

A cross-university collaboration model for engineering and technology education between developed and developing countries

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ABSTRACT: A collaboration project is described in this paper, between a large multi-campus university in Iran and a number of British universities for PhD training of academics from Iran. A favourable financial package was agreed, which included scholarships from the parent university and fee discount from the host universities. The agreement also required the candidates to gain experience in teaching, course development and quality assurance procedures alongside their research work. A total of 52 academics from a pool of about 1,200 candidates with a Master's degree, who met the entry and language requirements enrolled in the PhD course. Forty-two candidates have successfully completed their studies to date with an average duration of 44 months. More than 145 refereed journal and conference papers have been published so far, and more have been submitted or are being prepared. Candidates were actively engaged in curriculum development, delivery and quality monitoring of courses hence becoming familiar with characteristics and attributes of the British system of education. The project was deemed successful, benefiting all parties.

INTRODUCTION

Population growth, national aspirations and recent financial uncertainties have created a major shift in demand for engineering and technology education from developed to developing economies. This has resulted in growing requirements for academic staff in developing countries that not only have cutting edge research capabilities but are familiar with modern pedagogical strategies to provide leadership for a sustainable higher education development [1]. However, there are many perceived problems in recruiting and training such academics due to a number of limitations, such as lack of sufficient local capacity for PhD studies.

The Islamic Azad University (IAU) is the third largest university in the world and, arguably, the largest campus-based university [2]. The University started in 1982 as a non-profit organisation in response to the growing demand for higher education. Today IAU has about 1,700,000 students studying in more than 400 campus branches across Iran. There are over 35,000 academics and an equal number of administrative/clerical staff. Each branch is operated as an autonomous centre, with its own management structure, and large branches in major cities offer a comprehensive set of qualifications from Bachelor to PhD in a variety of subject areas. Although the main emphasis of the university is on education, a great deal of attention and resources have been directed to raise the research profile of the University, and practically all branches are actively involved with applied as well as fundamental research activities. The University has also invested extensively in research-active centres of excellence in recent years, to the extent that the University's international output has now overtaken all other universities in Iran [3].

In the third decade of its operation the University embarked on a strategic programme of quality enhancement. This was due to rapid growth in student population, expansion of university branches in rural areas, emphasis on enhancement of students' learning experience and the focus on establishing a proactive research culture. An integral part of this programme was staff development activities in general and increasing the number of academics with a PhD degree in particular. Entry to PhD programmes in accredited state and private universities in Iran is only possible through a stringent national entry examination due to high demands and limited places available. Every year only a small portion of applicants can enter into PhD courses irrespective of their quality and educational capabilities. Furthermore, only a small fraction of unsuccessful applicants can afford the substantial financial costs to move to overseas universities.

To achieve their staff development target while being mindful of limited local opportunities, IAU initiated a scholarship programme to enable their academic staff to study for PhD degrees in universities in the UK. The added benefit of this approach was not only the awarded degree, but the opportunities to make their academics familiar with a different system of higher education with a view to assisting with development of local educational strategies on their return. In 2007, the project was delegated to Azad University branch in Oxford, (AUO), to plan and manage.

PROJECT CHARACTERISTICS

To establish a collaborative model, AUO first approached Kingston University in London. The selection was based on the familiarity between the two universities as an undergraduate collaboration model already existed between them. Following a series of detailed negotiation a tentative PhD model was agreed between the two institutions. It included the provision of partial scholarship by IAU and fee reduction by Kingston University. Subsequently, similar models were adopted for collaboration with other universities. The main features of the agreement were:

- Applicants to spend a period of orientation at Azad campus in Oxford prior to commencement of their studies, to include English language courses dependent on individual needs.
- A supervisory team from the host university works with each applicant to design a project by pulling together the applicant's research aspiration, expertise of the supervisor and potential requirements of the IAU research strategy and local needs.
- Once a research proposal is finalised and approved by the appropriate research committees at the host universities, the students would register for the PhD with the host university and commence their research.
- By mutual agreement the students may spend periods of time at AUO to conduct their research, including the writing-up period towards the end of the project. These periods were included to satisfy the fee discount requirements of the host university.
- Providing opportunities for the students to be involved with teaching activities at the host university and to become familiar with the British system of higher education (HE), developments of learning, teaching and research strategies.

OPERATION

The programme was widely advertised through the IAU internal communication mechanism and an overwhelming number of applicants registered their interest. In the first Phase, 39 candidates who met the academic requirements were selected and entered the UK between April and September 2008, and were originally placed at AUO in Oxford.

Due to high demand in Phase 2, the selection process was further rationalised and candidates went through a series of local tests, including academic English. About 300 applicants from a pool of over 1,000 were shortlisted and finally 50 were approved for scholarship award. However, only 13 entered the UK to start their PhD studies from 2009. The programme was postponed due to issues outside the academic control of the University. One of the applicants from the second Phase also withdrew after only a few weeks and is not included in this investigation.

In total 51 academic staff from IAU entered the PhD programme and were placed in 12 different universities following a period of orientation at AUO in Oxford. In Figure 1, the percentage of students in different subject areas are shown, indicating that about 70% were in general science, engineering and computing (SEC) subjects.

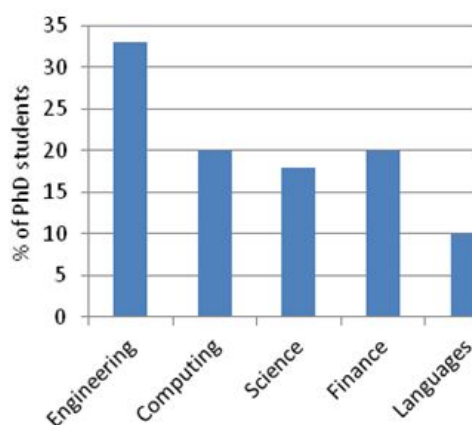


Figure 1: PhD subject areas.

This demonstrates the interest in SEC subjects from a staff development viewpoint at IAU, as well as the aspiration of individuals signifying the value of higher degrees in SEC subjects in the Iranian society. Finance, including accounting and business management, is also an area with a relatively high demand. The interest in this sector primarily was due to the opportunity to acquire knowledge and expertise in related operations in the West, thus educating UG and PG students in Iranian universities, who eventually will have a career in international business activities. The final area was mainly researching new methodologies in teaching English as a foreign language.

The distribution of students in host universities in the UK is shown in Figure 2. Forty-five percent (45%) of all students were placed at Kingston University, primarily in SEC subjects, as the original agreement was made between IAU and Kingston.

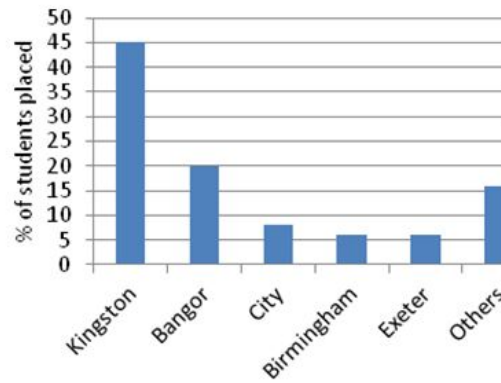


Figure 2: Collaborative universities.

A PhD in Iran is based on study and written examination in predetermined subject-specific modules, a comprehensive written examination, and finally a research project presented in a thesis and defended through an oral examination or viva. It normally takes two years to complete the taught element of the programme before the research project starts. This provides the student with ample opportunities to design a project plan in association with an expert supervisor who had initially proposed the outline project.

In contrast, in the UK the project is predominately the whole basis on which the PhD award is made and there are normally no written examinations. The student is responsible for the quality of learning that takes place during the programme [4]. It is, therefore, imperative to define a project and propose the plan of work even before the PhD study starts. Inevitably, the PhD project should contain originality and demonstrate independent critical judgment; hence, constituting an addition to the knowledge.

All IAU applicants in this investigation had an MSc or MA degree, with at least three years of experience as a university academic; however, for most of them the change of methodologies for a PhD study was initially difficult to adapt to although all had good ideas about their own research interests. They particularly found it difficult to propose an original research project and devise a plan to carry it out over a period of at least three (3) years with major milestones pre-defined at onset.

The problem was the selection of an overall methodology to conduct a fundamental programme of research and its distinction from *methods* used for collection, analysis and presentation of data. Methodology is a higher order term that refers to the logical principles that must govern the use of methods. Methodology is not detachable from the theory or philosophy of the approach to research whereas methods are concerned with achieving more specific procedural outcomes and can be used for a wide range of research approaches [5]. Checkland emphasises that the choice of methodology affects not only the way in which the research is conducted, but also:

- The way in which the data are analysed;
- The way in which validity is demonstrated;
- The type of knowledge contribution that legitimately can be claimed [6].

The original plan in this collaboration programme was for students to spend only a short orientation time at Oxford undergoing an intensive course in English for academic purposes. Due to the lack of clear research methodologies, the programme managers were concerned that if students were transferred to their host universities their PhD studies would be substantially prolonged incurring additional financial burdens. It is generally known that most doctoral advisers do not teach research methods; and some who do, tend to emphasise their own preferences.

This process normally makes PhD students accept what is provided and proceed with their research plan with a single perspective resulting in a short path to the dissertation without addressing the problem domain appropriate at the doctoral level. In many cases, such an approach results in failures at the final monitoring stage and inevitably prolongs the programme duration. The other alternative is that students look for research training at the university level while working on their specific project. This alternative seems the most innovative and one that can potentially lead to the ultimate objective, i.e. a better fit for research in the approach to problem-solving [7]. However, this may result in the application of methodologies from disciplines different in nature from the subject under study, creating confusion for the student.

In this programme, a combination of both approaches was introduced. The period of orientation at AUO was extended to introduce a general research methodology course delivered by in-house advisers, as well as invited guest speakers from Kingston University. The course eventually led to the engagement of academics from Kingston to work with all students to develop their initial research methodology proposals regardless of specific subject areas. In some cases, the

process resulted in the extension of the orientation period to up to nine (9) months. Students were then transferred to the host university to register for their PhD and start their research under the guidance of their supervisors.

PROJECT OUTCOME

The PhD completion rate is a major issue in many universities around the world. A figure as high as 50% has been reported for non-completion in science and engineering subjects in the USA, primarily in part-time studies [4]. The Higher Education Funding Council for England and Wales (HEFCE) has introduced a benchmark of seven (7) years (84 months) for PhD completion by full-time overseas students. It has been reported that in 2003, on average only 74% of overseas PhD students completed their PhDs within the seven (7) year period. The data are only marginally better for full-time home students showing a completion rate of 80% within seven years [8]. This indicates that, while duration of a PhD programme in the UK is considered as three (3) years in full-time mode, in reality it takes considerably longer.

For the current collaboration programme, IAU anticipated an average of three (3) years for research work, and another year for writing up a thesis; hence, an overall average of four (4) years (48 months) for completion. Of 51 students who enrolled on the programme, 42 completed their PhDs by the end of August 2013. The remaining nine (9) joined the programme in Phase 2 and are either on the 2nd or 3rd year of their studies. In Figure 3, the percentage of completed PhDs for different subject grouping is shown.

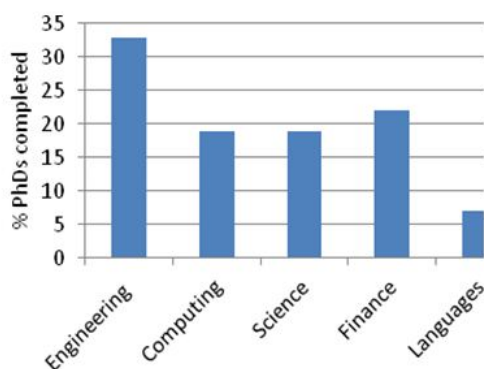


Figure 3: PhD completions.

By comparing this with Figure 1, it is evident that the subject area has little effect on the completion rate.

Figure 4 shows the completion duration, in months, for each student (indicated with an ID number from one (1) to 42 on the x-axis). The four-year completion time expected by the programme and the seven-year benchmark duration specified by the HEFCE are all shown on the same diagram. As shown, one-third of students managed to complete their studies, and pass the viva, in less than three (3) years, with four (4) students finished within 30 months (2.5 years). This is considered a great achievement for the programme and indicates the quality of the planning process, as well as the motivation of the students. In fact, more than two-thirds (67%) finished their studies in the less-than-expected time of four (4) years, and the remaining third completed within 58 months (less than 5 years), much less than average overseas students in England. The mean value of all completions is 44 months, with a standard deviation of 9.7 although the distribution is not normal.

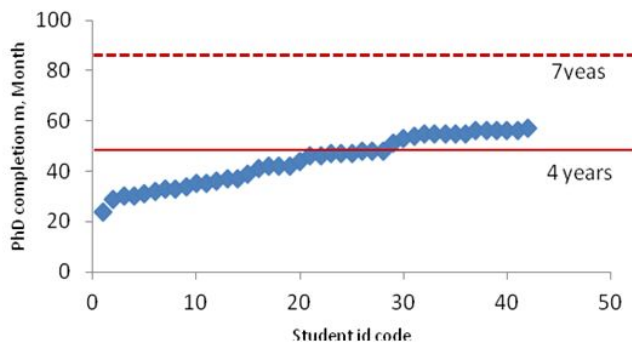


Figure 4: Individual students' completion duration.

There are many factors contributing to such an impressive completion rate, including the initial selection process, high motivation of the students, who were keen to complete and return to their work securing fast track promotions, and, most importantly, the planning process, which included a research methodology course at Oxford enabling students to fully engage with their research once they moved to the host university.

In Figure 5, the average time to complete the PhD for different subject groups is illustrated. While the completion time for students researching in engineering, computing and science subjects was on average between 45 and 48 months, the average for finance students was only 37 months. The practical aspect of SEC subject areas requiring experimentation and use of technology combined with simulation, analysis and theory development could be a contributory factor of this observation. However, the authors believe more research is required to investigate this particular aspect.

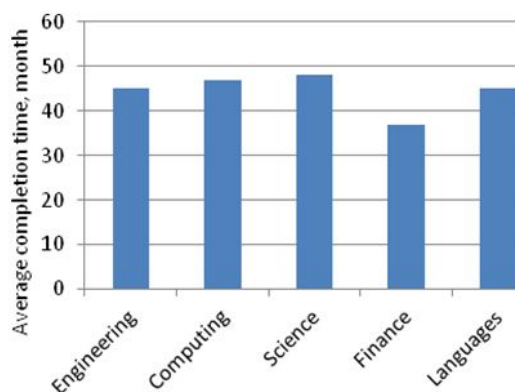


Figure 5: PhD subject completion.

CONCLUSIONS

Fifty-two (52) students from a pool of more than 1,000 academics at IAU in Iran started their PhD studies at Kingston and 11 other universities in the UK through a specially designed collaboration programme. To date, 42 have completed their studies with an average duration time of 44 months, below the anticipated average of four (4) years. The remaining nine (9), who started the programme later, are also expected to complete their studies within four (4) years. One applicant withdrew after just a few weeks.

By virtue of being involved with paid teaching at host universities, the majority of students become familiar with a wide range of teaching, learning and assessment strategies, as well as participating in planning and quality assurance processes. As of the date of this publication, more than 145 journal and conference papers in a wide range of topics have been published, and many students were able to travel and present their papers at international conferences in European countries. The project was deemed extremely successful, benefiting all stakeholders:

- Host universities benefited from highly motivated and fee-paying sponsored PhD students, who completed their studies on time while contributing to the university research standing.
- PhD graduates obtained valuable international qualifications from reputable British universities; gained knowledge and expertise in their own subject areas; were published in high impact learned journals; widened their network of scholarly contacts; became familiar with a different system of higher education; substantially improved their communication skills and paved the way for promotion to senior management roles in their home universities.
- The IAU developed their academics to take up responsible roles for future development of the University's educational and research strategies.

Many graduates from the programme already have been promoted to senior positions in their own IAU branch, such as head of department, vice presidents for education, research or international affairs. One graduate has been appointed as the president of a large university, as well as being in charge of higher education planning for a large provincial region.

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