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Distance learning program for a professional career in acoustics

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ABSTRACT

Acoustical consulting companies frequently face the need to employ staff but find that, while there may be very good applicants with engineering and science backgrounds, there are few that have any experience in acoustics. Larger consultancies can provide 'in-house' training but this is a strain on resources and smaller consultancies do not have this capacity. Any course available via a formal university system may not be available at a suitable time or location. A flexible distance learning program of study, based on the UK Institute of Acoustics Diploma, has been developed as a short course and managed via the university and supported by the Association of Australian Acoustical Consultants. A key feature of this program is that there is no need for the registrants to attend any central location at any time during the program. The early experiences with implementing the program have been influenced by the continued interest and support from the senior, experienced acoustical consultants. In this paper we will discuss the structure and experiences in the implementation of this fully flexible distance learning program.

INTRODUCTION

Acoustical consulting companies frequently face the need to employ staff but find that, while there may be very good applicants with engineering and science backgrounds, there are few that have experience in acoustics. For the right person with the right skills there are good career opportunities as an acoustics consultant in private industry or as an acoustics specialist in government or semi-government agencies. In this paper we describe the problem, outline the approach taken to provide a professional development program in acoustics and report on the experiences since the previous paper [1].

The job advertisements for new personnel for an acoustical consulting or government agency can often imply that a degree in engineering is a preferred requirement - often embedded in the job title as 'acoustic engineer'. However, the experience of most large consultancies is that a person with appropriate education opportunities *and* an interest and enthusiasm for acoustics can develop the necessary expertise. Also the extent and scope of acoustic and vibration courses within engineering degrees can be very dependent on the particular engineering school the person attends. Thus, even a graduate engineer may need further education. An applicant with a degree in a science or building discipline should be considered as possessing the suitable education requirements. In recent years, there has been an interest from those who have worked for some years as audio or sound engineers in the music industry and seek to transition across to broader acoustic consulting. Many of these audio engineering courses are not run as formal university programs but may be offered by Institutes of Technology or private schools. The work experience of these personnel in the music industry means they have a breadth of understanding of reproduced sound coupled with an interest in acoustics and they can be excellent appointees with appropriate training.

Acoustical consultancies are regularly seeking new employees and often this is done internationally ie advertisements for jobs in Australia appearing in European listings and vice versa. One reason for the difficulty in attracting new staff is that a career in acoustics does not have a high profile in the general vocational information. This is understandable as the proportion of the total number of engineering or science students that would undertake a career in acoustics is very small. Consequently the careers information for prospective engineering and science students focuses on the broader areas for employment and rarely mentions acoustics; just a few examples are the web pages for the engineering promotion by ASEE [2], Studying Science and Technology Worldwide [3] and the Vocational Information Centre web page on careers in engineering, science and maths [4]. This latter page does have a link (under education to 'Acoustical Programs') which leads to the web page for the American Acoustical Society on education and careers [5]. So knowledge of the opportunities for a career as a specialist in acoustics relies very much on chance, such as meeting someone who knows about the specialty, reading an article that highlights an acoustics achievement, seeing advertisements for acoustics specialists, or attending a university where acoustics and vibration research is being undertaken. The Association of Australian Acoustical Consultants (AAAC) [6] has recently published information on careers in acoustics to help address this shortage.

Employers would ideally like to offer positions to graduates who already have a good understanding of acoustics. However, there are only a few institutions around the world that offer an undergraduate degree in acoustics or offer a

degree program that allows for a major in acoustics. The extent of available subjects dealing with sound, noise and vibration depends on acoustics and vibration being a research strength within the school. When this is the case, there are staff who are particularly enthusiastic about the subject. Otherwise, control of acoustics or vibration may be discussed in courses where the main interest is on other topics such as structures or machinery and there is not the opportunity to focus on the details of the control options.

Once a graduate has decided on a career in acoustics developing and refining the appropriate skills is required and some form of post graduate study is recommended. Most major acoustical societies have links to post graduate opportunities for further study. There are some directories to assist for example those given as links from the International Commission for Acoustics (ICA) website [7], such as those set up by the American Acoustical Society or by the European Acoustics Association Schola. Such directories rely on the institution self listing and maintaining accuracy. Incorrect and outdated information is an annoyance. While national and international travel to undertake courses or programs of study is becoming increasingly popular, it is still not always a viable option.

When a consultancy or agency selects the best candidate from the applicants it is rare that person comes with the skills in acoustics required for the work. Skills development can be provided by in-house training, careful supervision, and mentoring. Even when there are suitable resources for in-house training, a responsible employer wishes to further develop and enhance the skills and knowledge of their personnel by encouraging them to undertake continuing and further education in acoustics outside their organisation. Unfortunately, this is when there can be a problem. Formal tertiary education opportunities often do not exist within a reasonable distance from the place of employment. For any formal education course to be be suitable, there is the need for formal enrolment and compliance with the commencement and completion dates. With varying workplace demands there can be difficulties meeting these time constraints.

For some time, the consulting companies in Australia faced this challenge. Many were expanding and seeking new staff but there were few appropriate education opportunities for developing the skills of these staff. The Australian Acoustical Society (AAS) and the Association of Australian Acoustical Consultants (AAAC) investigated the problem and developed a set of criteria for an appropriate program of study. They then investigated the opportunities that currently existed within Australia and internationally and found none met their requirements. The AAAC took the lead to establish an arrangement with a university for the offering of a professional education program in acoustics under the short course program via the business services office. The first module in the flexible distance learning program for professional education in acoustics was offered in 2007. A second module was released in 2008 and work is progressing on other modules to complete the program.

DEVELOPMENT OF THE PROGRAM

Following consultation with the various stakeholders a list of requirements was developed. There have been some small changes based on the experiences of the implementation but the core requirements include:

- Rigorous yet practical program offering courses covering the range of topics that are encountered in consultancies and agencies and with references to relevant Australian documents
- Available in a distance learning mode with no requirement to attend a particular location at a specified time
- Flexible completion
- Formal assessment process involving submissions and examination for some modules
- Possibility to convert or upgrade to a formal post graduate program of study
- No formal education prerequisites to commence the program
- Formal Diploma certificate to be issues by the AAAC on completion

The AAS/AAAC education committee reviewed the options that existed in Australia and internationally for appropriate further education programs. None of these satisfied the requirements; in particular most had a specified time frame and required a classroom component at some stage. The Diploma in Acoustics and Noise Control offered by the UK Institute of Acoustics (IOA) [8] seemed to best meet most of the requirements that had been identified. It has been running since 1975 and:

"…was set up to provide specialist academic training to meet the educational requirements for Corporate Membership of the Institute of Acoustics. Over the years the course has become well established as providing high level training in real-world practical acoustics."

While this diploma is normally undertaken by part time study at an Institution, there is also the option of a tutored distance learning scheme. Following discussions with the IOA it soon became clear that this program did provide an excellent basis for an Australian program but that it needed considerable revision and updating especially to meet the requirements for the fully flexible distance program.

The IOA were very cooperative and provided copies of their current material for the General Principles of Acoustics; the compulsory first module of the IOA Diploma course. While the basic concepts of acoustics are clearly the same, considerable work was necessary to revise and update this material for the Australian module. However, the overall syllabus was maintained. It was then decided that the general structure of the IOA program would be used as a guide but further modules would be developed within Australia. The cooperation has been reciprocal by way of theAustralian version of the module being forwarded to the IOA for their use during the revision of their program.

IMPLEMENTATION OF THE PROGRAM

The basic structure of the Professional Education Program in Acoustics comprises a number of modules of which the first, General Principles of Acoustics, is compulsory. The second recommended module is Acoustic Measurements and the subsequent modules will include Architecture and Building Acoustics, Environmental Acoustics, Vibration and Shock, and a Project as a component of each module. This measurement module differs from those with similar titles in other programs as it focuses on the basis requirements for the range of measurements that are encountered in practice and is not based on measurements in a laboratory.

The main content of each module has been agreed upon by consultation among the education committee. The staff in the consulting companies has reviewed the material initially produced by one author. For some of the later modules one author provided the structure for the module and as much content as possible. This was then supplemented by consultants with experience in those areas.

Enrolment for each module is individually processed with the only prerequisite being successful completion of the General Principles of Acoustics module. The fully flexible nature of the program means that students can register at any time during the year. They are sent the materials electronically for that module via secure pdf files. Each module provides assignments and experimental projects which are returned for assessment. There is no specific date by which these must be submitted. The students can decide to take the examination on one of the four dates of offer throughout the year.

One major initiative of the program is there is no requirement to go to a common centre for either the experimental work or the examination. Senior staff of the consulting companies arrange for the supervision. There is an agreement that AAAC member firm senior staff will also provide the supervision for any registrants in the local region that are not working for an acoustical consultancy firm.

The experimental work has been designed to be undertaken using equipment that is widely available in consultancies. For example, one experiment involves investigating sound source characteristics using a sound level meter and investigating the effects of different time periods on the metrics. One vibration experiment requires measurement on the casing of a machine and on a suspended floor which someone is walking on. These are not complex exercises but have been designed to highlight key elements in practical measurements. Presenting the findings in a clear and comprehensive report with a comprehensive interpretation is also part of the exercise. The registrants from one city are encouraged to undertake the experimental work together under local supervision; but individual work schedules make this is difficult to achieve.

Although no formal tutorial system has been implemented, the consulting companies have indicated strong support for the program and do provide assistance to the registrants as necessary. The registrants can also contact the program administrators to obtain assistance.

The examination is offered four times a year with supervision provided by a supervisor from the registrant's employer. The examination file is then sent in confidence to the nominated person who arranges for the invigilation of the test. This person then returns the test paper and answer books.

EXPERIENCE WITH THE PROGRAM

The promotion has not been intensive; rather it has relied on a web page listing [6] and an occasional item in the AAS journal. The demand for this program was immediately apparent with 38 registrants during the first year for the first module; this was largely driven by the AAAC member firms. Since then, the numbers have dropped to around 20 per year. The interest has included up to 10% of registrations from outside Australia.

The concept is certainly appealing and meets a need especially with the flexible approach. On completion of the modules, students may apply for credit in other studies. While in one respect this is clearly an advantage, the removal of rigorous times for completion means completion does not necessarily have high priority. For example, of the 38 registered in module one in 2007:

- 17 have completed all parts of the module
- Seven have assignments outstanding
- Six occasionally respond so they are potential completions
- Eight have formally advised of their withdrawal

The majority of the completions were within 12 to 18 months of registration. In two cases the registrant took a long break from work and returned to complete the module more than two years after initial registration. For those being sponsored by their employer an additional rule was introduced in 2008 that required completion within 12 months unless an extension was approved by their employer. Typically these registrants complete the test within the required time period but the submission of the assignments is deferred due to work pressures. With registrations in the module commencing at any time throughout the year, it is an administrative challenge for the course administrator to implement the time restriction. So while it can be used as a prompt and encouragement for completion, in practice this has been difficult to implement. It has been more effective when the employer has used successful completion of the module as a performance review criterion.

There have been a few who have not passed the test satisfactorily. In these cases discussions with the supervisor has led to alternatives for the assessment of the test. If the student admitted they had not prepared properly they were given the opportunity to resit the test the next time it was offered. In two cases, the supervisor advised that the student had difficulties in a test environment and alternative assessments were developed. In one case, the student had not read a number of the questions carefully so they were given the test paper and an electronic version of their original answers under supervision. They were advised to review the question and to reconsider their answer. In the other case, the student was given an opportunity to resit a modified test focussing on the topic of those questions for which their initial answers were inadequate.

The assignments and experimental reports have generally been of a high standard. Those working in the area have access to software that makes the presentation of their reports very clear. But often they focus on presentation and their interpretation of the findings is inadequate. These are then asked to resubmit their work.

The development of the material for the later modules has also taken longer than anticipated. It is a substantial time commitment to develop the material in a distance learning format for such a diverse range of students. The material needs to be clear and comprehensive and have many case study examples of practical implementation. At this time the compulsory general principles of acoustics and the measurement modules are available. Work is proceeding on the vibration and the room and building acoustics modules. The slowdown in the completion of the first two modules has reduced the pressure on those providing the course material due to the small cohort ready to enrol. But it is acknowledged that this is unfair to those few who have completed in the minimum and want to complete the program.

CONCLUSION

To address the high demand for education programs to develop the skills of new staff for acoustical consulting companies, a fully flexible distance learning program has been developed in Australia based on the model of the IOA diploma. The content has been developed with the input from AAAC member firm consulting companies and is aimed to be rigorous but with a strong practical element. The individual modules of the program are offered via a short course program managed by a university. This allows for commencements at the time that suits those entering the profession. The demand for this education has been shown by the high number of registrants for the first modules. The flexible nature of the program allowing commencement and completion at times suitable for the student and their employer is a great benefit for the program. However, the removal of hard deadlines for submissions and completions means that other priorities intervene and many students take longer to complete each module than is preferred by their employer. Future developments include Architecture and Building Acoustics, Environmental Acoustics, Vibration and Shock modules and the issue of AAAC Diploma certificates for students who complete the minimum requirements.

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