Game Changers

EDUCATION and INFORMATION TECHNOLOGIES

Edited by **DIANA G. OBLINGER**

EDUCAUSE

> **FROM THE EDITOR**
>
> I would like to thank the many people who made this book possible, particularly Gregory Dobbin for managing the project and Karen Mateer for her research.
>
> —Diana G. Oblinger

EDUCAUSE

EDUCAUSE is a nonprofit association and the foremost community of IT leaders and professionals committed to advancing higher education. EDUCAUSE programs and services are focused on analysis, advocacy, community building, professional development, and knowledge creation because IT plays a transformative role in higher education. EDUCAUSE supports those who lead, manage, and use information technology through a comprehensive range of resources and activities. educause.edu

ellucian™

Game Changers: Education and Information Technologies is published by EDUCAUSE, with generous support from Ellucian.

Cover and interior design by Michael Brady Design (michaelbradydesign.com).

The Open University of Hong Kong: The i-Counseling System

Chun Ming Leung and Eva Tsang

Need/Rationale for Approach

ESTABLISHED BY THE HONG KONG GOVERNMENT as a self-financed tertiary institution, the Open University of Hong Kong (OUHK) offers three study modes with a total enrollment of about 19,000: distance learning for working adults; full-time, face-to-face teaching for high school leavers; and e-learning for postgraduate studies. Prospective and current students often have enquiries related to career guidance and development, study paths and methods, program or course choices, previous academic qualifications recognized by OUHK, and study plans and graduation checks. While call center systems and online FAQs can handle common enquiries, more complex academic counseling questions require campus visits and face-to-face discussions with academic staff, which are time consuming and labor intensive. To provide prompt and round-the-clock academic counseling services for prospective and current students, the OUHK has developed the i-Counseling System, an intelligent online system that uses technologies in information retrieval and the concept of ontology.[1]

Description

The i-Counseling System combines an ontology-based information-retrieval engine, a guided search methodology for sophisticated search, and a mathematical optimization model to provide relevant responses to queries on studying in the university. It uses an animated character (i-Ambassador) with multilingual and text-to-speech capabilities as a front end to offer users a better and more natural enquiry experience. The system has two modules: (a) Academic Counseling for handling general queries from prospective students

about career development, program/course information, and learning modes, and (b) Academic Advisement for dealing with questions from current students on program specifics, study plans, and graduation checks. For a demonstration of the system, please see the video accessible at http://www.youtube.com/watch?v=6xDFn9Z9yC4.

Evidence of Effectiveness

The Academic Counseling module uses an ontology-based information-retrieval engine and a guided search methodology to guide prospective students step-by-step to get the information they want. It filters irrelevant results, returning only results that are relevant, thereby saving search time. It provides a one-stop integrated counseling service by integrating the Pre-enrollment Advisor, Program/Course Advisor, Administrative Services Advisor, Career/Study Advisor, and Financial Support Advisor to form a single user interface. Users no longer need to go to different places for different enquiries.

The effectiveness of the Academic Advisement module can be seen in the following examples:

- The Study Planner in the module helps students with course selection by suggesting appropriate courses and informing them of the course requirements.

- The module automates the administrative work involved in student graduation (i.e., checking whether a student is qualified to graduate in a specific program), thereby freeing staff from this very labor-intensive task. For example, it takes the module less than three hours to complete a graduation check of one thousand students in the nursing program. This task previously required three teams of academic and administrative staff working together for several weeks to complete. But most important of all, the results generated by the module are reliable and accurate.

- The module optimizes the Honor Classification for students graduating in honor-degree programs, thus eliminating human error, which may result in a downgrading of honor classification.

- Faculty members can check in real time students' outstanding courses directly via the Academic Advisement module and view the results at a glance.

Please refer to http://www.youtube.com/watch?v=bPUijlh8x0M for details on the design concept of the Academic Advisement module.

Challenges Encountered

Searching for relevant information on the university portal and the web can be a frustrating experience. Although popular search engines (e.g., Google Search API) index everything on the site, the search results are far from satisfactory. A great deal of primary data has been accumulated for many years, relevant documents and data are scattered from their sources, and some of the unstructured textual data is not easy to search. Because the portal uses HTML to present the information, mainstream search engines typically return every page containing the search words. As a result, online searches that rely only on keywords often return items that are not relevant.

In order to overcome this problem and to help students quickly locate information about career development, enrollment, programs/courses, and financial aid, the Academic Counseling module's methodology provides searching capabilities that go beyond the use of keywords common in many search engines. Unstructured information fetched from the portal and the web is first analyzed and reorganized as concepts/classes, individuals, and attributes/properties in an ontology framework. Each piece of captured information is classified and stored systematically in the ontology. The most relevant information is then extracted through information-retrieval algorithms that utilize the information captured in the ontology and then suggest related items that users may also be interested in. This helps in locating the most relevant information. For more details on the use of ontology in the design of Academic Counseling, please see the video accessible at http://www.youtube.com/watch?v=CUV5I9Vm7z0.

Ontology-based search is still an emerging discipline, with new ideas being introduced constantly. It is difficult to verify and maintain the domain ontology as new and modified classes, individuals, attributes, and relations are introduced. Constructing the required domain ontology from multiple data sources with unstructured information is a daunting task, and academic counselors generally lack the technical skills needed to develop the flows for guided searches. Also, academic counseling requires accurate answers and reliable responses to searches and queries, as an incorrect answer or misleading result can have dire consequences for students. The i-Counseling System provides functions that allow users to create the domain ontology from both internal and external sources and verify its accuracy. With domain knowledge continuing to be built up, it is likely that the system's intelligence and accuracy will further improve.

Applicability or Replicability to Other Institutions or Programs

The i-Counseling System has several innovative features: (a) a guided search methodology that analyzes the questions raised and offers step-by-step guidance to provide the most relevant answer; (b) intelligent search via an ontology-based information-retrieval engine to locate the most relevant information; (c) a smart user interface that employs a digital agent with multilingual and text-to-speech capabilities to mimic a real person handling the query process, making the system more user friendly; and (d) a mathematical optimization model to find solutions that match course-selection preference to academic-program requirements. Although the system was developed to meet the specific needs of the OUHK, the ontology framework and mathematical optimization model—with modifications—can be adopted for use at other educational institutions. Furthermore, the concepts, technologies, and tools developed for the i-Counseling System can be generalized and applied to professional knowledge-based portals (e.g., health-related services, airline and insurance industries), course-content development, and other knowledge-management-related projects.

Note

1. Chun Ming Leung, Eva Y. M. Tsang, S. S. Lam, and Dominic C. W. Pang, "Intelligent Counseling System: A 24 x 7 Academic Advisor," *EDUCAUSE Quarterly* 33, no. 4 (2010), http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterly MagazineVolum/IntelligentCounselingSystemA24/219101.

Chun Ming Leung *is the Vice President (Technology & Development) of OUHK, where he oversees the planning and development of technology infrastructure for the whole university. He was a physics professor in the United States before joining OUHK. His professional interest is in computational astrophysics and technology-enhanced education.* **Eva Tsang** *is the Senior Course Designer in the Educational Technology and Publishing Unit at OUHK. She is in charge of course development and various e-learning projects including the development of online learning platforms and mobile learning. She is also the Project Director of the university's Centre for Innovation.*