recruitment process to highlight deficiencies;
- In the design of ‘assessment centres’ – to be able to define more sophisticated discriminators knowing that key abilities have been met;
- Allowing company training schemes to be more carefully designed as a continuation of the students’ university work, thereby enhancing the benefit of the programme and giving companies a more professional image with students;
- Incorporating the standard into training programmes will allow the programmes to be more focused on the needs of the business and not cover skills already acquired;
- Employers having the knowledge that students from Universities that have not signed up to the standard can not be assumed to have these abilities.

4 Proposed revision to the wording of the EPC Output Standard

In addressing the concerns about the phrasing of the standard the Working Group proposed the following re-drafting of the EPC Standard. However, it is to be noted that it was not the intention of the Working Group to suggest changes to the underlying ‘substance’ of the standard.

4.1 Key Skills

The ability to exercise key skills is expected of all engineering graduates and these should be encouraged and developed during the degree course. These are:

- Communication
- General IT user abilities
- Application of number
- Working with others (including Team Working)
- Problem solving
- Improving own learning and performance

In addition to the above, which are recognised nationally as Key Skills, the Working Group considered that graduates should also demonstrate attributes of drive, motivation and innovation.

4.2 Proposed re-drafting of the EPC Output Standard

4.2.1 Ability to understand an engineering problem and see it in its context

This means the ability to:

- (a) Clarify customer's needs;
- (b) Identify and classify engineering systems (together with components);
- (c) Define the problem in terms of performance specification, objective functions and constraints;
- (d) Be aware of social, legal and environmental impacts, in the setting of constraints.

4.2.2 Ability to identify those concepts relevant to the problem

This means the ability to:

- (a) Consider alternative concepts and their features;
- (b) Resolve difficulties created by imperfect and incomplete information.

4.2.3 Ability to use these concepts to evaluate solutions

This means the ability to:

- (a) Use appropriate skills (mathematics, computing, engineering) to create a range of theoretical solutions;
- (b) Identify key parameters, limitations and merits of the solutions;
- (c) Summarise merits and limitations and select best option.

4.2.4 Ability to specify the selected solution to the engineering problem

This means the ability to:

- (a) Evaluate theoretical solutions using a range of inputs and constraints;
- (b) Critically assess results and if necessary improve knowledge database and refine solution;
- (c) Generate optimum specifications within national and international standards.

4.2.5 Ability to realise the specified solution

This means the ability to:

- (a) Select appropriate production methods;
- (b) Negotiate contracts relevant to the specified solution;
- (c) Implement production and deliver products fit for purpose, on time and within budget;
- (d) Operate within relevant health and safety and environmental frameworks.

4.2.6 Ability to evaluate the solution and ensure it meets the specified requirement

This means the ability to:

- (a) Verify that the real system complies with the specification and meets the customer requirement;
- (b) Assess whether the real system has achieved the planned cost/benefit analysis;
- (c) Assess whether the real system has adequately addressed environmental, social and ethical issues.

5 Recommendations

- 1 It is recommended that the EPC Output Standard Project endorse the revised specification of the standard.
- 2 It is recommended that further work is done on benchmarks to ensure alignment with the revised specification of the output standard.
- 3 It is recommended that careful consideration be given to an effective communication of this standard to employers. The value of the EPC exercise will be much greater if there is broad awareness of the standard amongst employers.
- 4 The importance of 'team-working' cannot be overemphasised and it is recommended that the EPC explore ways in which this vital skill can be developed during an undergraduate's time at university.
- 5 It is strongly recommended that the production of this output standard is not treated as a 'one-off' but as the start of a process that brings the university sector and employers closer together in terms of human capital development and that the EPC should broker this.

Annex A

Membership of Employers' Working Group and acknowledgements

The Working Group met formally three times between 14 August 2001 and 15 November 2001 and wishes to thank the Royal Academy of Engineering for its generous support of facilities for group meetings during this time. Thanks are also due to Tim Feest, Director of OSCEng, for help with editing and formatting of the report for printing

The Working Group comprised :

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Derek Dring	Filtronic plc
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Paul Watts (Chairman)	Marconi plc
Derek Spurgeon	EPC Co-ordinating Group Chairman
Ajit Shenoi	EPC Committee representative

Annex B

Terms of Reference

- 1 To clarify industry's desire for and expectation of the Engineering Output Standard; to determine significant omissions in the existing Standard and agree appropriate changes in content where necessary to reflect the needs of employers.
- 2 To report progress to the EPC Committee through the EPC Output Standard Co-ordinating Group.
- 3 To produce a final report on the outcomes from the Working Group for the EPC Output Standard Co-ordinating Group.

Annex C

Consultation with individuals involved in the recruitment process:

Dr John Dean	Technical Director, Filtronic Components Ltd
Dr Alison Hodge	QinetiQ plc (formerly DERA); also chair of CEng Committee; Institute of Physics.
Joanne Dodge	Personnel Manager, PACE MicroTechnology (reporting comments from three senior engineers).
Dr Robin Corlett	Senior Project Manager, Filtronic Components Ltd. (Milton Keynes).
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Prof John Roulston OBE	Director of Technology, BAE Systems (Avionics Group).
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Other contacts:

Corus CC&I including Engineering Business colleagues (CNES)
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Engineering Council (article published in EnVoxPeople)

