Informatics

Not to be confused with Information technology.
For other uses, see Informatics (disambiguation).

Informatics is the science of information and computer information systems. As an academic field it involves the practice of information processing, and the engineering of information systems. The field considers the interaction between humans and information alongside the construction of interfaces, organisations, technologies and systems. It also develops its own conceptual and theoretical foundations and utilizes foundations developed in other fields. As such, the field of informatics has great breadth and encompasses many individual specializations, including disciplines of computer science, information systems, information technology and statistics. Since the advent of computers, individuals and organizations increasingly process information digitally. This has led to the study of informatics with computational, mathematical, biological, cognitive and social aspects, including study of the social impact of information technologies.

Etymology

See also: Computer science § Etymology

In 1956 the German computer scientist Karl Steinbuch coined the word *Informatik* by publishing a paper called *Informatik: Automatische Informationsverarbeitung* ("Informatics: Automatic Information Processing"). The English term *Informatics* is sometimes understood as meaning the same as computer science. The German word *Informatik* is usually translated to English as *computer science*.

The French term *informatique* was coined in 1962 by Philippe Dreyfus together with various translations—informatics (English), also proposed independently and simultaneously by Walter F. Bauer and associates who co-founded *Informatics Inc.*, and *informatica* (Italian, Spanish, Romanian, Portuguese, Dutch), referring to the application of computers to store and process information.

The term was coined as a combination of "information" and "automatic" to describe the science of automating information interactions. The morphology—*informat*-ion + *-ics*—uses "the accepted form for names of sciences, as conics, linguistics, optics, or matters of practice, as economics, politics, tactics", and so, linguistically, the meaning extends

easily to encompass both the science of information and the practice of information processing.

History

This new term was adopted across Western Europe, and, except in English, developed a meaning roughly translated by the English 'computer science', or 'computing science'. Mikhailov advocated the Russian term *informatika* (1966), and the English *informatics* (1967), as names for the *theory of scientific information*, and argued for a broader meaning, including study of the use of information technology in various communities (for example, scientific) and of the interaction of technology and human organizational structures.

> *Informatics is the discipline of science which investigates the structure and properties (not specific content) of scientific information, as well as the regularities of scientific information activity, its theory, history, methodology and organization.*

Usage has since modified this definition in three ways. First, the restriction to scientific information is removed, as in business informatics or legal informatics. Second, since most information is now digitally stored, computation is now central to informatics. Third, the representation, processing and communication of information are added as objects of investigation, since they have been recognized as fundamental to any scientific account of information. Taking *information* as the central focus of study distinguishes *informatics* from *computer science*. Informatics includes the study of biological and social mechanisms of information processing whereas computer science focuses on the digital computation. Similarly, in the study of representation and communication, informatics is indifferent to the substrate that carries information. For example, it encompasses the study of communication using gesture, speech and language, as well as digital communications and networking.

In the English-speaking world the term *informatics* was first widely used in the compound medical informatics, taken to include "the cognitive, information processing, and communication tasks of medical practice, education, and research, including information science and the technology to support these tasks". Many such compounds are now in use; they can be viewed as different areas of "*applied informatics*". Indeed, "In the U.S., however, informatics is linked with applied computing, or computing in the context of another domain."

Informatics encompasses the study of systems that represent, process, and communicate information. However, the theory of computation in the specific discipline of theoretical computer science, which evolved from Alan Turing, studies the notion of a complex system regardless of whether or not information actually exists. Since both fields process information, there is some disagreement among scientists as to field hierarchy; for example Arizona State University attempted to adopt a broader definition of informatics to even encompass cognitive science at the launch of its School of Computing and Informatics in September 2006.

A broad interpretation of *informatics*, as "the study of the structure, algorithms, behaviour, and interactions of natural and artificial computational systems," was introduced by the University of Edinburgh in 1994 when it formed the grouping that is now its School of Informatics. This meaning is now (2006) increasingly used in the United Kingdom.

The 2008 Research Assessment Exercise, of the UK Funding Councils, includes a new, *Computer Science and Informatics,* unit of assessment (UoA), whose scope is described as follows:

> *The UoA includes the study of methods for acquiring, storing, processing, communicating and reasoning about information, and the role of interactivity in natural and artificial systems, through the implementation, organisation and use of computer hardware, software and other resources. The subjects are characterised by the rigorous application of analysis, experimentation and design.*

Academic schools and departments

Academic research in the informatics area can be found in a number of disciplines such as computer science, information technology, Information and Computer Science, information system, business information management and health informatics.

In France, the first degree level qualifications in Informatics (computer science) appeared in the mid-1960s.[*citation needed*]

In English-speaking countries, the first example of a degree level qualification in Informatics occurred in 1982 when Plymouth Polytechnic (now the University of Plymouth) offered a four-year BSc(Honours) degree in Computing and Informatics – with an initial intake of only 35 students. The course still runs today making it the longest

available qualification in the subject.

At the Indiana University School of Informatics (Bloomington, Indianapolis and Southeast), informatics is defined as "the art, science and human dimensions of information technology" and "the study, application, and social consequences of technology." It is also defined in Informatics 101, Introduction to Informatics as "the application of information technology to the arts, sciences, and professions." These definitions are widely accepted in the United States, and differ from British usage in omitting the study of natural computation.

Texas Woman's University places its informatics degrees in its department of Mathematics and Computer Science within the College of Arts & Sciences, though it offers interdisciplinary Health Informatics degrees. Informatics is presented in a generalist framework, as evidenced by their definition of informatics ("Using technology and data analytics to derive meaningful information from data for data and decision driven practice in user centered systems"), though TWU is also known for its nursing and health informatics programs.

At the University of California, Irvine Department of Informatics, informatics is defined as "the interdisciplinary study of the design, application, use and impact of information technology. The discipline of informatics is based on the recognition that the design of this technology is not solely a technical matter, but must focus on the relationship between the technology and its use in real-world settings. That is, informatics designs solutions in context, and takes into account the social, cultural and organizational settings in which computing and information technology will be used."

At the University of Michigan, Ann Arbor Informatics interdisciplinary major, informatics is defined as "the study of information and the ways information is used by and affects human beings and social systems. The major involves coursework from the College of Literature, Science and the Arts, where the Informatics major is housed, as well as the School of Information and the College of Engineering. Key to this growing field is that it applies both technological and social perspectives to the study of information. Michigan's interdisciplinary approach to teaching Informatics gives a solid grounding in contemporary computer programming, mathematics, and statistics, combined with study of the ethical and social science aspects of complex information systems. Experts in the field help design new information technology tools for specific scientific, business, and cultural needs." Michigan offers four curricular tracks within the informatics degree to provide

students with increased expertise. These four track topics include:

- *Internet Informatics*: An applied track in which students experiment with technologies behind Internet-based information systems and acquire skills to map problems to deployable Internet-based solutions. This track will replace Computational Informatics in Fall 2013.
- Data Mining & Information Analysis: Integrates the collection, analysis, and visualization of complex data and its critical role in research, business, and government to provide students with practical skills and a theoretical basis for approaching challenging data analysis problems.
- *Life Science Informatics*: Examines artificial information systems, which has helped scientists make great progress in identifying core components of organisms and ecosystems.
- Social Computing: Advances in computing have created opportunities for studying patterns of social interaction and developing systems that act as introducers, recommenders, coordinators, and record-keepers. Students, in this track, craft, evaluate, and refine social software computer applications for engaging technology in unique social contexts. This track will be phased out in Fall 2013 in favor of the new bachelor of science in information. This will be the first undergraduate degree offered by the School of Information since its founding in 1996. The School of Information already contains a Master's program, Doctorate program, and a professional master's program in conjunction with the School of Public Health. The BS in Information at the University of Michigan will be the first curriculum program of its kind in the United States, with the first graduating class to emerge in 2015. Students will be able to apply for this unique degree in 2013 for the 2014 Fall semester; the new degree will be a stem off of the most popular Social Computing track in the current Informatics interdisciplinary major in LSA. Applications will be open to upper-classmen, juniors and seniors, along with a variety of information classes available for first and second year students to gauge interest and value in the specific sector of study. The degree was approved by the University on June 11, 2012. Along with a new degree in the School of Information, there has also been the first and only chapter of an Informatics Professional Fraternity, Kappa Theta Pi, chartered in Fall 2012.

At the University of Washington, Seattle Informatics Undergraduate Program, Informatics is an undergraduate program offered by the Information School. Bachelor of Science in

Informatics is described as "[a] program that focuses on computer systems from a user-centered perspective and studies the structure, behavior and interactions of natural and artificial systems that store, process and communicate information. Includes instruction in information sciences, human computer interaction, information system analysis and design, telecommunications structure and information architecture and management." Washington offers three degree options as well as a custom track.

- Human-Computer Interaction: The iSchool's work in human-computer interaction (HCI) strives to make information and computing useful, usable, and accessible to all. The Informatics HCI option allows one to blend your technical skills and expertise with a broader perspective on how design and development work impacts users. Courses explore the design, construction, and evaluation of interactive technologies for use by individuals, groups, and organizations, and the social implications of these systems. This work encompasses user interfaces, accessibility concerns, new design techniques and methods for interactive systems and collaboration. Coursework also examines the values implicit in the design and development of technology.
- Information Architecture: Information architecture (IA) is a crucial component in the development of successful Web sites, software, intranets, and online communities. Architects structure the underlying information and its presentation in a logical and intuitive way so that people can put information to use. As an Informatics major with an IA option, one will master the skills needed to organize and label information for improved navigation and search. One will build frameworks to effectively collect, store and deliver information. One will also learn to design the databases and XML storehouses that drive complex and interactive websites, including the navigation, content layout, personalization, and transactional features of the site.
- Information Assurance and Cybersecurity: Information Assurance and Cybersecurity (IAC) is the practice of creating and managing safe and secure systems. It is crucial for organizations public and private, large and small. In the IAC option, one will be equipped with the knowledge to create, deploy, use, and manage systems that preserve individual and organizational privacy and security. This tri-campus concentration leverages the strengths of the Information School, the Computing and Software Systems program at UW Bothell, and the Institute of Technology at UW Tacoma. After a course in the technical, policy, and management foundations of IAC, one may take electives at any campus to learn such specialties as information assurance policy, secure coding, or networking and systems administration.

- Custom (Student-Designed Concentration): Students may choose to develop their own concentration, with approval from the academic adviser. Student-designed concentrations are created out of a list of approved courses and also result in the Bachelor of Science degree.

Applied disciplines

See also: Category:Information science by discipline.

Organizational informatics

Main article: Organizational informatics

One of the most significant areas of application of informatics is that of organizational informatics. Organizational informatics is fundamentally interested in the application of information, information systems and ICT within organisations of various forms including private sector, public sector and voluntary sector organisations. As such, organisational informatics can be seen to be sub-category of social informatics and a super-category of business informatics.

Theories of socio-technical systems

Theories about Socio-Technical Systems include: Functionalism/ Transaction economics, Socio-Technical Interaction Networks/Infrastructure, Media, Information Societies, and Ethics/Values.

Functionalism/transaction economics

Functionalism is defined as the impact new technologies have. Technologies are able to supply new functions or even revise preexisting functions. The main impact of these technologies is seen in the change that they provide and the new things that are possible with these changes. These changes also come with a grain of salt because of the costs that come along with these changes. Looking at the costs and benefits, transaction economics, is extremely critical in the study of the impact of a technology. The difference in costs that is given is equal to the impact of using the new technology. New technologies have made a lot of the tasks done on a daily basis a lot more cost efficient.

Socio-technical networks/infrastructure

Socio-technical interaction network (STIN) is a network that includes people, equipment, data, diverse resources, documents, messages, legal arrangements, enforcement mechanisms and resource flows. STINs are embedded in all of the ICT (Information Communication Technology) that are used today. The bases of these STINs are known as infrastructure. Infrastructure is known as the basic physical and organization structures that are essential to the operation of an enterprise This infrastructure offers solutions that may occur in STINs. Infrastructure is also often not visible and for that reason it is taken for granted. However, infrastructure is extremely important.

See also

- Artificial intelligence
- Behavior informatics
- Biomimetics
- Cognitive science
- Computer science
- Communication studies
- Information science
- Information systems
- Information theory
- Information technology
- Robotics
- Knowledge Management

Notes

1. **^** Karl Steinbuch Eulogy – Bernard Widrow, Reiner Hartenstein, Robert Hecht-Nielsen
2. **^** Dreyfus, Phillipe. *L'informatique*. Gestion, Paris, June 1962, pp. 240–41
3. **^** Oxford English Dictionary 1989
4. **^** Mikhailov, A.I., Chernyl, A.I., and Gilyarevskii, R.S. (1966) "Informatika – novoe nazvanie teorii naučnoj informacii." *Naučno tehničeskaja informacija*, 12, pp. 35–39.
5. **^** Greenes, R.A. and Shortliffe, E.H. (1990) "Medical Informatics: An emerging discipline with academic and institutional perspectives." *Journal of the American Medical Association*, 263(8) pp. 1114–20.
6. **^** [1]
7. **^** For example, at University of Reading, Sussex, City University, Ulster, Bradford, Manchester and Newcastle

8. ^ UoA 23 Computer Science and Informatics, Panel working methods
9. ^ BSc(Hons) Computing Informatics – University of Plymouth Link
10. ^ *"Informatics"*.
11. ^ *"Curriculum - Informatics - University of Michigan"*. *University of Michigan. Retrieved 6 February 2013.*
12. ^ *"Concentration: Informatics"*. *University of Michigan. Retrieved 8 February 2013.*
13. ^ *"UMSI plans new undergraduate degree"*. *University of Michigan School of Information. Retrieved 11 February 2013.*
14. ^ *"Kappa Theta Pi (KTP)"*. *Retrieved 19 February 2013.*
15. ^ *"Degree Options"*. *University of Washington Information School. Retrieved 6 April 2015.*
16. ^ Beynon-Davies P. (2002). Information Systems: an introduction to informatics in Organisations. Palgrave, Basingstoke, UK. ISBN 0-333-96390-3
17. ^ Beynon-Davies P. (2009). Business Information Systems. Palgrave, Basingstoke, UK. ISBN 978-0-230-20368-6
18. ^ [R. Kling, G. McKim, and A. King, "A Bit More to It: Scholarly Communication Forums as Socio-Technical Interaction Networks" JASIST, 54(1):47–67, 2003.]
19. ^ ["Infrastructure." Wikipedia. Wikimedia Foundation, n.d. Web. 11 Apr. 2015.]

External links

- informatics: entry from International Encyclopedia of Information and Library Science
- Software History Center: First usage of *informatics* in the US
- What is Informatics? : Indiana University
- Q&A about informatics
- Prior Art Database: Informatics: An Early Software Company
- Informatics Europe
- The Council of European Professional Informatics Societies (CEPIS)
- Informatics Department, College of Computing and Information, University at Albany - State University of New York
- Department of Informatics, King's College London
- *An Informatics Education: What and who is it for?*, from Northern Kentucky University
- Texas Woman's University's Informatics on Facebook