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Decision Support Systems to Support International Students: Potential for Practice?

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Tantisantisom, K. and Clayden, J., Edith Cowan University, Australia Decision Support Systems to Support International Students: Potential for Practice?

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ABSTRACT

International students now comprise a significant group within Australian higher education but many must overcome difficulties related to initial acceptance by the institution of their choice and enrolment in an appropriate course. The need to extend visas to permit completion or the application process for permanent resident status may also be important to the individual student.

Decision support systems (DSS) for customer relationship management (CRM) have been suggested as a means of utilising information technologies for admission procedures in higher education (McClea & Yen 2005). This paper will consider whether students may be defined as customers and reflect upon the possible introduction of a decision support system to facilitate the admission and satisfactory progress of international students through their courses. It will focus upon the experiences of international students and academic staff in the School of Computer and Information Science of Edith Cowan University.

INTRODUCTION

Within the last decade Australia has become one of the largest educational providers for international students (Marginson & Eijkman 2007). Several Australian universities have diversified to the extent that they now have large cohorts of on-shore international students. Edith Cowan University in Perth, Western Australia, is one such university. Much of the motivation for expansion has been financial: for example, those domestic students who have to pay full tuition fees will pay \$A9,390 for the first year of the Bachelor of Computer Science while international students have to pay \$A16,000 for the same tuition in an identical environment (ECU, n.d.).

The more on-shore international students universities enrol, the more revenue they will receive. This income contributes to better university facilities and services for all their students and staff. The financial importance of ensuring positive experiences for international on-shore students is obvious: disappointed students may change universities within Australia, return to their homeland or decide to relocate to another country in order to complete their studies.

DIFFICULTIES FACED IN STUDYING ABROAD

Prospective students wishing to complete a Master's degree from the School of Computer and Information Science at Edith Cowan University may choose any of one of 19 available courses (SCIS, 2008). Which courses are the most suitable for individual students and their current or future jobs? Although the availability of a variety of courses is one of most desirable factors for prospective

students (Joseph, Yakhou & Stone 2005), course selection is not a simple process. Even though a course handbook, information provided on the website and suggestions from alumni may help, a system which is able to analyse student personalities and job-related requirements would be more helpful.

Furthermore, even a current post-graduate student may be confused when it comes to choosing appropriate units from the number available. However, interesting the units, if students do not have adequate background knowledge of the content, they and the lecturer will experience difficulties. A system which is able to offer appropriate suggestions in unit enrolment based on academic background and course prerequisites seems more advantageous. As a consequence, enrolling in the right course and right units with some help from information technology may improve student sustainability within academic organisations.

Each semester, when it is time for students to enrol in new units, helpful suggestions from someone who knows about the unit enrolment process, prerequisites and has detailed knowledge of the content would smooth the progress of international students. However, international students may struggle to find good advice from an appropriate advisor if they are living in a country where there are neither friends nor family or where they know no-one who has previously studied the same course or even worked in the same area of specialisation. In this case, academic staff or course coordinators may help. Quality of service from university staff is one of the most important factors that students expect from their university (Joseph, Yakhou, & Stone 2005).

If universities can offer relevant services to their students, they will be able to sustain their students throughout the educational processes. However, insufficient numbers of staff or inadequately knowledgeable staff may cause or aggravate students' problems (Kapeliuk, Reich & Bar-Lev 2004). Inadequate part-time staff attempting to take care of a number of students' difficulties in a short period of time, on a case by case basis, may not offer optimum solutions to students' problems. Furthermore, convenient accessibility of both academic and administrative staff is also ranked in the top of prospective students' desires (Joseph, Yakhou, & Stone 2005). This may also apply to international students.

Furthermore, in the view of international students, language difficulties also hinder their attempts to make contact with university staff. English language proficiency is a major factor in environmental adaptation for foreign students (Ng 2006; Rosenthal, Russell & Thompson 2007). Emotional problems, socioeconomic background and study difficulties may also have a negative impact on student achievement (Kapeliuk, Reich & Bar-Lev 2004).

ALLEVIATION OF INSECURITY

Researchers suggest different ways of supporting and encouraging overseas students to adjust happily and quickly to the new host country. One suggestion is that students should bring personal belongings from home to alleviate home sickness (Ryan & Ogilvie, 2001). It is obvious that international students usually link their pleasures in their home country to similar things that they can derive from the host country (Ryan & Ogilvie, 2001). As strangers in a new place, it is not easy to acquire information related to their own interests and pleasures, such as places that remind overseas students of their home country or even traditional food outlets and restaurants. Living alone for the first time in an unfamiliar country and having no-one to answer questions isolates students and strengthens any negative first impressions they may have.

An introductory tour of the university city and an outline of available community services would assist international students to adjust rapidly to their new environment. Positive contact with local people may also improve the mental well-being of international students (Rosenthal, Russell & Thomson 2007). Such contact may not only improve bad days for international students but also make them feel more welcome. Nevertheless, obvious different cultural beliefs, particularly between western and

Asian cultures, may cause students to have negative expectation (Ryan & Ogilvie, 2001). For instance, people from western cultures are often independent and self-sufficient, while dependence is another way of demonstrating intimate relationships in the Asian culture (Ryan & Ogilvie, 2001).

Another suggested way to accelerate the adjustment process for international students, particularly Asian students, is for them to be able to join in religious and culturally-specific activities (Rosenthal, Russell & Thomson 2007). Students may seek information about religious and cultural institutions in the local and academic environment as soon as they arrive to commence their course. This paper contends that students would benefit from information about cultural and social activities being readily available before their arrival. Availability of such information may confirm that international students have each chosen a course and institution which will offer a positive experience.

The authors of this paper, through participation in and coordination of a Research Methods unit in the School of Computer and Information Science, have met many international students. Indeed, Australian-born students regularly comprise a minor subgroup of the classes. The authors have conducted informal nominal group technique (NGT) sessions and have asked students to interview each other and report about their experiences as international students. A recent class discussion identified the following as the most important information needs for international students. In no particular order, advice was needed about:

- Academic life in Australia
- Where to get legal advice
- Accommodation services
- Part-time work and the legal and visa implications of working as a student
- Places of worship
- Medical and health services
- Australian slang
- Coping mechanisms
- Government agencies and departments at federal, state and local levels
- Social gatherings, at the university and outside
- Student associations
- Scholarships
- Connections with people of their own cultural or ethnic background
- Counselling services
- Food shopping and restaurants

These findings echo the results of an earlier formal study conducted by Singh and Armstrong in 2006. The authors examined issues of academic and social integration and satisfaction with the university experience. Critical needs for improvement were identified as being course-specific academic orientation programs, provision for English-language development and the addition of a range of social activities to promote staff-student and student-student interactions.

No criticisms of existing services of the School or University are implied by these findings. The University has played a significant role in helping international students adjust to their new environment. However, staff resignation or retirement causes the loss of corporate memory and skills in dealing with student problems. It has been suggested that it is a good idea to provide ongoing training to staff working with international students (Alberts 2007). Student communication difficulties may also be compounded by a lack of knowledge of where to go for support. Although a number of information systems have been developed in order to assist universities and students for academic, administrative and social purposes, people whom international students are able to ask for help are still required (Rosenthal, Russell & Thomson 2007).

The School's intention to improve its website for the recruitment of international students does not mean it plans to offer less personal support to individual students. However, the new website may be enhanced by the subsequent addition of advice about living in Perth.

DECISION SUPPORT SYSTEMS IN UNIVERSITIES

Even though information technology has been applied to a wide range of university activities, not many of these applications have implemented for the purpose of directly assisting student adjustment. McClea and Yen (2005) describe the application of databases in customer relationship management (CRM) within enterprise resource planning (ERP) to the admission process in order to screen students before university admission.

Another example is the system developed for the use of decision support systems for the purpose of prioritising several information system projects (Dutta & Burgess 2003). Additionally, a decision support system for a university library was developed with the purpose of selecting appropriate books for purchase from a number of available book lists (Uzoka & Ijatuyi 2005).

A proposed decision support system which used case-based relationships (CBR) to prevent students from dropping out of their courses, was designed to assist in providing appropriate suggestions to students, regardless of the time involved and staff experiences (Kapeliuk, Reich & Bar-Lev 2004). Although this system produced satisfactory results, it was focused solely on academic achievement.

From these examples, it can be seen that a number of decision support systems or information systems has been applied for the use of university activities rather than for the direct benefit of students. Although such decision support systems may facilitate university activities which lead to benefits for students, students lack a system that helps them to solve their own problems.

PROPOSED FRAMEWORK

Figure 1 below is a stylised representation of the decision support framework proposed to support international students in the School of Computer and Information Science of Edith Cowan University.

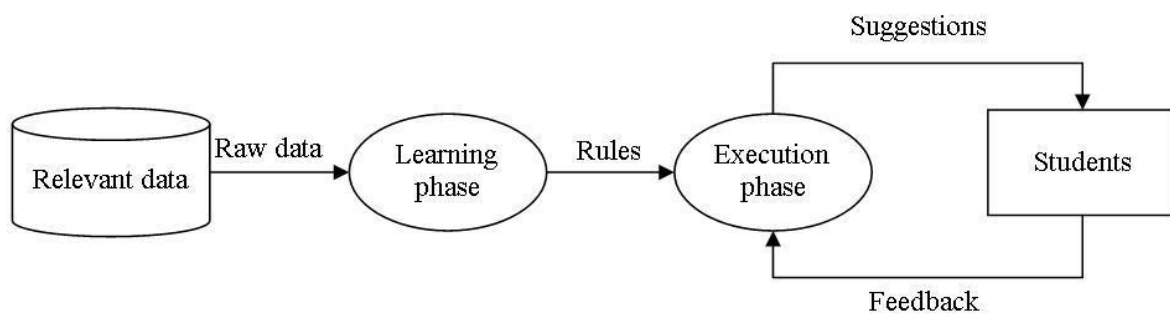


Figure 1: Decision Support System Framework for Students

The proposed system consists of two phases: the learning phase and the execution phase. The learning phase (see Figure 2) will investigate into a number of major student-related activities that may aid in generating a suitable initial rule set. The initial rule set will be generated from a student-related database through a learning approach; this is to avoid uncertainty based upon varied opinions among experts in this area. The outcome in this step is the rule set used in decision-making processes.

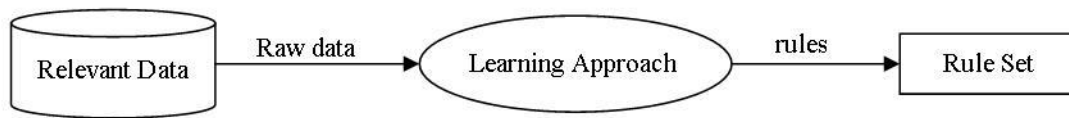


Figure 2: The learning phase to acquire fuzzy set rules.

The generation of fuzzy rules is processed by finding patterns corresponding to student interest and preferences. The rules are created in forms of “if-then”, and once a new rule is created, it will be checked with previously created rules within the knowledge base. If the new rule is not the same as one of existing rules, the system adds the new one into the knowledge base.

However, there is a chance that the newly created rule is incompatible with an existing rule. In other words, these two rule share the same *if-part* but different *then-part*. In case of conflicting rules, the use of a weighted value of each rule corresponding to matching data pairs generated for each rule will be applied. This weighted value is calculated and used in the form of a real number. The maximum weight for each rule is 1.0 and minimum weight for each rule is 0.0. This method uses weighted value for calculating and weighting decisions provided to the students. Therefore, the rule is adjusted to be the form of “if-then-with”.

*If property A is true [and property B is true],
then activity C should be proposed with weight value of D*

The decision-making process can be compared to a condition-action approach that is within the representative forms of these fuzzy rules. Moreover, a neural network’s learning ability, which imitates a human’s learning process, will support the system for changing environments. From this, the rule adjustment components within the execution phase (see Figure 3), which is the usage of neural networks to adjust these fuzzy rules in order to improve the fuzzy rules’ effectiveness, increases the level of intelligence within the proposed system.

In the execution phase (see Figure 3), whenever students require information for making decisions, the rule set from the previous stage will be processed by the fuzzy logic agent to suggest alternatives. To enhance the proposed system’s performance, the continuous learning capability is applied by continually obtaining student feedback to improve fuzzy rules used for providing suggestions. Feedback from students will supply additional inputs for the rule matching module in order to retrieve fuzzy logic rules related to the obtained feedback. The feedback may be in forms of the increasing or decreasing number of student preferences to the suggestions they obtain. Then the outputs of the rule matching module which are the feedback from students and relevant fuzzy logic rules will become inputs of the neural networks module afterward. This neural networks module will be responsible for examining the provided feedback and the corresponding feedback in order to refine the weight value in relevant fuzzy logic rules. This will further improve the efficiency in sourcing further solution suggestions.

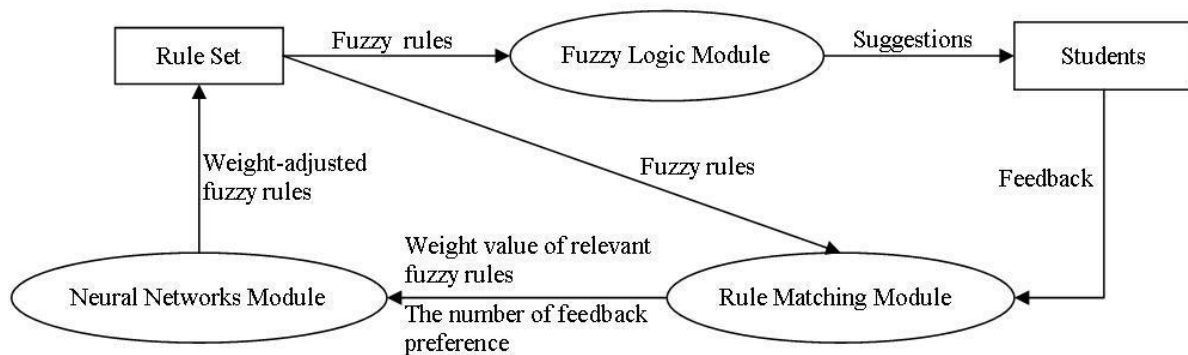


Figure 3: The execution phase to adjust rule weight.

In this proposed system, the fuzzy logic module and the neural networks module will collaborate. The neural networks module will process related inputs to generate output that leads to adjusted fuzzy logic rules. This technique becomes a hybrid system that employs approaches interacting with each other in order to accomplish the required tasks (Jacobsen, 1998).

Information resources directed towards supporting international students after their enrolment in courses offered by the School will be incorporated initially into an historical database. On one level, the DSS will benefit local and international students by providing easy access to course and unit advice. In addition, social, residential and medical, health and legal advice will be maintained and kept up-to-date by DSS functionality. The valuable experiences and understandings of staff and students will be retained through their contributions to the DSS. The provision of much-needed information through a user-friendly interface is likely to enhance the international student experience and permit teaching and research staff to focus more specifically on academic activities with their students. Ultimately the reputation of the School and the University, and its ability to recruit students, will be enhanced by the questions asked and answered through an effective DSS.

CONCLUSION

This paper has discussed the conditions for the suggested implementation of a DSS to assist onshore international students of the School of Computer and Information Science at Edith Cowan University. The implementation of the DSS is envisaged as the next stage of an ongoing project within the School as it seeks to enhance the international student experience and contribute to the sustainability of its courses in a global market.

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