“Airbus’ A380 double-decker jet is two years behind schedule, sending billions of dollars in potential profits down the drain. … But the reason sounds too simple to be true: Airbus factories in Germany and France were using incompatible design software, so the wiring produced in Hamburg didn’t fit properly into the plane on the assembly line in Toulouse.”

Although this might sound like a technology problem, its causes are deeply entangled with strategy and organizational policy issues.

That is the focus of: “GLOBAL INFORMATION SYSTEMS: STRATEGIC, TECHNICAL, AND ORGANIZATIONAL PERSPECTIVES”

As another example, one of the case studies that we consider throughout the course is based upon the experiences of an MIT Sloan graduate who rose to Chief of Staff for Foreign Exchange for one of the world’s largest banks.

He had recommended to the Board the development of a new Global Foreign Exchange Trading system. It was supposed to take 1.5 years and cost $25M. It is now 2.5 years and $35M later and it is not done. Some consultants brought in to evaluate it say it is close to completion, others say it is a hopeless cause.

What do you do? Some issues to consider are:
- What was the **strategic** purpose of the system? Are the assumptions still valid? Are there other ways to accomplish the necessary goals?
- Were the **technical** choices made appropriate and correct? What are the alternatives?
- What are the reasons for the different reactions throughout the **organization** to the proposed system? (ranging from rave reviews to all-out attempts to kill it.)

Note: No prior experience with Information Technology is required.
Motivation:

- It is estimated that 50% of IT dollars are spent on Enterprise Information Integration (EII).
- Lack of IT interoperability is estimated to cost $15B in capital facilities industry alone.
- NRC report on the 9/11 event noted the serious lack of effective interoperation of intelligence databases.
- BW: Airbus' A380 double-decker jet is two years and billions behind schedule due to incompatible design software

Learn the fundamental theories and essential skills for tackling these and many other related problems. By exploring the critical issues of global and internet-based information systems from multiple perspectives, this course is especially relevant to those who wish to effectively exploit information technology in their organizations.

Course Structure:

The course is divided into four parts.

Part 1: Strategic Connectivity (Applications & Cases)
We start with the strategic benefits and implications of intra- and inter-organizational systems in an increasingly global environment, the need for integration of information through frameworks such as competitive forces and interlinked value chains.

Part 2: Physical Connectivity (Communications & Network Technology)
This part focuses on critical communications and network technologies, such as hardware, (e.g., RFID), software/protocols (e.g., TCP/IP), and architectures (e.g., Wide Area Networks - Internet) needed to interconnect systems.

Part 3: Logical Connectivity (Database /XML/ Web Services / Semantic Web)
This part focuses on new technologies to aid logical connectivity, especially to address the syntactic and semantic mapping requirements. For example, I get "profit" data from two divisions who do their accounting differently - how do I reconcile these differences to make effective comparisons? This part of the course presents recent developments, mostly from the fields of Heterogeneous Distributed Database Management Systems, web data extraction, Web Services, and the Semantic Web.

Part 4: Organizational Connectivity (Organizational and Policy Factors)
The final part focuses on the organizational implications and management policy challenges of making effective use of systems that span normal organizational boundaries. Theories of loosely coupled organizations, development of standards, and motivating strategic alliances will be explored.
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<thead>
<tr>
<th>Day</th>
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<th>Topic</th>
<th>Assignment Due</th>
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<td>Sat March 1</td>
<td><strong>INTRODUCTION</strong></td>
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<td><strong>I. STRATEGIC CONNECTIVITY</strong></td>
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<td>2</td>
<td>Sat March 1</td>
<td>Exploiting Web Aggregation</td>
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<td>3</td>
<td>Sat March 1</td>
<td>Information Technology Strategy (Interlinked Value Chains)</td>
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<td>4</td>
<td>Sun March 2</td>
<td>Strategic Case Study (Johnson &amp; Johnson and FXX Cases)</td>
<td>HW1: J&amp;J</td>
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<td>5</td>
<td>Sun March 2</td>
<td>Business and Industry Transformation (McKesson Case)</td>
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<td><strong>II. PHYSICAL CONNECTIVITY</strong></td>
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<td>6</td>
<td>Sun March 2</td>
<td>Wide Area Networks (Packet Network, Internet2, IP-v6)</td>
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<td>Mon March 3</td>
<td>-- NO CLASSES --</td>
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<td>7</td>
<td>Tues March 4</td>
<td>Emerging Technologies III (RFID &amp; its IT infrastructure)</td>
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<td><strong>III. LOGICAL CONNECTIVITY</strong></td>
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<td>8</td>
<td>Tues March 4</td>
<td>Introduction to Database Management Systems</td>
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<td>9</td>
<td>Wed March 5</td>
<td>Distributed Homogeneous Databases</td>
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<td>10</td>
<td>Wed March 5</td>
<td>Distributed Heterogeneous Databases</td>
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<td>Thur March 6</td>
<td>View Integration Among Databases (ER Diagrams)</td>
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<td>12</td>
<td>Thur March 6</td>
<td>Web as a Database (COIN Project)</td>
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<td>Fri March 7</td>
<td>Semantic Integration (COIN Project)</td>
<td>HW3</td>
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<td>14</td>
<td>Fri March 7</td>
<td>Component Architectures (CORBA) and Web Services</td>
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<td>Loosely-Coupled Organizations (ERP)</td>
<td>HW4</td>
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<td>Markets and Hierarchies: Organizational Coupling</td>
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<td>17</td>
<td>Sat March 8</td>
<td>Development of Standards</td>
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<td>Motivating Strategic Alliances &amp; Organizational Transformation</td>
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<td><strong>V. FINALE</strong></td>
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<td>Course Summary and Review</td>
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<td>FINAL EXAM</td>
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ASSIGNMENTS AND EXAMS

Assignments:
- There are 2 kinds of assignments in this class: (1) assigned readings and (2) 4 written homework assignments (HW).
- Each assignment is due in class on the date indicated on the syllabus. These due dates are firm. If you anticipate a problem, see the instructor beforehand!
- Since partial credit is given, it is much better for you to turn in a partially complete assignment than to turn in nothing at all. Points will be subtracted for late homework. These assignments are important because: (1) they help to reinforce the concepts presented in class, (2) they prepare you for the examinations, and (3) they constitute a significant portion of your final grade.

Exams:
- In addition, there is a final exam as indicated on the syllabus.

Academic Integrity:
- All assignments, except if indicated otherwise, are to done individually.

GRADES POLICY

Grades will be assigned based on the following guidelines:
- Class participation: 20%
- Homework: 40%
- Final Exam: 40%
Reading List
(as of 12-15-2007 – subject to change)

INTRODUCTION

1 Introduction
   (Discusses the challenges and benefits of information systems integration. Integration may cost 50% of IT budget. Uses Dell as an example.)
   (http://www.cio.com/archive/111501/efforts.html)  
   (This article argues that getting different vendors to truly integrate complex software is impossible. Highlighting major problems faced by Oracle customers who were promised true integration and found that they never got it, not even a more limited form.)

I. STRATEGIC CONNECTIVITY

2 Exploiting Web Aggregation
   (This paper examines the development of aggregators, entities that collect information from a wide range of sources, with or without prior arrangements, and add value through post-aggregation services. Two key types of aggregators are comparison and relationship aggregators. It also suggests different business models as possible aggregator entry points into an industry and describes their impact on the value chain.)
   (This paper discusses the legal issues related to data re-use, including the European Union’s Database Directive.)

3 Information Technology, Corporate Strategy, and Competitive Advantage
   (Uses the five forces model and value chain model, but in the context of the Internet. He argues that the Internet does not change the “old rules”. He dispels many Internet myths, which have become more obvious in recent years, and illustrates that the “old rules” are also the “new rules.” He also suggests six principles for Strategic Positioning: (1) right goal, (2) value proposition, (3) distinctive value chain, (4) trade-offs, (5) fit, and (6) continuity of direction.)
   (This is a classic paper. Presents a summary of the key ideas from Porter’s widely-cited books Competitive Strategy and Competitive Advantage. It identifies five forces that determine industry profitability: (1) the entry of new competitors, (2) the threat of substitutes, (3) the power of buyers, (4) the power of suppliers, and (5) rivalry among the existing competitors. It also proposes three generic strategies for success: (1) cost leadership, (2) differentiation, and (3) focus. Another important concept is the value chain. The five major components of the value chain are: (1) inbound logistics, (2) operations, (3) outbound logistics, (4) marketing & sales, and (5)
service. There are three infrastructure activities that support the value chain: (1) human resource management, (2) technology development, and (3) procurement.

The value chain provides a systematic way to examine all the activities of a firm. Linkages, or "connectivity", between value chains is an important way to exploit strategic advantages. Furthermore, this article identifies three ways that technology affects competition: (1) it alters industry structure, (2) it supports cost and differentiation strategies, and (3) it spawns new businesses.

4 Strategic Case Study (Johnson & Johnson Case)
   (Both of these cases, one full-length, one a mini-case, illustrate situations where integrating existing information to support global operations was necessary.)

5 Inter- and Intra-Organizational Systems (McKesson Case)

II. PHYSICAL CONNECTIVITY

6 Wide Area Networks

7 Emerging Technologies: RFID
2. S. Tu, S. Madnick, and L. Wu, “Improving UccNet-Compliant B2B Supply Chain Applications Using a Context Interchange Framework”, Proceedings on International Workshop on Business and Information, Taipei, Taiwan, March 26-27, 2004, pp. 4-14. [Discusses UCC-Net which in its new form, now called EPCGlobal, serves as part of the RFID information infrastructure. Some of the shortcomings of UCC-Net are identified. This provides a good transition to the issues addressed in the Logical Connectivity part of the course.]

III. LOGICAL CONNECTIVITY

8 Introduction to Database Management Systems
1. Microsoft, “The Desktop Database Backgrounder”, 1995. [Provides a good background on basic database management systems concept and types of databases, such as hierarchical, network, and relational.]
9 Distributed Homogeneous Databases
   (http://www.mid.main.vsu.ru/docs/oracle/server.816/a76960/ds_conce.htm#12157)
   (Discusses distributed database systems, including several types of “transparency” and “autonomy”.)
   (Discusses some of the key requirements of distributed database systems, especially concurrency control and replication.)

10 Distributed Heterogeneous Databases
   (This paper presents the basic concepts of heterogeneous databases and describes several early experimental systems, such as Dataplex and Multibase.)

11 View Integration Among Databases
   (Provides an introduction to ER diagrams.)
   (A "schema" is a representation of all the data to be managed by an organization. In the context of distributed database systems and inter-organizational systems, it may be necessary to use data that spans two or more organizations. This paper addresses the issue of integrating the individual database schemas. It discusses various causes of schema differences and various approaches to solving these problems.)
   (This paper provides some motivation for the causes of heterogeneous systems and describes the process of integration – similar to the Batini et al paper.)

12 Web as a Database
   (Provides an introduction to XML and gives a brief comparison between HTML and XML.)
   (Describes the web wrapping technology for enabling semi-structured web sites to be accessed as if they were SQL relational databases.)
   (Describes both the capabilities of XML, that improve upon HTML, and its limitations, especially with addressing semantic problems – more about this in next session.)

13 Semantic Integration
   (Describes the problem of semantic heterogeneity – where the same “word” may have multiple interpretations. For example, does “price” include tax or not, is it in Dollars or Pounds, etc.)

   (This is the seminal paper when Tim Berner-Lee first introduced the notion of the “semantic web.”)

   (Describes the approach to context mediation developed at MIT and the use of ontologies)

14 Component Architectures & Web Services
   (This paper presents a brief overview of "web services.")

   (This paper shows how web services can be used to accomplish process integration, as well as the challenges that must be overcome.)

IV. ORGANIZATIONAL CONNECTIVITY

15 Loosely-Coupled Organizations
   (Presents a brief overview and history of ERP systems.)

   (Describes motivations for ERPs: Infrastructure (common platform), Capability (process improve, data visibility), and Performance (cost reduction, decision making, customer responsiveness). Major difficulties and success factors: (1) metrics, (2) on-going resources, (3) management reporting, and (4) addressing resistance. Major point is that standardized processes and data is key to flexibility.)

   (This is a classic paper that presents the notion of "loosely coupled" organizations, using educational organizations as examples. It argues that although certain actions or events may seem "irrational," it is often because we do not fully understand what is going on. He also presents seven advantages of loose coupling.)

16 Markets and Hierarchies: Organizational Coupling
   (Presents key issues of bounded rationality, uncertainty, complexity, and opportunism. These ideas were first introduced by Herb Simon.)

   (This is a classic paper that introduces transaction cost economics. Discusses reasons for vertical integration and multi-divisions. Asset specificity discussed.)
17 Development of Standards

18 Motivating Strategic Alliances & Organizational Transformation
   (http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=49180)
   (This paper explores the nature of strategic goals underlying composite information systems, also referred to as inter-organizational systems, and ways to increase the likelihood of success through three techniques: (1) bi-directional benefits, (2) co-operative pay-out, and (3) asymmetric control.)

V. FINALE

19 Course Summary and Review

20 FINAL EXAM