Service Science in iSchools

Kelly Lyons
Faculty of Information
University of Toronto
Toronto, ON, Canada
+1-416-946-3839

kelly.lyons@utoronto.ca

ABSTRACT

In this paper, we argue that the discipline of service science, in search of an academic home, is ideally situated within an iSchool curriculum and research community. We describe the features and expectations of the emerging field of service science and the skills identified as important for service scientists, and compare them to the features and expectations of iSchools along with skills important for information professionals. We present results of a systematic review of iSchool universities by identifying which faculties, schools or departments in those universities are pursuing courses, programs, and research in service science and demonstrate that most of the effort today is taking place from within business schools or engineering departments. We then discuss the opportunities, impact, and benefits of situating service science research and education programs within iSchools, thereby arguing why iSchools provide an ideal environment for the study of service science.

Keywords
Service science, iSchools, impact, research, education

1. INTRODUCTION

Gathering momentum in the early 1990's the iSchool movement has grown to include 24 schools at 23 universities in six countries in 2009 [9, 16]. The core vision of the iSchools involves bringing a multidisciplinary approach to the study of information, technology, and people as equally interacting entities [16]. A motivation for the emergence of iSchools is a tremendous growth in the amount of digital information [10].

On a slightly later timeline (early 2000's), a call to action or movement was taking place in a topic area being called *service science* (and, in some cases, *service science, management, and engineering*) [2]. Service science is the study of *service systems* which vary in scope (from individuals to businesses, organizations, governments, and nations) and involve people, information, organizations, and technology adapting dynamically

and connecting internally and externally to other service systems through value propositions [14]. Service science strives to bring together many disciplines (computer science, systems engineering, cognitive science, economics, organizational behavior, human resources management, marketing, operations research, and others) in an attempt to study and understand service systems [14]. A motivation for the emergence of service science is the fact that the service sector is the fastest growing in most economies yet it lacks strong conceptual foundations [2].

Companies, led by IBM, began turning to academics to help determine the foundational concepts necessary for a science of services to emerge [2]. Programs and courses began appearing in universities around the world from within different departments and schools. Some institutions were building service science programs in an attempt to bring more excitement to computer science which was experiencing a decline in enrollment [13]. Yet many service science programs are growing out of business schools in marketing, management, operations research, and administration.

In this paper, we look at the 23 universities that have iSchools in the iSchool Caucus (iCaucus) [9] and determine which faculties, programs and/or schools in those universities have service science research and teaching activities. In most cases, business schools have been the place from which service science has emerged. In several of the universities analyzed, engineering schools house service science programs. Only five of the 23 universities in the iCaucus have service science programs, activities, or courses within their iSchool.

We argue that there is a tremendous opportunity to bring impact both to iSchools and to the service science community by engaging in service science research and education through an information and iSchool lens. We formulate this argument by 1) comparing the goals and needs of service science initiatives to those of the iSchool movement; 2) describing and comparing the skills and knowledge of service scientists with those of information professionals; and, 3) describing one program within an existing, yet new, iSchool curriculum.

2. SERVICE SCIENCE PROGRAMS
We did an analysis of the 23 universities with iSchools listed as part of the iSchool caucus to determine which universities have a department or school that has identified service science or service science, management, and engineering as a program, center, course, or have individuals participating in research in service

science. Our research was carried out using the following method:

- Each iSchool website was accessed and courses, programs, research projects, and faculty member profiles were reviewed looking for references to service science, service science, management or engineering (SSME), or related topics

- Each university web site was searched for information about service science, management or engineering, or related topics

- A web search was conducted on the 23 university names with each of the terms "service science", "services science", "SSME", and "service, science, management, and engineering"

- Conference programs from key service science conferences [3, 4, 5] were analyzed for references to the 23 universities

We categorized service science participation as: *programs* which include degrees, certificates, or combinations of courses in service science; *courses* which include one or more individual courses offered on service science; or, *activities* which include individual faculty members or students participating in workshops or conferences on service science or individual research programs in service science. We found that, of the 23 universities with an iSchool, only three have no service science program or activities, twelve have some form of service science involvement through their business or marketing schools, eight have some in their engineering or computer science departments, and only five have a service science presence in their iSchool (some universities have service science presence in more than one discipline). Table 1 summarizes the results of our findings by identifying those universities and their school(s) or department(s) with *programs*, *courses*, or *activities* that are explicitly described as service science efforts. Most of the service science activities in universities with iSchools have emerged from the business schools and their established programs in service marketing or service operations. It is not clear that a discipline of service science can effectively evolve from business school programs (or engineering schools, for that matter) when there are many other facets to service science and a requirement to bring together many disciplines (computer science, systems engineering, cognitive science, economics, organizational behavior, human resources management, marketing, operations research, and others) [7].

Table 1: List of iSchool universities and service science activities (if any) at that university outside of and within the iSchool.

University and Corresponding iSchool		Service Science?		
		Program	**Course**	**Activities**
University of California, Berkeley	School of Information	(Engineering; CS; iSchool ✔; other disciplines) [7]	(Engineering; CS; iSchool ✔; other disciplines) [7]	(Engineering; CS; iSchool ✔; other disciplines) [7]
University of California, Irvine	The Donald Bren School of Information and Computer Sciences	--	--	--
University of California, Los Angeles	Graduate School of Education and Information Studies	--	--	Management
Carnegie Mellon University	School of Information Systems and Management, Heinz College	Computer Science	Computer Science	Computer Science
Drexel University	College of Information Science and Technology	--	--	Business
Florida State University	College of Communication and Information	--	--	Business
Georgia Institute of Technology	College of Computing	--	--	Engineering
Humboldt-Universitat zu Berlin	Berlin School of Library and Information Science	Not available	Not available	Not available
University of Illinois	Graduate School of Library and Information Science	--	--	Business Administration
Indiana University	School of Informatics and Computing	--	--	Business
Indiana University	School of Library and Information Science	--	--	Business
University of Maryland	College of Information Studies	Business	--	Marketing
University of Michigan	The School of Information	--	--	iSchool ✔
University of North Carolina	School of Information and Library Science	--	--	Marketing

The Pennsylvania State University	College of Information Sciences and Technology	--	--	iSchool✔; Engineering; Hospitality and Management
University of Pittsburgh	School of Information Sciences	--	--	Business
Royal School of Library and Information Science, Denmark		--	--	--
Rutgers, the State University of New Jersey	School of Communication and Information	--	--	Engineering
Singapore Management University	School of Information Systems	iSchool✔	iSchool✔	iSchool✔
Syracuse University	School of Information Studies	--	--	--
University of Texas, Austin	School of Information	--	--	Marketing; Business; Science, Technology and Society
University of Toronto	Faculty of Information	--	iSchool✔	iSchool✔
University of Washington	Information School	Engineering	--	--
Wuhan University, China	School of Information Management	Software School	Software School	Software School

Some iSchools have realized the similarities in goals with service science and are working to build programs in service science. In describing their service science, management, and engineering program, the Dean of the Singapore Management University iSchool said, "Over the past five years, our School of Information Systems (SIS) has been pioneering new educational approaches right at the intersection of information technology, IT solutions and business needs – which means we have been working in the spirit of service science all along." [15]

While most iSchools do not have direct link to or work in the emerging field of service science, many have courses and programs with similar goals and content. For example, the Masters of Information Management degree program at the University of Maryland iSchool describes teaching future information professionals "... what they need to understand to manage issues related to users of information, the organization, the content, the technology, and the global environment without being experts in each one of them." [16]. This capability is similar to that of service scientists who need to have knowledge in human, business, and technical issues and should be deep problem solvers in one or more disciplines but have the ability to capably interact with and understand specialists and concepts from other disciplines [8]. In the next section, a more detailed comparison of the motivations and challenges of iSchools and those of service science is presented which further highlights the similarities between the two.

3. SERVICE SCIENCE AND iSCHOOLS

According to Maglio and Spohrer [14]: "Service science combines organization and human understanding with business and technological understanding to categorize and explain the many types of service systems that exist as well as how service systems interact and evolve to cocreate value." Service science, therefore, brings knowledge and understanding in organizations, humans, business, and technology to bear in a study of service systems which are made up of people, information, organizations, and technology. We compare that to iSchools which, "are interested in the relationship between information, people and technology" [9]. Given this comparison, one can see that the scholarly pursuits within iSchools are well suited to the study of service systems.

The iSchools' vision addresses the multidisciplinary requirements necessary for progress to be made in science, business, education, and culture: "An iSchool provides the venue that enables scholars from a variety of contributing disciplines to leverage their individual insights, perspectives, and interests, informed by a rich, 'trans-disciplinary' community." [12]. Service science requires bringing together understanding and knowledge in different areas (organizational and human, business, technology) and different disciplines together to study service systems [14]. Crossing academic disciplines is difficult for a number of reasons including the fact that each discipline has different methods, norms, values, goals, models, ethics, and ways of interacting with external bodies [11]; however, these multidisciplinary hurdles are not only being overcome in iSchools but being exploited to enhance the research and education of information professionals [11]. The multidisciplinary focus in iSchools makes them an ideal place to engage in service science research and teaching.

Another component of the iSchool vision is the importance of industry which can help shape an applied research agenda and also the leadership iSchools bring in providing direction to industry and government. An important strategy in the creation of a science of service is engaging with university, government, and industry partners [19]. The importance of conducting research that is defined jointly with industry and academia is well-understood in iSchools and in the field of service science.

3.1 Education and Knowledge

In addition to similarities in motivations and challenges with respect to content and vision, iSchools and service science have related knowledge needs and ideals for graduates of their programs. The iSchools' vision states that expertise in all forms of information is needed to make progress and must include "understanding of the uses and users of information, as well as information technologies and their applications." [11]. Service

science is the study of interconnections of people, technology, organizations, and information that requires knowledge and understanding in human and organizations, business domains, and technology [14]. There are significant relationships between the kinds of knowledge and expertise needed to study all forms of information and that needed to study the entities that make up service systems.

Some people have stated that progress in service science requires people who are "T-Shaped" [7, 8] with deep knowledge (the vertical part of the "T") in one or more areas but able to bridge and communicate across the complexities of the other disciplines (the horizontal part of the "T") – others have described "π-Shaped" people which better symbolizes the requirement for depth in more than one area. A similar concept is described by the Georgia Institute of Technology College of Computing iSchool in a document outlining their undergraduate computer science program. It states that their program helps students become symphonic-thinking people who "will develop expertise in multiple, high-value areas of computing and act as innovative boundary crossers." [6] This perspective is motivated by several recent writings including that of Pink in which he identifies that: "The last few decades have belonged to a certain kind of person with a certain kind of mind – computer programmers who could crank out code, lawyers who could craft contracts, MBAs who could crunch numbers. But the keys to the kingdom are changing hands. The future belongs to a very different kind of person with a very different kind of mind –creators and empathizers, pattern recognizers, and meaning makers." [18].

It is no longer sufficient for people to have expertise in one area without understanding the connections and contexts of that expertise in relationship to other disciplines. This is especially true in a multidisciplinary field such as service science and in iSchools where information, technology, and people are of roughly equally significance [17] such that knowledge and understanding in one (no matter how deep that knowledge reaches) is not sufficient without connections to the others.

Table 2 summarizes the similarities identified between the iSchool vision and the goals and motivations of the emerging discipline of service science.

Table 2. Summary of service science and iSchool motivations

iSchool Vision	Service Science Goal
Interested in relationship between information, people, and technology	Studies service systems which are made up of information, people, technology, and organizations
Requires multidisciplinary approach	Requires multidisciplinary approach
Work with industry to shape research direction	Bring academia, industry, government together
Must bring understanding in uses and users of information, information technologies, applications	Must bring understanding in human and organizations, technology, and business domains
Depth in one of information, technology, people not sufficient to understand connections between them	Requires depth in one or more areas and the ability to communicate across complexities of other disciplines

3.2 Service Science iSchool Program

In this section, we describe the Universit of Toronto iSchool program with several specializations including one in architectures and services which includes a service science course, and service science research activities. We show how the program connects to and fits within the existing iSchool program and discuss some of the benefits of participating in a service science research and education program within an iSchool.

The iSchool@Toronto offers a masters of information program with four core courses in: 1) knowledge and information in society; 2) representation, classification, organization and meaning-making; 3) information systems, services and design; and, 4) an information workshop that integrates concepts across the core courses using a set of team-based, hands-on activities. Students then choose a path of study: critical information studies; library and information science; archives and records management; information systems, media and design; cultural heritage; knowledge management and information management; or, the more general field of information. Within each path, clusters of courses can make up a further specialization. In the field of information systems, media and design, students may specialize in services and architectures which includes a course on service science.

This introductory course is available to masters level students across the areas of specialty within the iSchool. It was originally taught in a computer science graduate program. Variants of that original course have been offered twice since in the iSchool. The course is broken into four main topic areas each covered in approximately one quarter of the term:
1. Introduction to service science and service systems: What is it? Why is it important? How does the service system lens apply (or not) in information service contexts?
2. Modeling, analyzing, and optimizing service systems: review of literature and hands-on experience
3. Innovation in service systems: What new technologies, work practices, or business models can be used to enhance service systems?
4. Service oriented architectures (SOA) and service oriented computing: How can SOA be used to implement and architect service systems?

The first assignment asks students to select an organization, entity, infrastructure, or institution to analyze as a service system. They analyze their selected system according to various criteria and definitions presented in the service science literature. We have found that most of the service science concepts and definitions, coming from business schools, have been applied in business and government instances of service systems. In the iSchool, students test the published service science concepts on different kinds of service systems such as cultural and public institutions, non-profit organizations, and information-focused entities. By applying an information or iSchool lens to service science concepts, we have been able to challenge notions such as those of *customer* and *recipients of value* as they are currently defined in service science literature. This has led to many interesting discussions, analyses, and new research topics and directions. Our experience provides an example of how iSchools can bring impact and important diverse perspectives to studies in service science.

4. CONCLUSION

In this paper, we compared the motivations and challenges of service science with that of the iSchools. We argue that there is considerable benefit to studying service science from within iSchools. These benefits include being able to explicitly investigate information as a significant part of service systems, having access to multiple disciplines and perspectives within one school or faculty, looking critically at the technological, domain, and social aspects of service science and their connections and interactions, and studying service science concepts with relation to social good, public institutions, and benefit to society.

It is not yet clear whether service science will grow out from an existing academic field or emerge as an entirely new discipline [7]. It is clear, however, that a multidisciplinary approach is needed and it can be much easier to forge ties and build programs within one academic discipline such as an iSchool than across the existing academic silos that are faculties, schools, departments, and colleges.

Despite the similarity in service science and iSchool challenges and motivations, there are very few iSchools engaged explicitly in service science research or teaching. There are, however, a variety of service science programs that have been launched from other departments and schools within the universities that house the iSchools. There is an opportunity to bring service science knowledge, teaching, and research activities within the scope of an iSchool. Not only will the iSchools be able to branch into and help define an important emerging discipline [1, 20] and have access to industry partnerships and funding in the area, but service science will benefit tremendously from the iSchools' multidisciplinary approach to research and knowledge about the connections among information, technology, and people.

5. ACKNOWLEDGMENTS

6. REFERENCES

[1] America Competes Act, Public Law 110–69—Aug. 9, 2007, Retrieved November 17, 2009 from http://arpa-e.energy.gov/public/pl110-69.pdf

[2] Chesbrough, H. and Spohrer, J. 2006. A research manifesto for services science. Communications of the ACM, Vol. 49, No. 7 (July 2006), ACM Press, New York, NY, 35-40.

[3] Frontiers in Service. 2007. 16th Annual Frontiers in Service Conference Schedule, Retrieved November 18, 2009 from: http://fvortal.cimerr.net/ssme/entry/16th-Annual-Frontiers-in-Service-Conference-Conference-Schedule

[4] Frontiers in Service. 2008. 17th Annual Frontiers in Service Conference, Retrieved November 18, 2009 from: http://www.rhsmith.umd.edu/frontiers2008/

[5] Frontiers in Service. 2009. 18th Annual Frontiers in Service Conference, Retrieved November 18, 2009 from: http://www.rhsmith.umd.edu/ces/eBrochure.html

[6] Furst, M. and DeMillo, R. A. 2006. Creating symphonic-thinking computer science graduates for an increasingly competitive global environment, Whitepaper, Retrieved November 18, 2009 from: http://www.cc.gatech.edu/education/undergrad/bscs/threads_whitepaper.pdf

[7] Glushko, R. J. 2008. Designing a service science discipline with discipline. IBM Systems Journal, 47(1), 15-27.

[8] IfM and IBM. 2008. Succeeding through service innovation: A service perspective for education, research, business and government. Cambridge, United Kingdom: University of Cambridge Institute for Manufacturing. ISBN:978-1-902546-65-0. iSchools, Retrieved November 18, 2009 from: http://www.ischools.org/

[9] iSchools Motivation, Retrieved November 18, 2009 from: http://www.ischools.org/history/motivation/

[10] iSchools Organization, Retrieved November 18, 2009 from: http://www.ischools.org/history/organization/

[11] iSchools Vision, Retrieved November 18, 2009 from: http://www.ischools.org/history/vision/

[12] Jones, E. L., Owensby, J. N., and Allen, C.S. 2008. Strategy for inserting SSME into the undergraduate experience at a minority serving institution. In Service Science: Research and Innovations in the Service Economy, Service Science, Management and Engineering Education for the 21st Century, Eds., B. Hefley and W. Murphy. Springer, NY, 141-146.

[13] Maglio, P. and Spohrer, J. 2008. Fundamentals of service science. J. Academy of Marketing Science, 36(1), 18-20.

[14] Miller, S., Dean of the School of Information Systems, Singapore Management University, Service Science, Management and Engineering (SSME) Programme, Retrieved November 18, 2009 from: http://www.sis.smu.edu.sg/programme/SSME/

[15] MIM Program, University of Maryland, Retrieved November 18, 2009 from http://ischool.umd.edu/programs/mim.shtml

[16] Olson G. M. and Grudin, J. 2009. The information school phenomenon. In Interactions, 16, No. 2 (March and April 2009). ACM Press, New York, NY, 15-19. DOI=http://doi.acm.org/10.1145/1487632.1487636

[17] Pink, D. H. 2005. A whole new mind: Moving from the information age to the conceptual age. Riverhead Books, New York.

[18] Spohrer, J. 2009. Welcome to our declaration of interdependence, Service Science 1(1), i-ii, 2009, Retrieved November 18, 2009 from http://www.sersci.com/ServiceScience//upload/12273996030.pdf

[19] Spohrer, J. and Riecken, D. Guest Editors, 2006. Communications of the ACM, July 2006, 49(7), 31-32

[20] Wobbrock, J. O., Ko, A. J., and Kientz, J. A. 2009. Reflections on the future of iSchools from inspired junior faculty. In Interactions, ACM Press, New York, NY, 69-71. DOI=http://doi.acm.org/10.1145/1572626.1572641