

**STRATEGIC PLAN FOR INFORMATION AND  
COMMUNICATIONS TECHNOLOGY (ICT)  
INFRASTRUCTURE IN ARCHITECTURAL  
EDUCATION**

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## **Abstract**

Information technology is today one of the most critical tools in higher education. New ways to deliver instruction are now available, with the resulting ability to reach students in many ways other than the traditional classroom setting. Changes in research tools and methodologies in many disciplines and professions have resulted from the spread of information technology throughout the disciplines. But information technology, though critical, is still just a tool. It relies on people for its effective utilization, whether they are those who use these tools on a daily basis, those who instruct others how to use them, those who create or design new uses for these tools in teaching and research, or those that ensure they are maintained in good repair. To meet the current trend in education, therefore, schools of Architecture must implement an effective strategic plan for the use of information technology in research and academic computing, teaching and learning, and administrative support. The paper highlights on the guiding principles (strategic plan) required for an effective information technology infrastructure which include Sound Fiscal Planning; Access to Network Resources; Institutional Commitment; Support for Student Computing; Digital Libraries and the Scholarly Record; Security, Privacy, and Intellectual Property

**Key Words:** - administrative support, architectural education, information technology infrastructure, learning, strategic plan, teaching.

## **1.0 Introduction**

Information technology is fundamental to the teaching, learning, and research missions of universities (McRobbie and Palmer, 2001). It is transforming the way universities do business; it is fueling major changes in research, creative activity, and scholarly communication; and it offers the potential for major innovation in the entire teaching and learning process. Information and communications has become an essential tool for faculty, students, and staff who use it to organize their ideas, seek information, and communicate with one another and with the world. However information technology, though critical, is still just a tool. It relies on people for its effective utilization, whether they are those who use these tools on a daily basis, those who instruct others how to use them, those who create or design new uses for these tools in teaching and research, or those that ensure they are maintained in good repair. Therefore, schools of Architecture must implement a strategic plan for an effective use of information technology in research and academic computing, teaching and learning, and administrative support.

Today Information and Communications Technology (ICT) is used in almost all facets of society. To provide guidance to educational institutions, and because ICT is rapidly changing with no fixed limits, Titthasiri, (2000) is of the opinion that institutions need a strategic ICT plan to guide their future development. Such a plan will help institutions address the challenges of budget constraints for new or increased investments in ICT, better respond to the rapidly changing ICT environment, provide technical support for ICT, and develop software and tools not only for research but also for the teaching-learning and administrative processes.

The strategic plan outlines the use of ICT in research and academic computing, teaching and learning, telecommunications, and administrative support. It recognizes the transformational power of ICT in higher education and the pace of technological change, which call for flexibility and experimentation in every phase of ICT planning and

implementation. The strategic plan provides a framework for optimising knowledge and information for learning and management through the strategic deployment of information and communication technologies.

The information and communications strategic plan is meant to reflect the mission, vision, guiding principles, themes, and objectives for the effective and efficient use of information technology. As such, its adoption has many implications for students, faculty, staff, and the University community. The ICT infrastructure will be robust, scaleable, flexible and secure to meet the needs of the institution. Recognizing that the demands for new technologies are constantly increasing and changing, the infrastructure will allow for growth and expansion, adaptation to new technologies and applications, and accommodation of specialized equipment needed for research.

## **2.0 ICT Infrastructure Planning Principles**

Technology choices are selected in alignment with the strategic direction of the school. The needs of existing and planned applications, prevailing and developing industry trends, and the most efficient use of resources form the basis for selecting appropriate technology standards and operating practices. Information technology goes beyond computers. It includes the networks that connect them, electronic databases and other electromagnetic storage of data, and increasingly, with convergence of media, it includes all telecommunications: not just transmission of data, but also video, voice (and audio generally). In general therefore, the guiding principles required for an effective overall information technology infrastructure include Sound Fiscal Planning; Access to Network Resources; Institutional Commitment; Support for Student Computing; Digital Libraries and the Scholarly Record; Security, Privacy, and Intellectual Property (Titthasiri, 2000; McRobbie and Palmer, 2001; Beauchamp, 2007)).

### **2.1 Solid Foundation of ICT Infrastructure & Sound Fiscal Planning**

Information technology is now a fundamental of higher education; and given its key role in research, teaching and service, it is no longer responsible to budget for it in an ad hoc manner and to fund it on a crisis basis (McRobbie and Palmer, 2001). Planning for the full cost of technology, including on-going replacement and support, must be built into the budgeting of all the units in the school. This applies to everything from desktop computers, to classroom technology, to central and distributed systems.

Planning for ICT presents schools with enormous financial challenges. Nearly every institutional program and office, both academic and administrative, has the potential to be affected by ICT. The rapidly changing pace of technological development intensifies the breadth of this impact. Without careful planning, a school can quickly exceed its capacity to support the financial demands of this enhanced technological environment. Therefore, any ICT strategic plan should be accompanied by sound fiscal analysis of the estimated expenditure requirements, time horizons for implementation, activity and funding priorities, and alternative resource support possibilities. To build a solid foundation of ICT infrastructure and assure that sound fiscal planning permits maintenance of this infrastructure at state-of-the-art levels, McRobbie and Palmer (2001) suggests that standard amount per year must be budgeted to support life-cycle replacement of equipment and to assure appropriate levels of technical support for faculty, students, and staff

A related issue, which also has fiscal implications, is the institution's ability to recruit and retain the technical staff needed to support information technology. It is critical to recognize that the information technology function depends upon the skills of technical staff and that those skills are in demand in employment market nationally and internationally (Bartell, 2007). Thus the human resource shortage in ICT presents a challenge that threatens the most thorough planning. Higher salaries, greater incentives, and bonus structures are needed to attract and retain high quality ICT staff. Such incentives may be necessary even though they are outside broader institutional compensation plans. One element of a plan for human resources is to grow and retain ICT talent internally.

The school should build a solid foundation of ICT infrastructure that will help and enable her to achieve excellence, and to assure that sound fiscal planning permits the maintenance of this infrastructure at state-of-the-art levels. It should be the policy of the school (Beauchamp, 2007) to build life-cycle replacement into its planning at every level of information technology investment (personal, departmental, and central systems, and network hardware and software).

## **2.2 Access to Network Resources**

Timely, seamless, and integrated access to efficient and appropriate institution infrastructure is critical to the pursuit of excellence in all academic, research, and administrative matters (CTSTATEU, 2003). Thus efficient use of information technology depends on providing students, faculty, and staff with outstanding access to this technology. The nature of academic work will require faculty and staff to have reliable and high-speed access to the network, on campus and off; from the office, at home, or in studio settings; while traveling; or wherever they may be working. The transformation of teaching and learning and advances in distributed education will call for network access in classrooms and throughout campus, in residence halls and homes, or wherever students, faculty and staff may work and study.

Students, faculty, and staff should be provided with reliable access to computing and network services, on and off the campuses. The electronic borders between home, community, workplace, and campus should become invisible. The need for reliable access to network services should guide the development of network services and the mechanisms to fund them. Funding mechanisms should not be the primary determinant of what network services are made available. In pursuing this goal the school must keep watch on advances in the telecommunications industry that may make remote network access a ubiquitous and competitively priced commodity. Along with access to the network itself, the school should develop and implement technologies (e.g., mass storage, metadata) that will allow students, faculty and staff to store, search for, and easily retrieve information using the network.

## **2.3 Institutional Commitment: Faculty and Staff Engagement**

Innovative applications of information technology are those which change in some significant way the research methodologies or learning strategies or service models within a given discipline (CTSTATEU, 2003). Disciplines are always open to such transformations, of course, but the information revolution has the potential to change the very way research, teaching, and services are conducted. Such innovative and transforming efforts should be implicitly and explicitly recognized as valued contributions to scholarship and pedagogy at the various disciplines. This in turn (Eden, 2004) requires removing disincentives and putting

in place a program of incentives to encourage and reward faculty and staff innovation in the use and application of information technology for teaching, research and service.

Appropriate incentives and support should be established so that faculty and staff are encouraged in the creative use and application of information technology for teaching, research, and service. In particular, the incentives may be in the areas of tenure and promotion, merit awards, faculty fellowships and staff development grants. Ways must be found to move faculty and staff along the ever increasing learning curve associated with mastering and keeping up to date with the information technologies relevant to their work.

## **2.4 Teaching and Learning: Content, Access, and Distributed Education**

Teaching and learning are central to the mission of a university, and information is of central concern to teaching and learning. It is no surprise then that the revolution in information technology is changing the very ways in which teaching and learning are conceptualized by enhancing student access, removing obstacles of time or place, and increasing the level of interaction in learning. Information technology is also the defining characteristic of what is now referred to as distributed education— meaning, technology-supported learning, provided both on and off-campus, and based on both synchronous and asynchronous communication (McRobbie and Palmer, 2001).

To become efficient in information technology, the school must become efficient in the innovative application of technology to teaching and learning, both for use on its campuses to improve the education that its students receive, and also for external use to share and promote the school's best to new learners. Achieving this goal of technology efficiency in teaching and learning will depend upon advances toward several of the goals outlined in this plan, most especially in the areas of Access to Network Resources, Engaging Faculty and Staff, Support for Student Computing, and building a sound ICT Infrastructure.

## **2.5 Research: Computation, Communication, and Collaboration**

Revolutionary changes in information technology have set the stage for social and economic transformations. These changes, brought about by the convergence of computational and communication technologies, have created entire new industries. Information technology now allows problems to be solved in new ways and human communities to be thought about in a new light. All researchers work in intellectual communities and increasingly one of the most important uses of information technology in research is to support their collaboration. It is essential that all researchers have access to at least a common base of collaborative technology such as Web access and email and, in addition, that more advanced collaboration technologies are introduced and systematically deployed.

High performance computing should be an area of distinction, and one that can only be maintained through continued attention and support. The school's participation in many national and international research partnerships will depend upon its capabilities in high performance computation and communications. Advances in computing and communication have created increased demands for data storage and management. And underpinning all of this is the need to provide researchers with good software tools and good support services. In support of research, the school should provide broad support for basic collaboration technologies and begin implementing more advanced technologies.

## **2.6 Information Systems: Managing Information Assets**

Information itself is a strategic organizational asset for the school and must be carefully managed. The University Information Systems (UIS) is responsible for the development and deployment of many of the University's business information systems. Although the goal of the institution's information systems is to make it easy for the end-user to execute day to day tasks, the technologies behind these require highly skilled staff for development and maintenance.

University-wide prioritization, coordination, oversight and planning are needed for the development and implementation of information systems. Standards are needed for software tools, development methodologies, project management, and computing platforms in order to achieve cost savings and make the best use of resources that are available. Leadership is needed in the implementation of enterprise-wide information systems to help continue the transformation of the administrative units of the University, and to support the goals set forth in other areas of this plan for teaching, research, service and support for student learning.

## **2.7 Telecommunications: Applications, Infrastructure, Convergence**

Telecommunications is one of the most important and fundamental technologies in the last decade of this century. It is revolutionizing commerce, industry, education, science and society. At a University level telecommunications consists of two components: its voice, video and data intra- and inter-campus networks and services, and the connections from this infrastructure to national and international telecommunications networks and services. In a very real sense telecommunications is the cement that binds the University together and which binds it to the national and international research community in all academic areas. As such this infrastructure, physical and human, represents a fundamental strategic asset for the University. Thus it is vital that the University keep control over its telecommunications infrastructure so it can most effectively manage it to maximize its contribution to achieving the University's fundamental goals.

## **2.8 Support for Student Computing**

Advances in information technology in areas of teaching, learning, and academic research will depend upon the quality of support provided for student use of computing. The school must provide the information technology tools, infrastructure and support services so that students may effectively engage in learning and research, appropriate to their various academic disciplines and areas of study. ICT support for students should include technology support centers and a computing environment that is seamless across boundaries of campus, home, residence hall, and community (Smith K, 2004).

## **2.9 Digital Libraries and the Scholarly Record**

The transformation of teaching and learning through the use of information technology also entails the transformation of scholarly literature and learning resources through the widespread implementation of electronic journals, online databases, digital libraries, and other networked information services. Academic research is integrally involved with access to information and the creation of the scholarly record.

There is a science to the management and mining of information, and the library is the heart of this enterprise. The nexus of the next revolution, according to Eden (2004), will not be based on Web technology alone; it will be based on tools that integrate intelligent knowledge acquisition systems with the ingenuity of the individual scholar, teacher, or learner who has access to a well catalogued, distributed, digital library. In this process there will develop a new role for the academic librarian as information agent and information broker, working across many traditional boundaries of organizations and scholarly disciplines, providing a service to faculty and students by connecting them with the information resources they need for research, teaching and learning. The professional expertise of librarians in the university Libraries and of faculty in the School of Library and Information Science will be invaluable in this transformation. The school should therefore, build upon and expand its digital library program, and develop the digital library infrastructure needed to support research, teaching and learning.

### **2.10 Security, Privacy, Intellectual Property**

Security and privacy are important issues for schools to address in achieving effectiveness in information technology. Computing and network technologies have the ability to make local information available worldwide, and to access locally information from almost anywhere in the world. It is essential in this environment to both promote access to information and freedom of discourse, while ensuring personal privacy and protecting the intellectual property rights of individuals and other rights-holders.

The security of information and information technology is a university-wide concern, requiring a university-wide response: institutional vision and commitment, clear and forceful policies, appropriate plans and procedures, and ongoing programs of education and awareness. The University, must continue to develop policies and implement procedures that protect the security of her information technology resources and institutional data, safeguard personal privacy, and respect intellectual property rights, while at the same time promoting two traditional university values associated with academic freedom: access to information and freedom of discourse

### **3.0 The ICT Strategic Planning Process**

ICT strategic planning process (CTSTATEU, 2003; Beauchamp, 2007) includes: (a) organizing a planning team, (b) fact-finding and trend assessment, (c) determination and dissemination of ICT strategies; and (d) implementation and revision of programs. ICT strategic planning, which is a subset of institutional strategic planning, begins with a review of institutional goals and objectives before initiating any ICT strategic planning and an agreement to proceed. The next step is Fact-Finding and Trend Assessment which is for the purpose of evaluating the current status of ICT resources, trends and forecasts of demands, and the environment that affects ICT resources. Data obtained from this phase would be used to determine the strengths/weaknesses and opportunities/threats, describe what and how the current status of ICT resources are operating, determine user needs, and decide how ICT can be applied to fulfill these needs

The third phase in institutional strategic planning process is the determination and dissemination of ICT Strategies. That is, a vision statement should be developed to express what the institution desires and sees as the future of technology in the institution and community. Then a mission statement should be prepared to describe the purposes and plans to fulfill the vision of ICT in the institution. In addition, goals and objectives should be

determined stating what the institution plans to accomplish to achieve the goals. These final strategic objectives should then be disseminated to the university community to ensure that there is sufficient awareness of the strategic benefits to users. The Considerations are ICT Architecture (Hardware Strategies and Software Strategies); Networking Strategies; Data Strategies; Human Resource Strategy (Professional Development Strategies and Recruiting ICT Staff Strategies); Funding Strategies; Organizational Strategy; Purchasing Strategies; and Marketing Strategies

The final phase is the Implementation and Revision. Implementation, an important part of planning, is to know when and who is responsible for acting on the plan and what has been and is being accomplished. Thus a need exists for continuous monitoring and for feedback and revision of the ICT strategic plan based on changes in the environment. After implementation, an evaluation should be required to consider how the plan can be improved.

#### **4.0 Conclusion**

The ICT strategic plan is a tool with which the University can chart a course and make progress toward the accomplishment of the information technology mission, vision, themes and objectives contained herein. A central theme is that information technology plays a critical role in the success or failure of the University's overall mission. As such, the University treats its investment in information technology and its associated resources as a valuable asset--one that is equally as important as its human, financial, and facility resources.

The ICT strategic plan recognizes that eminence in the use and application of information technology requires the school to build more effective partnerships with other research institutions as well as with industry and government. And finally it recognizes the importance of effective access to the school's infrastructure and information assets from anywhere and at any time.

#### **5.0 Recommendation**

Information technology is in a state of rapid change. For this reason, flexibility and experimentation should guide every phase of information technology planning and implementation. Indeed, flexibility and experimentation are so important that these might well be guiding principles for this entire plan.

Strategic plan is a coordinated approach to leveraging knowledge and information resources. So students, faculty, and staff should have reliable and high-speed access to the network, on campus and off; from the office, at home, or in studio settings; while traveling; or wherever they may be working.

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