This document contains the one-page descriptions of the 11 Practicum team projects undertaken by the Carnegie Mellon MSIT in eBusiness Technology students in 2016. Each project resulted in a demonstratable software prototype.
Atlas Talent Audition System

Background: The Atlas Talent Agency (atlastalent.com), with offices in New York and West Hollywood, is the country’s premier Commercial talent agency that represents actors who specialize in Voiceover and On-Camera work in Commercials, Documentaries, Movie trailers, Audio books, Animated films and Promo Announcements for the majority of Cable, Radio and TV stations in the U.S. It has over 700 clients, including Academy Award winner Kathy Bates and Emmy winner Lily Tomlin (who won for a voiceover role). As you can see from the company’s logo, it enjoys a fun and funky approach to its business. The outputs of this Practicum should embody the same spirit.

The Problem: A producer (“Buyer”) approaches Atlas with requirements for a particular role. Atlas selects the talent (“clients”) it feels are most suitable for the job. For voiceover, the agent emails the producer’s audition text (“copy”) to the client so that they may record it in their own studios. Requirements can be very detailed, e.g., such as a female, age 30-40, husky voice and a studio with ISDN. The chosen clients send mp3s to the agent, who uploads selected ones to an FTP site and sends a link to the buyer for review. For On-Camera, the producer’s talent requirements are even more specific (hair color, height, black belt in karate etc.). Once the talent is booked, Atlas needs to invoice, collect, deposit, clear and pay the Client minus the agency fee. Atlas needs to a system that can quickly locate appropriate talent for a particular project, keep actors’ schedules, record bookings and perform billing.

The Opportunity: Atlas currently uses a system called StarTracker that was developed during the 1990s and has not been substantially updated. Atlas needs a full end-to-end, Web-enabled application to 1) obtain audition materials from Clients; 2) submit appropriate Clients to Buyers; 3) track Clients’ schedules for both auditions and bookings; 4) send invoices for jobs; and 5) maintain a historical database so the work and earnings of Clients can be reviewed. The vision is for a complete solution that will vastly streamline current operations and be accessible via a web browser and through mobile devices.

Outputs: A prototype of Talenta, a solution for talent agencies, responsive to 1-5, above, including:

- Replacement and enhancement of the current functions of Startracker.
- An intuitive screen interface for an agent who is not a sophisticated computer user to perform a search based on multiple criteria, such as age, physical characteristics, languages spoken and voice parameters (on multiple dimensions, such as pitch, range, texture).
- The scheduling module must be able to record periods when the Client will not be available.
- Ability to capture data from the current Atlas system for a smooth cutover to Talenta.
- Ability to interface with accounting software that records receipt of funds and issues payments.
**Background Information:** The Bank of New York Mellon Corporation (BNYM) was formed in 2007 through the merger of the Bank of New York and Mellon Financial. It is the largest bank in the world measured by assets under custody and administration, which total over $28 trillion. It employs over 50,000 people, operates in 35 countries and serves over 200,000 professional users and millions of investors.

**The Problem:** The bank engages in a huge number of investment transactions on a daily basis, for which trustworthiness and accurate recordkeeping are paramount. These include, for example, securities transaction involving stocks and bonds, and foreign exchange transactions. Traditional databases are subject to alteration, damage, hacking and other forms of failure. Blockchain technology is widely believed to have the potential to make existing business processes safer and more efficient by using a distributed ledger that is shared by a network of participants, eliminating the need for frequent data exchange and reconciliation and protecting against failure of one or more ledger nodes. Due to their rigid structure and expensive consensus verification methods, popular blockchains like Bitcoin’s are not suited for enterprise grade applications.

**Opportunity:** One of the key features of blockchain is immutability – once a chain of transactions has been verified, it is computationally infeasible to alter. This prevents fraud and enhances trust. Furthermore, the distributed nature of the ledger renders it safe from various kinds of attacks, disasters and failures. The goal of this project is to leverage the immutability and inherent safety of blockchain and use it to maintain a clean copy (or copies) of bank data that could be used to restore a system after a failure or disaster event.

**Objective:** Create a private, light-weight blockchain/distributed ledger system that is more efficient than the commonly used Bitcoin blockchain and is also more resistant to data corruption and cyber-attacks than a traditional database. The proposed system would act as an auxiliary system, working alongside a primary system which is used to process financial transactions. The proposed system will capture transactional data into a high-performance, custom, blockchain/distributed ledger for recoverability purposes. The system should be built by using an embedded database, or by customizing one of the open-source blockchain/distributed ledger platforms, to meet desired security & performance objectives.

**Outputs:**

- A system to capture transactional data in real-time and store it in a custom blockchain.
- A light-weight blockchain/distributed ledger system that can store transaction data replicated across multiple nodes.
- An API to access the stored data which could be used to restore the state of the primary system following a failure.
Background: CommunityVibe Inc. (ComVibe.com) is a Pittsburgh-based company that provides a cloud-based system for managing maintenance tasks in residential properties, such as apartment houses. When a tenant reports a problem, such as a leak, a defective appliance or an electrical issue, the property manager must assign a maintenance team to make a repair. The ComVibe system tracks all such reports, prioritizes them, monitors their progress and follows up with tenants to assess satisfaction. ComVibe sponsored a Practicum in 2012 to develop a dashboard enabling property managers to monitor maintenance activity at all of their properties. This project was a success that resulted in the company winning the Technology Innovator Award from the National Multifamily Housing Council. On an operational level, ComVibe works with larger tier property managers. One of the customers engaged in this project has a portfolio of over 60,000 high end apartments, with approximately 300 service technicians who are using ComVibe’s mobile platform to complete more than 10,000 service requests weekly.

Problem: Successful property management involves the maintenance and support of critical assets used to generate revenue, in this case rental income from residents, typically of apartment units. To successfully address property maintenance and support concerns, property managers need to be good at performing both reactive maintenance as well as preventive maintenance. Reactive maintenance involves the assignment of maintenance team members to active, ongoing service requests, frequently initiated by the residents. Preventive maintenance involves the scheduled maintenance of assets (i.e. HVAC units) which would have a costly impact on property operations were they to stop functioning. ComVibe has traditionally been good at addressing reactive maintenance requests and would like our help in bridging the platform gap to better address the need for preventive maintenance.

Opportunity: ComVibe would like the team to partner with one of its large key customers to build a solution that will help property managers better address preventive maintenance. The challenge to date is that managers have not always had a clear vision of all their assets in each unit (such as air conditioning equipment, water heaters, plumbing, ovens, etc.) in order to be able to automate portions of their preventive maintenance process, particularly scheduling. Furthermore, an inability to understand and visualize the maintenance history of assets makes it hard for the managers to determine who their best equipment suppliers are.

Output: A working prototype of a mobile solution to be used by maintenance teams to easily tag and collect data about key assets in each property. Since these assets may be in locations with dead spots in WLAN and 4G coverage, the solution needs to work in areas without internet connectivity. The team should explore how RFID tags, sensors, and even barcode and QR code readers can effectively be leveraged.
DesignConnect – Using the Web to Improve Urban Properties

**Background:** Design Center Pittsburgh (designcenterpgh.org) is a non-profit that facilitates access to design and planning resources as tools for social change. Shelter is a basic human need. Buildings in which we live, work and play are the foundation of our cities and our communities. Yet across the world people live in communities that are crumbling, vacant, or substandard. Pittsburgh alone has over 10,000 vacant structures and a need for 20,000 low-income housing units. Rehabilitation of older homes and commercial buildings is essential to prevent urban decay. Property owners struggle to understand how to redevelop and modernize these structures economically. Since 1988, the Design Center has matched property owners to design professionals such as architects and interior designers. It has completed over 2,000 consultations leading to $12 million in reinvestment in residential and commercial properties. Each year our capacity to provide more than 200 consults is limited by the current administrative process and capacity of the organization. The Center wants to develop a for-profit spinoff to provide its matching service beyond the Pittsburgh region. Our goal is to provide access to designers across multiple cities (and possibly countries) and increase the number of property owners who engage architects in rehab properties.

**Problems:** The Center’s goal is provide property owners with greater access to experienced designers. Property owners are often do not understand the value of working with or hiring an architect during the rehab process. Only 2% of property owners choose to work with an architect. Yet architects are trained in the skillset most needed to tackle older homes, and can help with advice on increasing property value, zoning, obtaining permits, project management and even hiring a contractor. Toward this end, the Center removes barriers to working with an architect by matching property owners with designers who provide a low-cost initial consultation that yields an action plan. The result is that the owner is able to locate an expert designer who has the ability to advise on and manage the rehab and design.

**The Opportunity:** The Design Center is too small to expand its essential services beyond Pittsburgh with its present staff. It needs a web-based system that will allow owners and designers anywhere in the world to connect for rehab projects without the need for human intervention by Design Center staff.

**Outputs:** A demonstratable software application, to be called DesignConnect, with these facilities:

- Web (including tablet) interface for owners to enter information regarding the property, location, photos and rehab needs.
- Web (including tablet) interface for designers to input their expertise and images of their work or firm. The interface will also provide professional development opportunities, and possible continuing education credits.
- Development of a matching algorithm that automates the matching rather than the current first come first serve process. This could also be developed to give the property owner options to choose from a list of designers.
- A practical fee-for-service model that will make the platform financially self-sustaining. For example, designers might pay to use the information as a sales generating or lead service. Ads can be integrated to generate further revenue.
- Integration of data and information with the Salesforce system.
Background. Dick’s Sporting Goods, Inc. (dicks.com), headquartered in Pittsburgh, is a full-line sporting goods retailer offering a broad assortment of brand name sporting goods equipment, apparel and footwear in a specialty store environment. A Fortune 500 company, Dick’s has over 600 retail locations. Through its acquisition of Blue Sombrero (bluesombrero.com), Dick’s gained access to over 7000 sports leagues that used Blue Sombrero’s website-building and league management tools. In January 2016, Dick’s launched Team Sports HQ (TSHQ), an all-in-one platform that will offer youth sports leagues across the country three key services: (1) online registration and team/league websites; (2) custom uniforms and FanWear; and (3) access to donations and sponsorships. This premium league management software will both facilitate and simplify the registration, scheduling and communication processes for league organizers and coaches. League administrators will also be able to use the online tools through DICK’S TSHQ to design gear specific to their league, allowing coaches and parents to order uniforms and FanWear right from their league website. A variety of brands, styles and designs are available.

Problem: Team Sports HQ is missing a critical opportunity to further engage with the customer because it does not offer eCommerce during the registration process. This does not align with the one-stop-shop experience it is looking to provide. Dick’s Sporting Goods eCommerce business, currently outsourced, is being brought in-house and built on the IBM Websphere platform. Launch is scheduled for January 2017. As Dick’s lays the foundation for TSHQ and the larger Dick’s eCommerce business, we have an opportunity to architect a scalable solution to extend the commerce services through the new platform.

Opportunity: Dick’s TSHQ would like to leverage the power of dicks.com and provide an eCommerce experience (utilizing the future platform) on the team sites. This experience will pull together the vast offerings of dicks.com and tailor product offerings to suit the needs of the respective leagues and teams. A web application will provide the league administrator a full experience, from choosing the sports ‘catalogue’ to display to the league members, adding individual items, and launching the site as well as provide the ability to checkout and create/utilize an eCommerce scorecard displaying key metrics concerning the league’s use of its website.

The team will work closely with Dick’s locally to develop a project plan and milestones.

Outputs:

1. A prototype web application that allows a user to walk end-to-end through creation and utilization of the store:
   a. League administrator uses Dick’s catalogs to build the league store. This will be an innovation because the number of potential product choices is vast (over 1 million) and the admin needs the ability to select products in an efficient manner.
   b. Administrator publishes the league store to team sites
   c. User browses the team site, chooses product, and adds to cart
   d. User checks out
2. A league management dashboard enabling a league administrator to monitor use of the league’s website and display key scorecard metrics.
3. An API implementation guide explaining the software interface to the web application.
Background: e.e. books is a Pittsburgh-based startup focused on changing the future of reading and electronic media. This year, more than 50% of the world’s population expects to be reading the majority of their books in eBook form. In 2013, 460,000 books were self-published – a 206% increase over 2010. Because of advances in technology, specifically the ability to integrate text, graphics, audio, 3D visualizations, virtual reality and gesture recognition, it is clear that the “book,” even the “eBook” as we know it will morph into a multimedia object that will be experienced by people using devices that saturate their entire visual and audio perception (e.g., with headsets). Authors are generally not programmers, however, and generating such objects will require simple, easy-to-use tools. e.e. book is position to enable people having existing content (such as bloggers, professors and business people) to generate a quality e-book containing media and export it use the major existing eBook formats. Unlike existing tools, like iBooks Author and Kindle Direct, the e.e. books platform does not hold the final book hostage by only exporting to one file type, but rather allows the writer to publish to all online stores, greatly increasing the writer’s revenue.

The Problem: Writing by itself is difficult without having to worry about hyperlinks or incorporation of multimedia. Even for simple text, a common complaint about iBooks Author and Kindle Direct is that they are too complicated or time-consuming to use and do not provide for inclusion of video or sound. Authors needs to be able to create multimedia books that are suitable for delivery on a variety of platforms.

The Opportunity: This is a chance to revolutionize the entire concept of the eBook. The team needs to (1) develop an eBook structure that can accommodate existing multimedia formats and still be flexible enough to allow integration of future multimedia types; and (2) develop a tool to enable web users with little or no technical knowledge to create multimedia eBooks that can be output in a variety of eBook formats.

Outputs: A demonstratable prototype of the e.e. books web application implementing the following:

- A futuristic eBook architecture able to accommodate future multimedia.
- Ability to drag and drop images, sounds, videos and animations into the text and anchor them so that resizing of text does not disrupt the format.
- Ability to form text into shapes easily definable by the user (e.g., to run around images).
- Ability to create animations from images (directing image path, etc.).
- Ability to edit and include music files (at a low level of capability).
- Ability to export an eBook to a representative selection of the following formats: iBooks, Amazon, Mobi, PDF, .apk, .ipa, ePub and ePub3.
Background: Started by Carnegie Mellon alumni in 2014, Naturi is a food company with a mission to make impactful change in the food industry through innovation. Currently in national distribution across over 30 states, Naturi is focusing is on their Organic, Grass-Fed Greek yogurt. Naturi strives to make products that have the cleanest ingredient statements in the industry – its products have no artificial sugars, flavors, colors or thickeners.

Naturi’s Brand Champion team consists of individuals across the country who communicate the company story and values to consumers so they can trust the product and become loyal to the Naturi brand. Brand Champions participate in a wide variety of events from foot races and farmer’s markets to, most importantly, in-store demos. One-day sales of the product typically increase by a factor of 3 following these demos, which plays an important role in educating consumers and promoting brand loyalty. Naturi employs 25 independent brand ambassadors in the Northeast, and with new national presence is looking to hire many more across the United States, who are constantly visiting stores.

Problems: (1) Brand ambassadors have multiple responsibilities beyond promoting products. They must keep to a schedule, assess shelf space devoted to competitors, record price information and judge inventory levels of the company’s products at the stores they visit. They need to record how many customers they meet and obtain their reactions to the products. This is difficult for them to do while concentrating on the primary mission of displaying the product. Naturi envisions a smartphone app that the ambassador can use to capture data of various kinds, including audio comments from customers, photos of store shelves, geographic location and textual input of inventory quantities. All of this data can be uploaded to headquarters in real-time. Ultimately, this data will form the basis of analytics assist Naturi in strategizing its offerings and promotional activity.

(2) It is difficult to schedule visits by ambassadors to retail stores. The store must have availability, and the proposed visit time must fit into the ambassador’s travel schedule and territory. As the number of stores and ambassador’s increases, the result can be unmanageable. A matching system is necessary to plan ambassador routes, taking driving time into consideration, that will fit with store schedules. Ambassadors should be able to review available store time slots and sign themselves up for demos at selected times.

The Opportunity: Naturi realizes that problems (1) and (2) are not confined to yogurt or even to food products, but are important for all types of in-store demos, including clothing, appliances and other consumer products. It believes that a successful Practicum result will provide it with a general eBusiness technology service that can be offered to many types of companies.

Outputs: A demonstratable software application having the following facilities:

- A smartphone app to support brand ambassadors in capturing data in various forms, including audio, text, video and photos.
- A scheduling module to plan ambassador routes.
- A management console enabling headquarters to review the work of ambassadors and monitor the effectiveness of demos.
**Background:** Newton Consulting (newtonconsulting.com) is a global management consultancy based in Pittsburgh that helps clients achieve their goals faster than the traditional management consulting firms can offer. It rejects traditional methods that focus on personal pride and elevated pricing and offers an employee-friendly, client-focused, lean perspective based on value realized by the client.

**The Problem:** All consulting engagements require an understanding of the issues at play inside of a client organization. Management and leadership have a certain perspective when engaging a consulting firm, but significant research (i.e. discovery) is needed to assemble an accurate picture. The best information gathering comes from one-on-one interviews, but these are time-consuming and expensive, therefore limited in number. In an attempt to save time and money, some consulting firms use online questionnaires (Google Forms, Qualtrics, Survey Monkey, etc.). However, the coarse nature of these tools results in inaccurate results and rarely offer the added value promised. The balance of a consulting engagement is based on information received during discovery, so collecting full and accurate data is essential.

**The Opportunity:** Newton can collect input better, faster and more economically through a more technological. The team will implement Newton’s Smart Questionnaire, accessible through a browser. It incorporates active, real-time natural language processing and computational linguistics to uncover deeper insights from user responses, which are not limited to yes/no or multiple-choice questions, but extend to free-form text responses. Time series analysis of subject behavior, such as how long it takes a user to answer a question, pause points in responses, and even analysis of deleted text provides valuable insights. Determining how passionate, thoughtful, fearful, or sensitive a person is on a questionnaire can vastly improve outcomes and make the entire process more efficient. The product needs to be deployed securely and across geographical boundaries. It needs the basic processing and analytics capabilities of standard textual surveys, but there is potential to do much more.

**Outputs:** A demonstrable software application having the following facilities:

- A customizable and easily deployable survey platform on a web app (both browser and mobile friendly).
- Ability to analyze input data in real-time against natural language processing techniques for providing insight into the thoughts and intuitions of a particular group of subjects.
- Ability to run basic regression analytics to identify patterns and trends in the resultant textual data. To be able to suggest common topics and themes even if slightly different words/phrases are used by various respondents (e.g. - cup, container, glass, mug all refer to the same concept).
- Ability to represent the data visually so consultants can take actions on uncovered conclusions. Not only the final output from a respondent, but the ‘tagging’ of the output to suggest the emotions and strength of the outputs.
- Methodology to identify questions that produce poor results during deployment and modify/exchange them for better questions in the future.
The Hologram Marketplace

**Background:** Promenant Management is a New York based company that is completely revolutionizing the way people shop, entertain and view information. Its founder, Adam Somer, is an entrepreneur with extensive experience in brand management and product marketing. Promenant follows technology advances in various fields, such as mobile communication, drones and robotics. It believes the next killer app in eBusiness will make use of holograms and speech input/output. When Obi-Wan Kenobi appears to Princess Leia in the original Star Wars, it’s by hologram and speech.

**Problem:** Think about how eBusiness takes place now. Users view and navigate through web pages, either on a mobile device or laptop/desktop. They scan multiple flat pages, put items in a shopping cart and check out. Now imagine how much easier it could be. The user talks to a small device: “I want a new lawnmower.” The device asks a few questions, then projects a hologram to the user, who can view the lawnmower in space from any angle. 3D video of the lawnmower in action can be displayed. The user says, “How much?” The device responds, “That one is 499 dollars.” The user says, “I’ll take it,” and the deal is done. It should be that easy. Think of it as Siri with a three-dimensional avatar that speaks to you, listens to you, shows you products, which can be examined in space, and then takes your order.

**Opportunity:** There have been recent dramatic advances in hologram technology. For example, Ostendo Technologies, Inc. (ostendo.com) makes a chip that allows smartphones to display holograms without the need for Google Glass, Oculus or headsets of any kind. RealFiction has a line of dreamoc™ high-definition holographic displays. Promenant also envisions use of holographic displays for home entertainment, although this involves larger and more expensive equipment. Promenant is working on a device that is portable, lightweight and extremely user-friendly. When turned on, the device will connect to the Internet and various sensors and other devices by WiFi. All instructions and communication to the device will be done through voice commands processed using several open source Natural Language Processing frameworks. The device will respond holographically. Promenant wants the team to develop an entirely new way of conducting electronic business using this device.

**Output:**

A working prototype of a system that integrates voice input/output with holographic display to allow consumers to request information about products, review and order them without the need to view web pages. The purpose of the prototype is to explore the feasibility of Promenant’s conception.

The team should obtain holographic devices and connect them to a smartphone or other computer and demonstrate the ability to perform consumer eBusiness transactions using voice input and hologram output. The team is not expected to develop Promenant’s entire device.
**Background:** RoBotany (robotany.ag) is a Pittsburgh-based startup dedicated to fully automated vertical farming. Traditional farms can only grow one layer of crops in a given land area and are susceptible to many uncontrollable variables, such as droughts, floods, and diseases. In vertical farming, many layers of crops are hydroponically grown on industrial racks in a controlled environment that simulates optimal growing conditions year-round by independently modulating temperature, light, moisture, and other variables. Vertical farms are especially effective in harsh climates where crops cannot grow outdoors and typically result in yields per square foot that are 10x - 100x that of traditional agriculture. This has driven explosive market growth over recent history and the industry is anticipated to grow five-fold over the next five years.

**The Problem:** Despite the efficacy of vertical farming, the process has been highly labor and manual intensive, with workers dangerously retrieving plants by hand using ladders and scissor lifts that reduce valuable production space. Until now, these issues have called into question the long-term scalability and sustainability of vertical farming. As a solution, RoBotany is developing a profitable, fully automated vertical farm. To start, we are building a test farm that includes i) our patent pending smart grow tray and flow rack system that works for all methods of hydroponic irrigation and grow media, ii) our patent pending autonomous transport robot that can navigate X and Y planes, manipulate and retrieve trays, and log visual plant data using a hyper spectral camera, and iii) a fully integrated sensory network and production control software platform.

**The Opportunity:** RoBotany's solution will improve labor efficiency by over 50%, increase crop output by over 1.5x, and provide an unprecedented level of data collection and analytics.

But to get there, RoBotany needs you; software is needed to operate the farm. Networked robotic peripherals will be developed by RoBotany's engineers; however, an all-encompassing system and virtual console is required to control the farm. Tasks performed by the system will range from simple I/O controls, such as toggling a pump, to accessing historical data, to autonomously planning optimal paths for every plant tray, to interpreting and optimizing data.

**Outputs:** A demonstrable software application / farm operation console having the following:

- A clear overview on the status of the farm, sensor values, and queued actions
- An expandable I/O to control and query hardware peripherals, such as lights, a camera, fans, and sensors
- An accessible log of historical sensor values and farm actions, including a log for every tagged plant tray, its sensor values, and its current status
- An extension to command the robot manipulator to retrieve and manipulate any tray
- An easy-to-use interface for forecasting demand and required resources
Background: Tiversa (tiversa.com) is a venture-funded cyber intelligence company based in downtown Pittsburgh that provides computer security services to an array of government agencies and commercial customers. Using a sophisticated infrastructure of servers and storage systems, it downloads and indexes approximately 2 terabytes per day from the Dark Web, Deep Internet and P2P—all of which are networks reachable through the Internet but require special protocols to access, such as BitTorrent, Freenet, I2P and Tor. Much of the content on the Dark Web is illegal, privacy-invading or terrorist activity. For example, the exchange of a person’s Social Security, credit card or bank account number on the Dark Web would be a source of immediate concern. Material is collected and saved in EMC storage in a wide variety of languages in Unicode representation and indexed using Lucene. Tiversa’s datastore is around 2 petabytes in size. Tiversa owns more than 120 patents covering techniques for searching in P2P and file-sharing networks.

Problem: Tiversa regularly probes its datastore for customers that include B2B, B2G and consumer direct. A consumer’s profile includes DSP (Dynamic Signature Profile) or various types of Personally Identifiable Information (PII). As content is downloaded from the Dark Web, it is passed against these profiles for hits, which are then investigated further. Tiversa performs monitoring of this kind for many different types of organizations. However, this sort of probing works only when Tiversa knows what to look for. To develop new client opportunities, Tiversa wants to mine its datastore to learn what it should be looking for. For example, it is possible that data has been leaked from health insurers resulting in highly sensitive medical information appearing on the Dark Web. If this is the case, Tiversa could approach insurance companies and offer to provide specific cybersecurity services. The problem is that so much data is being collected that Tiversa needs tools to mine it, both historically and on a daily basis.

The Opportunity: Tiversa’s datastore is a unique resource that is potentially extremely valuable because of what it reveals about underground activity worldwide and in many languages. Tiversa needs a system to provide insight into what its huge datastore contains through intelligent mining, e.g., using multilingual text analytics. Here is an example: collect keywords from multiple industries (insurance, banking, electronics) in multiple languages. Pass them against the datastore to learn whether documents from particular industries have been appearing on the Dark Web. If so, that industry is a potential business opportunity for Tiversa. Many other data mining techniques can be employed. The goal is to allow Tiversa to realize the full value of its datastore.

Outputs: A demonstrable software application having the following facilities:

- Ability to navigate through Tiversa’s datastore to determine which downloads pertain to particular industries and individual companies within an industry.
- Ability to isolate and display content in any language relating to any given industry. A user should be able to type “insurance” and see a graphical representation of documents in any given time period relevant to the insurance industry. (Note that the word “insurance” might not appear in a given document.)
- Ability to define new keyword profiles from the information obtained above to create new alerts for Tiversa as part of daily data collection.