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Issues Associated with Professional Accreditation of UK Master's Programmes

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Abstract: *Traditionally in the UK, the Professional Engineering Institutions (PEIs) have accredited undergraduate programmes as meeting the educational requirements for registration as a professional engineer. Students follow either a BEng programme, which is three years full time study or an MEng programme, which is four years full time study. MEng programmes have a higher entry requirement than BEng programmes and are expected to produce graduates with both a broader and a deeper knowledge base than a BEng graduate in the same discipline. In 2004, the UK Engineering Council published UK-SPEC, which expressed the competences required by professional engineers in terms of outcome statements and set the MEng outcomes as the minimum educational requirement for professional registration. With the introduction of UK-SPEC, PEIs have started to accredit MSc programmes as meeting the further learning requirements for a BEng graduate wishing to become a chartered engineer. This has raised a number of issues in both PEIs and UK engineering departments regarding the assessment of the learning outcomes of MScs against the requirements of UK-SPEC. These issues include how to determine the level of the learning outcomes and the specific nature of many UK masters programmes. The paper will address both the issues raised by PEIs and the problems encountered by departments. Although this paper is focused on issues related to UK taught postgraduate programmes, the observations on good practice are applicable to the quality assurance procedures of other taught postgraduate programmes.*

Introduction

In the UK, engineering degrees are accredited by the Professional Engineering Institutions (PEIs) as satisfying the educational requirements for registration as a professional engineer. Depending on their accredited first degree, graduates can apply for either Chartered Engineer (CEng) or Incorporated Engineer (IEng) registration with the relevant PEI. In the UK, Chartered Engineers are considered to be concerned with the progress of technology through innovation, creativity and change. An Incorporated Engineer is considered to be concerned with current technology (Engineering Council 1997). Engineering undergraduates wishing to become chartered engineers will either take a Bachelor of Engineering with Honours (BEng) programme, which is three years study full time, or a Master of Engineering (MEng) programme, which is four years study full time. UK engineering departments have higher entry requirements for their MEng programmes compared to their BEng programmes with the expectation that MEng graduates from an accredited programme will obtain above average degree results. MEng programmes are designed to produce graduates with both a deeper and a broader knowledge base than a BEng graduate. Although the MEng qualification uses the term Masters it is an extended and enhanced undergraduate award and not a postgraduate qualification.

In terms of UK study credits a BEng student must take 360 credits and an MEng student must take 480 credits. An MSc programme in the UK is usually 180 credits and lasts a full calendar year. With the introduction of SARTOR 3 (Engineering Council 1997), MEng degrees were considered the minimum requirement to meet the educational base for registration as a Chartered Engineer. Students who completed a BEng degree were required to undertake additional further learning requirements to reach the educational level of an MEng graduate. In 2004 SARTOR 3 was replaced by UK-SPEC (Engineering Council UK 2004), which expressed the competences required by professional engineers in terms of outcome statements. The move to assessing outcomes meant that the completion of a suitable taught postgraduate degree would now satisfy the requirements for a BEng graduate wishing to “top-up” to MEng level. Thus an accredited Masters degree provides a CEng applicant who holds an accredited BEng award with the total exemplifying academic qualifications for professional engineering registration.

The accreditation of UK undergraduate degrees is established practice with the various PEIs accrediting degrees under licence from the Engineering Council (EC-UK). Each PEI has a group of senior academics and industrialists, drawn from its own corporate members, who act as the visiting panels for accreditation visits. Prior to a visit, departments submit supporting documentation which includes such information as aims and objectives, detailed descriptions of programme and module content, student progression and retention data. The visits to the departments last between one and three days depending on the PEI involved. During the visit itself, the Panel meets with staff and current students and examines the outputs from student assessments and the documents relating to quality assurance procedures. Panels make recommendations to their accreditation committee and it is usual to ask departments to agree to satisfy some conditions before accreditation is awarded. Examples of these conditions are departments could be asked to put procedures in place to ensure all students have study at least one design topic or introduce budget planning into project work. Programmes are accredited for a maximum of five academic years and departments must keep the PEI informed of any major changes which effect the programme structure or content. The introduction of UK-SPEC meant that PEIs have started to approve, or more recently, accredit MSc programmes as suitable to meet the further learning requirements for BEng graduates. As well as increasing the number of degree programmes accredited by PEIs, the introduction of accrediting MScs has raised a number of issues, both from the perspective of the PEIs and UK Higher Education Institutions (HEIs). The author is a member of the Institution of Mechanical Engineers Academic Standards Committee and has taken part in many accreditation visits for taught masters programmes. Also the author is a member of the Engineering Accreditation Board's (EAB) Working Party on Documentation, which revised the format of the documentation that HEIs are required to complete in order to apply for accreditation. The author was an invited speaker at the recent EAB Workshop on Masters Degree Learning Outcomes (Engineering Accreditation Board 2007). The following issues have occurred in the majority of the visits the author attended and/or during the review of submissions for MSc programmes.

Issues Raised by Professional Engineering Institutions

The procedures for accrediting UK undergraduate programmes have evolved since the introduction of the process in the 1970s. Visiting panels must assess the outcomes of degree programmes and check that the programmes under scrutiny ensure full coverage of all the aspects of UK-SPEC. For undergraduate degrees this requires graduates from accredited programmes to have achieved four sets of general learning outcomes and five sets of specific learning outcomes. Universities

demonstrate that these outcomes will be achieved through their programme aims and objectives and by completing an output standards matrix showing the relationship between the modules in the programme and the attainment of the different learning outcomes. Also a judgement must be made that the programme under review will produce graduates at a suitable level for the named award. With undergraduate qualifications, this assessment of level is often informed by the progression through out the programme. Subject experts will often examine one technical area in detail, checking the content of modules from the first to the final year. All PEIs will expect that certain technical areas are covered in the programmes they accredit and some PEIs specify additional practical activities. An example of the latter is the requirement of the Royal Aeronautical Society for undergraduate students on accredited aeronautical engineering degrees to take part in a flight test activity.

When reviewing MSc programmes, a number of issues begin to emerge in the discussion of the visiting panels. One of the key issues is establishing the level of the material taught and assessed in the degree. MSc programmes by their nature lack the clear hierarchy of undergraduate programmes. Thus the familiar process of checking the incremental progress in a specific technical area throughout three or four years of study is not possible. Also MSc programmes are designed for student intakes with a range of possible backgrounds unlike the final year of MEng degrees, which are natural extensions of the third year. This means that each MSc has to contain some material delivered at sub-Master's level to ensure all students have a suitable knowledge base. This is reflected in the fact that an MSc is 180 credits and the final year of a MEng is 120 credits. The UK has introduced the National Qualification Framework for Higher Education in England and Wales (NQF) (Quality Assurance Agency 2004), which assigns level descriptors to qualifications. These level descriptors describe, in general terms, the skills and attributes that a successful student will gain at each stage or level in their higher education. The Engineering Council advises (EC-UK 2007) that any MSc applying for accreditation must produce graduates who meet the correct level descriptors. Thus any accredited MSc programme must satisfy the NQF as well as contributing to the requirements of UK-SPEC. It should be noted that full coverage of UK-SPEC is an unrealistic expectation for an MSc programme (this point is discussed further below). While industrial panel members are comfortable with UK-SPEC, they are unfamiliar with the NQF. Much of this uncertainty comes from the language used in NQF, which was written for those working in the educational sector. This leads to some uncertainty on the industrial panel members' part on making judgements about level.

Another issue that visiting panels must consider is that of an MSc programme only partially covering the outcomes listed in UK-SPEC. Again with undergraduate programmes, the process is more straightforward, with an accredited programme expected to deliver all the outcomes over a much longer time period. This point produces debate (Engineering Accreditation Board 2007) on whether an accredited MSc should deliver a depth of knowledge in a certain narrow area of engineering or attempt to cover all the outcomes in UK-SPEC. Clearly if an MSc is to also satisfy the NQF level descriptors, then the material in the MSc must deepen knowledge beyond the final year of a BEng degree. Much of the debate comes from PEIs who are associated with a very specialist branch of engineering and are concerned about someone applying for membership who has not studied a certain topic to the required depth. Making a judgement on the partial coverage of UK-SPEC in MScs often requires panels to be familiar with postgraduate level outcomes. Also it might be argued that a postgraduate student is more mature than an undergraduate one and that some of the UK-SPEC outcome statements, such as those related to underpinning maths and science would have to be satisfied before a student started

a technical MSc programme. Associated with this point is also the issue of MSc programmes which cover broad, but specialist areas versus MSc programmes with a very narrow focus. Thus it may be expected that an MSc, which satisfy the requirements of UK-SPEC, would deliver competences in the areas of engineering knowledge and the application of problem solving analysis. Finally there is the debate on the amount of non-core engineering material offered in some MScs. Clearly for an MSc to be accredited it must deliver an engineering content. However many MSc programmes, such as those in medical engineering or sports engineering clearly must cover material which would not be considered as core engineering disciplines. Again, visiting panels have to make a judgement on the amount on of non-core engineering that is acceptable. Generally, visiting panels are more confident with programmes that mix technically deep engineering material with non-core engineering material than those programmes that provide a mix of technical deepening, broadening and non-core engineering material.

Universities often set up taught postgraduate programmes in partnership with a particular employer. Such programmes tend to be closed courses and designed to reduce the amount of time a student has to spend away from their workplace. Often this type of MSc will use assessment strategies such as reflective portfolios to prevent the assessment load becoming too great for part-time students. Again many work-based assessment methods may be unfamiliar to visiting panels, especially the industrial members. This means visiting panels may have to make more subjective judgements in their review of the different assessment method outputs and may often not have the traditional “hard copy” output available for review. Techniques for assessing work based learning are well established and the advantages and disadvantages of different approaches discussed in detail (Little and Nixon 1995). PEIs should ensure that their accreditation committees are familiar with the merits of these methods of assessment rather than perhaps assuming that all MSc programmes should be assessed using formal exams and coursework.

Issues Associated with Higher Education Institutions

In most UK engineering departments, academic staff will tend to have administrative duties associated with either undergraduate or taught postgraduate programmes. This means that those academics that are familiar with the accreditation process are usually focused on undergraduate activity. Many taught MSc programmes are niche activities in departments involving a small number of staff that are also active researchers in the field of the MSc programme. This can result in the PEIs receiving submissions for accreditation for MSc programmes, which fail to address key points, such as external reference points for the level of the taught material. This can also results in PEIs spending much of the time of the visit explaining why these points are important and sometimes extracting answers from University staff with great difficulty.

Many MSc programmes in the UK have a significant overseas student cohort. Universities are increasingly seeing the accreditation of an MSc as an external indicator of quality, which assists with the marketing of the programme overseas. This can lead to concerns within some PEIs that prospective students are under a false impression that completion of the MSc alone is sufficient to apply for corporate membership of the PEIs. Especially, if the staff involved in running the programme are unfamiliar with the accreditation process and membership criteria of the PEI. Also if a programme takes students from a wide range of backgrounds, there is usually a need to introduce some to transferable skills, which are now part of all UK engineering undergraduate degrees. These points have to be addressed in the accreditation submission.

Compared to undergraduate degrees, many specialist MSc programmes are only run for a few years. Often MSc modules or even whole programmes are launched at the request of a particular sector of industry. This does not easily fit the accreditation process, which is based on reviewing the student output. HEIs must realise that students have to be registered on a programme before the process will start. Also guidelines state that HEIs must inform PEIs of significant changes to accredited programme structure. This puts a restraint on the course development process that will be unfamiliar to academics not involved with undergraduate programmes.

Many MSc programmes in the UK started as closed programmes taking part-time students only from one large engineering company. The industrial partner can heavily influence the taught content of these MScs, even after the programme is “opened out” to additional full-time students. This can create a tension between the necessity to meet the requirements of PEIs for accredited status and the wishes of the industrial partner. For example the PEI may expect that students write major reports in a formal manner whereas the company may desire students to follow a corporate style. Ultimately, it must be hoped that industry will value the accreditation process and support the University in making any necessary changes.

There is also the issue of Universities allowing students to gain credit on the MSc programme via accredited prior learning (APL). If the APL offered by a prospective student clearly satisfies UK-SPEC at the correct level, it can be argued that it should be allowed to replace credit obtained from taught modules on an accredited programme. If Universities are accepting prior experience as APL it is more problematic, as this is unlikely to fit with UK-SPEC. Most prior experience offered at postgraduate level will tend to be narrow in nature, and probably much narrower than an equivalent taught module in the subject. It is unlikely that an MSc programme with a significant entry cohort with experience based APL would easily satisfy the accreditation requirements of PEIs.

Finally, there is the issue of “conversion” MSc programmes from one engineering discipline to another. Both UK-SPEC and the NQF view taught masters programmes as delivering material at a more advanced level than a BEng programme. This implies that conversion programmes would never be acceptable for accreditation. However many engineering MScs which are designed to allow the graduate to seek a career in a particular industrial sector are far more in-depth than may first appear. The onus is on the University to articulate the depth of material offered in these programmes correctly. Also to realise that descriptions of programme content aimed at attracting students to register for the MSc often give a misleading impression to visiting panels.

Issues of Output Level

In the previous sections, the issue of the depth of material in an MSc programme was alluded to at several points. This is probably the most important issue with MSc accreditation. Put simply, if a programme is structured around technically deep material, it clearly satisfies the NQF. If the programme material is technically broad, it is more difficult to determine the output level. In the UK, it is expected that an MSc programme will require a student to complete a major individual investigative project, typically worth a third to a half of the total programme credits. The project should allow students to demonstrate that they have developed technical and problem solving skills of the required depth. The onus is on departments offering technically broad MSc programmes to ensure that all students will be given projects that require technical depth to complete the assigned task. These projects must allow students to demonstrate their ability to solve open-ended technical problems. The necessary

competences must be self evident from the final project reports that would be examined by the visiting panel. Generally projects that require students to just review a technical area would not be considered acceptable for an accredited programme. Visiting Panels will also ask to see the guidance issued to students at the start of their individual investigative project. Again the expectation is that the guidance will indicate to students the depth of both technical and problem-solving skills required in a successful project and align with the NQF.

Issues with Delivery Mechanisms

MSc programmes in the UK use a variety of delivery mechanisms, often to allow programmes to take a mix of full-time and part time students. For example, if an MSc is delivered through block taught modules, students may not be present at the University when the accreditation panel visits. Universities are reluctant to schedule a visit during a teaching "block" as there may not be time available in the schedule to allow students to meet the panel. This presents a difficulty for a panel, as they will expect to meet with current students to discuss their experiences. The standard visit report forms contains a section on reporting back on discussions with students. Universities need to make every effort to ensure current students are present during the visit. Also if students are not available for discussions with the panel, it can sometimes lead to the impression that the department is attempting to conceal negative student comments.

The use of such approaches as distance learning or work-based learning can lead to different forms of assessment. The Visiting Panels will have to become familiar with evaluating student output that is in a different form to the traditional undergraduate programmes. This requires the PEIs to be flexible in their approach to novel assessment methods. Requiring students to demonstrate competences by using only "traditional" methods, fails to recognise the demands on work based part-time students. Also it is vital that the Universities can demonstrate that any novel assessment strategy is rigorous and requires students to attain the correct level for the award. Again the onus is on the University to provide the evidence that the assessment mechanism is suitable, rather than expect the visiting panel to extract the information from various course materials. In particular, the industrial members of the visiting panel may initially be most concerned about assessment strategy such as reflective portfolios. So supporting evidence must emphasise the technical rigour as much as the educational philosophy.

Concluding Remarks and Summary of Good Practice

When assessing the outcomes from MSc programmes the fundamental issue is level. Universities must demonstrate that their engineering MSc programmes build on a knowledge base that satisfies the minimum requirements for an accredited BEng programme from the awarding PEI. This means those MSc programmes that are designed to cover a broad, often very industrially relevant area, must ensure the investigative project allows students to demonstrate depth of both technical and problem solving abilities. An accredited MSc programme implies that the graduates of the programme will have attained certain competences and this cannot be compromised to meet any short-term requirements of industrial sponsors. Also MSc programmes are not expected to cover every outcome statement in UK-SPEC, as this will tend to broaden the material in the programme. PEIs should expect to see significant coverage of UK-SPEC but focused on those areas that are traditionally covered in the latter part of undergraduate programmes. Finally, if rather obviously, PEIs will expect that a programme will have significant content relevant to their

branch of engineering. The pressure to recruit postgraduate students can lead departments to offer programmes that are a hybrid of engineering and another discipline.

To summarise, the following good practices should be observed by PEIs and HEIs for the process of accrediting taught masters programmes to work effectively.

PEI

- Guidance to departments seeking accreditation must emphasise the need to align with both UK-SPEC and NQF. Also make clear that taught masters programmes are not expected to produce graduates who satisfy every competence in UK-SPEC.
- Ensure that industrial members of visiting panels are familiar with the NQF and are comfortable with using the descriptors
- Ensure that accreditation committees are familiar with approaches to assessing work based learning and prepared to be flexible
- If the PEI is visiting a department that is unfamiliar with the accreditation process, the Chair of the Panel must explain that it is usual to ask for conditions to be met before accreditation is awarded.

HEI

- Ensure that the department team putting together the accreditation submissions have some experience of doing previous quality assurance documentation. If such experience is not available in the department, PEIs will have staff who can advise on the submission
- Clearly indicate in the documentation where programme modules are introductory in nature and which deliver the more in-depth material. Ensure the output standards matrix is completed correctly.
- Guidance notes for major individual project work should ensure that students understand they are expected to demonstrate certain competences in their work. Also ensure that students are not given review style projects
- If work-based assessments are used, be prepared to explain the rationale for using the assessment method and ensure that evidence of the rigour of the approach is supplied to the panel.
- Ensure that the suggested visit date will allow the panel to meet current students
- It is to be expected that the award of accreditation will be subject to certain conditions and recommendations. This is the normal practice of PEIs and should not be viewed as criticism of the department or the programme.
- Be aware that PEIs accredit the programme content and structure as described on the visit. If there are subsequent major revisions to the programme, the PEI must be informed before the planned changes are implemented.

The issue of the European Qualifications Framework (Department for Education and Skills 2007) should also be mentioned when discussing MSc programme. At present both the UK MEng and MSc programmes do not satisfy the Bologna model of a 3+2 degree cycle. At the time of writing, there is much debate in the PEIs on how the Bologna model will affect programme structures in the future (Hibbert 2008). UK-SPEC is based on students attaining certain competences throughout their higher education with four years of hierarchical study satisfying the educational base for Chartered Engineer status. It must be hoped that the competence-based approach of UK-SPEC is recognised as complementary to the number of degree cycles approach of the Bologna model. The rigorous approach of PEIs to the accreditation process can assist in this process.

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