Information Technology – An Academic Discipline

This document represents a summary of the following two publications defining Information Technology (IT) as an academic discipline.

> *IT 2008: Curriculum Guidelines for Undergraduate Degree Programs in Information Technology*. (Nov. 2008). Association for Computing Machinery (ACM) and IEEE Computer Society.
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> *Computing Curricula 2005 Overview Report*. (Sep. 2005). Association for Computing Machinery (ACM), Association for Information Systems (AIS), Computer Society (IEEE-CS).

The full text of these reports with details on the model IT curriculum and further explanation of the computing disciplines and their commonalities/differences can be found online: http://www.acm.org/education/education/curricula-recommendations)

From IT 2008: Curriculum Guidelines for Undergraduate Degree Programs in Information Technology

IT programs aim to provide IT graduates with the skills and knowledge to take on appropriate professional positions in Information Technology upon graduation and grow into leadership positions or pursue research or graduate studies in the field. Specifically, within five years of graduation a student should be able to:

1. Explain and apply appropriate information technologies and employ appropriate methodologies to help an individual or organization achieve its goals and objectives;
2. Function as a user advocate;
3. Manage the information technology resources of an individual or organization;
4. Anticipate the changing direction of information technology and evaluate and communicate the likely utility of new technologies to an individual or organization;
5. Understand and, in some cases, contribute to the scientific, mathematical and theoretical foundations on which information technologies are built;
6. Live and work as a contributing, well-rounded member of society.

In item #2 above, it should be recognized that in many situations, "a user" is not a homogeneous entity. Students should recognize that the role of user advocate is often complicated by the fact that different users have different and sometimes contradictory interests and goals. For example, among the people who might be included in the category of user and who often have different goals are: 1) clerks who are hands-on users of computers; 2) professionals and analysts who are hands-on users of computers; 3) people who are users of information generated through computers; 4) managers and executives who have views about how computers and computer applications should be deployed and used in their

organizations; 5) internal and external customers of IT-reliant work systems; and 6) other stakeholders who care about the situation for a variety of reasons.

From Computing Curricula 2005 Overview Report

Information technology programs began to emerge in the late 1990s. During the 1990s, computers became essential work tools at every level of most organizations, and networked computer systems became the information backbone of organizations. While this improved productivity, it also created new workplace dependencies as problems in the computing infrastructure can limit employees' ability to do their work. IT departments within corporations and other organizations took on the new job of ensuring that the organization's computing infrastructure was suitable, that it worked reliably, and that people in the organization had their computing-related needs met, problems solved, etc. By the end of the 1990s, it became clear that academic degree programs were not producing graduates who had the right mix of knowledge and skills to meet these essential needs. College and universities developed degree programs in information technology to fill this crucial void.

The new landscape of computing degree programs reflects the ways in which computing as a whole has matured to address the problems of the new millennium. In the U.S., computer engineering had solidified its status as a discipline distinct from electrical engineering and assumed a primary role with respect to computer hardware and related software. Software engineering has emerged to address the important challenges inherent in building software systems that are reliable and affordable. Information technology has come out of nowhere to fill a void that the other computing disciplines did not adequately address.

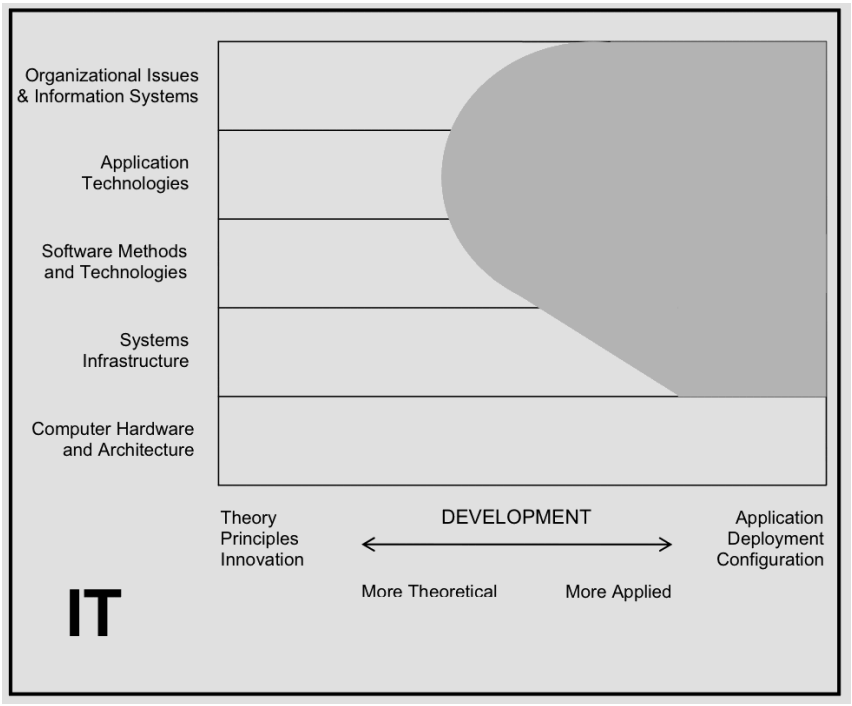
Information technology is a label that has two meanings. In the broadest sense, the term information technology is often used to refer to all of computing. In academia, it refers to undergraduate degree programs that prepare students to meet the computer technology needs of business, government, healthcare, schools, and other kinds of organizations. In some nations, other names are used for such degree programs.

In the previous section, we said that Information Systems focuses on the information aspects of information technology. Information Technology is the complement of that perspective: its emphasis is on the technology itself more than on the information it conveys. IT is a new and rapidly growing field that started as a grassroots response to the practical, everyday needs of business and other organizations. Today, organizations of every kind are dependent on information technology. They need to have appropriate systems in place. These systems must work properly, be secure, and upgraded, maintained, and replaced as appropriate. Employees throughout an organization require support from IT staff who understand computer systems and their software and are committed to solving whatever computer-related problems they might have. Graduates of information technology programs address these needs.

Degree programs in information technology arose because degree programs in the other computing disciplines were not producing an adequate supply of graduates capable of handling these very real needs. IT programs exist to produce graduates who possess the right combination of knowledge and practical, hands-on expertise to take care of both an organization's information technology

infrastructure and the people who use it. IT specialists assume responsibility for selecting hardware and software products appropriate for an organization, integrating those products with organizational needs and infrastructure, and installing, customizing, and maintaining those applications for the organization's computer users. Examples of these responsibilities include the installation of networks; network administration and security; the design of web pages; the development of multimedia resources; the installation of communication components; the oversight of email systems; and the planning and management of the technology lifecycle by which an organization's technology is maintained, upgraded, and replaced.

To illustrate the commonalities and differences among computing disciplines, we have created graphic characterizations of them. They suggest how each discipline occupies the problem space of computing. They represent current realities, not ambitions for the future. The focus is on what students in each of the disciplines typically do after graduation, not on all topics a student might study. Some individuals will have career roles that go beyond the scenarios described by these snapshots.



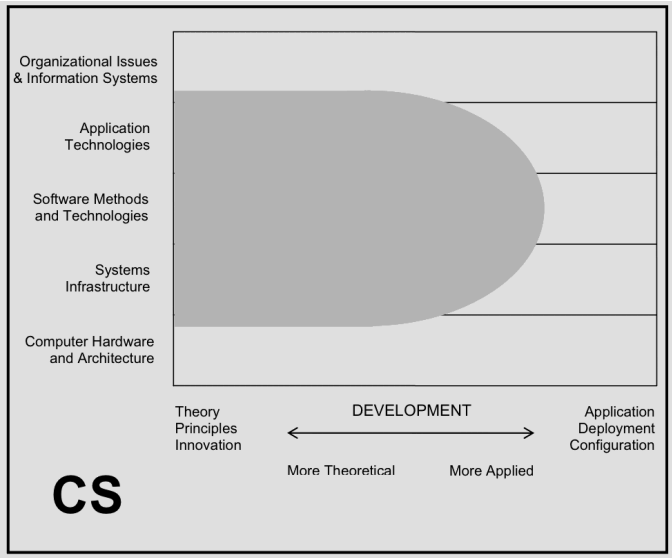
The horizontal range runs from Theory, Principles, Innovation on the left, to Application, Deployment, Configuration on the right. Thus, someone who likes the idea of working in a laboratory to invent new things or in a university to develop new principles will want to work in a discipline that occupies the space to the left. Conversely, someone who wants to help people choose and use appropriate technology or who wants to integrate off-the-shelf products to solve organizational problems will want an area that Computing occupies space to the right. Because there are many kinds of job tasks that fall between the extremes, one should not just look only at the far left and far right but also consider possibilities between the extremes.

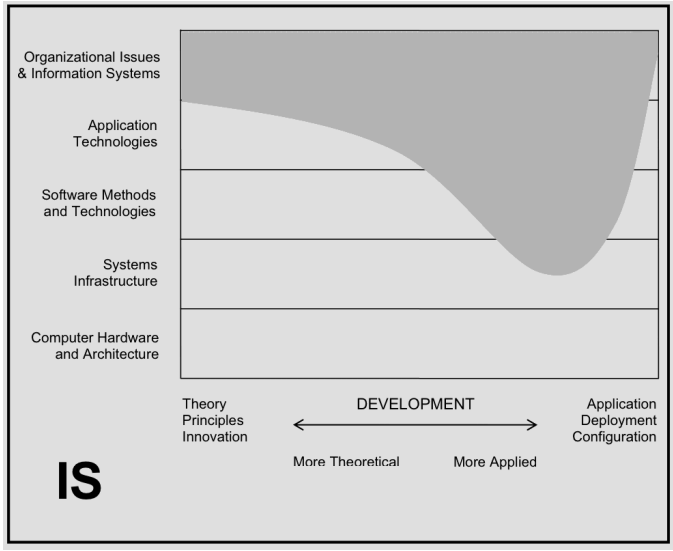
The vertical range runs from Computer Hardware and Architecture at the bottom, to Organizational Issues and Information Systems at the top. As we go up this axis, the focus is on people, information, and the organizational workplace. As we move down on this axis, the focus is on devices and the data shared among them. Thus, someone who likes designing circuits or is curious about a computer's inner workings will care about the lower portions; someone who wants to see how technology can work for people, or who is curious about technology's impact on organizations, will care about the upper portions.

The shaded area for IT extends down most of the right edge as it focuses on the application, deployment, and configuration needs of organizations and people over a wide spectrum. Across this range (from organizational information systems, to application technologies and down to systems infrastructure), their role has some overlap with IS, but IT people have a special focus on satisfying human needs that arise from computing technology. In addition, the IT shaded area goes leftwards from application towards theory and innovation, especially in the area of application technologies. This is because IT people often develop the web-enabled digital technologies that organizations use for a broad mix of informational purposes, and this implies an appropriate conceptual foundation in relevant principles and theory.

Because IT is a very new discipline, its focus has been on developing educational programs that give students a foundation in existing concepts and skills. Many in the community of IT faculty assert that research in their field will grow to create and develop new knowledge in relevant areas. When that happens, an appropriate snapshot would feature a shaded area that extends significantly further to the left. However, this is an ambition and not yet an achievement. This figure reflects the current status of IT.

As a comparison here are similar charts for computer science, information systems, and computer engineering:





IT programs focus on producing graduates who know how to make information technology work in a wide range of settings. Organizations of all kinds have become dependent on networked computing infrastructure to such a degree that they cannot function without that infrastructure. IT people are prepared to select, manage, and maintain that infrastructure, ensuring that it meets organizational needs. They also create digital content for that infrastructure and take care of the IT support needs of the individuals who use it.

The emergence of IT programs represents a grassroots movement by computing educators to respond to the very real needs of both their local communities and their students. IT programs exist, not

because computer science or information systems programs failed to do their job, but because those disciplines each define themselves as having a different job. The existence of IT programs reflects one part of the evolution of career opportunities in computing.

Some people question whether IT programs are a passing fad. Others ask if IT programs are too technical in nature to deserve the status of an academic discipline. People asked similar questions about computer science more than thirty years ago yet, after a number of years, the great majority of North American colleges began to offer CS degrees. We may well see similar results with respect to IT. IT degree programs address an important need that is widespread throughout society. To the extent that organizations rely on computer technology, the IT discipline has a key role to play.

There are two important issues here.

- *Rigor*. Planning and managing an organization's IT infrastructure is a difficult and complex job that requires a solid foundation in applied computing as well as management and people skills. Those in the IT discipline require special skills – in understanding, for example, how networked systems are composed and structured, and what their strengths and weaknesses are. There are important software systems concerns such as reliability, security, usability, and effectiveness and efficiency for their intended purpose; all of these concerns are vital. These topics are difficult and intellectually demanding.

- *Acceptance*. In the U.S., the IT discipline is the new kid on the block and, as a result, faces problems of acceptance among the more established disciplines. This is a natural phenomenon, and it will take time and experience for those in the more established computing disciplines to evaluate and recognize the value that the IT discipline provides. IT is seeking to establish itself as a discipline with its own intellectual core, a rigorous curriculum, and accreditation guidelines. To the extent that it succeeds at these challenges, acceptance and respect will naturally follow.

At many institutions, administration is motivated to see an IT program created to respond to community needs and to provide more choices for prospective students. Whenever an institution creates an IT program, it must take special care to ensure that it implements the program properly. One must ensure that the people who are responsible for an IT degree program recognize IT's importance and are excited about creating high-quality educational experiences for IT students.