

# Using Trend Analysis to Influence New Course Production

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**Abstract - The Engineering Division at the University of Northampton provides a range of courses at both undergraduate and postgraduate level, in full-time, part time and distance learning modes. Many of these courses have been designed for specific industries, but of those some have been successful and others less so. The courses that have been successful tend to have strong links to the industry association, such as the courses developed for the Lift and Escalator Industry Association (LEIA), or the quality courses with the Institute of Quality Assurance (IQA). Others, such as the Electronics for Computing or the Motorsport Foundation Degrees, do not map on to any specific association, which may be one of the factors that have led to their relative lack of success.**

**This paper will analyse the trends in these courses over the last decade and draw conclusions on the factors that have made the courses successful or not. In particular it will raise issues of assessment e.g. are exams necessary, and progression.**

**In 2005 we were approached by the Northampton-based British Institute of Non-Destructive Testing (BINDT) with a view to collaboration. They are interested in developing an academic qualification that could be gained by people in the Non-Destructive Testing (NDT) industry. A proposal was made to develop a Foundation Degree (equivalent to the first two years of a 3-year BSc) called the FdSc in NDT, which would be distance-taught and would be closely linked to the practical certification that NDT practitioners have to undertake. It is intended that material will have been developed for a validation in June 2007. As stated earlier, our distance-taught material that has been successful has a strong link with an industrial association. By analysing performance on existing courses we hope to learn from our experience and ensure that this new course is a success.**

*Index Terms* – Curriculum Development, Trend Analysis.

## INTRODUCTION

The Engineering Division of the University of Northampton (UoN) runs a number of courses included a full-time classroom delivered BSc degree and at sub-degree level, a Higher National Diploma (HND) in Engineering, 2 part-time Higher National Certificates (HNC) in Engineering awards, and an IQA Diploma. It has also been running distance learning courses since 1983 in the specialist area of Lift Engineering. Initially this was a Professional Development Certificate in Engineering designed and taught for the Lift and Escalator Industry Association (LEIA). In 1999 this was extended when a masters degree called the MSc in Lift Engineering was produced, which is also taught by distance learning. More recently the distance learning provision in the Engineering was expanded following two successful bids to the European Social Fund (ESF) to fund the production of a Foundation Degree in Lift Engineering, and a BSc (Hons) and Foundation Degree in Electronics for Computing. These courses have been running since 2003. A further award was added to the portfolio in 2005 with the validation of another foundation degree, the FdSc High Performance Engineering (Motorsport). In all cases, the Foundation Degrees have been relatively unsuccessful, attracting very small numbers of students. In 2005 the British Institute of Non-Destructive Testing approached us and suggested that with their help we might like to produce a Foundation Degree in Non-Destructive Testing. We therefore decided to look into our existing courses to see if we could ensure that the new course would be more successful.

## THE POTENTIAL MARKET

Non-Destructive Testing (NDT) is a field of engineering which cuts across many industries, from power generation to aviation. It employs in excess of 25,000 individuals in the United Kingdom alone, many of which are based in small to medium size enterprises (SMEs). Education provision within this sector has traditionally focused on the technician level and there has been no graduate level provision. This has placed a major barrier to advancement and continuous lifelong-learning.

The BINDT has indicated that there is a significant market, both in the UK and abroad for an academic qualification which expands upon the practical certification that all NDT

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engineers have to undertake to continue practicing. This certification is the Personal Certification in NDT (PCN) which is awarded by the BINDT in the UK. In addition, many of the larger companies run their own equivalent certification which is accredited by the BINDT.

A recent survey of the members of the British Institute of NDT [1] which is considered to be representative of the 25,000 or so individuals working in the UK NDT industry, revealed that there are two significant problems adversely affecting the construction, fabrication and in-service plant maintenance sectors:

1. A lack of new entrants into the NDT profession, resulting in an acute shortage of inspection personnel available to service cyclic peaks in demand (such as experienced in power station maintenance during outages, major plant construction projects, overhaul of offshore oil and gas installations).
2. A demographic problem of ageing NDT professionals caused by the lack of new entrants to the profession, which is in turn caused by a poor perception of engineering as a profession and, for NDT in particular, the lack of any available foundation or first degree courses.

This is illustrated in Table 1, which shows the demographic distribution of NDT employees in the UK and other countries.

TABLE 1  
AGE PROFILE OF NDT PERSONNEL (FEBRUARY 2007)

	-30	30-39	40-49	50-59	60-69	70-79	80+	Age
Czech Republic	12	31	25	27	5			Percentage
France	16	29	33	21	1			
Germany	1.5	15	30	32	17	4	0.5	
Slovakia	13	28	41	25	2			
South Africa			Majority					
Spain	12	37	25	23	3			
Sweden				Majority				
UK BINDT	4	9	27	37	18	4	1	
UK PCN	15	25	32	23	5			

A further hindrance to the development of any undergraduate courses in NDT is the fact that NDT engineering individuals and businesses are geographically widespread. The proposed distance learning solution is the only viable option.

There are principally two target groups:

1. Existing industry professionals vocationally qualified to Level 3 NVQ, whose careers are stagnating because of the lack of a recognised academic degree level qualification that would enable them to progress into middle and upper management;
2. Younger entrants to the NDT profession who, unlike their forbears, have little or no engineering skills and background, and lack higher education qualifications such as to properly equip them for a career in NDT – a consequence of which is that they leave the profession early to seek a career where advancement through

gaining one or more readily available academic educational qualifications is a real prospect.

The BINDT is a Charitable organisation and is the Professional body for the NDT industry within the UK. It is not part of their remit to hold and run HE level courses and they receive no direct funding to undertake such activity. Given the particular need and uniqueness of this new qualification they have received the commitment from their Governing Council to provide support in 'In kind'. The requirement for this Foundation Degree is confirmed by a statement from Tony Wooldridge, MA, CEng, FInst NDT from the British Nuclear Group:

*"On behalf of British Nuclear Group, for whom I manage the NDT resources for our Magnox reactors, I can confirm that there is a national shortage of suitably qualified NDT engineers. The problem is particularly acute for inspections involving advanced techniques for which the training provided for standard NDT personnel certification is not sufficient. I have no doubt that it would be valuable to develop an educational structure which allowed operators who are qualified in conventional NDT techniques to develop their skills in more advanced techniques. Such a structure would also encourage new entrants to this sector of engineering by demonstrating that there is a very worthwhile career path in NDT."*

The BINDT would be keen to accredit an academic qualification as part satisfaction of its educational requirements for professional status and upon completion of the course graduates would be able to seek Engineering Council UK (ECUK) registration through the BINDT at EngTech or IEng level. This would create a properly educated and motivated pool of management potential personnel, and encouraging new entrants at Level 1 and 2 as defined in EN 473, which will feed into the higher education system in due course. The following table shows the relationship between PCN certification, academic awards and Engineering Council status.

TABLE 2  
RELATIONSHIP BETWEEN ACADEMIC AND VOCATIONAL QUALIFICATIONS

WORK BASED	VOCATIONAL	ACADEMIC	PROF. REG	NQF EQUIV
WORK BASED LEARNING - APPRENTICESHIPS		Engineering Doctorate		8
		Masters Degree	Chartered Engineer	7
		BSc (Hons) NDT	Incorporated Engineer	6
	PCN Level 3	Foundation Degree Y2		5
				4
	PCN Level 2	Foundation Degree Y1	Engineering Technician	3
	PCN Level 1			
SCHOOL LEAVER OR OTHER ENTRY LEVEL				

## THE PROPOSED QUALIFICATION

This proposed solution is a Foundation Degree (FdSc) in Non-Destructive Testing (NDT) which will be the first academic qualification in NDT at this level in the UK (and possibly further afield). The FdSc will be a highly flexible, part-time modular based course which will meet the needs of the industry.

The FdSc in NDT overlaps the PCN Certificate in terms of academic level, but extends to second year degree level. As part of a career progression, it aims to enhance the breadth of the student's knowledge and academic skills to an extent where

- the engineering responsibility of a successful student can be expanded with confidence on the part of both the student and the employer
- the student is capable, if she/he so wishes, of benefiting from entry into the final year of the UoN BSc Non-Destructive Testing (which will be produced and validated at a later date)
- given appropriate additional experience, the student can apply for recognition by the Engineering Council to the level of Engineering Technician (Eng Tech), Incorporated Engineer (IEng) and possibly Chartered Engineer (CEng).

The proposed qualification will deliver a flexible industry focused qualification which is strongly supported by the vision of the Vice Chancellor who in a recent paper stated "...we must address as a matter of urgency, the development of mixed-mode delivery across all our provision utilising web-based and other technologies" and that we must "...deliver to the students place of employment or home the requisite course materials...". This vision forms a key part of the University's mission statement and corporate goal. Furthermore the strategic 5 year plan of the School of Applied Sciences identifies the development Centres of Excellence in the areas of Lift Engineering and NDT as key to the development of the Engineering Division. Over the past three years through support from the New Technology Initiative the Division has invested in significant NDT equipment. To support this activity the Division has also employed staff in some of the specialist NDT disciplines.

The links between this Foundation Degree and current Government policy are strong. This is evidenced by the partnership strategy used to develop the course, the method of delivery and the target beneficiary groups. The Department for Trade and Industry in the UK (DTI) in their report "Engineers for the 21st Century Inquiry Launch" [2] regarded the need for developing new engineering provision within Universities and promoting Continuing Professional Development (CPD) amongst engineers as vital for the advancement engineering profession. The current policy voiced by the Department for Education and Skills (DfES), in their report "The Future of Higher Education" [3] argues that to increase HE uptake and close the current skills gap which exists (particularly in Technical areas) HEIs are going to have to offer more flexible, part-time, industry and work focused courses which encourage CPD and Life-long Learning. They state: "There are not enough choices for

flexible study - including part-time courses, sandwich course, distance learning, and e-learning - and there must be an increasingly rich variety of subjects to study, which keep pace with changes in society and the economy." The DfES further states: "Higher Education should be a choice open to everyone with the potential to benefit - including older people in the workforce who want to update their skills." The proposed Foundation Degree addresses most if not all of these current concerns and will go some way to assist in the educational challenges outlined by both the DTI and the DfES.

## COMPARISON WITH OTHER COURSES

Many of the arguments presented above about the need for more flexible industry-focussed qualifications could be applied to any of our Engineering courses. However, all of the Foundation Degrees that we have put on recently have recruited poorly. There seems to be a number of reasons for this:

- Foundation Degrees are a new qualification that perhaps isn't understood by employers;
- Many of the students who have joined these courses already have qualifications and are only interested in doing specific modules and not getting the award;
- There are competitive courses in the subject area of some of the Foundation Degrees;
- The targeted industries are not represented by a strong single organisation;
- Overseas students are attracted to the courses because they are distance learning, but are then put off because they have to come to the University to attend a weekend school and to take exams.

Within the UK, the Universities and Colleges Admissions Services (UCAS) [4] lists over 145 Foundation Degrees of which 15 are motorsport related, and 21 are electronics related. The University of Northampton is the only place which offers a Foundation Degree in Lift Engineering, and the only place that offers its Foundation Degrees in Distance Learning mode. The proposed FdSc in NDT will also be the only one of its kind within the UK.

## STRUCTURE OF THE COURSE

The FdSc will be modular in structure and will run over an academic year. Initial entry points to the course will be flexible. There will be regular assessment which will take a variety of forms suitable to distance learning courses. The benefit to industry and specifically small businesses is that an individual can take any module at any time to satisfy a specific skills requirement. The benefit to the individual is that they can accumulate modules and ultimately acquire a HE level 4 qualification. The FdSc course will cover the training and examination syllabus published in support of European standard EN 473:2000 (Non-destructive testing – qualification and certification of personnel), and will be aimed at the highest level – Level 3 – available under this vocational qualification standard.

Foundation Degrees are to have a number of principles within their design, which were specified by Higher Education Funding Council for England (HEFCE). These are:

- 240 CATS (Credit Accumulation and Transfer System) points
- Equivalent of two years full time, but can be part time.
- Must include work based learning
- Demonstrate links to higher qualifications
- Partnerships between institutions are encouraged.

The approach of this Foundation Degree will be that work based learning constitutes a Level 1 40 credit module.

### ADMISSIONS POLICY

A specific admissions policy has been developed for this award in conjunction with the British Institute of Non-Destructive Testing. In the first instance it is assumed that the target audience will be existing practitioners in NDT who will have practical certification, PCN, at level 1, 2 or even 3. The PCN scheme is run by the BINDT who, in addition, accredit other qualifications from around the world and can give specific advice, if necessary, on the level of equivalent qualifications.

It is proposed that students without any certification must take all modules on the FdSc. However, PCN Certification (or its equivalent) allows the following exemptions:

- PCN Level 1 certification (or equivalent) – Students are exempt from the modules:
  - Introduction to NDT;
  - Work-Based Learning;
- PCN Level 2 certification (or equivalent) in Visual Inspection, Penetrant, Magnetic and/or Eddy Current Techniques - Students are exempt from the modules:
  - Introduction to NDT;
  - Work-Based Learning;
  - Materials Properties;
- PCN Level 2 certification (or equivalent) in Ultrasonic and/or Radiographic Techniques - Students are exempt from all of Stage 1;
- PCN Level 3 certification (or equivalent) - Students are exempt from all of Stage 1 and the specific Stage 2 module in the method in which level 3 certification is held e.g. PCN Level 3 in Ultrasonic Inspection would exempt Ultrasonic Testing.

### LEARNING AND TEACHING STRATEGY

Each module will be assessed by coursework only. The coursework usually consists of tutor-marked assignments (TMAs) and computer marked assignments (CMAs) or examples for the student to work through. The CMAs are normally multiple-choice questions that are aimed at giving the students feedback on their progress quickly and are therefore primarily formative although a mark is still awarded.

Modules will consist of an appropriate number of learning packages (LPs) and other materials such as reference texts, with self-assessment questions at relevant points in each LP, in order to assist students in monitoring their own progress.

In a distance learning programme, it is essential to provide the student with a framework for study. Consequently, each module will be provided with a timetable indicating the expected rate of progress through the material, together with key dates for the submission of assignments. The cut-off dates of TMAs and CMAs is fixed, but in order to allow a more flexible study pattern, these cut-off dates can be interpreted as the latest dates for submission. In other words, students can submit and expect to get feedback on assignments at any time up to the cut-off date. This is achieved by giving each student their own customised assignment.

Customised assignments will be achieved by the creation of a bank of questions. When students open up an assignment, they enter their student number, and a selection of questions are taken from the bank. This ensures that each student gets a different assignment, allowing feedback to be given to the student at any time after they submit, without giving other students access to the solutions to their assignment.

Every student will be required to attend UoN for a weekend school during each year of study. Normally, this will be the inaugural weekend school at the commencement of the academic year. This will simplify the registration process and provide the opportunity to receive guidance on:

- operation of the programme
- study skills, and
- time management

During the academic year, there will be at least one other, voluntary weekend event where tutors will be available to students for face to face discussion.

### CONCLUSIONS

When the University of Northampton launches its new distance-learning FdSc in Non-Destructive Testing in 2007 it confidently expects to attract a significant number of students. In the first instance these will be mature workers in the industry who want to capitalize on their life's work and knowledge by achieving an academic qualification. Over time it is expected that younger people will be attracted to the course because of its place in the overall structure of a career in NDT. Given that there is no competing course in the UK at present, the University should be able to hold on to this lead for some years to come.

### REFERENCES

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