

The Capstone Experience

From Students...to Professionals



COMPUTER SCIENCE AND ENGINEERING 2012-2013





The Capstone Experience



**CSE498
Collaborative Design**

**Dr. Wayne Dyksen
Professor of Computer Science and Engineering**

The Capstone Experience provides the educational capstone for all students majoring in computer science at Michigan State University. Teams of students build software projects for corporate clients.

During the Capstone Experience, students

- design, develop, debug, document, and deliver a software project for a corporate client,
- work in a team environment,
- develop written and oral communication skills,
- become proficient with software development tools and environments, and
- consider issues of professionalism and ethics.



Corporate clients are local, regional, and national including Auto-Owners Insurance, Boeing, Chrysler, Dow Chemical, Electronic Arts, Ford, GE Aviation, GM, Google, IBM, Meijer, Microsoft, Motorola Mobility, Mozilla, MSU Federal Credit Union, Quicken Loans, Spectrum Health System, TechSmith, Toro, the Union Pacific Railroad, Urban Science, and Whirlpool.

At the end of each semester, the College of Engineering sponsors Design Day, at which student teams from throughout the college showcase their Capstone projects in the MSU Union.

Computer science capstone teams demonstrate the software projects that they have designed, developed, and delivered for their corporate client. Teams compete for four awards, which are conferred by a panel of corporate judges.

We thank Auto-Owners Insurance of Lansing, Michigan for their continued support of Michigan State University and the Capstone Experience, including the printing of this Capstone Experience booklet.

Check out the Capstone Experience web site at www.capstone.cse.msu.edu.

For more information about the capstone experience or becoming a capstone project sponsor, contact Dr. Wayne Dyksen by email (dyksen@msu.edu) or by phone (517-353-5573).

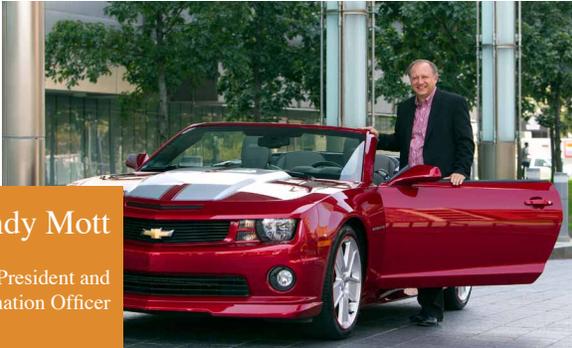
The Capstone Experience, 2012-2013

Department of Computer Science and Engineering

Michigan State University

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Corporate Sponsors



Randy Mott

GM Vice President and
Chief Information Officer

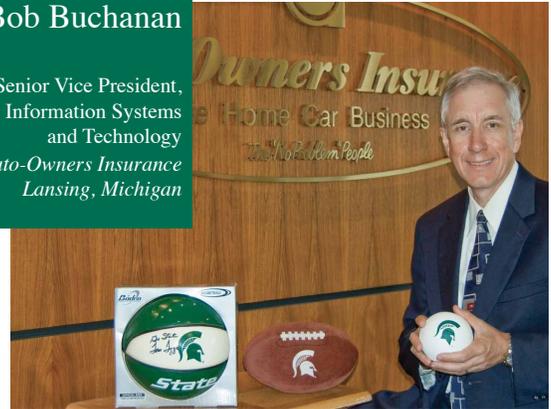
General Motors
Detroit, Michigan



“General Motors looks to Michigan State University to hire outstanding computer science graduates. Students in the capstone course gain valuable experience with a wide diversity of state-of-the-art information technologies being used at GM. This is a tremendous chance for students to network with IT professionals and benefit from a powerful learning opportunity.”

Bob Buchanan

Senior Vice President,
Information Systems
and Technology
Auto-Owners Insurance
Lansing, Michigan

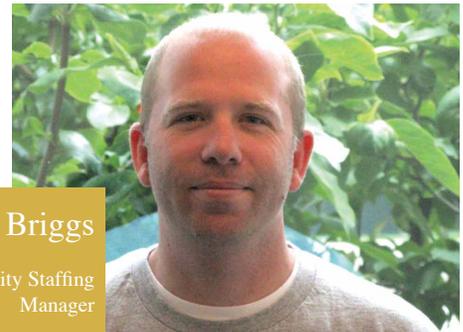


“Auto-Owners Insurance is proud to be a long term capstone project sponsor. The business-like environment of the capstone experience provides a unique opportunity for students to develop into professionals. Our strategic partnership has enabled us to identify and recruit many outstanding MSU graduates.”

Bob Feldmann

Vice President and
General Manager

The Boeing Company
Seattle, Washington



Jeremy Briggs

University Staffing
Manager

Microsoft
Redmond, Washington



“Michigan State’s capstone course provides students with real-world experiences within the aviation and aerospace industries. The Boeing capstone teams continue to produce outstanding projects including a flight visualization system for the Navy’s Blue Angels as well as complex scene rendering software for our simulation environments.”



“Michigan State University’s program in computer science has been a focal point for Microsoft for many years. We continue to recruit and hire outstanding graduates including 29 permanent hires and 24 summer interns in just the last four years.”

Capstone Alumni

Michele Winsky

Software Engineer

Google
Mountain View, California



"The capstone experience at MSU challenges students to build innovative software solutions to complex technical problems, which was great preparation for my job at Google."

BS, CSE: May 2012

Hometown: Morrice, Michigan

Tom Smale

Network Engineer

General Motors
Warren, Michigan



"My GM capstone project taught me real-world problem solving skills that apply directly to the corporate environment. It also gave me the opportunity to meet people in the company and a leg up on my career."

BS, CSE: May, 2013

Hometown: Grosse Pointe Farms, Michigan

Ben Pedersen

Software Test Engineer
TechSmith
Okemos, Michigan



"As a Michigan native, I wanted to pursue my career within the state. The capstone course project sponsors include companies of various sizes from throughout Michigan, including my company, TechSmith of Okemos, Michigan."

BS, CSE: May 2010

Hometown: Lansing, Michigan

Angela Mireau

Software Development
Engineer

Amazon
Seattle, Washington



"Designing and architecting a large scale software project was a very valuable aspect of my capstone experience at MSU, which gave me a good head start for my career at Amazon."

BS, CSE: May 2012

Hometown: St. Clair, Michigan

Fall 2012

Project Sponsors

We thank the following companies for their generous support of the computer science capstone experience.

Auto-Owners Insurance
Lansing, Michigan



The Boeing Company
St. Louis, Missouri



The Ford Motor Company
Dearborn, Michigan



GE Aviation
Grand Rapids, Michigan



Google
Mountain View, California



Meijer
Grand Rapids, Michigan



Mozilla Corporation
Mountain View, California



Quicken Loans
Detroit, Michigan



Spectrum Health Systems
Grand Rapids, Michigan



TechSmith
Okemos, Michigan



Urban Science
Detroit, Michigan



Whirlpool
Benton Harbor, Michigan



Auto-Owners Insurance Pig "E" Bank

Auto-Owners Insurance is a Fortune 500 company that offers many types of insurance including life annuity accounts, which are investment structures designed to provide payments at specified intervals.

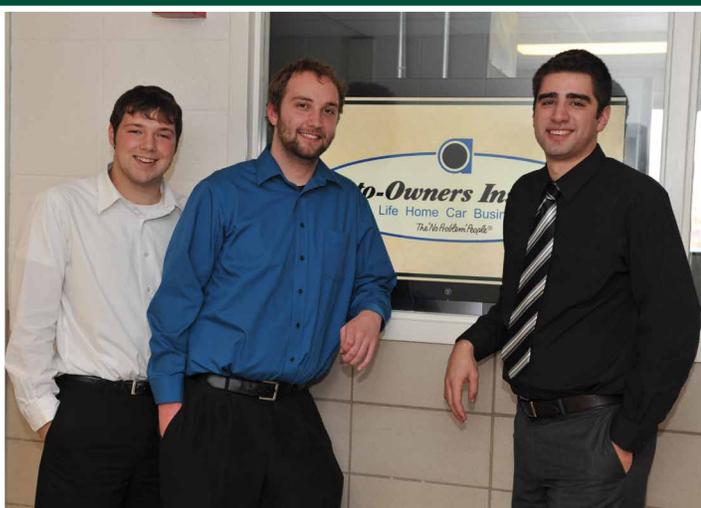
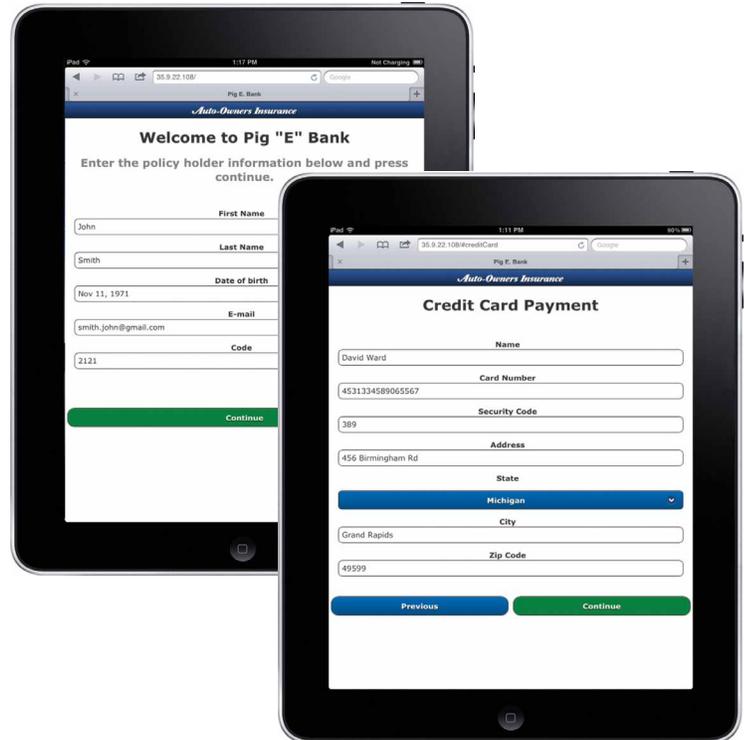
Pig "E" Bank is a web application that provides a convenient and easy-to-use way for users to make electronic deposits into annuity accounts. The users may be the annuity account holder or even a family member or friend making a deposit as a gift.

Electronic deposits are made with a simple three-step process. If the deposit is a gift, a user can send an additional small gift like a teddy bear or a note to the annuity account holder. Payment options include credit cards or electronic fund transfers.

Pig "E" Bank works with mobile web browsers. With such accessibility, making deposits into annuity accounts has never been easier or more convenient.

Our system also includes an administrator web site, which is used to track and possibly resolve payments. Payment records can be searched by date and by the account holder's name.

Our Pig "E" Bank web interface is written in HTML and JavaScript. The backend is written in C# using ASP.NET.



Michigan State University Team Members (left to right)

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The Capstone Experience

The Boeing Company Design, Fly and Compete Sim Suite V2.0

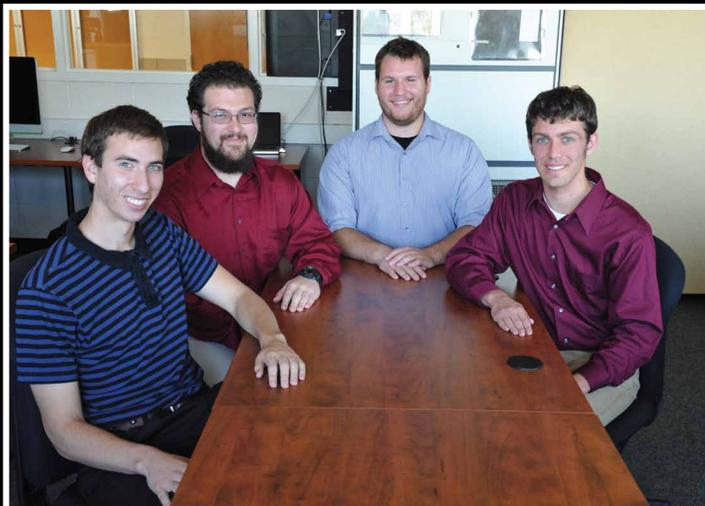
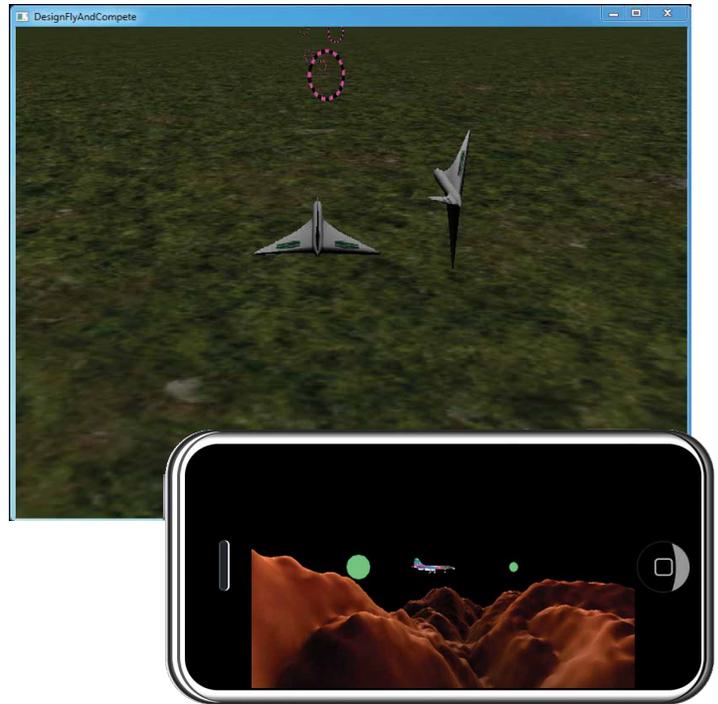
Boeing is the world's leading aerospace company and the largest manufacturer of commercial jetliners and military aircraft combined.

Research and development of new products represent significant investments for Boeing. In addition, training users on existing products represent significant investments for Boeing customers. To minimize time and maximize efficiency, Boeing utilizes complex modeling and simulation software systems.

Design, Fly and Compete Sim Suite V2.0 is a flight simulator that features six degrees of freedom with realistic physics of flight. Players can choose from four different planes to navigate through nine different obstacle courses. A new feature of V2.0 is a multiplayer mode where players can interact with each other via an internet connection.

In addition to a standalone Microsoft Windows desktop version, our flight simulator also includes a web version, which runs in both Chrome and Safari for use on Desktops, iPhones, and iPads. Our web version is designed with extensions to provide an immersive feature-filled user experience.

The Microsoft Windows desktop application utilizes the Qt framework and OpenSceneGraph for the application and DIS and HLA for networking. The browser version uses HTML5, JavaScript and WebGL for the application and Socket.IO for communication.



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The Ford Motor Company MyKey Report Card

Founded in 1903, the Ford Motor Company is a Fortune 500 company that develops and produces some of the most innovative cars and trucks in the world.

One such innovation is the Ford MyKey system, which allows owners to program a key that sets safety restrictions for each driver. For example, owners can limit the top speed of a car or the maximum volume of the radio.

As an addition to the Ford MyKey system, our MyKey Report Card provides owners with a report card of the driving habits of each of a car's drivers by collecting data from the vehicle using an Android phone or tablet.

Users view the report cards using the MyKey Report Card web site. Users can customize the data displayed on their report cards and specify additional methods of report card delivery. Users can set emergency notification options that send text messages or e-mail if a vehicle exceeds a specified threshold.

The MyKey Dashboard, an Android application that supplies driver data from the vehicle, displays real-time data in a virtual instrument panel while sending driving data to a centralized database.

The MyKey Report Card website is written in HTML5 and Java EE 6. The driving data is stored using SQL Server 2008. The Android application uses the Android SDK and OpenXC vehicle interface, which enables an Android device to receive data from a vehicle.



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The Capstone Experience

GE Aviation Mobile Avionics Satellite Imagery

By using state-of-the-art digital technology, GE Aviation is meeting the needs of the world's evolving airspace. Their products offer the flexibility and enhanced performance that are essential in safety-critical aircraft operations.

The Federal Aviation Administration (FAA) has approved the use of iPads by pilots, which allows state-of-the-art mobile technologies to provide innovative replacements for outdated technologies along with a host of new ones.

When pilots must fly to remote areas or unfamiliar airports, ultra-high-resolution satellite images can provide valuable visual insights about the airport and the area surrounding their destination.

Our Mobile Avionics Satellite Imagery iPad app provides a convenient way of displaying and manipulating GE Aviation's ultra-high-resolution satellite images. The app incorporates the use of familiar touch screen gestures as well as the ability to display the latitude and longitude of any point in the image as shown in the example to the right.

The iPad app provides pilots with information in a way that is more convenient and lightweight than the equivalent paper maps while taking advantage of the image quality that an Apple iPad has to offer.

Our Mobile Avionics Satellite Imagery iPad app is written in Objective-C. The images are preprocessed by an application written in C++ and follow the GeoTIFF image specification.

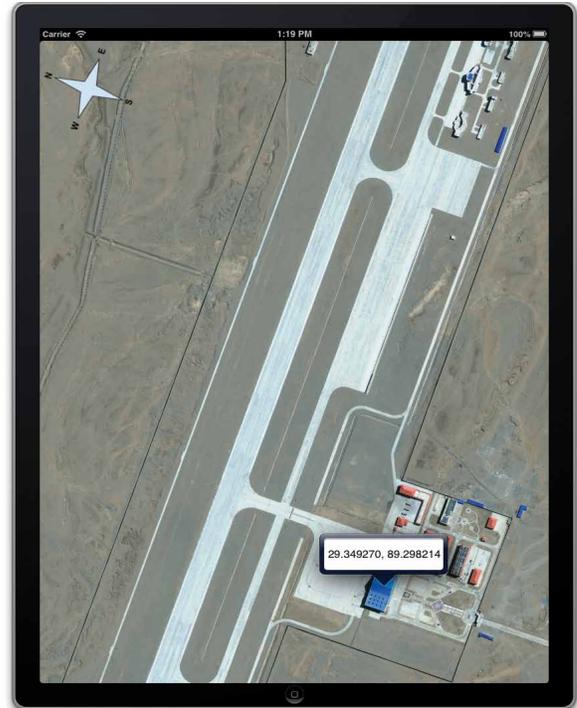
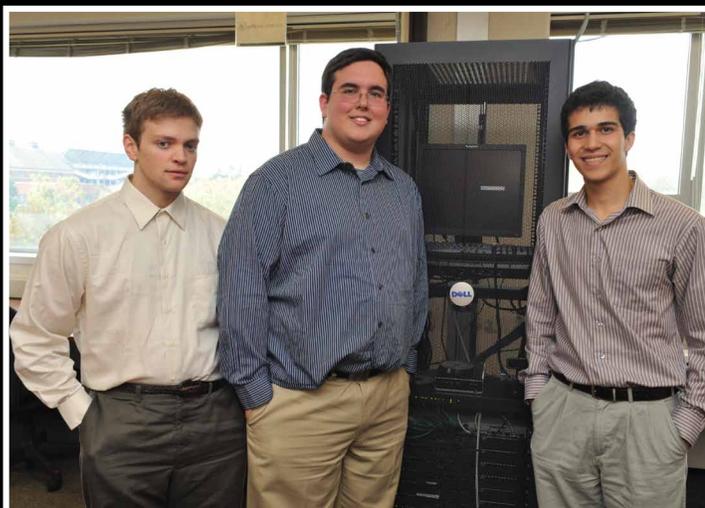


Image © GeoEye



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Google Indexing System Mobile Dashboard

Google's mission is to organize the world's information and make it universally accessible and useful. This is made possible through various support tools including Google's indexing system dashboard.

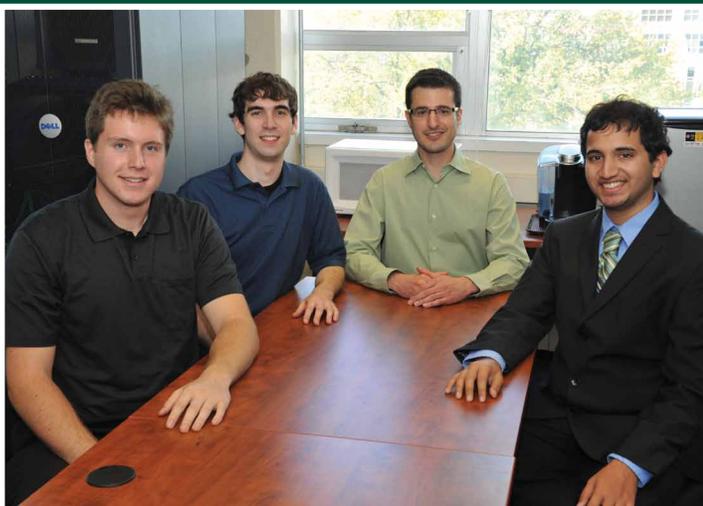
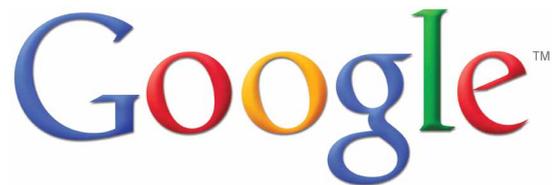
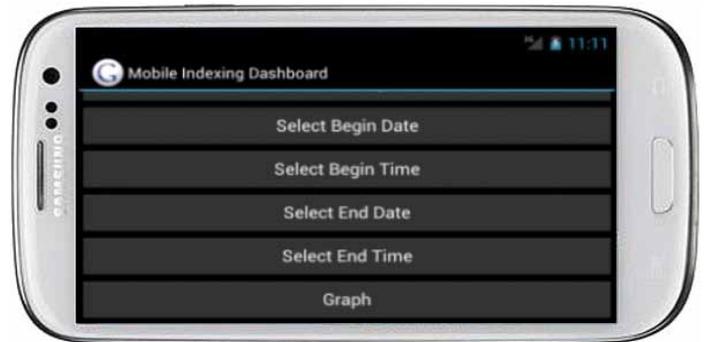
The dashboard monitors and displays information about various Google systems to ensure continuous smooth operation. Google uses an online dashboard system that requires the indexing network engineers to carry a laptop computer at all times in order to access the dashboard.

Our Indexing System Mobile Dashboard provides the capability of monitoring Google's indexing systems from an Android mobile device, thus freeing their engineers from needing to carry a laptop computer.

After launching the Mobile Dashboard, a menu is displayed from which a user can choose which indexing system performance graphs they would like to view. Users can also choose which time periods of data they would like to see.

Users can pan and zoom on graphs to monitor various indexing system variables. Users can highlight any specific variable, which makes it stand out in the time series graph.

The Indexing System Mobile Dashboard serializes data using Google Protocol Buffers for transfer between the phone and server. The server and Android are programmed in the Java programming language.



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Google

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The Capstone Experience

Meijer IT ePager System

Meijer is a family owned chain of supercenters committed to providing quality food and products to its customers with over 190 stores throughout the Midwest, including Michigan.

In order to provide the best service possible for their customers, Meijer must keep each of these stores up and running 24 hours a day. To do so, system emergencies must be handled efficiently and effectively.

Our IT ePager System is designed to notify the appropriate Meijer associates quickly in the event of a system emergency. Associates at Meijer can quickly contact each other in case of power outages, pricing calculations, recalls or other important tasks that require immediate attention. Messages can be sent to multiple employees and even to entire departments.

Users of the IT ePager System can send messages to mobile phones, email or pagers. An individual user can specify the mode of communication with which they want to be paged.

The IT ePager System features a message template creation option, which enables administrative users to create and save a message template for future use. Users of the system load these pre-defined templates and need only fill in a few key variable fields before sending a message.

Our IT ePager System is web-based, written in C# and ASP.NET. Microsoft SQL Server 2008 is used for the database backend.

The screenshot shows the 'Reporting History' page in a web browser. At the top, there's a navigation bar with 'Home', 'Reporting', 'Send', and 'Admin'. Below that, a 'Reporting History' section includes a date selector and a calendar for October 2012. The main content is a table with columns: PageID, Sender, Timestamp, Subject, and Message. The table lists several entries related to power outages and emergency services.

PageID	Sender	Timestamp	Subject	Message
161	Ovenhouse, Nick	10/17/2012 8:28:03 AM	Power Outage - On Generator	Sender: Nick(2) 834902 TK# 248935847 - ST 3432921 - Power Outage - Emergency services contacted. Running on generator. POS is Up - Affecting multiple stores. Additional Comments:
160	Ovenhouse, Nick	10/17/2012 8:27:44 AM	Power Outage - On Generator	Sender: Nick(2) 834902 TK# 248935846 - ST 3432920 - Power Outage - Emergency services contacted. Running on generator. POS is Off - Affecting single stores. Additional Comments:
159	Schwerzler, Mark	10/17/2012 8:20:07 AM	Power Outage - On Generator	Sender: Mark(1) 12388 TK# 248935845 - ST 59468405968 - Power Outage - Emergency services contacted. Running on generator. POS is Off - Affecting single stores. Additional Comments:
158	Schwerzler, Mark	10/17/2012 8:19:01 AM	Power Outage - On Generator	Sender: Mark(1) 14679 TK# 45869241234 - ST 15879046534 - Power Outage - Emergency services contacted. Running on generator. POS is Off - Affecting multiple stores. Additional Comments:
157	Schwerzler, Mark	10/17/2012 8:17:17 AM	Power Outage - On Generator	Sender: Mark(1) 14673 TK# 4586924534 - ST 1587903489 - Power Outage - Emergency services contacted. Running on generator. POS is Up - Affecting all stores. Additional Comments: Contacting emergency services
156	Schwerzler, Mark	10/17/2012 8:16:28 AM	Power Outage - On Generator	Sender: Nick(2) 12347 TK# 10047 - ST 23942 - Power Outage - Emergency services contacted. Running on generator. POS is Up - Affecting all stores. Additional Comments: Providing assistance soon
155	Ovenhouse, Nick	10/17/2012 8:14:07 AM	Power Outage - On Generator	Sender: Nick(2) 12347 TK# 10047 - ST 23942 - Power Outage - Emergency services contacted. Running on generator. POS is Off - Affecting all stores. Additional Comments:
154	Ovenhouse, Nick	10/17/2012 8:13:52 AM	Power Outage - On Generator	Sender: Nick(2) 12346 TK# 10046 - ST 23941 - Power Outage - Emergency services contacted. Running on generator. POS is Off - Affecting all stores. Additional Comments:



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Mozilla Corporation Reader Mode for Desktop Firefox

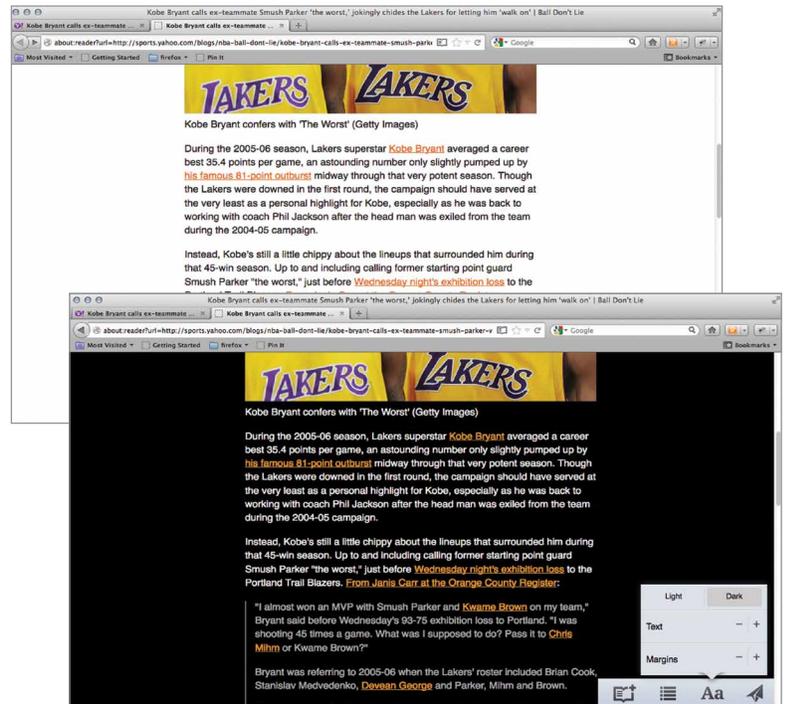
Mozilla Firefox is a free, open source web browser that brings a multitude of new and innovative functionalities to both its mobile and desktop clients.

Over the years, websites have become more cluttered with ads and other miscellaneous content that distracts the user from the main content of interest. Some browsers have implemented a reader mode, which loads a new view of a page, with all extraneous content removed. Most of these are plugins that must be downloaded and installed separately from the browser.

Produced with guidance from Mozilla Developers, our Reader Mode for Desktop Firefox provides a built-in reader mode for the desktop version of Firefox.

Reader mode can be enabled for a site by clicking the easy to find button in the address bar. When Reader mode is activated, the current page is replaced with a de-cluttered version of itself. A preferences menu allows the user to change the font, font color, font size and various other attributes of the page.

The Reader Mode button is written in XUL. The Reader Mode functionality is implemented with JavaScript and the Readability.com algorithm. The Reader mode page and general styling are done with CSS and HTML.



mozilla
Firefox



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The Capstone Experience

Quicken Loans Secure Note Taking and Collaboration Tools

Quicken Loans is a financial institution headquartered in Detroit, Michigan. Founded in 1985, Quicken Loans specializes in mortgage lending and financing.

Quicken Loans currently uses third party collaboration tools to store notes on the Internet so they can be easily accessible to other team members. Storing these notes on servers outside of Quicken Loans creates a potential security issue since the notes can contain sensitive customer information.

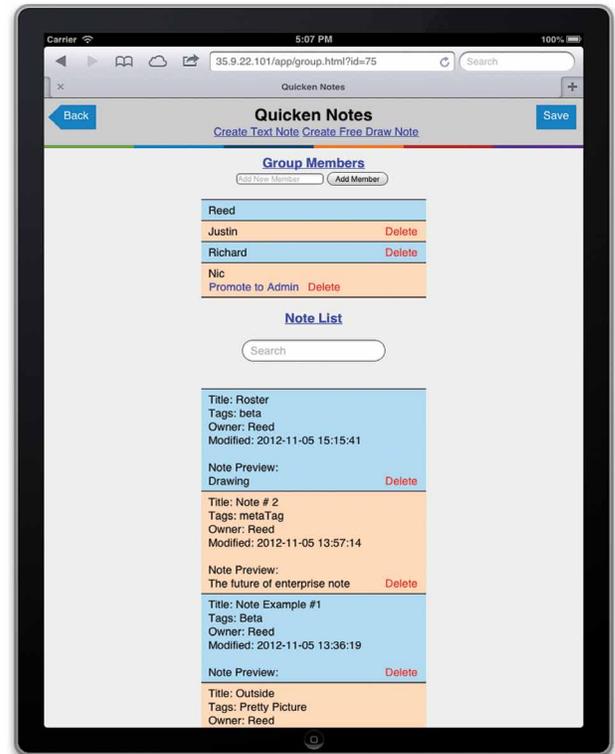
Designed in collaboration with our clients from Quicken Loans, our Secure Note Taking and Collaboration Tools provide a single unified location that stores all of the notes on Quicken Loans' internal computer servers.

After logging in, users can create rich text notes or freehand drawing notes. Users can save attachments to their notes and upload photos to free draw notes and draw on them. Users can do text-based searches for notes.

Quicken Loans teams can collaborate by organizing and sharing groups of notes, which are accessible only to other members of the team.

Our Secure Note Taking and Collaboration Tools run in any modern desktop web browser. It is also compatible with iPhones, iPads and Android mobile devices.

Our system is written in HTML5 and JavaScript with CSS3 styling. The underlying database is Microsoft SQL Server and the backend API is written in PHP.



Quicken[®] Loans[®]
Engineered to **Amaze[®]**



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Spectrum Health Systems Medication Shortages Dashboard

Spectrum Health is a health care organization operating in Western Michigan, with its headquarters located in Grand Rapids. The non-profit organization aims to improve the health of the communities in which they operate.

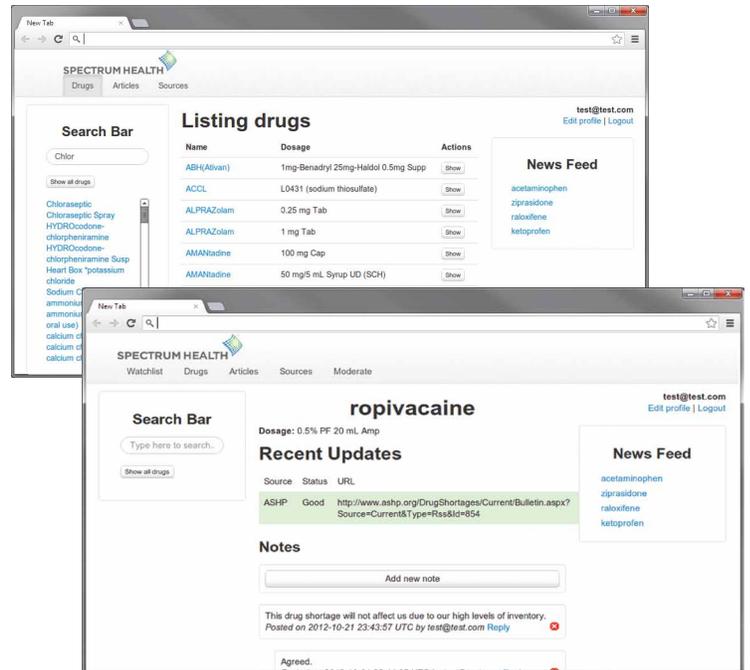
To work effectively, Spectrum Health pharmacists need to be able to visualize and analyze medication shortages in order to make educated decisions on how to manage them. Our Medication Shortages Dashboard enables pharmacists to manage and deal with medication shortages easily and effectively.

The Medication Shortages Dashboard provides pharmacists with an at-a-glance overview of current national drug shortages. The pharmacists can rate the impact of each shortage on their hospital, and collaborate with other pharmacists in order to determine the best course of action.

Each pharmacist can create and maintain a watchlist of drugs, allowing the pharmacist to be quickly notified about status changes on those drugs.

Information about medication shortages is pulled in real time from the Food and Drug Administration (FDA) and the American Society of Hospital Pharmacists (ASHP). The data is molded into a format that is easy to process, and is displayed to the user in a clean, color-coded interface.

The dashboard is built using Ruby on Rails, HTML/CSS, and JavaScript.



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The Capstone Experience

TechSmith Snagit Power Tools

TechSmith is a software development company based in Okemos, Michigan that focuses primarily on the creation of screencasting tools that allow users to capture or record their computer screen. Their products, such as Camtasia, Snagit, and Jing, are used all over the world by large corporations, small businesses, educators and individuals.

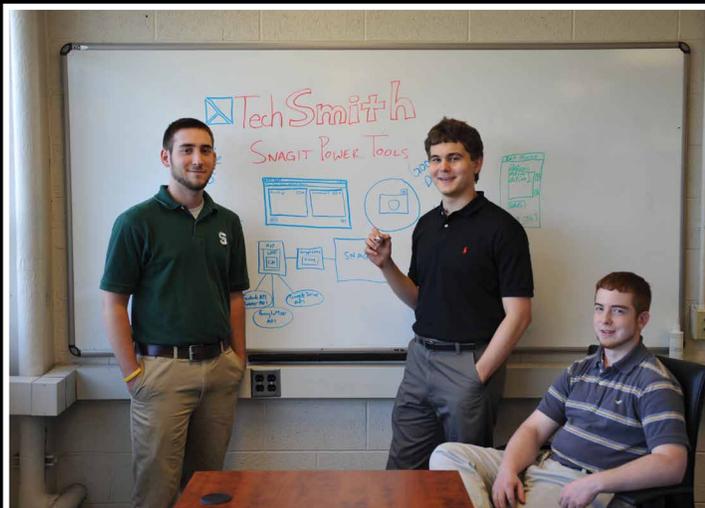
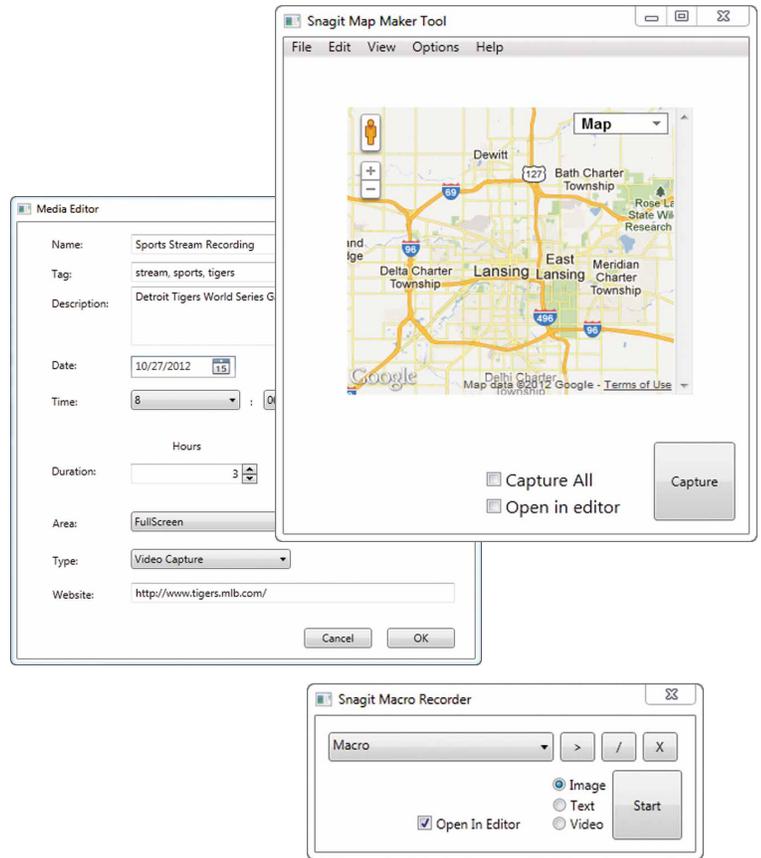
Snagit, TechSmith's most popular and best-selling product, is an application that allows users to quickly and conveniently capture their computer screen and annotate the results in a variety of ways.

Our Snagit Power Tools are a suite of four applications that extend Snagit's functionality, allowing users to do potentially tedious and time-consuming tasks with relative ease.

The Screen Recording DVR Tool schedules Snagit captures for a future time and date. The Macro Recorder Tool records macros ending in a Snagit capture.

The Social Media Stream Tool displays images from a user's Facebook account that can be edited with Snagit. The Map Maker Tool captures Google maps, which can then be edited with Snagit.

Our Snagit Power Tools are written in C#, use WPF for the interfaces and use the Snagit COM SDK to communicate with Snagit.



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Urban Science

Mobile Geography Management

Urban Science delivers maximum results in the automotive industry for OEMs (original equipment manufacturers) worldwide through optimization software and scientific analysis. Their products and services enable clients to evaluate and manage their dealer networks more effectively and more efficiently.

One very important aspect of dealer network management is that of geography management, which allows OEMs to view and modify geographic territories defined by census data.

Our Mobile Geography Management application extends this concept to mobile devices, specifically the iPad, featuring touch gestures for an optimized and well-formatted display. Since dealer networks and therefore geography assignments change constantly, we provide several visual cues allowing for straightforward interactions and analysis of data.

After launching the application, the user can zoom and view geographic territories and automotive dealerships within the United States in one continuous motion. The user can select and edit any geographic territory with the touch of a finger.

Our application provides a mobile solution for managing geographic territories and assists in achieving maximal results for OEM dealer network evaluation and management.

The Mobile Geography Management application is written using JavaScript, HTML5, and PHP. Geographic data is stored using an SQL Server 2008 database.



URBAN SCIENCE™



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The Capstone Experience

Whirlpool Connected Appliances Analytics Dashboard

Whirlpool Corporation, headquartered in Benton Harbor, Michigan, is a global leader in appliance manufacturing across all major categories.

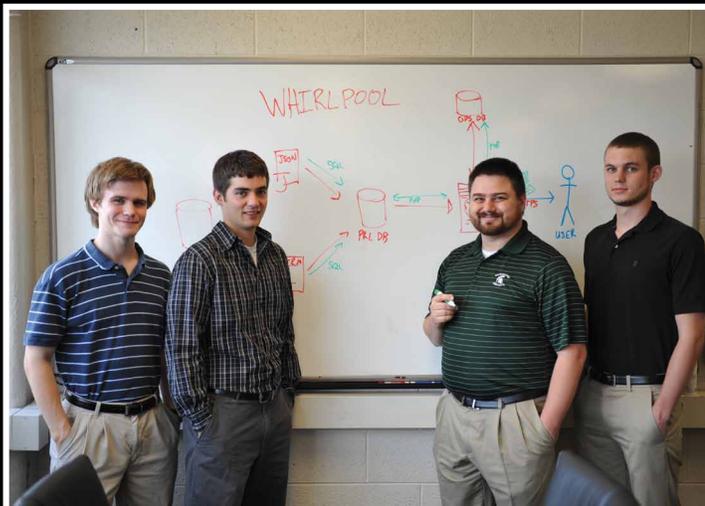
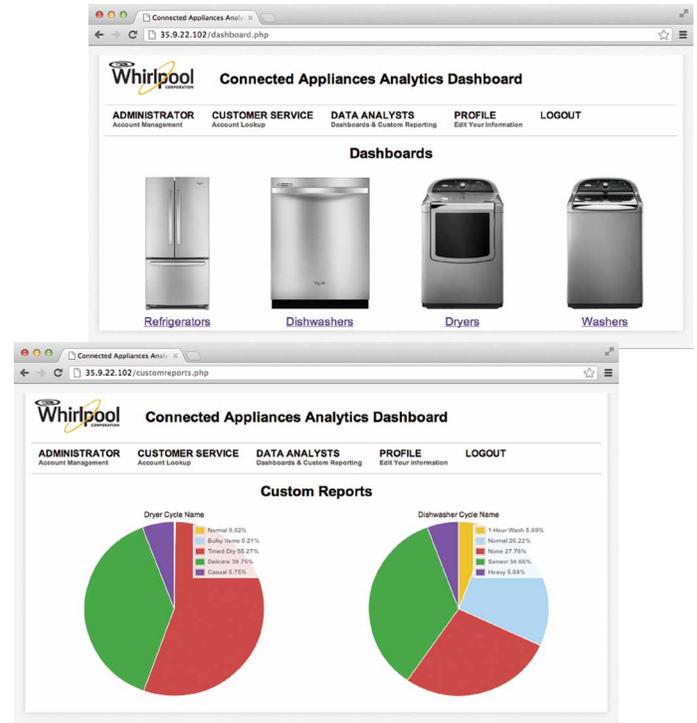
As a constant innovator in the field, Whirlpool is now offering “Connected Appliances” that give greater control to customers and greater insight into how Whirlpool products are used.

Connected Appliances provide a large amount of information to Whirlpool. Our Connected Appliances Analytics Dashboard acquires this data, presenting it in a user-friendly format.

Whirlpool customer service representatives can use this system to aid a customer in identifying their online account ID by using minimal information to search customer records. Representatives can view the current state of a customer’s appliances and assist in their use or recommend future products.

To guide future strategy in research, development, and marketing, the Connected Appliances Analytics Dashboard provides an overview for broad categories of appliances, such as dishwashers or refrigerators. In addition to these dashboards, Whirlpool users can create custom queries of the data to gain understanding into very specific customer usage and needs.

Our Connected Appliances Analytics Dashboard uses a variety of technologies, including Java, MySQL, PHP, CSS, jQuery, and JavaScript.



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All-Hands Meetings



Corporate Sponsors

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Vice President,
Chief Information Officer

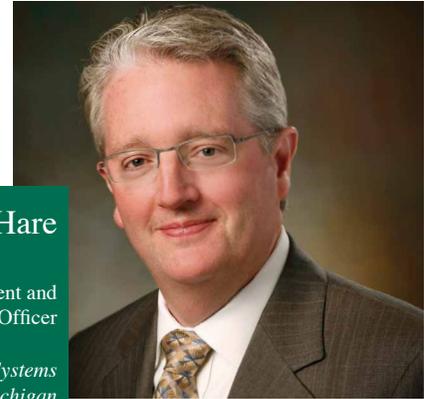
Meijer
Grand Rapids, Michigan



Patrick O'Hare

Senior Vice President and
Chief Information Officer

Spectrum Health Systems
Grand Rapids, Michigan



"Meijer is proud to have sponsored MSU capstone projects over the past four years. We have been impressed with both the capabilities of the students and the quality of the solutions they have developed. The latest project, the IT Metrics Repository, will be used by Meijer to improve IT services to our internal customers."



SPECTRUM HEALTH

"As a Design Day judge, I have evaluated capstone projects from many of the corporate sponsors. The software systems produced by the MSU students rival that of professional developers. The Spectrum Health sponsored capstone teams have presented excellent software solution options to us for consideration."

Bill Hamilton

President and Co-Founder

TechSmith
Okemos, Michigan



"TechSmith is a global technology company located just five miles away from MSU in Okemos. Our capstone projects give students real-world experience with some of the latest trends including multimedia technologies, cloud computing and mobile applications, all of which add to their marketability. We also recruit the majority of our software engineers from MSU, so the capstone experience gives us a meaningful connection to many prospective employees."

Louise Hemond-Wilson

Distinguished Engineer

IBM, Somers, New York



"At the beginning of the semester, each MSU capstone team receives a challenging business problem from their sponsor. These are not hypothetical or artificial problems. They very much resemble problems I see when working with client and IBM teams in my role as a consultant for IBM. I have had the honor and pleasure of judging capstone teams' software solutions, examining their design, development and delivery. Repeatedly and consistently, the students, their projects, and their presentations impress me with their high degree of innovation, creativity and professionalism."

Capstone Alumni

Jayson Vincent

Modeling & Simulation
Software Engineer
The Boeing Company
St. Louis, Missouri



Gina Chernoby

Software Development
Engineer in Test II

Microsoft
Redmond, Washington



“My capstone project with Boeing was technically challenging, team-oriented, and concluded with a result that was rewarding to observe. Alongside summer internships and mentors who continually believed in me, my capstone project inspired me to pursue an exciting career in aviation and aerospace.”

BS, CSE: May 2005
Hometown: Mason, Michigan

Microsoft *“Learning how to give and defend technical presentations is a key feature of the capstone experience, which I use often in my work at Microsoft.”*

BS, CSE: May 2009
Hometown: Wyoming, Michigan

Michelle Truong

Associate

Urban Science
Detroit, Michigan



URBAN SCIENCE.

“The capstone course provided me with a challenging real-world experience working on a mobile app designed to teach American Sign Language, which has given me a strong foundation for the start of an exciting and successful career at Urban Science.”

BS, CSE: May 2013
Hometown: Northville, Michigan

Joe Korolewicz

Software Developer

Auto-Owners Insurance
Lansing, Michigan



“The entire capstone course is designed to be a real-world, professional experience, which helps graduates transition from being students to professionals. Being a student member of the Auto-Owners capstone project team made me aware of the career opportunities at Auto-Owners and inspired me to apply.”

BS, CSE: December 2011
Hometown: Sterling Heights, Michigan

Spring 2013

Project Sponsors

We thank the following companies for their generous support of the computer science capstone experience.

Auto-Owners Insurance
Lansing, Michigan



The Boeing Company
St. Louis, Missouri



The Dow Chemical Company
Midland, Michigan



Electronic Arts
Redwood City, California



General Motors
Detroit, Michigan



Meijer
Grand Rapids, Michigan



Mozilla Corporation
Mountain View, California



MSU Federal Credit Union
East Lansing, Michigan



Spectrum Health Systems
Grand Rapids, Michigan



TechSmith
Okemos, Michigan



Urban Science
Detroit, Michigan



Whirlpool
Benton Harbor, Michigan



Auto-Owners Insurance Event Planning Web App

Auto-Owners Insurance is a Fortune 500 company with written premiums of over \$5 billion. For over 95 years, Auto-Owners has been dedicated to the independent agency system. Auto-Owners is recognized for exceptional financial strength and stability among the nation's largest insurers.

Auto-Owners provides its associates and independent agents with many opportunities to socialize at events outside of the work environment. Our Event Planning Web App is a mobile ready web app that allows associates and independent agents to register for these events.

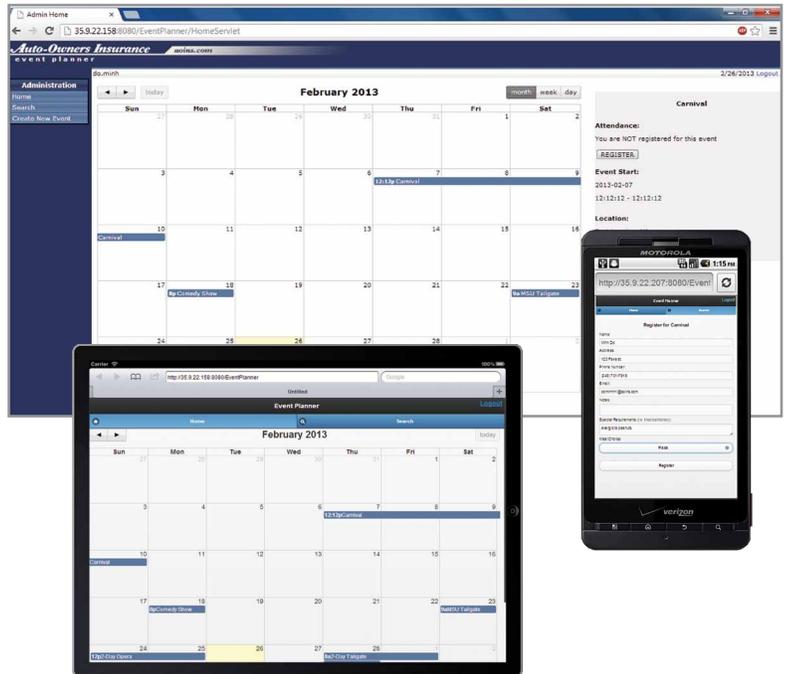
Auto-Owners administrative users can schedule events, edit events, send invitations, send reminders and view lists of registered attendees.

Our Event Planning Web Application includes built-in events for performing arts, golf outings, baseball games and football tailgates. Administrators are also able to create new types of events as needed.

Auto-Owners associates and independent agents use our Event Planning Web App to register for invited events or search and register for open events.

Our app is designed to accommodate various screen sizes including mobile screens so it works well on most mobile phones and tablets.

Our Event Planning Web Application is written in Java and JQuery Mobile, with the data hosted on an IBM DB2 database.



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The Capstone Experience

The Boeing Company Paper Airplane Building Game Simulator

Boeing is the world's leading aerospace company and the largest manufacturer of commercial jetliners and military aircraft.

Our Paper Airplane Building Game Simulator is a game in which a player's goal is to organize a factory of humans and robots to assemble one or more paper airplanes.

The game begins with a default layout of humans and robots along with a budget and a time limit. A player can manipulate the position of humans and robots before the simulation takes place while robots may be purchased from the Game Shop.

Pressing the play button begins the simulation. The different game objects then proceed to carry out their different functions. Once the paper pieces are taped together, they form a large sheet of paper, which is folded into a paper airplane.

During the simulation the overall safety on the factory floor is taken into account. Safety concerns such as collisions between the factory workers are highlighted and warnings are issued.

A player can pause the simulation and edit the setup including purchasing more robots if they have enough funds.

A player can advance if the paper airplanes are constructed within the time limit, budget and safety violations threshold. Our Paper Airplane Building Game Simulator is compatible with Ubuntu 12.04 and runs above the Gazebo Robotics Simulator, uses Ogre3D renderer and Bullet Physics.



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The Dow Chemical Company Personalized Intranet Portal

The Dow Chemical company connects chemistry and innovation with the principles of sustainability to help address many of the world's most challenging problems such as the need for clean water, renewable energy generation and conservation, and increasing agricultural productivity.

Our Personalized Intranet Portal keeps Dow's 50,000 employees in over 160 countries connected with each other via this internal web communication portal.

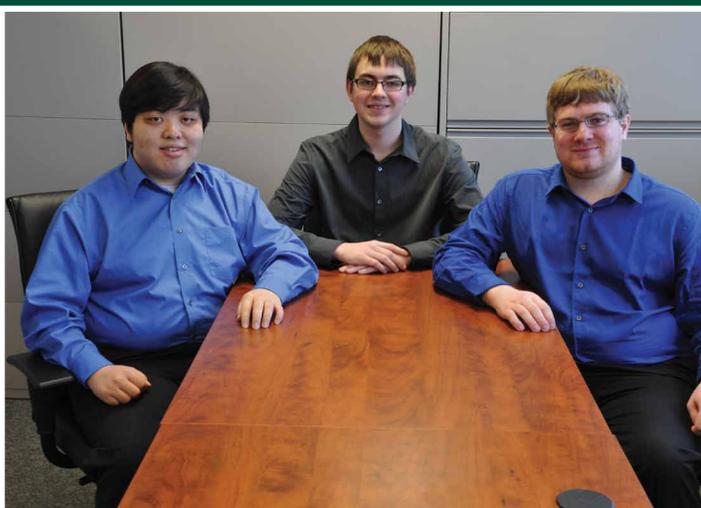
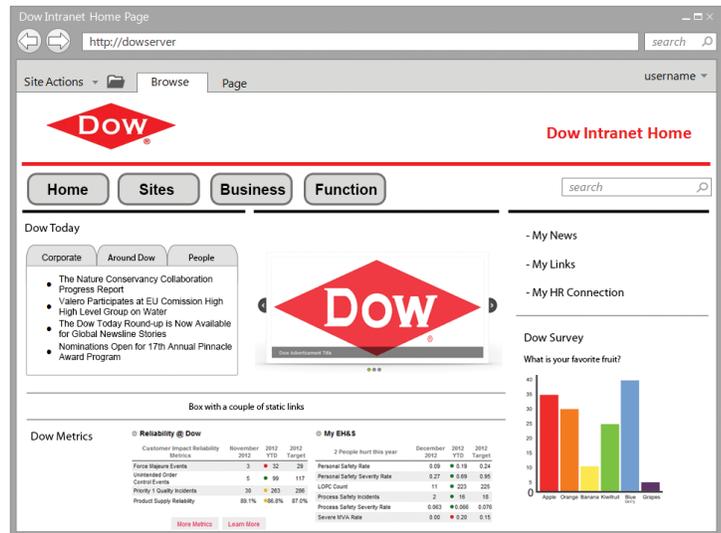
We leverage modern technologies to replace Dow's existing older portal. In order to provide an easy transition for users, the overall look and feel of our new portal remains mostly consistent with the legacy version.

Our Personalized Intranet Portal is designed around the taxonomy of Dow's business structure and common functions. Hence, portal navigation is based on this taxonomy.

We support many of the features of the legacy portal. For example, administrators are able to use a survey tool to create and distribute surveys. After users complete surveys, results are displayed as charts in the portal.

In addition, Dow employees are able to publish content such as memos and technical reports on the website within their branch of the company. This provides Dow with the ability to manage their web content easily.

The Intranet Portal is built using Microsoft SharePoint 2013 Enterprise, HTML, CSS and Microsoft SQL Server 2012.



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Electronic Arts Streaming Android Emulator for EA Games

Electronic Arts (EA) is a leading interactive entertainment software company that develops, publishes and distributes interactive software for internet-connected consoles, personal computers, mobile phones, tablets and social networks.

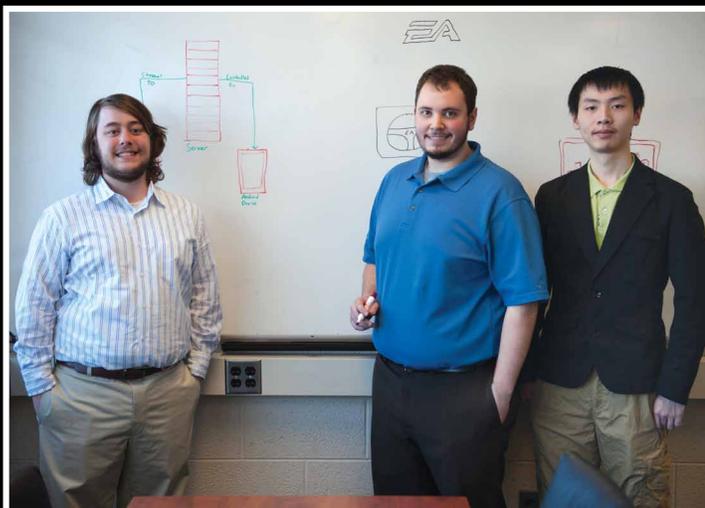
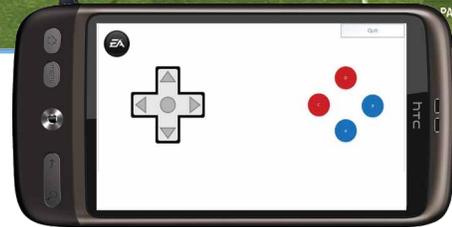
With mobile development on the rise, EA must find ways for users to run mobile games simply on non-mobile devices.

Our Streaming Android Emulator for EA Games enables Android-based games to be run on any computer with a capable web browser such as Chrome or Firefox. A wide variety of games can be streamed from EA over the internet and played without installing any additional software.

After players select a game to play from an EA game server, game video streams to their local PC. Players control the game running on their PC using an Android device, which supports multiple sets of controls schemes including options such as touch, multi-touch, swipes and accelerometers.

Since the Android-based game controller is implemented as a web app, users can run and control games immediately without installing any additional software on their Android device. The layout and functionality of the game controller is customized depending on the game being played.

Our Streaming Android Emulator for EA Games system uses a slightly modified version of the Android SDK emulator. HTML5, PHP and JavaScript are used to implement the game controller interface.



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General Motors My Conference Room

In today's fast-paced, ever changing world, businesses must be agile to stay ahead of the competition. Among other things, such agility requires the ability to hold impromptu meetings.

My Conference Room is a mobile app that enables GM employee groups to identify and book open conference rooms for "spur-of-the-moment" meetings.

Conference room availability is determined easily and quickly with a smartphone by scanning QR (quick response) codes located outside of each conference room.

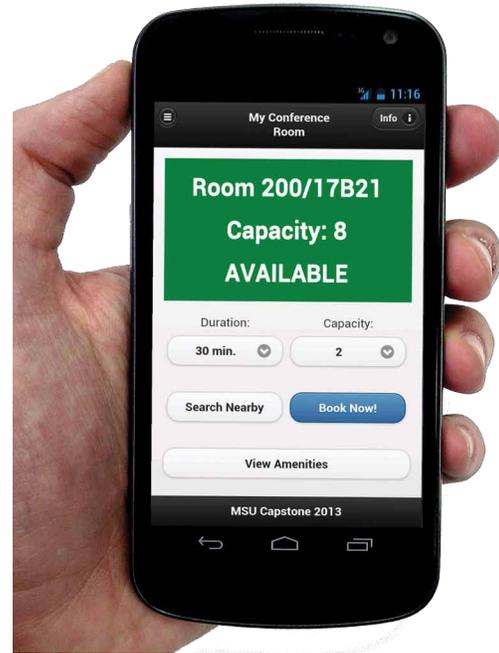
Based on the QR code, users are automatically directed to a mobile website that shows the room number in a color-coded box that indicates the availability of the room.

If a room is available, users can book the room immediately by pressing the "Book Now!" button.

If a room is booked, users can search for nearby available rooms based on the desired duration of their impromptu meeting and the capacity of the room.

My Conference Room displays a variety of information including the room capacity, the next booked appointment and various amenities associated with the room such as Wi-Fi, SmartBoards, video conferencing and outdoor views.

C# and ASP.net are the underlying code for the mobile website. Conference room schedules are hosted on Microsoft Exchange Server 2013.



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The Capstone Experience

Meijer IT Metrics Repository

Meijer is a regional supercenter providing quality food and merchandise in five states throughout the Midwest. Headquartered in Grand Rapids, Michigan, Meijer has nearly 200 stores and over 60,000 employees.

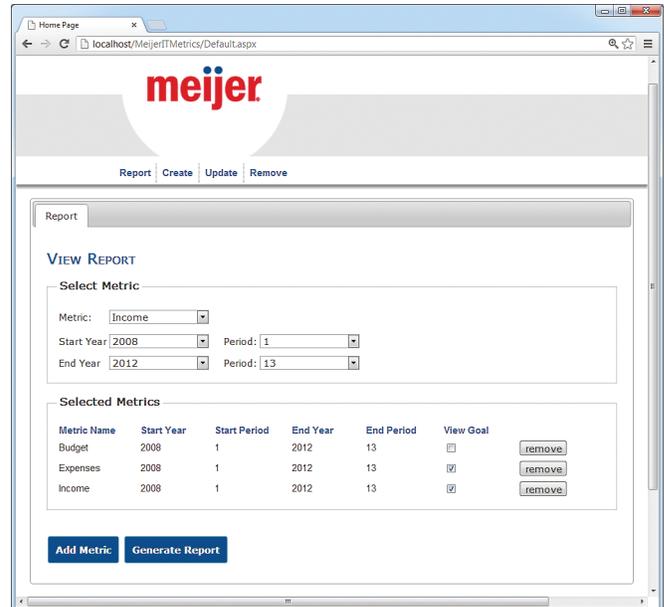
In order to provide the best service possible for their customers, Meijer collects large amounts of data used to measure performance. These data measurements, or metrics, are used by comparing data to desired goals or to other metrics.

One important area to monitor is that of Information Technology (IT). Providing low cost, available and reliable IT computer applications and infrastructure are keys to remaining a leading company in the competitive supercenter business.

Our IT Metrics Repository provides Meijer's IT group with an easy and flexible means of creating, storing, viewing and updating IT metrics. Users can create, edit and populate new metrics along with corresponding goals. New metrics can be based on existing metrics.

Metrics are viewed via user generated reports, which present graphs and tables of the metrics over a user selected time range. Each metric's performance is compared to its goal.

Our IT Metrics Repository is a web-based application developed in Microsoft's .NET framework using C#. Microsoft SQL Server 2012 with Reporting Services is used for our database backend.



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Mozilla Corporation Multi-Touch Gestures for Firefox

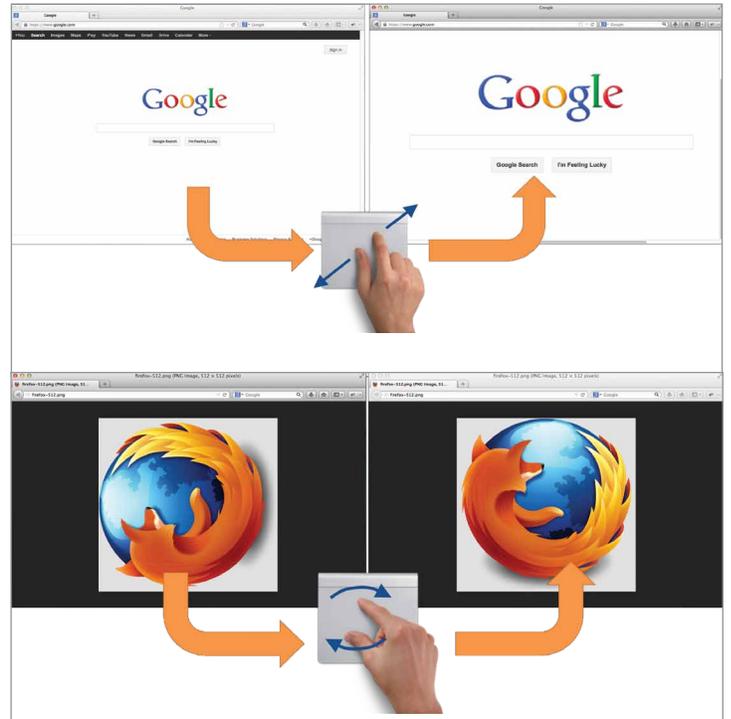
Every day, millions of users choose the Firefox browser to navigate the web. Mozilla Corporation, the creator of Firefox, is committed to providing the best web browser experience in today's market in order to retain their existing users and to attract new ones. In particular, modern users expect the same touch features found on their mobile devices to be present on their laptops and desktops as well.

Multi-Touch Gestures for Firefox, done in collaboration with Mozilla Firefox developers, provides improved gesture support for Firefox on Apple OS X and Microsoft Windows by introducing pinch and rotate gesture features, as well as double-tap on OS X. The gestures are input using a trackpad or touchscreen capable of recognizing multiple touches simultaneously, which are standard on many current laptop models and is available as an accessory for the iMac.

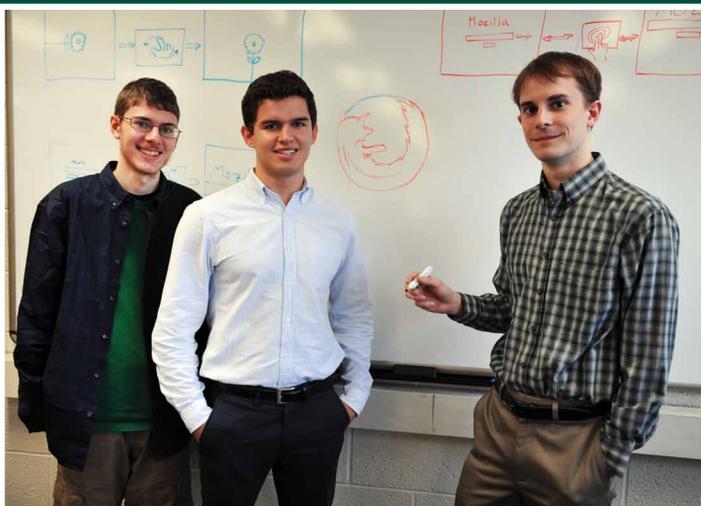
Multi-Touch Gestures for Firefox provides the ability to use the pinch or double-tap gestures to zoom in or out while surfing the web. These two gestures work on any web page.

The rotate gesture allows the user to rotate an image opened directly (known as a synthetic image document). Unlike the zooming gestures, which are featured in other web browsers, this new rotate feature is unique to Firefox.

Gesture recognition is performed by the operating system. The resulting gesture events are sent to Firefox. JavaScript is used to create XUL elements and CSS properties that display the rotated or zoomed web content.



mozilla
Firefox[®]



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The Capstone Experience

MSU Federal Credit Union Mobile Information App for Staff

With over \$2.25 billion in assets and 168,000 members, Michigan State University Federal Credit Union, or MSUFCU, is the largest university-based credit union in the world.

MSUFCU strongly believes that effective communication plays a key role in the success of an organization.

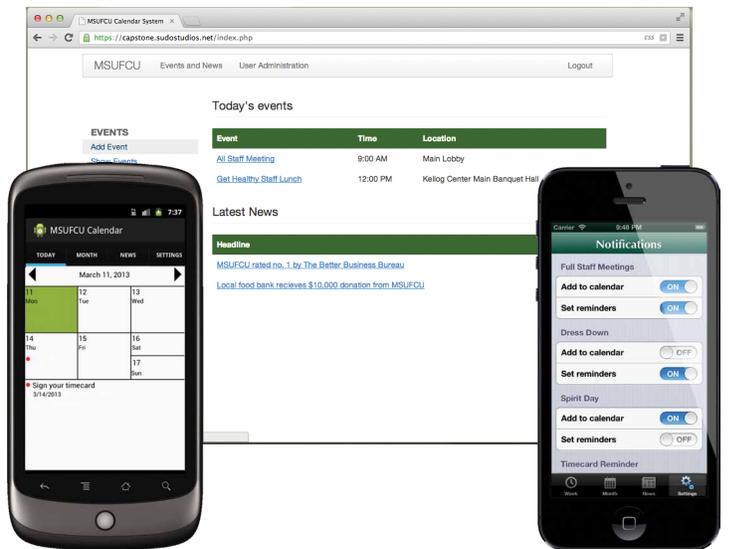
Our Mobile Information App for Staff enhances and strengthens communication within MSUFCU by providing an easy and convenient way for staff to access information regarding important events, news and announcements directly from their iPhone, iPad or Android mobile devices.

MSUFCU employees always have the latest details of upcoming staff meetings, charity events, credit union holidays and paydays right at their fingertips. Events can be integrated directly with users' mobile devices so they can receive notifications prior to the start of events.

All of the events, news and announcements to be published are edited through an online website interface, making it easy to share information and keep everyone abreast of the latest developments at MSUFCU.

Our Mobile Information App for Staff system is comprised of three distinct apps including a native iPhone app, a native Android app and a web app.

The iPhone app is written in Objective C. The Android app is written in Java. The web app is implemented in PHP, JavaScript and a MySQL database backend



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Spectrum Health Systems SLA Management and Metric Reporting System

Spectrum Health Systems, located in Grand Rapids, Michigan, provides high quality, high value healthcare through its nine hospitals in West Michigan, which are maintained by 19,000 employees, 1,500 physicians, and 2,600 active volunteers.

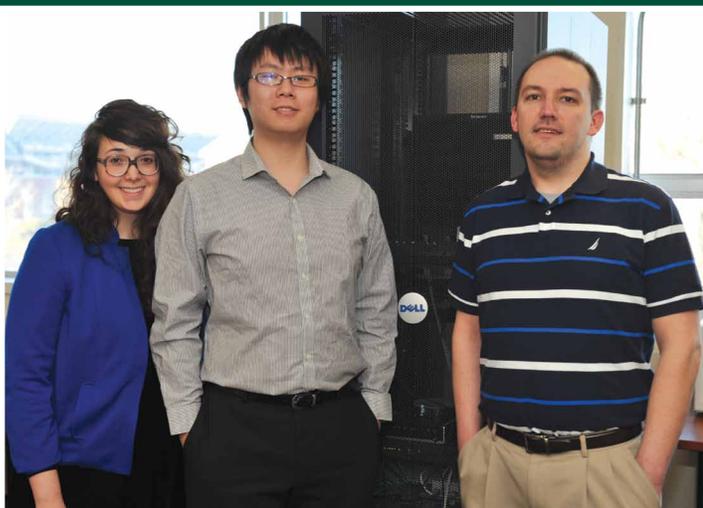
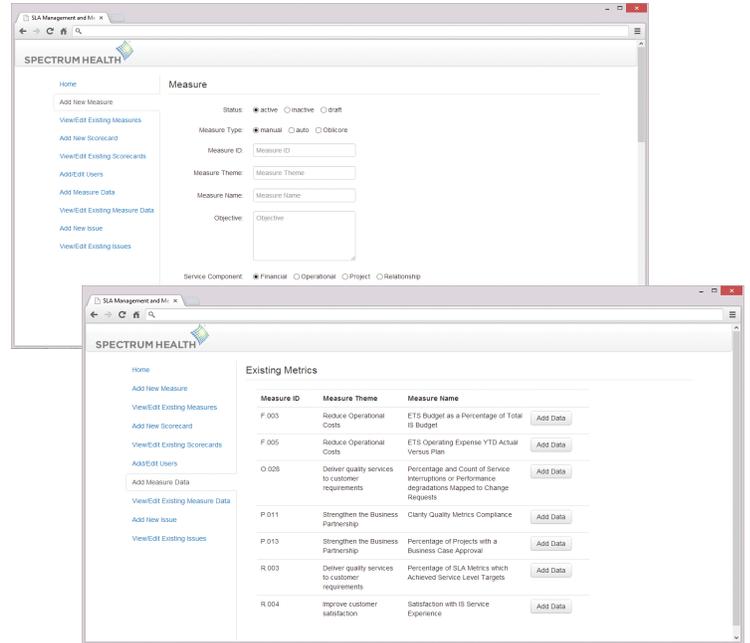
In order to manage such a large and complex organization, Spectrum Health leadership must be able to know how well they are meeting their business objectives and service-level agreements. Business metrics help leadership evaluate progress of business initiatives and assist in decision-making.

Our SLA Management and Metric Reporting System allows metric data to be managed easily and viewed by users. Leadership can quickly view data using succinct scorecards that display up to six months of metric data.

Designated users can define new metrics and scorecards. A metric creator can designate specific users to enter monthly data, choose the scorecards on which to display the metric data, and add detailed information about the metric, such as the method used to calculate the data.

Once the monthly data has been entered, leadership can review the completed scorecard. Information is presented in a color-coded format. Monthly values that hit their target are shaded green, while unsatisfactory values are shaded yellow or red, depending on the severity.

Our SLA Management and Metric Reporting System is written in HTML, CSS and jQuery. The data is stored in a MySQL server and the backend API is written in PHP.



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The Capstone Experience

TechSmith American Sign Language Learning App

Learning American Sign Language (ASL) is an interactive process between students and teachers. Feedback from teachers is needed for students to learn proper technique.

Even when traditional classroom settings are not available, the same interactions are required to effectively learn ASL.

Our American Sign Language Learning App, developed in collaboration with TechSmith, bridges this gap by allowing students and teachers of ASL to learn and teach remotely.

Teachers use the app to create lesson plans for their students either by bookmarking YouTube videos or creating videos themselves. Students review the lessons, record themselves signing and send the video to their teacher.

Teachers critique students' recorded videos by annotating the video with lines, arrows, circles, text or voice. After critiquing, teachers send the video back to their students.

There are two different options for teaching and learning. A teacher and student can share the same device in person. Or, a teacher and student can use separate devices with the video being shared between devices via a backend server.

Our American Sign Language Learning App runs on a Microsoft Surface tablet. The tablet, along with Windows RT, allows us to create a rich, interactive learning environment.

Our app is written in C# backed by a SQL database.



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Urban Science Dealership Consultant Mobile App

Urban Science provides automobile manufacturers and dealers worldwide with software tools and analysis that enable their clients to evaluate and manage their dealer networks more effectively and more efficiently.

The Dealership Consultant Mobile App enables Urban Science consultants and field personnel to prepare for and to manage dealer visits by providing mobile access to dealer key performance indicators (KPIs) and by providing ways to track dealer visits using an iPad.

Consultants use our Dealership Consultant Mobile App in a variety of valuable ways. For example, they use it to prepare for consultations. The application identifies areas for dealer improvement based on KPIs, showing value, rank and percentile. Visually appealing graphs and charts are used to present the information to dealers in meaningful ways.

During dealer visits, consultants use our Dealership Consultant Mobile App to document the visit including agreements on areas, tasks and timeframes for improvements. These are then tracked to determine if the desired effects are achieved.

In addition, our app provides historical trends of KPIs by dealer thereby giving consultants and dealers a better understanding of the effects of changes over time and better ideas for making improvements in the future.

The application is implemented using Cordova, JavaScript, HTML5 and PHP to access data on a SQL database.



URBAN SCIENCE™



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The Capstone Experience

Whirlpool Corporation Guided Cooking and Recipe App

Whirlpool Corporation, headquartered in Benton Harbor, Michigan, is a worldwide innovator in manufacturing a diverse range of household appliances and technologies.

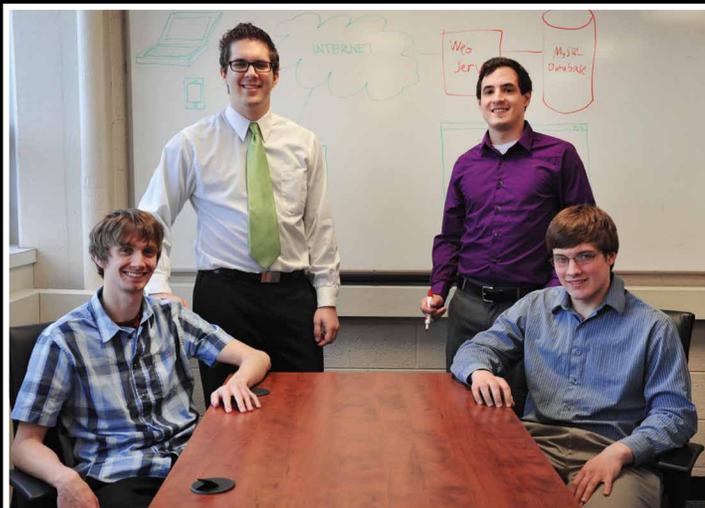
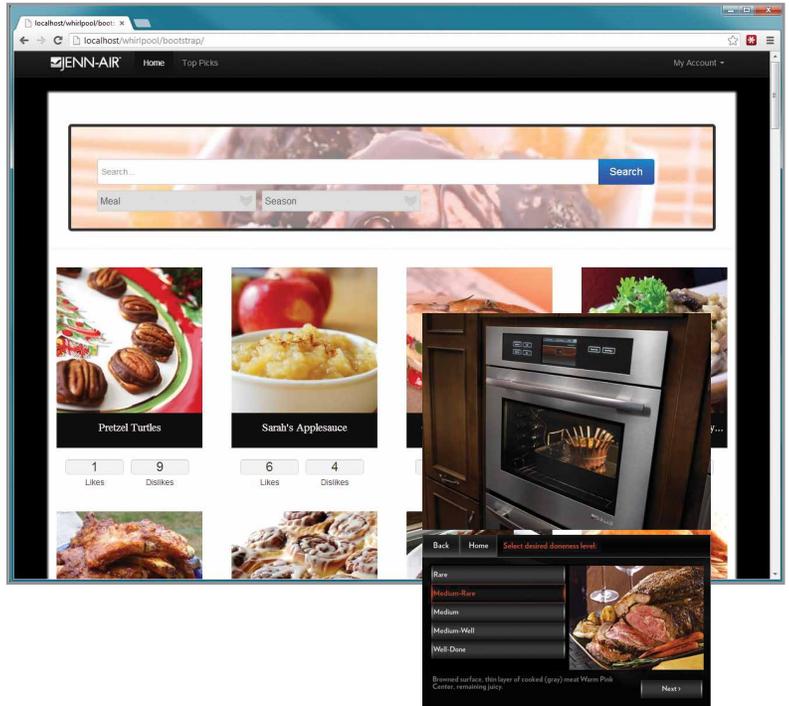
As an innovator in the field, Whirlpool now offers “Connected Appliances” that give customers new ways to interact with their appliances.

As expected, our Guided Cooking and Recipe App is a cooking and recipe guide that provides recipes including the typical lists of ingredients and preparation instructions along with cooking steps. The remarkable feature of our app is that eventually it will be able to communicate directly with a new line of Whirlpool ovens, displaying the cooking steps directly on an oven's touchscreen display.

Whirlpool customers can create their own customizable version of the guide. They can personalize existing recipes and add recipes of their own. Ingredients that a customer does not have are added to their individual shopping list by simply clicking a button.

Select Whirlpool employees are given administrator rights, which grant them the capability to add edit and remove recipes.

Our Guided Cooking and Recipe App uses a variety of technologies including PHP, MySQL, HTML5, CSS3, jQuery and JavaScript.



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Reagan Craven
Benton Harbor, Michigan

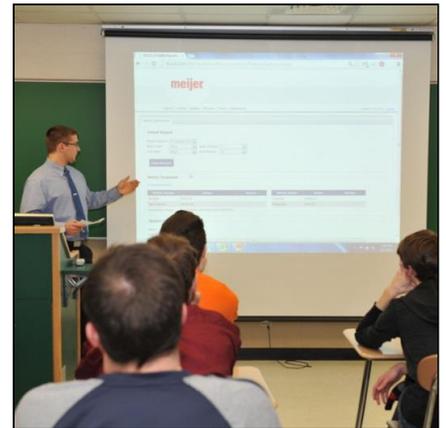
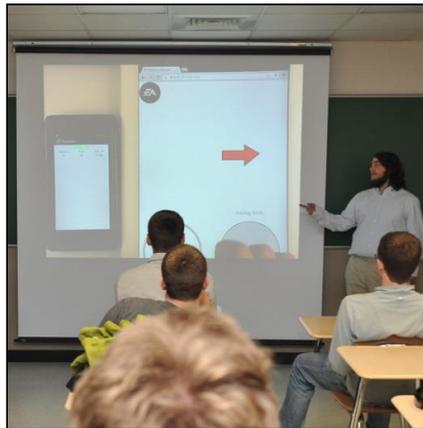
Richard Hughes
Benton Harbor, Michigan

Vince Ireland
Benton Harbor, Michigan

Michael Jakeway
Benton Harbor, Michigan

Carl Wendtland
Benton Harbor, Michigan

All-Hands Meetings



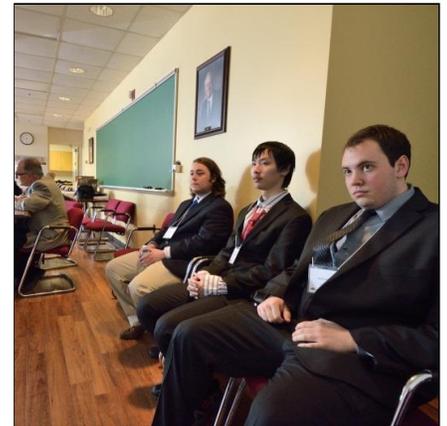
The Capstone Experience

Design Day

Fall 2012



Design Day



Design Day Award Winners

Fall 2012



Auto-Owners Exposition Award
Team Mozilla: Reader Mode for Desktop Firefox



Chrysler Praxis Award
Team Boeing: Design, Fly and Compete Sim Suite V2.0



TechSmith Screencast Award
Team Ford: MyKey Report Card



Urban Science Sigma Award
Team Spectrum Health: Medication Shortages Dashboard

Spring 2013



Auto-Owners Exposition Award
Team GM: My Conference Room



Chrysler Praxis Award
Team Mozilla: Multi-Touch Gestures for Firefox



TechSmith Screencast Award
Team Whirlpool: Guided Cooking and Recipe App



Urban Science Sigma Award
Team TechSmith: American Sign Language Learning App

Auto-Owners Insurance

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becoming a project sponsor, contact**

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