Academic Computing Components in Malaysian Higher Education

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ABSTRACT
In the information age, higher education institutions in Malaysia are implementing academic computing to provide better education services and remain competitive in a global knowledge industry. It encompasses the utilisation of staff, infrastructure (hardware and software) and services (technology, information content and human resources) which enable and support the management and delivery of academic programmes in teaching, learning and research. Research by UNESCO (2004) shows that many Asia-Pacific countries including Malaysia lack the proper framework to assess and evaluate IT implementation in higher education. Seven main areas of academic computing are identified. They include teaching and learning, research and publication, infrastructure, information services, institutional support, plan and policy and assessment. These areas encompass a total of thirty-four components. To determine the importance of these components within the Malaysian context, a pilot survey was conducted on a selected higher education institution. This research discusses the results.

KEYWORDS
Academic Computing, Assessment, Framework, Higher Education

1. Introduction

Academic computing refers to the utilisation of staff, infrastructure (hardware and software) and services (technology, information content and human resources) which enable and support the management and delivery of academic programmes in teaching, learning and research. This includes educational technologies and applications, as well as infrastructure and services that support research (Carleton University 2001).

A framework that visualises the different elements of academic computing is shown in Figure 1. Academic computing can be represented by three distinct layers consisting of seven main areas. These areas in turn are comprised of thirty-four components.

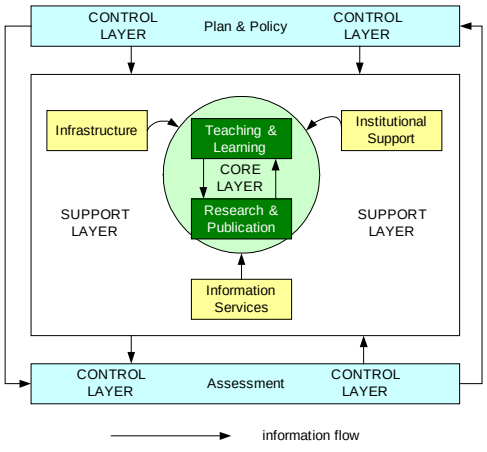

Figure 1: Academic Computing Framework

The Core Layer represents the core activities of higher education, encompassing Teaching and Learning as well as Research and Publication areas. The Support Layer represents the support activities of higher education, encompassing Infrastructure, Information Services and Institutional Support areas. The Control Layer represents the activities that control the IT implementation, encompassing Plan and Policy and Assessment areas.

2. Areas of Academic Computing

Plan and Policy: Implementing academic computing in higher education is a long process that may take many years to be successful (Dias 1999). Therefore, IT planning and policy are crucial.

Teaching and Learning: The emergence of IT particularly the Internet has ignited the information age and is changing how teaching and learning is conducted. Innovative ways of using IT to enable and enhance teaching and learning are being implemented in higher education throughout the world (Haddad 2003).

Research and Publication: IT enables faster processing of large amount of data with higher precision as well as simulates complex systems and phenomena. IT also allows different groups of researchers to collaborate across time and space, share data, ideas, expertise, and the latest findings (National Science Foundation 2003).

Infrastructure: Infrastructure refers to the IT environment in which academic computing is implemented. The absence of the necessary infrastructure, due to its high costs or its perceived lack of importance, forms a barrier to institutions providing IT enabled education (Blurton 1999).

Information Services: Higher education institutions are important producers of information and knowledge. Unlike in the past, students' expectations do not end with the offering of programmes, but they also expect information regarding their study and other institutional services at their fingertips.

Institutional Support: To acquire the necessary IT skills, the institutions need to support the students and staff through effective training programmes (Rogers 2000). Other forms of institutional support include technical and administrative support.

Assessment: Assessment can provide the necessary information to help institutions minimise the risk of making poor or uninformed decisions to implementing academic computing initiatives (Fleit 1994).

3. Components of Academic Computing

The areas of academic computing are further represented by a total of thirty-four components.

Plan and Policy

C1. Formal IT plan for academic computing (i.e. short-term, mid-range, long-term plan)
C2. Documented standards for IT infrastructure (i.e. hardware and software specifications)
C3. Written policy/guide for acceptable IT use (i.e. software downloading/ duplication, use of copyrighted content, etc.)
C4. IT skill development plan (i.e. plan for staff IT skills development, policy for IT to be integrated into the curriculum, etc.)
C5. Institutional incentives/reward to support IT initiatives (i.e. time allocation/funding for developing instructional software, part of performance evaluation, etc.)

Infrastructure

C6. Internet-enabled computers and other IT peripherals (i.e. computers connected to the internet, printers, scanners, display screen technology, etc.)
C7. High speed and reliable network infrastructure with sufficient internet bandwidth (i.e. Gigabit Ethernet, Mbps internet bandwidth, wireless network, etc.)
C8. Software/system/tools for teaching, learning, research, (i.e. application software, e-learning systems, lesson plan templates, etc.)
C9. Campus portal infrastructure (i.e. one-stop centre for information, services, software repository, online community, etc.)
C10. Electronic security mechanism to ensure integrity and validity of information (i.e. network security, virus protection, password and encryption, back-up systems)

Teaching and Learning

C11. IT to support learning (i.e. complementary activities typically conducted outside scheduled learning; e.g. using internet for research, word processor for assignment, etc.)
C12. IT in a role similar to traditional classroom tool (i.e. using presentation software with display screen technology to replace the use of OHP and transparency, etc.)
C13. IT used in parallel with traditional learning (i.e. using multimedia courseware, computer modelling, computer simulation, etc. to complement traditional lecture mode)
C14. IT to enable flexible learning (i.e. e-learning/virtual learning for independent, self-paced, flexible time, remote location learning)
C15. Electronic communication and collaboration between/among students and teaching staff for teaching and learning purposes (i.e. e-mail, forums, discussion groups, peer advising, etc.)

Research and Publication

C16. The use of internet/online resources as an important source of information for research purposes
C17. The use of IT as a data gathering tool (i.e. online survey, web logs and tracking tools, interviews via e-mail, etc.)
C18. The use of computer software to analyse/ transform research data (i.e. statistical software, program code analyser, modelling software, etc.)
C19. Communication and collaboration with other researchers through IT (i.e. e-mail, collaborative tools, online databases for data sharing, online peer review, etc.)

C20. Publishing of research findings to the internet/intranet (i.e. journal papers, proceedings, student dissertations, etc.)

Information Services

C21. Online academic information (i.e. student handbook, programme information, rules and regulations, academic calendar, timetables, guidelines, downloadable forms, etc.)
C22. Online student information (i.e. course registration status, examination results, academic transcripts, etc.)
C23. Online teaching support materials (i.e. curriculum webpage, lecture notes, question banks, case studies, etc.)
C24. Online reference resources (i.e. journals, proceedings, dissertations, e-books, etc.)
C25. Digital library services (i.e. online library/card catalogue, book reservation, interlibrary loan request, etc.)

Institutional Support

C26. IT courses for students (i.e. basic computing, accessing online information, communicating using IT, etc.)
C27. Professional development for staff (i.e. courses/workshops covering IT skills, IT in specific disciplines, instructional IT, researching using IT, publishing on the WWW, etc.)
C28. Technical support for maintenance of IT infrastructure
C29. Technical assistance in the use of IT (i.e. helpdesk, IT assistance in labs, classes and the library, etc.)
C30. Technical/pedagogical assistance in the development of course material (i.e. courseware, curriculum webpage, etc.)

Assessment

C31. A structured system to identify user/ stakeholder needs regarding academic computing
C32. A structured system to address complaints/feedback related to academic computing
C33. A structured system to assess the quality of IT infrastructure, information services and support services
C34. A structured system to evaluate the contribution of IT towards enhancing the core activities of teaching & learning and research & publication

4. Methodology

A pilot survey was conducted on a faculty of a higher education institution. The survey form consists of questionnaire where respondents were asked to rate each academic computing component for its perceived importance and the performance by the institution. A Likert scale of 1 to 5 was used where 1 represents the least significance and 5 represents the most significance. Introductory text about academic computing was included in the questionnaire to provide respondents with a general understanding of what the survey is all about.

The selected faculty is considered a new university whereby it was recently upgraded from college to university status. Respondents identified consist of academic staff of the institute. Thirty-five out of forty-five respondents returned their survey forms, representing 78 percent of the total.

5. Results

Analysis on the data shows that respondents rated all thirty-four components as very important, ranging from an average of 4.4 (C3. Written Policy/Guide; C15. E Communication/ Collaboration) to 4.9 (C28. Technical Support for Maintenance). The standard deviations are relatively small, ranging from an average of 0.4 to 0.8.

As for performance of the institution, the average ratings vary from as low as 1.7 (C25. Digital Library) to a respectable 3.7 (C1. Formal IT Plan). The standard deviations are slightly larger compared to those of importance, ranging from 0.7 to 1.3. This indicates that different respondents have more varied views on the performance by the institute on the components.

Correlation analysis between the performance and importance generates a positive value, with the Pearson product moment correlation coefficient calculated at 0.335. This value, however, is not large enough to indicate significant correlation exists between the values. This suggests that the ratings on importance of the components were not influenced by the perceived performance by the institute.

Figures 2 to 8 compare the performance against the importance ratings for the thirty-four components, grouped according to their corresponding areas.

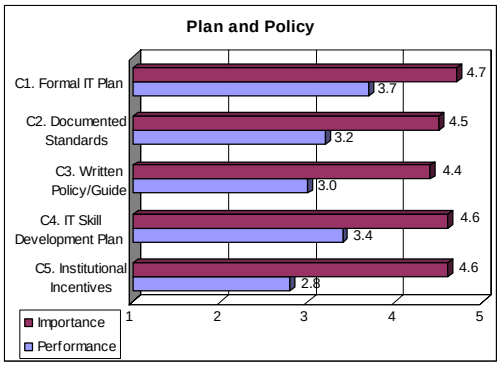

Figure 2: Plan and Policy

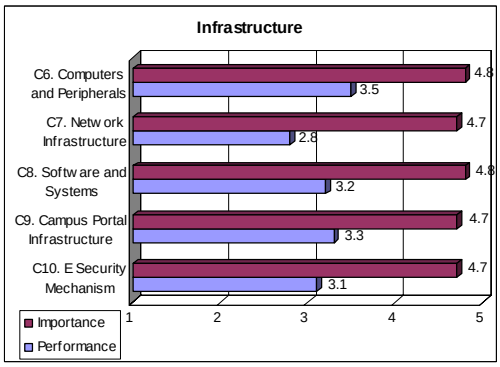

Figure 3: Infrastructure

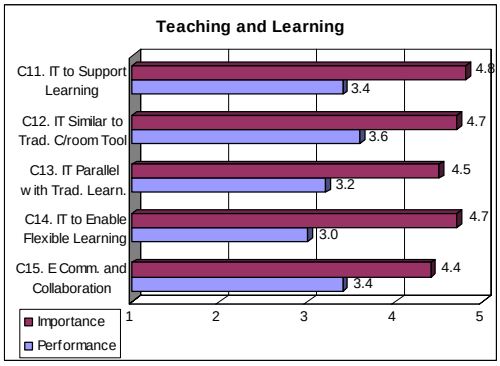

Figure 4: Teaching and Learning

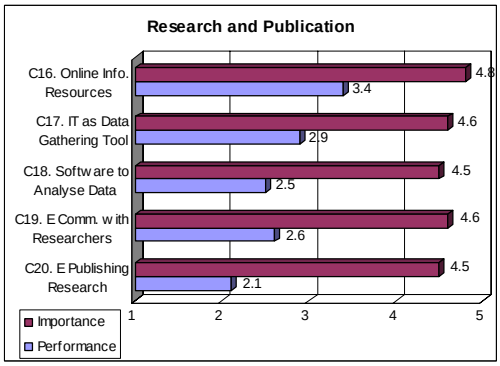

Figure 5: Research and Publication

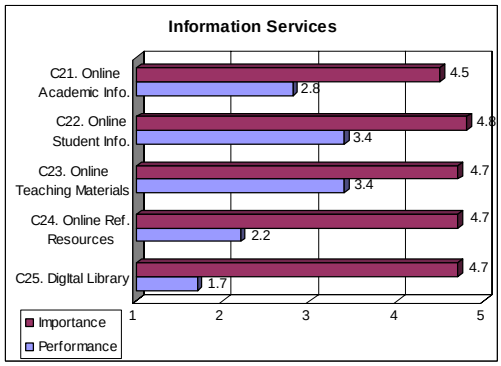

Figure 6: Information Services

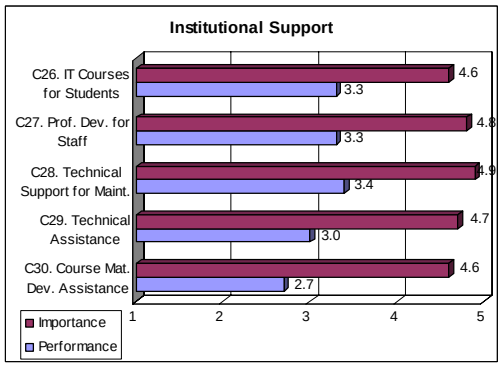

Figure 7: Institutional Support

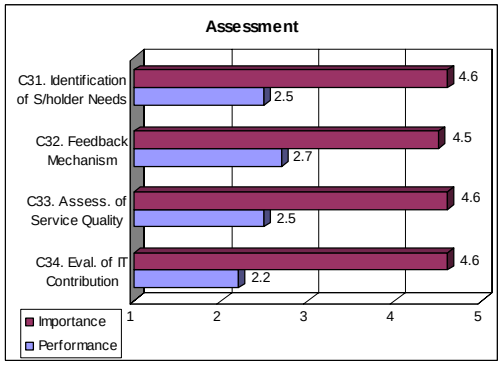

Figure 8: Assessment

6. Conclusion

The results give initial justification on the academic computing components proposed in the framework. However, to fully validate the components in the context of Malaysian higher education, a comprehensive survey should be undertaken involving various types of higher education institutions in Malaysia. Analysis should identify clusters and patterns of academic computing implementation, and research should determine whether they influence the inclusion of different elements in the proposed framework.

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