Course Description

Describes Web 2.0 that emphasize interactivity by online collaboration and sharing among users, such as social networking sites, wikis, and communication tools. Then introduces Web 2.x, transitional technologies that make the web more proactive, such as cloud computing and web services.

Finally presents the emerging Web 3.0 providing high proactivity, including transforming the Web into a database and the leveraging of artificial intelligence technologies, such as the Semantic web.

Addresses the range of new Web technologies, the applications made possible, and the business opportunities and challenges provided by the emergence of Management 3.0. Discussions of basic principles, cases, industry and academic speakers, and a team project.

This is the first offering of this course. Although some materials will be presented by the instructor, significant input, views, and experiences from students is expected to enrich the discussion and guide the direction of the course.

For more information, contact Prof. Madnick (E53-321, smadnick@mit.edu, 253-6671).
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**HW1 dates:** Part 1 - Questions for a Guest Speakers - due 4 days before guest speaker presentation; Part 2 - Comment on two sets of Questions by midnight the day before guest speaker presentation.

* To accommodate the schedules of some Guest Speakers, who often preferred the 4-5:30 time slot on that day, some sessions will be slightly out of order, noted by the “*.”
Useful Information

STAFF

Lecturer:
Stuart E. MADNICK
E53-321
Ext. 3-6671
smadnick@mit.edu

Secretary:
Michelle Cole
E53-340
Ext. 8-5583
mmcole@mit.edu

TA:
James Blair
james.blair@jb.ca
blairj@mit.edu

TA:
Yaar Schnitman
yaar@sloan.mit.edu
yaar@mit.edu

Office hours by appointment

WEB SITE

15.579 web site is accessed via Stellar
If you are not a Sloan student with access to Stellar, let the TA’s know.

READINGS

The sources for the Readings are primarily Internet Downloads:
The readings that we had included in the Course Packet in the past (and that you had to pay for) are now available for free on the Internet. That also gives you the choice of printing them out or reading them online.

Some of the Internet Downloads are available free because of MIT’s subscription to certain services. In that case, you must access them through a computer on the mit.edu network or use the special procedures (see http://libraries.mit.edu/vera) available through the MIT Library Services (requiring MIT certificates).

You will be held responsible for reading the assigned materials and being prepared for class discussion. Optional or suggested readings may also be identified for various topics to allow further study for those interested in more depth.

ASSIGNMENTS AND EXAMS

Assignments:

- There are 3 kinds of assignments in this class: (1) assigned readings, (2) written homework assignments, including case writeups, and (3) a term project.

- 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.

GRADES POLICY
Grades will be assigned based on the following guidelines (subject to change):

- Class participation: 20%
- Homework: 40%
- Term Project: 40%

**Professional Conduct and Academic Integrity:**

- Students are expected to be knowable about and observe Sloan’s Professional Conduct standards.
- All assignments, except if indicated otherwise, are to done individually, as explained in the memo, "Sloan School Policy on Individual Work."
- However, the Term Project and Computer Project (except for part CP1) are intended to be team efforts. In those cases, all members of the team are expected to contribute equally.
Description of Sessions and Reading List

(As of 04/24/2009 – subject to change)

To save both most printing and copyright charges, we have provided the URLs for most of the readings. They can be accessed for free while on the MIT network (it is recommended that you access and either print or save to disk while at MIT). Sometimes merely clicking on the URLs will get you the article, sometimes you may need to “cut & paste” URL into your browser. Most can be also accessed at home, using the MIT private virtual network and/or instructions that can be found at http://libraries.mit.edu/vera

INTRODUCTION

1 Introduction and Overview
Introduction to the course. Class will discuss the characteristics and distinctions between Web 1.0, 2.0, 2.x, and 3.0 and current trends.
No readings for this session.

WEB 2.0
WEB 2.0 EXAMPLES

2 Web 2.0 & User generated content
Discussion of the definition of “Web 2.0” and the transition of the Web from users who only are consumers of content to users as generators of content, known as User Generated Content (UGC). Discussion of successful consumer and business applications.

Tim O'Reilly is generally credited with coining the term “Web 2.0.” This paper was his first initiative to define “Web 2.0” and understand its implications. He defined the core competencies of Web 2.0 companies to be: (1) services, not packaged software, with cost-effective scalability, (2) control over unique, hard-to-recreate data sources that get richer as more people use them, (3) trusting users as co-developers, (4) harnessing collective intelligence, (5) leveraging the long tail through customer self-service, (6) software above the level of a single device, (7) lightweight user interfaces, development models, and business models.

3 Early Mashups and Web Aggregators
Mashups have recently become the basis of many new business models and online services.

In web development, a mashup is a web application that combines data from more than one source into a single integrated tool. The term Mashup implies easy, fast integration, frequently done by access to open API's and data sources to produce results data owners had no idea could be produced. An example is the use of cartographic data from Google Maps to add location information to real-estate data, thereby creating a new and distinct web service that was not originally provided by either source.
[ http://en.wikipedia.org/wiki/Mashup_(web_application_hybrid) ]

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.


4 Collective Intelligence and Recommendation systems

Guest Speaker: Robert Laubacher (MIT Center for Collective Intelligence).

While people have talked about collective intelligence for decades, new communication technologies—especially the Internet—now allow huge numbers of people all over the planet to work together in new ways. The successes of systems like Google and Wikipedia suggest that the time is now ripe for many more such systems, and the goal of the MIT Center for Collective Intelligence (CCI) is to understand how to take advantage of these possibilities. CCI’s basic research question is: How can people and computers be connected so that—collectively—they act more intelligently than any individuals, groups, or computers have ever done before?


Remember outsourcing? Sending jobs to India and China is so 2003. The new pool of cheap labor: everyday people using their spare cycles to create content, solve problems, even do corporate R & D.

[http://www.wired.com/wired/archive/14.06/crowds_pr.html]


Many internet superstars owe much of their success to the contributions made by countless people from outside their organizations. Cook, the founder of Intuit (maker of products such as Quicken and TurboTax), challenges traditional companies to tap this emerging source of value by actively creating what he calls user contribution systems. He creates a taxonomy of the systems that can capture user contributions and shows the variety of ways in which companies from Honda to Procter & Gamble to Hyatt Hotels are leveraging them. He offers advice on how business leaders can catalyze action to create user contribution systems in their own organizations.

[Go to http://libraries.mit.edu/vera Do Exact Search on “Harvard Business Review”, choose year 2008, then month October, and go to paper #15.]


This chapter provides an overarching model that includes detailed descriptions of several interesting case studies in a way that nicely illustrates the framework.


This article offers a new framework to help identify the underlying building blocks—to use a biological metaphor, the “genes”—that are at the heart of collective intelligence systems, the conditions under which each gene is useful, and the
possibilities for combining and re-combining these genes to harness crowds effectively.

5 Social networks

Many social network services, such as Facebook, MySpace and LinkedIn, have emerged. Class will discuss social networking theory in the fields of information disimination, marketing and productivity, and how business can harness emerging social web technologies to their advantage.


People are connecting with one another in increasing numbers, thanks to blogs, social networking sites like MySpace and countless communities across the Web. Some companies are learning to turn this growing groundswell to their advantage.
[Go to http://libraries.mit.edu/vera  Select Exact Search for “Sloan Management Review” and choose “Continued by MIT Sloan management review”, then choose “Full text - ProQuest ABI/INFORM Global,” then select “Spring 2008” and go to article #5]


Social network sites (SNSs) are increasingly attracting the attention of academic and industry researchers intrigued by their affordances and reach. This paper describes features of SNSs and propose a comprehensive definition. It then present one perspective on the history of such sites, discussing key changes and developments. After briefly summarizing existing scholarship concerning SNSs, it discusses other relevant articles and concludes with considerations for future research.
[Go to http://libraries.mit.edu/vera  Select Exact Search for “Journal of Computer-Mediated Communication” and choose “Full text - Synergy Blackwell” then select “2007”, then select “Volume 13 Issue 1 - October 2007”, go to the 11th article]

6 Two-sided platforms/markets

Guest speaker: Erik Brynjolfsson, (Director, MIT Center for Digital Business)

Many successful Web 2.0 businesses are based on a two-sided platform--between, for example, social network users and advertisers. This session will discuss strategies for two-sided markets and ways to exploit the network efforts of Web 2.0.


This article reports on strategies for two-sided markets. Companies in industries such as banking, software, and media make money by linking markets from different sides of their customer networks – e.g., audiences and advertisers. The distinct character of these businesses demands a new approach to strategy. Of the blockbuster products and services that have redefined the global business landscape, you will find that many of them tie together two distinct groups of users in a network.
[Go to http://libraries.mit.edu/vera  Do Exact Search on “Harvard Business Review”, choose year 2006, then month October, and go to paper #19.]

This paper refines the concept of "network effect" and uses this to explain free goods and seemingly anomalous pricing behavior in the Internet Economy. Results affect almost any market that seeks to introduce a new goods format. Since network industries tend to concentrate, pricing issues also matter to antitrust law.


WEB 2.0 TECHNOLOGIES

7 Mobile/Geo/3D web

The proliferation of mobile devices, as well as satellite imagery and geographic databases, is quickly changing the way we access the internet, search for information and interact socially. In the meantime, these technologies allow companies to collect more detailed and personal data about us. Class discussion will cover current state of the art, such as Geographic Information Systems, mobile development platforms, and 3D web, such as 2nd Life.


Second Life is a "metaverse" (ie, metaphysical universe), a three-dimensional world whose users, or "residents", can create and be anything they want. Second Life is not just a game. Increasing numbers use Second Life for things that are quite serious. They form support groups for cancer survivors. They rehearse responses to earthquakes and terrorist attacks. They build Buddhist retreats and meditate. Many use it as an enhanced communications medium. Everything about Second Life is intended to make it an engine of creativity, Linden Lab early on decided that residents should own the intellectual property inherent in their creations. Linden Lab does not sell advertising; instead it is a virtual property company.

[Go to http://libraries.mit.edu/vera Do Exact Search on "The Economist", select option: "Full text - ProQuest ABI/INFORM Global," choose date Sep 30, 2006; Vol.380, Iss.8497,and go to paper #67.]


IBM said it will become the first company to host private regions of the Second Life Grid on its own servers, marking a new focus by Linden Lab on serving corporate customers.

[http://secondlife.reuters.com/stories/2008/04/02/ibm-to-host-private-second-life-regions/]


This article describes how IBM is integrating support for Second Life (and a few other virtual world platforms) into its Lotus Sametime corporate instant-messaging product. It also includes a YouTube video demonstration.


This paper gives a comprehensive overview of mobile web applications, divided into three major categories: context specific (e.g., location-based), ever-present, and mobility.

WEB 2.0 IMPACT

8 Broad Impact on Business and Society

Guest speaker: Daniel J. Weitzner, (Director, W3C Technology and Society Policy)
The web needs to support the basic social values of trustworthiness, privacy, and respect for social boundaries.


Existing legal and technical mechanisms intended to protect our privacy, copyright, and other important values have been overwhelmed by the increasingly open information environment in which we live. These threats follow from the ease of information storage, transportation, aggregation, and analysis. We face the real risk that the technical laws spelled out by Gordon Moore (growth in processing power) and Robert Metcalfe (network effects) will permanently overwhelm our values as enshrined in society’s laws.


A description of the social-networking strategy that took an obscure senator to the doors of the White House.

[www.technologyreview.com/web/21222 It is free, but you might need to register with Technology Review.]

9 General impacts & success stories

Guest speaker: Stephen Kaufer, (CEO TripAdvisor)
Web 2.0 provides opportunities to create new businesses and change existing businesses. These can be based on Consumer-consumer; consumer-business, or business-business interactions. This session will discuss a successful example: TripAdvisor.


TripAdvisor was founded in February 2000 and is among the world’s largest online travel communities with over 20 million unique monthly visitors and approximately 5 million registered members. TripAdvisor is currently part of Expedia. The site is a winner of PC Magazine’s Top 100 Web Sites and Forbes’ Best of the Web.


Nancy Keates on how seasoned travelers decode the ratings on the nation’s most influential hotel review site.

[http://online.wsj.com/article/SB118065569116920710.html]

c) Peter O’Connor, “User-Generated Content and Travel: A Case Study on TripAdvisor.Com,” Information and Communication Technologies in Tourism, Publisher Springer Vienna, February 17, 2008, Pages 47-58

This paper focuses on TripAdvisor.com. Using a sample of London hotels, it was shown that the system displays detailed, rich and relevant data for use by consumers in their travel planning. Analyses also suggest that the belief that the system is compromised by false reviews posted to enhance a hotel’s reputation or tarnish that of competitors is unfounded. Little evidence was found of characteristics that typify false reviews.

[First go to http://libraries.mit.edu/get/springer (you will need MIT certificate), once there, search for the document by using full title (or this might work if you are on MIT network http://www.springerlink.com/content/v41163686402r3x7/)]

Steve Kaufer, Langley Steinert, Nick Shanny, and Thomas Palka started TripAdvisor, an online travel site, in 2000. The online travel forum was a pioneer in the now common practice of having users pick the winners, instead of leaving the choices up to human editors. TripAdvisor became the largest online travel community in the world, and was acquired in 2004 by Barry Diller’s InterActiveCorp (IAC). As of July 2006, TripAdvisor had amassed more than five million user reviews and opinions, covering 220,000-plus hotels and attractions.

[First go to http://libraries.mit.edu/get/springer (you will need MIT certificate), once there, search for the document by using full title (or this might work if you are on MIT network http://www.springerlink.com/content/xu732647wi71650v/ )]

10 Open Innovation

Many companies have discovered that there is an alternative to total reliance on internal R&D. By harnessing the power of the web, companies can tap into a worldwide pool of experts.


This paper discusses how companies are increasingly rethinking the fundamental ways in which they generate ideas and bring them to market — harnessing external ideas while leveraging their in-house R&D outside their current operations.

[Go to http://libraries.mit.edu/vera Select Exact Search for “Sloan Management Review” and choose “Continued by MIT Sloan management review”, then choose “Full text - ProQuest ABI/INFORM Global,” then select “Spring 2003” and go to article #10]


The movement from internal R&D to external connect and develop opens the door for companies – large and small – to reach beyond their core competencies to remain competitive in an increasingly complex, uncertain and changing environment. This report explains the phenomenon, the process and provides examples and a case report.

[ http://www.openinnovatie.nl/download/LowResIKMarch08Case%20Study.pdf ]


InnoCentive inspires and unites a web community of scientists, engineers, professionals and entrepreneurs worldwide who collaborate to deliver breakthrough solutions for some of the world’s most progressive organizations.

[ http://www.innocentive.com/_assets/pdfs/InnoCentive_Corporate_Overview.pdf ]

WEB 2.x

11 Introduction to Web 2.x technologies

This session provides an introduction and overview of the Web 2.x technologies to be discussed in the following sessions, including: cloud computing, web services, Service Oriented Architectures (SOA), Open APIs, Advanced Mashups, and Collaboration services.

*No readings for this session.*

WEB 2.x TECHNOLOGIES

12 Web Services

This session will discuss: what are web services and the technologies behind them. Some of the key players and their respective platforms will be discussed, as well as perspectives among providers and consumers.

This is a collection of three articles that address: (1) how web services will automate the flow of information among companies, (2) what are web services, and (3) how web services are making companies more flexible and more profitable.

[http://download.mckinseyquarterly.com/web_services.pdf]

13 Cloud Computing
This session will discuss: what is cloud computing and its origins and technologies. Discussion of some of the key vendors in this space and applications of cloud computing, including Amazon Web Services, Google App Engine, Salesforce.com, and Rackspace’s.

Information technology is turning into a global “cloud” accessible from anywhere. This Special Report contains several short articles that discuss what it means for the way people conduct business.

[http://www.economist.com/surveys/downloadSurveyPDF.cfm?id=12446057&surveycode=NA&submit=View+PDF contains all the articles in one PDF file or http://www.economist.com/specialreports/displayStory.cfm?story_id=12411882 to get first article and then link to get the subsequent articles]

WEB 2.x EXAMPLES

14 Component Examples, OpenAPIs, and Advanced Mashups
Web services, OpenAPIs, and other Web 2.x technologies provide capabilities for much more advanced mashups, but they also entail a need to understand the interdependencies and risks created.

Mashups are an area of enormous innovation that is manifested through new business models, new technologies, and clever new ways to use and share data. The focus of this case study is the relationship between innovation in Web services applications and their interoperability (or interoperability potential). This paper discusses several options for creating greater sustainability over time, such as license interoperability, open standards, and back-up in the form of traditional law enforcement.

[http://ssrn.com/abstract=1033232]

15 Collaboration Examples
Guest speaker: Satwik Seshasai (Senior Manager, Online Collaboration Services, IBM).

Email, IM and have widely reduced the use of paper mail, travel and phone as collaboration tool, but they have not fundamentally changed how people work together. Novel technologies, such as online workspaces, wikis, and search can fundamentally change how team can work together and increase productivity.

Meshing formal business processes with informal human collaborations is needed to support business activities. Most knowledge work is collaborative, informal, and situationally adaptive. When business activities require support
that does not inhibit its informal and locally adaptive nature, it is called Unified Activity Management (UAM).

[Go to http://libraries.mit.edu/vera Select Exact Search for "Communications of the ACM" and choose "Full text - ACM Digital Library", then select "December 2005" and go to the article]


This paper describes research into secure managed extranets, motivated by the requirements of companies (possibly competitors) needing to collaborate on occasion. There are two requirements addressed: (i) a service-construct abstraction based on what they term a 'Collaborative Context' where authorized participants (e.g. project leaders) have collective provisioning capabilities for the purpose of negotiating and contributing exclusive resources to create a virtual private enterprise, and (ii) a realization of the collaborative context as a commercially oriented, on-demand Virtual Private eXtranet Service (VPXS).

[ Go to http://libraries.mit.edu/vera Select Exact Search for "IEEE Xplore" and do a basic search for the article by title "Enterprise Collaborative Contexts." ]

c) Antone Gonsalves, "IBM Opens 'Bluehouse' For Cloud-Based Social Networking," InformationWeek, October 6, 2008, 2 pages.

The article describes how IBM ties together parts of its Lotus, Rational, and Tivoli software to appeal to SMBs and departments in larger corporations, because of the minimal up-front costs and maintenance.

[ http://www.informationweek.com/shared/printableArticle.jhtml?articleID=210700289 ]

WEB 3.0

16 Introduction to Web 3.0 & Semantic web concept

Discussion of the long-term vision of the “data web” and “semantic web.” Brief explanation of the Semantic Web and its “Layer Cake” of technologies.


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


The Web has been evolving towards the vision of the Semantic Web — an extension of the existing web through which machines are better able to interoperate and work on our behalf. It is a dramatic vision that stands to transform the existing Web in devastatingly powerful ways. This paper also briefly introduces the Semantic Web “layer cake” of technologies.

**WEB 3.0 TECHNOLOGIES**

17 Semantic Web

**Guest speaker:** Tim Berners-Lee (MIT and World Wide Web Consortium – W3C).

The Semantic Web is an evolving extension of the World Wide Web in which the semantics of information and services on the web is defined, making it possible for the web to understand and satisfy the requests of people and machines to use the web content. It derives from Tim Berners-Lee's vision of the Web as a universal medium for data, information, and knowledge exchange.


>This article includes many scenarios in which intelligent agents undertook tasks on behalf of their human or corporate owners. Of course, there are shopbots and auction bots on the Web, but these are essentially handcrafted for particular tasks: they have little ability to interact with heterogeneous data and information types. Because there is not yet large-scale, agent-based mediation, some commentators argue that the semantic Web has failed to deliver. This paper argues that intelligent agents can only flourish when standards are well established. Web standards for expressing shared meaning have progressed steadily over the past five years.

[Go to http://libraries.mit.edu/vera Do Exact Search on “IEEE intelligent systems”, select “Continued by IEEE intelligent systems,” select “Full text - IEEE Journals,” first choose year “2006,” then choose “Volume 21, Issue 3,” and go to paper entitled “The Semantic Web Revisited” which is next to last on list.]

18 Semantic Representation: Ontology Languages

An “ontology” is a representation of "what exists" and is based on the meaning (also known as “semantics”) from traditional philosophy. In the Semantic Web, there are ontology languages such as RDF and OWL.


>Ontologies have moved beyond the domains of library science, philosophy, and knowledge representation. They are now the concerns of marketing departments, CEOs, and mainstream business. Ontologies are used as central controlled vocabularies that are integrated into catalogues, databases, web publications, knowledge management applications, etc. This paper discusses ontologies and requirements in their current instantiations on the web today and how both simple and complex ontologies are being and may be used to support varied applications.


>This article discusses both old and new ideas of semantics and ontology and how they affect the way we analyze data. It introduces the main concepts and shows examples of the Resource Description Framework (RDF) and the Web Ontology Language (OWL) languages.

[http://www.tdan.com/view-articles/5025]

19 Semantic Reasoning

Although semantic representation provides meanings, it is semantic reasoning that makes that knowledge useful. In this session, a particular application – information integration – is presented and semantic reasoning techniques developed at MIT are presented.

There are many different kinds of ontologies, from lightweight ontologies to formal ontologies. This paper compares and contrasts the lightweight and formal ontology approaches to data interoperability. It also provides a structure for context descriptions. The structure can be exploited to facilitate semantic reasoning for automatic composition of context mappings. This mechanism leads to a scalable solution to semantic interoperability among disparate data sources and contexts. [http://web.mit.edu/smadnick/www/wp/2007-13.pdf]


Data quality issues have taken on increasing importance in recent years, especially when integrating information from multiple sources. This paper notes that many “data quality” problems are actually “data misinterpretation” problems – that is, problems caused by heterogeneous data semantics, especially the issue of aggregational ontological heterogeneity, which concerns how complex entities and their relationships are aggregated. It is shown how the MIT COnText INterchange (COIN) technology can be used to capture data semantics and apply semantic reasoning to reconcile semantic heterogeneities, thereby improving data quality. [Free pre-print version available from http://ssrn.com/abstract=825650]

WEB 3.0 APPLICATIONS & IMPACTS ON MANAGEMENT

20 Web 2.0, 2.x, 3.0 -- Debates by Students

21 Web 3.0 Applications


Activity area: health care and public institution; Application area of SW technologies: data integration; SW technologies used: RDF(S), OWL, GRDDL, Rules, Rules (N3), and public vocabularies; SW technology benefits: automation, incremental modeling, and improved search [http://www.w3.org/2001/sw/sweo/public/UseCases/ClevelandClinic]


Activity area: life sciences; Application area of SW technologies: data integration and text mining; SW technologies used: RDF(S) and in-house vocabularies; SW technology benefits: incremental modeling, rapid response to change, faceted navigation, and share and re-use data [http://www.w3.org/2001/sw/sweo/public/UseCases/Pfizer/]

STUDENT PRESENTATIONS

22 Student Presentations

Presentations of selected student term projects