Demystifying Mashups

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Abstract

Software mashups have been called the 21st century analog of the spreadsheet, the universal business tool that gave countless end-users the ability to develop sophisticated business intelligence and decision support tools without relying on resources and support from information technology departments. Mashups are viewed as the next wave of end-user development. Increasingly businesses are utilizing mashup technology for enterprise applications. Since the interest in business mashups is expected to grow, business students will benefit with proficiency in this Web 2.0 technology. The introductory Information Systems course provides a logical place to introduce our students to this 21st century technology. Developing mashup skills early in their coursework may also help students recognize the opportunities that are associated with the Information Systems major.

Keywords: Mashups, Web 2.0, Web Applications, Information Technology Education, Information Technology Curriculum, Business Education

Introduction

A software mashup is an application, a widget or a resource that blends data from more than one source. The first software mashup appeared in 2005. Soon after they began appearing, software mashups were generating considerable buzz as the next wave of end-user development; the 21st century analog of the spreadsheet. Mashups give users the potential for delivering business intelligence and decision support tools that were previously considered too expensive or too impractical to warrant formal IT development and support.

The egalitarian aspect of user-created software has historically given Information Systems professionals discomfort, some of which is probably undeserved. For example, user-developed spreadsheet applications were sometimes unrecognized or disallowed by IT departments simply because the IT department did not develop or control the application. Any deserved discomfort comes from user-created applications that neglected adherence and conformance to data integrity standards, formal testing and documentation standards, information security policies and regulatory compliance issues.

Mashups are evoking similar angst in some IT departments today where IT managers have seen this relatively new Web 2.0 technology " … infiltrate the corporate world at the grass-roots level and threaten to render the command-and-control style of IT management obsolete" (Brandel, 2008, p. 1). Brandel argues that these Web 2.0 technologies, driven by the consumer side of the world, will cause a shift in power that enterprise IT departments should not ignore. These technologies

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need to be explored by organizations, and not just the IT side of the organization. Some may view mashup technology as equally disruptive for IS education. As today's digital-native students increasingly bring vast, consumer-side technology experiences into the classroom, educators in Information Systems will need to consider how to adapt the curriculum to meet the demands and changing needs of all of our business students. Ideally this can be viewed as an opportunity to deliver an alluring skill set that draws students to the major.

Information Systems educators should benefit from a solid understanding of this type of innovation, especially those who seek ways to adapt the IT curriculum to promote the effective development and implementation of user-driven applications like mashups. The objective of this paper is to demystify mashups. Our starting point is to focus on how to integrate this content into the required "Principles of Information Systems", "Computing Concepts" or "Management Information Systems" course. This course, although the title often varies, is typically required of all business majors and serves to introduce students to the general concepts about how information systems are used in business. We are particularly interested in understanding the mashup components and the skill set necessary to effectively integrate this innovative Web 2.0 technology into student learning for the general business student. In this paper we will describe what mashups are, why they are important to business, why we should introduce the technology to business students, and how this impacts student learning.

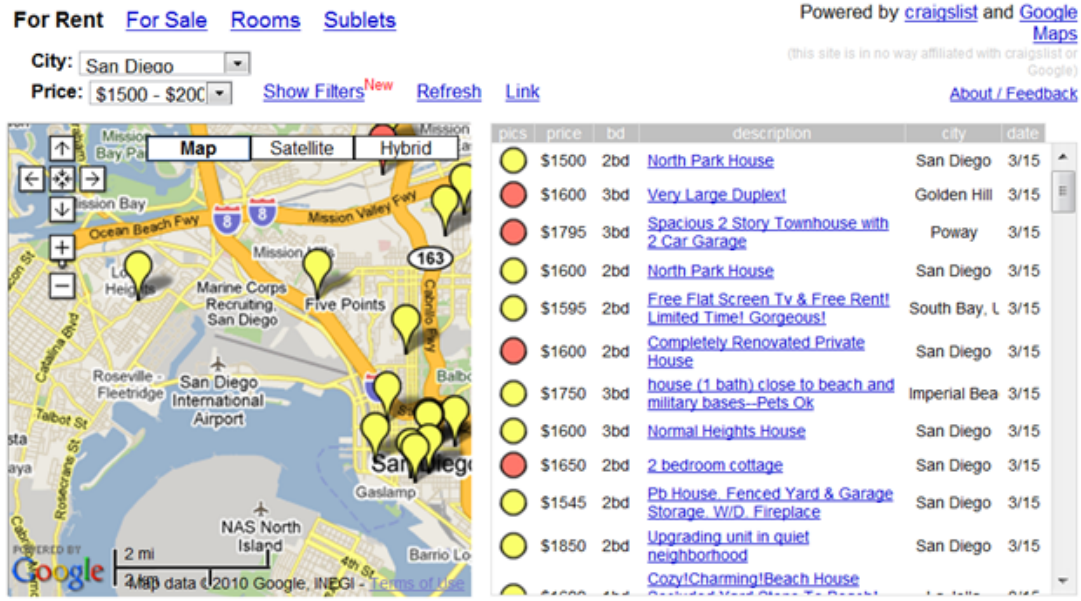
What is a Mashup?

The genesis of the term mashup is the music milieu where new songs are created out of existing songs. In music, a mashup is typically the result of remixing the vocal track of one song with the music track of another song (Rojas, 2002). Digital technology, desktop software and bootlegged music have made music mashups relatively easy to produce and have inspired a growing number of would-be artists. Such is the case of the YouTube sensation known as Granny Teller who can be seen at http://www.youtube.com/watch?v=driXX37mPiA In essence, music mashups allow just about anyone to become a musician.

A software mashup, on the other hand, is a web application that mixes services and/or data from two or more online sources to provide a unique service that meets the situation needs of a particular group of users. Figure 1, for example, shows HousingMaps.com, the first and one of the best known software mashups. HousingMaps.com mashes housing data (bedrooms, bathrooms, monthly rent, address, etc.) from craigslist.com with maps from Google maps.

Figure 2 depicts the underlying architecture of the HousingMaps mashup. A user sends a request to the HousingMaps.com website via a browser. The mashup website uses the application program interfaces (API) that Google and craigslist have created to access their data services and software libraries. On the mashup site, the user selects the data criteria of interest (e.g. city, price, etc.) to filter the search results. The relevant map and housing data is sent to the mashup site, processed, and presented to the user. If the user selects a particular item from the mashup, they are transferred to the original data source. For example, if you were to click on one of the specific properties that are shown on the map in Figure 1, you would open a new window that contains the add appearing on craigslist.

Despite the relative youth of software mashups, there are already multiple mashup taxonomies. One way to classify a software mashup, for example, is by its content and its sources ("Mashup", n.d.). This taxonomy yields four general types of mashups:



(Sources: "Map data © 2010 LeadDog Consulting, Google, Tele Atlas, INEGI, Europa Technologies" and HousingMaps.Com; used with permission)

Figure 1: HousingMaps.com mashup.

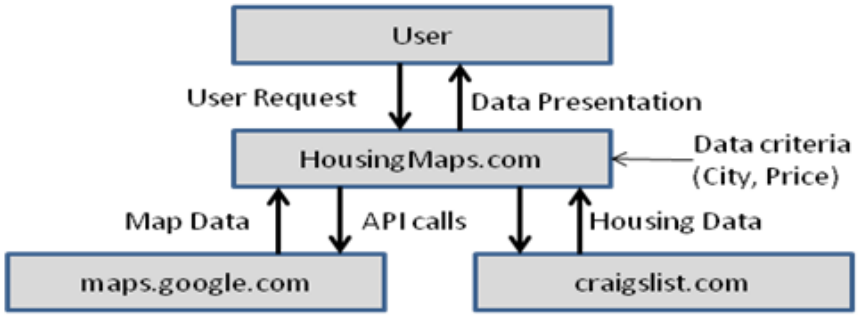


Figure 2: The Architecture of the HousingMaps.com mashup.

- **Mapping Mashups,** such as HousingMaps.com, combine data from different sources with a mapping program, such as Google Maps or Yahoo Maps. Another consumer-oriented mashup might combine data from a ranking of top restaurants in a city with data from the health department related to safety ratings. These could be integrated with a map so that the consumer could easily see the location of these restaurants.

- **Video and Photo Mashups** allow the combination of photos and/or video with the meta-data stored with the image/video. Metadata can include information such as who took the picture, the date and time taken, etc. Mashups in this category may create a personal collage of photos by combining images available from a variety of sources and filtering

those to only show ones that meet certain values of metadata – such as "where it was taken." Another example of a photo mashup would be to substitute actual images that match tagged words in an online news story.

- **Search and Shopping Mashups** are used to provide comparison shopping information. These types of mashups typically combine data about product prices and availability. Additional data that might be integrated includes customer satisfaction ratings, shipping costs, and tax information.

- **News Mashups** rely on using existing RSS feeds from various news sources, such as The Los Angeles Times or CNN. By integrating these different sources, you could create a personalized "newspaper" that provides only stories about topics that you have selected.

Another mashup taxonomy, created by Forrester Research, categorizes mashups based on their relative sophistication (Forrester Research (2008) as cited in Catone, 2008). This taxonomy, illustrated in Figure 3, includes three levels of mashups:

- **Presentation Layer Mashups** are the least sophisticated type of mashup according to the Forrester Research taxonomy because these mashups maintain a unified view of discrete content from disparate information sources. Examples of this type of mashup include the News mashups described above and portals that welcome RSS feeds such as My!Yahoo and Netvibes.

- **Data Mashups** provide the next level of sophistication in this taxonomy as they combine, and manipulate, data from disparate sources to produce a unified view of the data. HousingMaps.com and Twittervision are two examples of a data mashup.

- **Process Mashups** are the most sophisticated mashups in the Forrester taxonomy. These mashups allow users to combine data sources with business processes.

Complexity	Mashup Level	Representative mashup	Enterprise Vendors
Simple ↕ Complex	Presentation layer	Pageflakes, Netvibes	NewsGator Technologies, KnowNow
	Data	Housingmaps.com, Fastfoodmaps.com	JackBe, IBM
	Process	N/A	Serena Software

Figure 3: Taxonomy of Mashups
(adapted from Forrester Research, Inc.)

Due to the ease in creating mashups, it seems that just about anyone can become a software developer. Today there is over 4700, live, mashup-based applications in existence as reported on

the ProgrammableWeb website, the on-line clearinghouse of mashup information ("Dashboard", n.d.). In the next section we will discuss the business case for mashups.

What is the Business Case for Mashups?

The business case for mashups has been masked by the many lightweight, some say frivolous, mashups that exist today. Like many user-developed spreadsheet applications, IT departments initially labeled mashup applications as trifling; many of these initial mashup applications simply integrated pushpin data-overlays (Asbrand, 2007). This criticism towards mashups reflects what Hinchcliffe calls the "consumerization of the enterprise" (2007, p. 1) which, he suggests, is a by-product of a workforce that has well-developed Web 2.0 skills and habits.

Mashups are quickly outgrowing this stigma as mashup developers take aim at real business problems and enterprise-wide processes. Modern mashups are upheld as one of the primary drivers of what many are calling Enterprise 2.0. Web 2.0 was "the era when technologists …use technology to interact with each other, and also tap into the good stuff that emerges when we do. Enterprise 2.0 will be the era when business leaders join them" (McAfee, 2006, p. 1).

There are an increasing number of enterprise mashups and mashup platforms available that suggest we have entered this new era. IBM, for example, is developing a mashup "for a home improvement store that allows a logistics manager to drag and drop weather reports and maps and hardware inventory data into a mashup that shows which stores need rock salt, shovels and snowblowers" (Jones, 2006, p. 1). Figure 4 illustrates many of the current mashup development platforms. A few of these tools, such as Yahoo Pipes, are consumer-oriented. Most are targeted towards the Enterprise 2.0-grade mashups. This list is likely to continue to change frequently over the next few years. For example, both Microsoft (Popfly) and Google (Google Mashup Editor) discontinued their support for their mashup editors earlier this year.

Figure 4: Mashup Development Tools.

The McKinsey Quarterly Survey on Web 2.0 ("Building the Web," 2008) reports that companies are seeing fundamental changes occurring as a result of their use of Web 2.0 technologies. In some cases they are leveraging them to change management practices and organizational structures. Additionally, customers are also being asked to join in developing products that will help distribute knowledge.

According to Catone (2008), Forrester Research predicts that the tipping point for the enterprise mashup market will be reached during the 2009-2010 timeframe. Further, Forrester Research expects that the enterprise mashup market will reach $700 million by 2013 as mashups are rolled into major IT products.

Serena Software (2008) reports on successes that businesses have seen in creating/using mashups built with their software. For example, Thomson Financial streamlined business processes through mashups and was able to generate customer quotes 2,000 times faster than with their previous methods. The Philadelphia Stock Exchange was able to reduce paperwork and administrative approval delays, resulting in a decrease of 2,500 hours of administrative work per year.

Gartner, Inc. (2009) sees an increased usage of mashups for analytic applications. They describe the creation/usage of "coarse-grained application mashups" that overlay different analytical insights (e.g. queries, calculations, metrics, etc.) onto the graphical interface of the operational application. They predict that by 2012, coarse-grained applications will comprise 1/3 of the analytic applications used for business processes.

Why Teach Students about Mashups?

Given the increased importance in business of mashups, and other Web 2.0 technologies, IT educators need to better understand these innovations and should consider adapting the IT curriculum to support the needs of end-users and businesses alike.

In most universities, business majors are required to take a course in Information Systems. This course often covers the different types of information systems, how these systems add value to an organization, issues to consider in designing and implementing systems, along with hands-on exposure to creating applications using spreadsheets, databases and web-based technologies. Today's digital-native students come into our classes experienced with Web 2.0 technologies of Facebook, MySpace, YouTube, and Twitter, among others. They are living the Web 2.0 promise of communities, collaboration and knowledge sharing. While most of them will not become the IT experts in an organization, they all will continue to rely on information technology throughout their careers. They will need to know how to use the data available to them. They need to learn how to create applications that integrate data that are important to them, and they need to learn how to share these applications with their "community."

Initially, students should be given a chance to see the basic structure/components of a mashup. For example, Figure 5 illustrates how a mashup needs different sources of content, a mashup engine to assemble the content sources and a web browser to display the results.

Using this basic structure, students can then be exposed to the different technologies that are used in building a mashup. For example, mashups use XML, RSS, and Web Services technologies. By bringing these terms "to life" through the development of a mashup, students will also experience the different stages of software development. Currently our students already learn XML and RSS technologies by creating their own RSS feed. Extending this learning into the mashup space is a natural extension of their work, and allows them to better understand this technology.

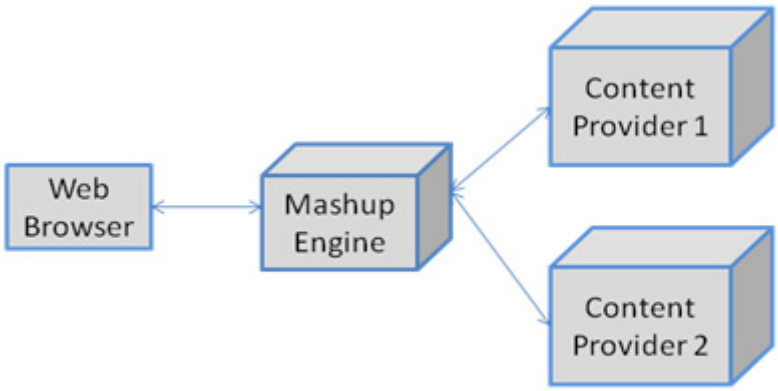


Figure 5: The Components of a Mashup.

How Will This Benefit Student Learning?

Students will benefit through this exposure to mashups by gaining a better understanding of the realities of information systems and information technology. Mashups provide unique, user-friendly opportunities to show the general business student how many of the disparate information technology concepts are related. For example, they can begin with different data sources they have created in spreadsheets or database software. They can then learn to work with a graphical user interface to connect these different data sources with various web services and applications, such as an RSS feed or a mapping application. Finally, they will be able to see how their mashups will achieve corporate legitimacy faster if they are designed with security mechanisms to prevent vulnerabilities, such as cross-site scripting (XSS), and implemented with authentication mechanisms, such as Windows Live ID or OpenID, which will help minimize the exposure of user information.

The objective of our conference presentation will be to demystify mashups. We will explain how we have integrated this mashup content and practical student projects into the curriculum. Samples of student work will be discussed, along with student reactions and lessons learned.

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Biographies

Dr. Annette Easton is an Associate Professor of Information Systems at San Diego State University. She teaches a wide variety of courses encompassing information technology. Most recently she has been focused on the Principles of Information Systems and Information Systems Design courses. She received a B.S. in Information Systems from California State University, Fresno and a Ph.D. in Management Information Systems from the University of Arizona. Her research interests are in information technology education, skills assessment of entry level information systems students, and integrating new technologies into the information systems curriculum.

Dr. George Easton is an Associate Professor of Information Systems at San Diego State University. His Ph.D is from the University of Arizona in Management Information Systems. He has taught many of the courses in the MIS curriculum at both the undergraduate and graduate level including data communications, systems development and decision support systems. His current research interests include information systems education, collaboration technologies such as SharePoint, and the Web 2.0 technologies.