

SHAUN KELLY|HCI CAPSTONE SPRING 2013

MILESTONE 3 – THE DESIGN

Yard Genius

Yard Genius is an application to help homeowners maintain their yards by keeping track of maintenance tasks and suggesting appropriate plants and vegetation based on the user's context.

The main user group for my system will be homeowners with yards and gardens to maintain. Users who will benefit most from the application are those with limited experience and knowledge about yard and garden maintenance.

The three main tasks for the application identified during user research are:

1. Determining suitable plants for a given location
2. Determining which tasks (planting, mowing, fertilizing, pruning, etc.) are required based on what items are planted
3. Design a pleasing layout for plants in the yard

Requirements

The functional requirements for each of the three main tasks determined in milestone 2 are:

Note: The term plants is inclusive of grass, flowers, bushes, trees, and all other plantables.

1. Determining suitable plants for a given location
 - The system shall be able to automatically identify the user's location based on GPS or network-based location.
 - The user shall be able to enter a location overriding the automatic location.
 - The user shall be able to identify the type of soil in a prospective location for a plant.
 - The user shall be able to identify the sun conditions (shady, sunny, occasionally sunny, etc.) of a prospective location for a plant.
 - The user shall be able to identify terrain (in ground, bed, raised bed, pot) of a prospective location for a plant.
 - The user shall be able to request a list of suggestions for suitable plants for a prospective location.
 - The system shall be able to identify a list of suitable plants based on the characteristics of the prospective location.
 - The user shall be able to filter the list of suitable plants by type, appearance, and care requirements.

2. Determining which tasks (planting, mowing, fertilizing, pruning, etc.) are required based on what items are planted
 - The system shall automatically identify and schedule the appropriate tasks for a plant type given the user's location, time of year, and weather conditions.
 - The user shall be able to view a list of tasks to complete.
 - The user shall be able to manually add additional tasks.
 - The user shall be able to edit all tasks including automatically generated tasks.
 - The user shall be able to delete tasks.
 - The user shall be able to mark tasks as complete.
 - The user shall be able to view tasks sorted by specific plant or by time.
 - The system shall be able to notify the user when tasks are due.
 - The user shall be able to add plants and tools noted to a shopping list
3. Design a pleasing layout for plants in the yard
 - The user shall be able to create a diagram of the layout of their yard, including the location of the house, paths, driveways, and other structures.
 - The user shall be able to add structures to the layout.
 - The user shall be able to search for plants.
 - The user shall be able to add existing plants to the layout.
 - The user shall be able to search for recommended new plants.
 - The system shall be able to prioritize suitable plants in search results.
 - The system shall be able to notify the user if selected plants are unsuitable for the location.

Design Space

The application has two categories of functions (that ultimately work together). The first category is choosing plants and laying out the yard. The second category is task management. The main design tradeoffs I explored revolved around how to balance these functions. Most of my initial sketching process involved sketching different variations of the application home page with some showing only yard layout tasks, some showing only task management, and some combining the two functions on a single overview.

A second main category of design tradeoffs revolves around information density. A user's yard is likely filled with grass and plants and trees that need to be tracked so that the application can determine which tasks need to be completed. How much information needs to be displayed to be useful without becoming cluttered? Additionally, my initial design explorations quickly showed that an auto-generated list of yard tasks going *ad infinitum* might become overwhelming and discourage the user from continuing on with their yard work.

The layout tool will be the most challenging element of the design. The interactions of adding and moving different pieces on the screen are more challenging than simply pressing buttons or entering text. Additionally, this design area has the most potential to pack too much information into a single screen. Limiting the information density of

this screen while making it clear to users how to drill down into the rest of the data and functions is key to creating a good interaction for this screen.

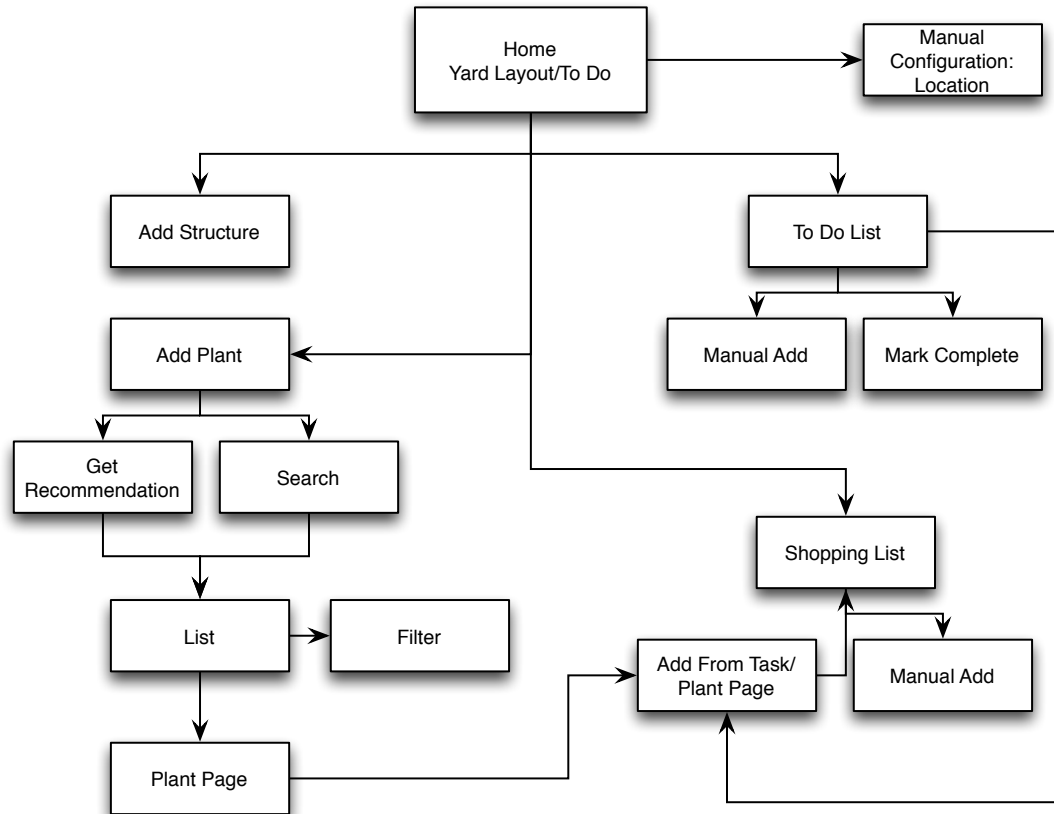
The Design

Scenario

It's Saturday morning in early spring. Jim is sitting on the couch with his coffee planning his day. He knows he needs to do some yard maintenance so he opens Yard Genius on his tablet. Yard Genius notifies him that it is time to fertilize his lawn and to plant those rose bushes he selected the last time he checked the app. Jim puts fertilizer and rose bushes on his shopping list. Looking at his yard layout, he sees a couple of prime areas where he could add additional plants while he's out. He gets up and takes his tablet into the yard to inspect the areas. He asks Yard Genius for recommendations and selects lilies for the sunny spot. With lilies added to his shopping list, Jim heads off to his local home improvement store. In the garden center, he shows his shopping list to one of the employees who helps him pick out what he needs. All set, he heads home for a morning of planting and fertilizing. When he's finished in the afternoon, he marks those tasks as done on his to do list. Looks like he's clear until next weekend, so now he can enjoy a drink on his porch while enjoying his handiwork.

Information Flow

Before beginning to create any sketches of the interface, my I first sketched out the information flow for the application. A more refined version is shown below.

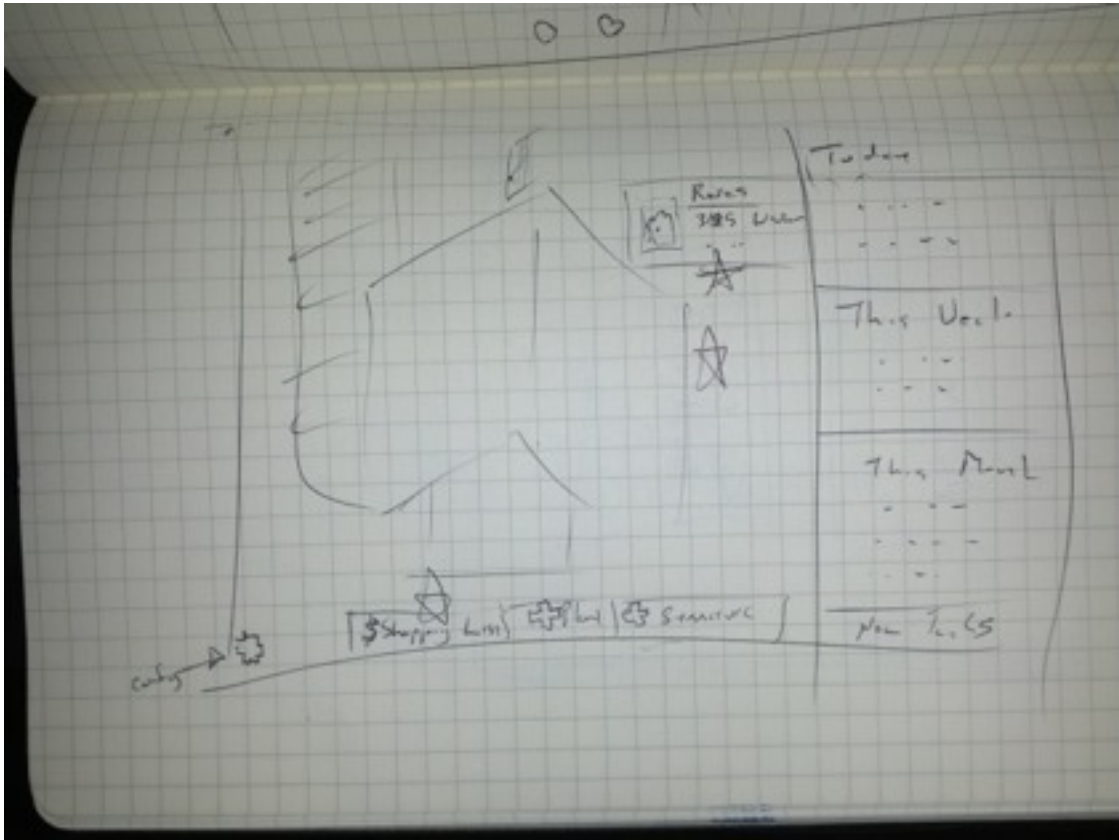


My initial challenge with the information flow was determining whether the user would enter at the task interface, the yard layout interface, or an interface combining the two.

Ultimately, I decided to use an interface combining the two screens while working to keep the level of information from being overwhelming. I chose to keep the yard layout front and center even when working with tasks to follow Norman's (2002) principles of using good mappings and mental models. This will allow users to visualize where in the yard tasks need to be completed.

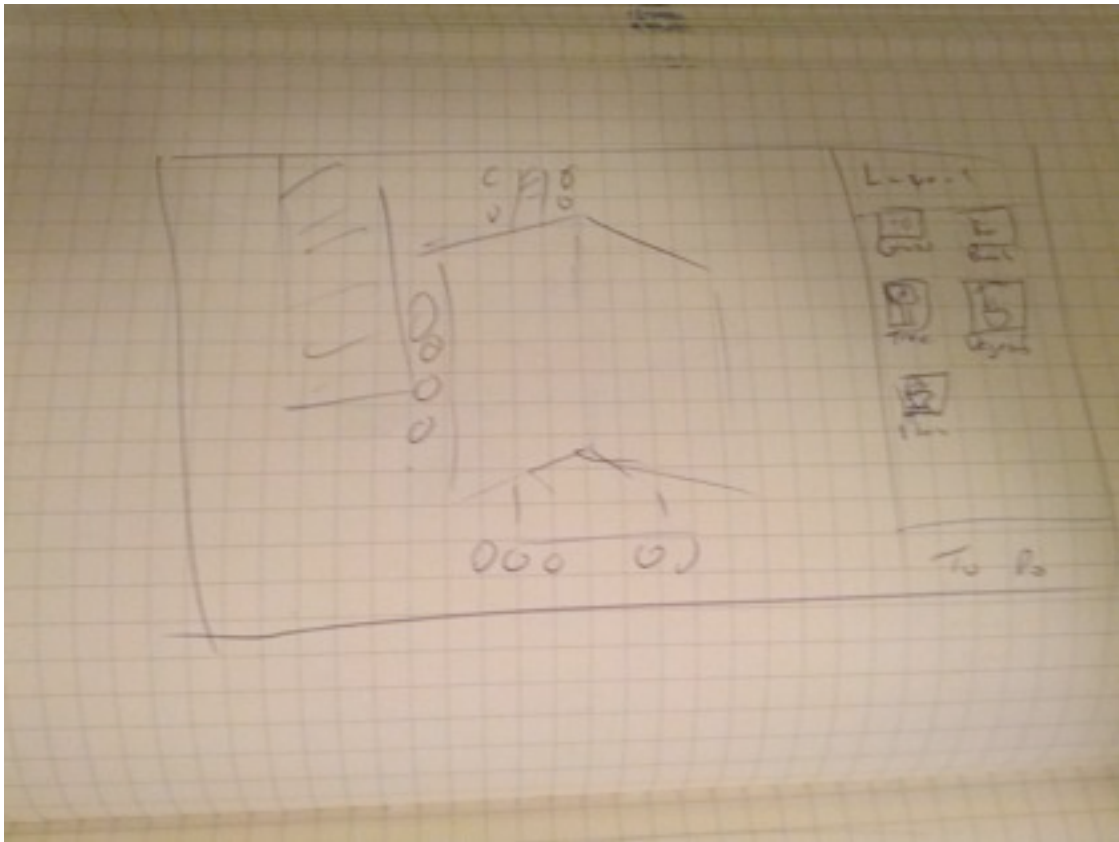
Selected Design Sketches

Home Page



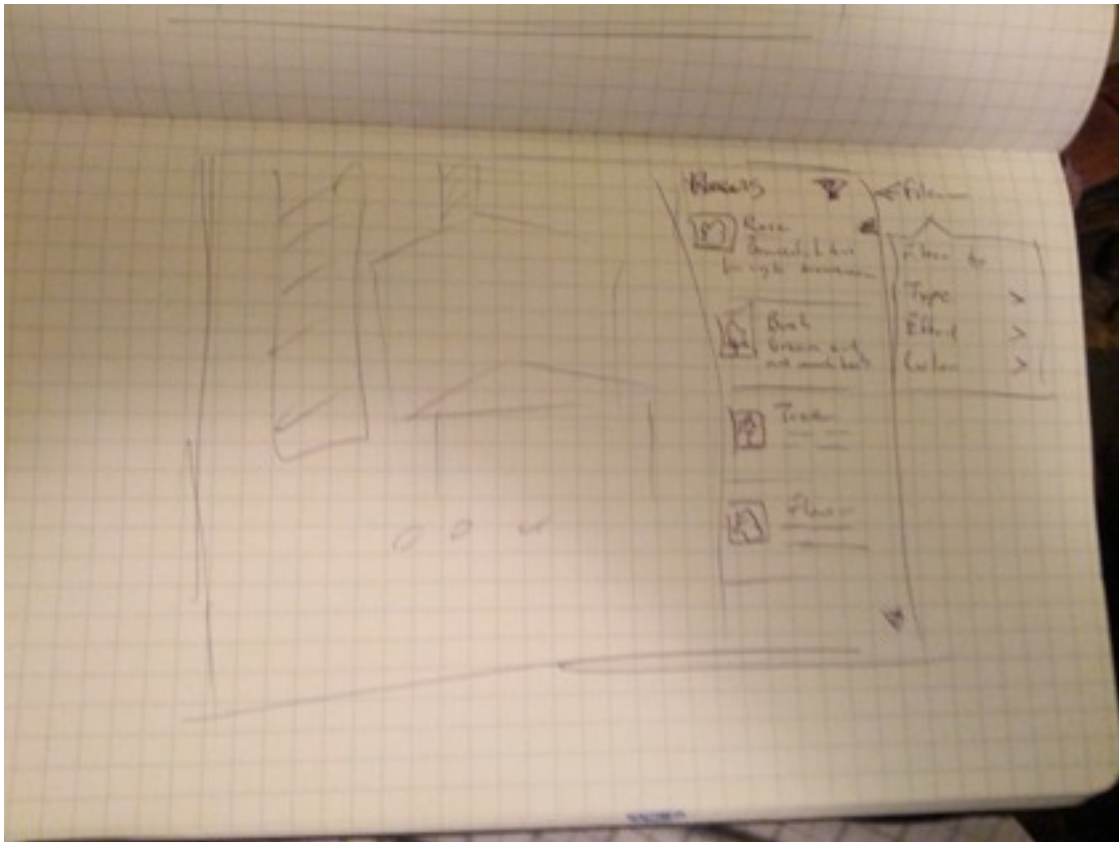
As described above, I chose to highlight the layout aspect on the home page while providing the upcoming tasks in a list on the right. Access to the additional features is provided along the bottom, using salient touch targets.

Layout Editor



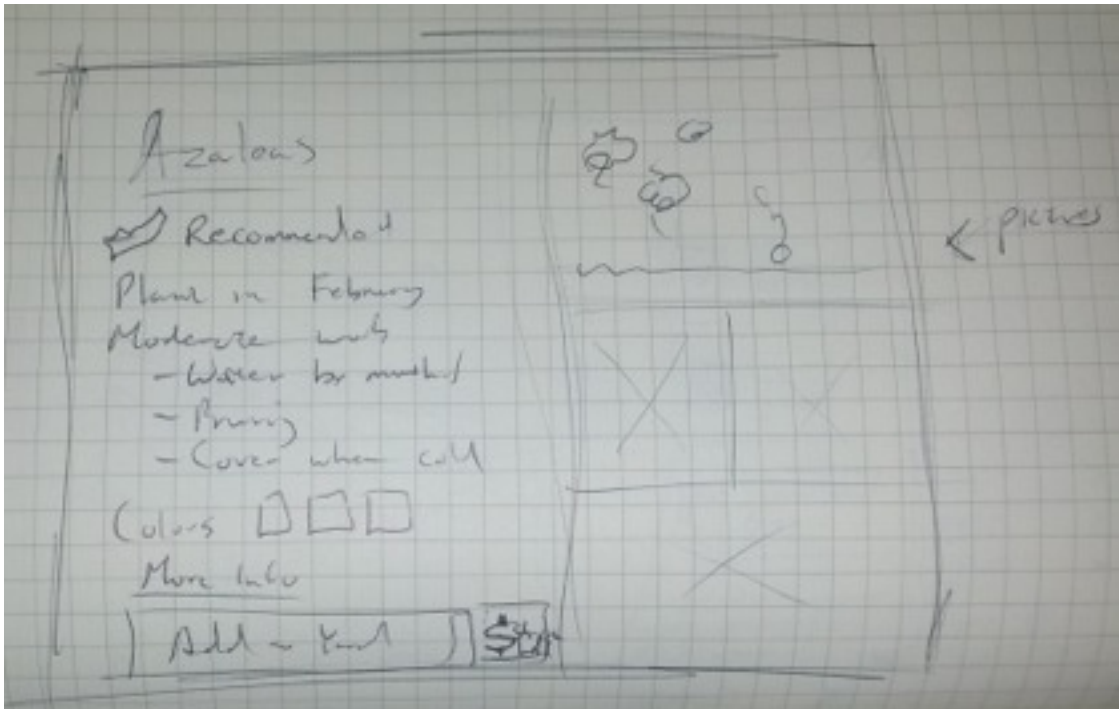
The layout editor continues the visual language from the home page. Users will use drag and drop from the list on the right. I chose a simple list of structures to provide a frame of reference for planting without overwhelming the user with architecture as the focus of the application is planting.

Get Plant Recommendation



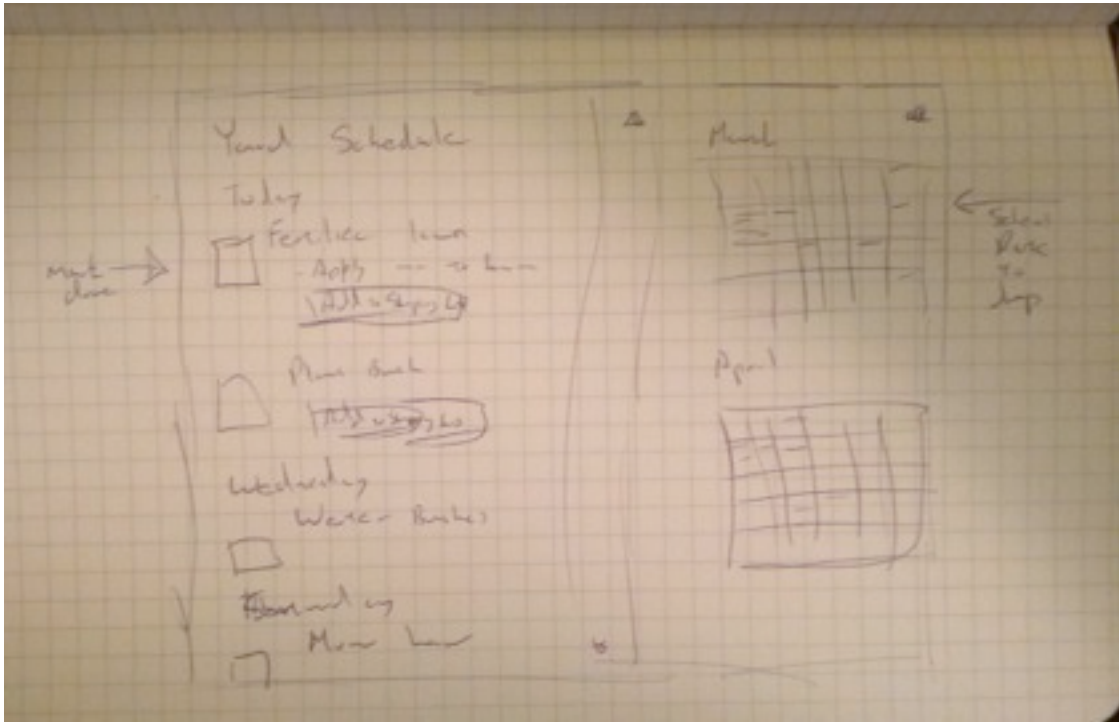
We use a consistent layout again. Filters available following the conventions for tablet apps. The list provides an image and brief description to keep information density low and users can select the plant for more detailed information.

Plant Page



The plant page gives a more detailed overview. The plant page provides the basic information that a user would want to know and provides some photos of the plant for inspiration. From here, the user can add the plant to the yard and to the shopping list.

Full To Do List



Again, the full to-do list page follows the philosophy of keeping the most important details on the home page and letting the user drill down to more functionality on the following pages. I added month-by-month navigation that also gives an at-a-glance view of how much work is to be completed.

Emerging Technologies

As indicated in milestone 2, I have chosen a tablet application as the format for this project based on feedback from users that they would like to access the application both working in the yard. Mobile and tablet applications are among the most popular current manifestations of ubiquitous computing, the notion that we will seamlessly use computing technology in every aspect of our lives.

A key concept of ubiquitous computing is the notion of context (Dourish, 2004). Context is the notion that the user's current situation (physical location, device type, time of day, user's current goals) are ever-changing and must be considered when designing applications. In the simplest case, a user sitting in front of a computer at a desk has different goals and needs from the application than a user looking at a mobile phone waiting in line at the store.

In the case of Yard Genius, considering the user's context allows us to automate data input for a number of pieces of information either using the device's sensors (location, date and time) or data from the Internet (recent weather and weather forecasts). Context, however, also requires us to consider the design tradeoffs discussed above revolving around information density. Sitting quietly at a couch doing research, the

user may be able to process more information than when walking around the yard outside. (Conversely, the user may be distracted by children, pets, and phone calls inside and only have peace and quiet outside. Context is always evolving and not described by only the device and location.)

The choice of tablet application means that a touch interface is the mode of interaction used by this application. Recent years have seen the growth of more natural forms of interaction, such as touch and speech, complimenting or supplanting traditional keyboard-based methods of interaction. However, Wickens (2004, pg. 226-227) shows that as far back as the mid-1990s, touch interfaces were considered more intuitive and easy to use by users.

While not currently integrated in the design plans for this iteration, Yard Genius has great potential to integrate with the Internet of Things (Ashton 2009). While the tasks generated by Yard Genius would currently be based on expected behaviors of certain types of plants combined with knowledge of the weather and location, Yard Genius could potentially interact with sensors throughout the yard indicating the height of plants, the amount of light received, how wet the soil is, etc. In a recent keynote, Bill Buxton (2012) identified this seamless integration of sensory data (see the Nest thermostat for a leading current example) as one of the top technology opportunities of the next five years.

Social Implications

One major ethical concern regarding any new technology is the extent to which that technology may displace existing workers whose jobs may be obviated by the technology. One of the functions of home improvement store or garden center employees is to be able to provide the types of information that Yard Genius will apply to users. One of the users interviewed for milestone 2 indicated that home improvement store workers were one of the sources he or she used to find needed information of the sort provided by Yard Genius. With the application available to that user, he or she may not need to advice of that employee. This tradeoff between new technologies and old jobs epitomizes what Joseph Schumpeter (1942) characterized as “creative destruction,” which he identified as simultaneously the driving force of capitalism and its greatest challenge.

While the widespread adoption of this technology would certainly not eliminate all home improvement and garden store employees, it could certainly make some of those employees less necessary and also devalue garden knowledge as a required skill. Perhaps some highly skilled and knowledgeable employees could be eliminated and some could be replaced with lower skilled workers.

On the other hand, the application may help create more sophisticated consumers who require more highly skilled employees at these stores to service their needs.

Another key ethical concern for any networked application is privacy and data security. While this project focuses on user interface development, applications that

connect to the network and store user information must be coded with security in mind. Data must be protected when stored on the device, when stored in the cloud, and when in transit so that secure user information cannot be accessed by unauthorized parties. Even seemingly innocuous information (such as birthdays or pictures of houses) could be combined with other information to gain access to a user's secure data through either social engineering or forgot password links.

Citations

Ashton, Kevin. (July, 2009). That 'Internet of Things' Thing. In: RFID Journal. Last accessed on February 24, 2013 from <http://www.rfidjournal.com/article/view/4986>.

Dourish, Paul. (2004). "What We Talk About When We Talk About Context" in *Personal and Ubiquitous Computing*, 8(1), 19-30.

Wickens, C. D.; Lee, J. D.; Liu, Y.; Becker, S. E. (2004). *An Introduction to Human Factors Engineering*. Second Edition. New Jersey: Pearson Education Inc.

Norman, Donald A. (2002) *The Design of Everyday Things*. New York: Basic Books.

Buxton, Bill. (October, 2012). *Welcome to the Social*. Keynote at ReMix South. Atlanta, GA. <http://vimeo.com/54402285>

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