EXECUTIVE SUMMARY

W.W. Grainger, Inc., a company based in Lake Forest, Illinois, is an industrial supply company that specializes in business to business sales. This company is in the midst of a massive expansion to include more products to service more companies. As part of this expansion, Grainger would like to develop a mobile application for its customers and employees. This application will allow customers as well as employees to search and order Grainger products from their BlackBerry or other mobile device. Additionally, this program will allow Grainger to expand its influence in telecommunications marketing and increase its customer service. Darren Taylor of Grainger approached us with the task of developing an algorithm to spearhead development of this mobile application.

After surveying potential users to determine what Grainger’s customers deem the most important in a mobile application, we formulated a design, *Grainger on the Go*, which meets the following main requirements:

**Simplicity:**
- Three simple processes: log-in, order, and search
- Easy to read, business-oriented menus
- A simple user interface
- Minimal steps in each process

**Security:**
- Log-in function prevents public access of private information
  - Protects customer identity from identity theft or other electronic dangers
  - Prevents public access to confidential company information

**Intuitive features:**
- Features and standards well-known to computer and/or mobile phone users
  - Uses built-in BlackBerry function keys
  - Uses steps and wording common to Grainger.com and other websites
  - Uses Bluetooth printing, SureType, and other popular features commonly available on BlackBerry phones.

*Grainger on the Go* makes searching and ordering from Grainger on a mobile device simple, secure, and intuitive. The efficient algorithm and sample model sets the foundation for further development.
INTRODUCTION

As technology progresses, more and more employees are using Smartphones to enhance their job experience. Smartphones have the ability to do even the things computers can now do. They can access the Internet, exchange data, and even locate landmarks at the click of a button. They also possess the advanced features that a normal phone would have. But now, businesses are moving to create a market through telecommunications software and Grainger would like to be ahead of those businesses.

Darren Taylor, of the eCommerce branch of Grainger Industrial Supply, proposed that our team design a prototype process to pioneer Grainger’s design for a mobile phone application (See Appendix B). This application is designed to allow the customer to do many things he would be able to do on Grainger’s website, including ordering products, searching for products, and finding local branches. Our team first examined the issues past teams had with designing the application, and found that a website could not just be inserted into a mobile phone, because the processing power between a computer and a BlackBerry is extremely different.

Our design accomplishes the basic user needs that a prototype program would require. These functions are addressed in three straightforward processes centered on a log-in function, a search function, and an order function. The log-in function ensures the protection of customer and company data and any personal information as well. This is extremely important because identity theft and other forms of electronic crime are prevalent in electronic business. The search function allows the user to search for a product as he would on Grainger’s site, except that the display is simplified to suit the interface of a Smartphone, which most likely will be a BlackBerry. The order function also resembles the process of online ordering. This resemblance will make the customer feel confident, as he or she will have had experience ordering from a website and will not be frightened by the interface.

The purpose of this report is to outline the research methodology and design process that led to this production, highlight the design’s major features and how they work together to create an effective design, and demonstrate how the design meets requirements best suited for the user.
**USERS AND MAJOR REQUIREMENTS**

The primary users of this design are Grainger’s customers who possess a BlackBerry (For a list of other users who will interact with this design, refer to Appendix A). Grainger’s customers range from large corporations to small businesses. Different customers receive special prices and discounts based on the individual cases of the company. Grainger’s target audience, however, consists of maintenance engineers who may benefit from using a BlackBerry to order products from Grainger as they would as if on Grainger’s website.

For the results of user observation and testing see Appendix C.

In order to be an effective design, *Grainger on the Go* needed to meet the following requirements:

**Simplicity**

*Grainger on the Go* needs to load quickly. The purpose of the program to have users who are “on the go” or not near a computer to be able to order products as they would sitting in front of a computer. Long loading times were a problem with the solution that previous teams developed. Therefore, we have determined that the program needs to be somewhat minimalistic and that there needs to be a small number of steps. This directly affects the speed, as with each new page loaded, time is used. Further, due to the small size of the Blackberry screen, pages need to be short so that the user does not spend much time scrolling through selections. According to user testing, purchasing through *Grainger on the Go* should require less time than purchasing through a phone call. Therefore time-efficiency is an extremely important factor in our design.

**Intuition**

The program also needs to be intuitive and easy to use. This way, customers will inherently “possess the knowledge” of how to use the program (the program will consequently have a low learning curve). When a user would like to perform a task such as searching and ordering, the user should be able to do so without being confused or aggravated by convoluted or hidden abilities that they are not aware of. Wording should be clear and precise. With these considerations, users should be able to search and order products from Grainger as easily as possible.

**Security**

Because the mobile application involves private customer and company information, security is an important issue that must be addressed. This design cannot afford to have vulnerabilities that threaten private user information. Precautions must be taken in the case of unauthorized users having access to a customer’s mobile device. In general, this ethical consideration is of utmost importance to perfect to protect the company, and more importantly the customer, from electronic dangers.
DESIGN CONCEPT

For our final *Grainger on the Go* design, please see Appendix D.

Main Processes

**General Process**

*Grainger on the Go* is divided into three main sections— the general process, the search process, and the order process. When users first open the application, they will start at general screen. Here users can choose to log-in or continue using the application as a guest. Guests can search or order Grainger items, but only users who have logged in can view their recent orders and saved order forms as well as search and order items without entering information. Figure 1 highlights this function.

![Diagram of General Process](image)

Figure 1: General Process.
Search Process
The next function to be addressed is the search process. In this algorithm, users attempt to find their desired product and then save it to their order form. The search process is divided into two main options "Keyword Search" and "Browse," which is modeled heavily from Grainger’s website to prevent confusion (makes the program intuitive). Depending on which search options and sub-options the users choose, users can narrow down Grainger's vast amount of products to their desired item in a step-by-step fashion. Once they find a desired item and save it in their order form, users can either continue searching for items or proceed to the order process. See Figure 2 for a visualization of this process.

Figure 2: Search Process.
Order Process

The main goal of the order process is to allow users to order items from their shopping carts, while keeping in mind the importance of user confidence and user information security. The process is divided into four sections: Specify, Confirm, Order, and Receipt. Through this step-by-step process, users first specify what they want to order and confirm their shipping information, purchase order, and payment information. Then users can order and subsequently receive a receipt. See Figure 3 for a depiction of this process.

Figure 3: Order Process.
Product Features

Appearance
The color scheme chosen for *Grainger on the Go* is a white background with black and red text and figures. A Grainger logo is present in the upper left-hand corner of every page (except the main homepage). There are two types of buttons used in our application, selection buttons and decision buttons. Selection boxes can be scrolled to clicked upon and are within the center of the application. They are usually used to make selections between lists of multiple options. Boxes with gray outlines and/or gray backgrounds surround each selection button that a user may want to click. When a user scrolls onto one of these selection buttons, the button's area is highlighted by a different shade of gray. Decision buttons are found on the bottom of certain screens. They are options such as "Back," "Select," "More Details", etc. When they are "pressed", their background color also changes instantaneously to indicate that they were pressed.

General Application Features
*Grainger on the Go* has several features, common to most pages. First of all, each Grainger logo, when highlighted and clicked upon, links back to the Grainger homepage. The "End Call" button on the BlackBerry itself closes the application and the "Back" button on the BlackBerry sends the user back to the previous page. The "Left," "Right," and "Select" buttons (or scroll wheel on most models) on the BlackBerry can be used to navigate and select the decision buttons found at the bottom of some screens. Also, some pages have a "Help" button. This button links to a screen that offers to call Grainger's customer support from the application. The user's log-in status is also clearly stated in the upper right-hand corner of each screen.

General Process

Log-in
Before downloading the *Grainger on the Go* onto their phones, users can personalize the application by specifying a user name, password, contact information, billing information, etc... This information can only be used if users enter their log-in information into the BlackBerry application. When users start the application, they are given the option of logging in or continuing as guests. Guests can search or order Grainger items, but are limited to basic features. In addition to searching and ordering items, users who have logged in can also view their recent orders, saved order forms, and have other personalized features such as customer-specific pricing, and browsing items by the most popular in their company or by the most popular in their field of work.

View Recent Orders
Users have the possibility to view orders that they previously made. Within this feature, users can select specific recent purchases to re-order.
View Saved Order Form
After users save items to an order form, these items are saved onto the application. If the user returns to the homepage or exits the application and logs in again, the saved order form can be opened up and viewed from the first main screen. Users can review their order forms and continue shopping or proceed to make a purchase.

Edit Account Information
Users can edit their account information as necessary once they enter their log-in information.

Search Process
Accordion Arrangement of Search Options
When selecting the method in which a search is to be made, options are arranged in an accordion-like manner with tabs that open and close displaying various search options and sub-options.

Searching by Number
Within the Keyword Search option, users can choose to search by number. Within the search by number tab, they can choose from the following sub-options: Grainger Item number, Manufacturer Model number, National Stock number, and Cross Reference number.

Searching by Manufacturer/Brand
Users can search items by their manufacturer or brand. Once users choose a manufacturer or brand, they can choose to keyword search or browse this subcategory.

Take a picture of the SKU
This feature allows users to take a picture of the SKU. The application then processes the SKU and gives the user the corresponding detail page of the item.

Search All
There is also a "Search All" option which is the closest search option to a general Internet search; it searches all the main fields for the inputted keywords (title, company, etc.). Unfortunately, due to the limitations of a BlackBerry's procession power, the search all searching method can be very slow. Thus, the search all option has a warning next to it which states that this method of searching might take more time.

Browsing
Users can also select items they want to purchase by browsing certain lists such as most recent purchases, most popular products for their company, most popular products in their field of work, and by categories and sub-categories.
Details and More Details
Due to download time constraints as well as screen size restrictions, we have divided our item descriptions into segments. The first of which, Product Details, displays only the title of the item (which includes specific information about the item such as dimensions and package quantity), the Grainger item number, the manufacturer model number, the brand, and the price. There is also the "Find In-Store" option and the "Add to Order" option. The user also has the opportunity to click on a "More Details" decision button. This button links to a screen where the user can choose from the following types of additional product details: Tech Specs, Additional Information, Repair Parts, Alternative Products, Accessories, and MSDS.

Order Process
Product on Order Form
As mentioned above, to order an item, the item has to be saved onto an order form. When users enter the order process, they are first asked whether the item(s) they wish to order are on their order form. If the users indicate "No," they are linked to the search process where they can locate their product, save it to their order form, and get sent back to the order process to make a purchase. This loops the Search and Order processes together.

Check Desired Items and Input Quantities
Once user have their items on an order form and are prepared to order, they can input the amount of each item they want. User can also delete which items they do not want to order.

Shipping or Pick-up Details
Items can either be shipped or picked up. An item's shipping address is set to the user's default item shipping address, which would have been provided at the time the user created his or her Grainger on the Go account (if the user is logged in). However, the default shipping address can be changed manually or by choosing an alternative address from the user's address book within the BlackBerry. These manually entered addresses or addresses extracted from the address book can be set as new default shipping addresses. Items can also be picked up at the nearest Grainger branch (default) or other Grainger branches (which can be specified). Once a pick-up location is specified, the Grainger branch's address and telephone number are displayed on the screen for the user’s reference.

Confirmation
Before an item is ordered, users are asked to confirm if the items they are ordering, price, quantity, and shipping/pick-up locations are correct.

Log-in to Purchase
For safety reasons, users must re-enter their passwords before they can make a final purchase.
**Email Purchase Order Confirmation and/or Receipt**
Purchase order confirmations and receipts can be emailed by the user to manually entered email addresses or to email addresses found in the BlackBerry's address book. When emails are being manually entered, SureType can auto-fill email addresses based on the first few letters of the email address that the user enters. In general, receipts are emailed automatically to the provided default email address once a purchase is made, but receipts can be also sent in additional emails as the user requests.

**Print Purchase Order Confirmation and/or Receipt via Bluetooth**
Purchase orders and receipts can be printed out from the BlackBerry application to a Bluetooth enabled printer wirelessly.
RATIONALE FOR DESIGN

Appearance
The color scheme chosen for our application is a white background with black and red text and figures because we believe that a Grainger application should have a color scheme, and an overall appearance, indicative of Grainger. A Grainger logo is present in the upper left-hand corner of every page (except the main homepage) for the same reason. Overall, our application's screen will look simple and clear with large, legible text. This will be convenient for users and will make the application simple.

General Application Features
The general features of the application are based on widely used, well-known methods used in computers and mobile phones. The linking of each Grainger logo back to the Grainger homepage is one such example of a well-known feature that users have come to expect in all websites. By incorporating this intuitive feature, we allow the program to be easily understood. There are no hidden functions or convoluted abilities.

Likewise, the use of the "End Call," "Back," "Left," "Right," and "Select" buttons on the BlackBerry are intuitive to BlackBerry users and mobile phone users, in general. The "Help" button is included for user convenience as well as to promote user confidence; if a user has trouble or is confused about a certain portion of their interaction with Grainger, they can easily get help to continue using the application. The user's log-in status is included for the user's convenience to indicate whether the user has logged in or if the user is searching as a guest.

The application also uses a minimum amount of graphics and interaction with an online database, in order to reduce download times. In fact, no interaction with the Grainger website is needed when running the application. In addition, some graphics and most information are saved on the BlackBerry and don't have to be taken from a database. All these factors reduce the download times users would have to wait. During user testing, users indicated that time would be a decisive factor in whether they would choose to use a mobile application over the Internet or a phone call.

General Process
Log-in
The log-in function is primarily added as a secure method for users to store personal and billing information on the application. Users are given the option of either logging in or continuing as guests, in case a user might not want to log-in (has forgotten his or her password, etc.) or just wants to check the availability of a product. The log-in function also allows users to view saved preferences including but not limited to recent orders, private information, customer specific pricing, and items commonly viewed in their field of work.
View Recent Orders
Viewing recent orders with the possibility of re-ordering can be very timesaving and convenient for those who buy the same products multiple times. Also, viewing recent orders is another way for the user to confirm that he or she made certain purchases, adding to user confidence in Grainger on the Go.

View Saved Order Form
Viewing the saved order form from the homepage makes Grainger on the Go more simple and convenient. Users know that as long as they save an item on their order list, no matter what they do after that, they can always find it in the first screen after they log in. Adding items to the order form or proceeding to the order process can also be very easily done from the “View Saved Order Form” screen.

View/Edit Personal Information
This adds to the application's versatility since personal information and billing information may change. Making logging in necessary for this feature adds to security.

Search Process
Accordion Arrangement of Search Options
This method allows users to easily look through the search options by opening and closing the accordion tabs as necessary. This is convenient if the user is uncertain of which search option he or she would prefer using, because with this method the user can just close up the tab, if needed. Splitting the search up into different sections also decreases download times and makes the search process a simpler, easier, step-by-step process, which will be more attractive to users.

Take a picture of the SKU
This feature was suggested during user testing as a method of searching. It uses the BlackBerry's built in camera to make it easier for the user to find a specific product.

Search All
This option has a “more time” warning next to it, in order to let users know in advance that the search option may be relatively time-consuming.

Browsing
By browsing different lists, users can quickly find items that may be of interest to them. Also, browsing by categories is another simple, step-by-step method that can be used to find a desired product without having to wait a long time for a general search.

Details and More Details
Dividing necessary item details into categories also reduces download time and, as mentioned above, users placed a special emphasis on the device being faster than other product searching and ordering methods.
**Order Process**

**Product on Order Form**
This screen conveniently transfers users that want to order items but have not searched for the items yet, adding to the convenience and user-friendliness of the application.

**Delete Undesired Items and Input Quantities**
This adds to the convenience and user-friendliness of the application as well since it allows users to purchase only the specific items they want from their order form.

**Shipping or Pick-up Details**
The default shipping address and nearest pick-up location options allow shipping and pick-up to be confirmed more quickly. However, setting a different shipping address and specifying a different pick-up location are also options introduced to meet different user preferences. Using the address book's information takes away from the time-consuming process of manually entering a lot of information on a very small BlackBerry keypad. Addresses and telephone numbers of the Grainger pick-up location are included for user convenience.

**Confirmation**
Before an item is ordered, users are asked to confirm if the items they are ordering, price, quantity, and shipping/pick-up locations are correct for security purposes.

**Log-in to Purchase**
Users must re-enter their passwords before they can make a final purchase for security purposes.

**Email and/or Print Purchase Order Confirmation and/or Receipt**
Purchase order confirmations and receipts can be emailed for user convenience. It was also indicated during user testing that users sometimes have to send their supervisors purchase orders (PO) before they are allowed to order items; it was suggested that a feature be added to allow purchase orders to be emailed or printed. Suretype, which auto-fills email addresses, was added for user convenience and time-saving purposes. Receipts are also emailed automatically for user convenience, so that users may have an easily available copy of their receipts. This is a method that is widely used in Internet purchasing and is intuitive to users with prior experience with Internet purchasing.
LIMITATIONS

Coding
In order to make this prototype design a working model, the application will need to be coded and tested again on a mobile device. As our team members did not have programming skills, we were unable to create a physical prototype to test. However, we did create visual representations so that clients can see what the program roughly resembles.

User Testing
After the program is coded, it should go through a real version of user testing, as we did with our questionnaires. New surveys can be developed and submitted to examine what users find practical and what they do not. Then, through additional testing and refining, the program can be released to the public for all customers of Grainger to use.
CONCLUSION

The assignment we received from Grainger was to design an efficient algorithm that enabled a customer or employee to search for and order Grainger’s products from a mobile device. After numerous surveys and changes, not only were the requirements specified by the client met to the best of our abilities, but user preferences and security were also taken into strong consideration. The following section briefly explains how each feature in Grainger on the Go addresses specific problems.

Based on the questionnaires we released and inquiries we made, Grainger on the Go meets the following user needs and client requirements:

**Efficiently Address Key Problems**
- ✔ Highlights the three key functions:— log-in, search, and order
- ✔ Is clear and straight-forward

**Extremely Intuitive and Simple to Use**
- ✔ Does not have animation or extra features – only contains basic necessities for operation
- ✔ Has a simple layout that is efficient and easily seen on a small Smartphone screen

**Addresses Security Issues**
- ✔ Has built-in log-in function to keep personal and company information confidential
REFERENCES


Produce - Create interactive flash applications online. 13 Apr. 2009 <http://produce.com>
APPENDIX A: PROJECT DEFINITION

Project name: Grainger on the Go Mobile Application
Client: Mr. Darren Taylor, W.W. Grainger, Inc.
Team Members: Eric Han, Yoke Peng Leong, Constance Mihalache
Date: May 13, 2009
Version: 2

Mission Statement: To design a dedicated digital method for W.W. Grainger Inc. that, which allows customers to access Grainger’s services through a mobile device.

Constraints

- Must cost no more than $100.

Users and stakeholders

- Customers (large corporations and small businesses)
- Internal Grainger employees (field sales and service teams)
- Our client (Mr. Darren Taylor)
- EDC development team

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<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Simple</td>
<td>• No fancy graphics</td>
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<td></td>
<td>• No promotions</td>
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<td></td>
<td>• Minimal steps from the homepage to placing an order.</td>
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<td>Compatible to BlackBerry</td>
<td>• Can be downloaded and used on a BlackBerry</td>
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<td>• Screen size range:</td>
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<td>Requirement</td>
<td>Specification</td>
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<td>Time saving</td>
<td>• Minimize the time needed:</td>
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<td></td>
<td>o To connect the application to Grainger's internet database</td>
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<td></td>
<td>o To load the application's screens</td>
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<td>Ease of searching product</td>
<td>• Ability to search for the product in various ways:</td>
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<td>o By search/type</td>
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<td>o By most popular in type of business</td>
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<td></td>
<td>o By products they users have already bought (application knows previous</td>
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<td>individual sales)</td>
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<td></td>
<td>o By keywords/part numbers</td>
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<td>Ease of ordering product</td>
<td>• Include the ability to save an order (shopping cart)</td>
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<td></td>
<td>• Feature that auto-fills personal information including address and credit</td>
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<td>card information after sign-in</td>
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<td>Ease of searching for nearest</td>
<td>• Incorporate BlackBerry’s GPS system with directions</td>
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<td>Grainger branch</td>
<td>Safety</td>
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<td></td>
<td>• Auto log out upon ending the application</td>
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APPENDIX B: CLIENT INTERVIEW SUMMARY

On Monday April 6, our team attended a client interview with Mr. Darren Taylor, from W.W. Grainger. During the interview, questions were asked about project goals and specifications including the project's use-cases, the application's future users, and additional requirements with reference to http://grainger.com. The following is an outline of the information obtained from the interview.

Background Information on Grainger

- Largest North American facilities maintenance company
  - Nation's largest company for safety products
- Sells a large variety of products – "everything"
  - From light bulbs, to screens, to signs, to highway safety jackets
  - Hospitals, schools (including NU), military, manufacturing, commercial, etc.
  - For example, 40,000 fasteners
- Products are in stock, right then, so customers can get quick access when needed

Problem

- World is shifting towards electronic purchasing
  - In some countries, people are getting high-speed internet cell phones before they're getting regular phones
  - Now electronic purchasing is at 18-20%, but by 2012 it's expected to reach 40%

- Maintenance engineers usually have a BlackBerry with them, but not a computer
  - Might be more comfortable w/ a cell phone
  - Mobile device they can have wherever their job takes them (different facilities, etc.)

- Previous Solution - to compact grainger.com into a special form for phone users who were trying to access the site
  - Didn't really work because grainger.com is too complicated to be reformatted for a BlackBerry.
  - Too much scrolling involved
  - Too much download time - needed quick results (to also make them want to use program to buy products)
  - Program needs to be small (screen size) and more simple
• **Requirements** – Does one or two of the following use-cases
  o **Key goal**: To encourage people to order products
    ▪ No promotions
    ▪ Just plain steps (no fancy graphics, etc.)
  o Uses least amount of steps for the following use-cases
  o Uses BlackBerry functions
    ▪ Buttons
    ▪ Address book
    ▪ Company info, etc.
  o Downloadable from the internet
  o Connect to Internet database for least amount of time
  o **Use-Cases**
    ▪ Order product when you know part #
    ▪ Search for products in various ways
      ▪ By search/type
      ▪ By most popular in type of business
      ▪ By products they've already bought (know previous individual sales)
    ▪ Incorporate GPS to give a map of where nearest location with item in stock is
      ▪ Grainer stores nearby
      ▪ "Click for directions" to one of 600 stores →Link to Google Maps
      ▪ Uses address book – (know individual shipment)

**Users**

• Whoever is responsible for maintaining or repairing a building, etc.
  o Maintenance Engineer or his supervisor
  o Might be able to interview Northwestern maintenance engineers for user testing
  o BlackBerry users
  o Sometimes such users multi-task because of the mobility of the BlackBerry
  o How would this change their job?

**Additional Client Suggestions**

• Observe users more than surveying them because where new technology is concerned, it’s hard for people to imagine what affect such an application would have in the future.
• Focus on what type of feedback you want from user testing
• For the project, clearly focus on one portion of the problem
• Prototype could display one component of the problem while report could explain various other ideas
• Weekly updates for client
APPENDIX C: USERS OBSERVATION AND TESTING SUMMARY

Obtaining User Feedback
Since understanding user preferences is key to the successful design of a project such as ours, we contacted numerous potential users for feedback. The potential users we contacted include:

- Grainger AM Representatives
- City of Evanston Facilities Management
- Evanston District 202 and 65 schools
- Northwestern University Facilities Management
- Northwestern University Laboratory Coordinator

In order to obtain user feedback in an effective manner, we made a user feedback survey. Users who completed the survey were asked to give general comments on their experience with Grainger and on our overall project, as well as quantitative ratings of our proposed design features.

User Feedback Survey (Paper version – Online version was sent)

We are designing a mobile application for WW. Grainger Inc. which will allow Grainger customers to access Grainger’s services through mobile devices such as Blackberrys. Users would be able to download this application onto their phones and easily interact with Grainger even if they are not at a computer.

First we have a few general questions:

1. About how often do you usually order from Grainger?
   - Daily
   - Once a week
   - Once a month
   - Less than once a month
   - I don’t order from Grainger, but I order from a similar company (i.e. McMaster-Carr) on a regular basis.
   - Other
2. Do you usually order by item number?
   - Do you usually order by item number? I usually don't know my item number, so I search for the item.
   - I usually know my item number and order by item number.
   - I usually know my item number, but I prefer to search for the item before ordering, anyway.

3. Please provide any comments you have on ordering from Grainger or similar companies. What would make ordering from Grainger easier for you?

4. Do you use a mobile phone? (Please select all that apply, if any)

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<tr>
<th></th>
<th>Yes</th>
<th>It has an internet connection</th>
<th>I can download applications onto it</th>
<th>I use it for work</th>
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<tr>
<td>I have a Blackberry</td>
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<td>I have a different</td>
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<td>mobile phone</td>
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5. Do you believe a mobile phone application would make ordering from Grainger easier in your line of work? Please explain briefly.
6. How important would the following general features be to you?

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<thead>
<tr>
<th>Feature</th>
<th>1 - Not important</th>
<th>2 - Not very important</th>
<th>3 - Important</th>
<th>4 - Very important</th>
<th>5 - Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Back/Cancel/Home buttons on every page</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>2 - Minimal scrolling up and down</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>3 - Step-by-step ease of use</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>4 - Fast download times for each screen</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>5 - Minimal number of screens</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>6 - Confirmations after every purchase/save</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

7. How important would the following homepage features be to you?

<table>
<thead>
<tr>
<th>Feature</th>
<th>1 - Not important</th>
<th>2 - Not very important</th>
<th>3 - Important</th>
<th>4 - Very important</th>
<th>5 - Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log-in</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Order items by item number</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Search items</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Find nearest Grainger branch</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Your recent orders</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Order lists (to save unordered products)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
8. The application could be divided into 3 main sections:
Ordering items
Searching for items
Finding the nearest Grainger location

How important would the following features from these sections be to you?

<table>
<thead>
<tr>
<th>Feature</th>
<th>1 - Not important</th>
<th>2 - Not very important</th>
<th>3 - Important</th>
<th>4 - Very important</th>
<th>5 - Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering: Shopping cart</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Ordering: Product details</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Ordering: Advanced product details</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Ordering: Confirmation</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Searching: Categories search</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Searching: Direct keywords search</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Searching: Browse most popular</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Searching: Browse recently purchased</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Searching: Additional product details</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Searching: Order list option to save unordered items</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Grainger Location Search: City/State/Zip Search</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Grainger Location Search: Nearest Branch Search</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Grainger Location Search: Recent Shipping Location</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Grainger Location Search: Page with contact information</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Grainger Location Search: Interactive GPS Map</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
</tbody>
</table>
Thank you for filling out our user feedback form! We appreciate and value all your responses, comments and suggestions. They will be very helpful to us throughout our design process.

Thank you once again,

Team 1 - Section 02
Engineering Design and Communication
McCormick School of Engineering and Applied Science
Northwestern University
Group E-mail: edc.2009.sec02.team1@u.northwestern.edu
Analyzing User Feedback
After obtained user feedback we compiled the feedback information and analyzed the data. Upon analyzing the qualitative data we came to the following conclusions:

- Most users (86%), whether they knew their item number or not, preferred to search for the item before placing an order, as opposed to ordering directly by item number.
- Only 18% of users who have a mobile phone (some did not indicate they had a mobile phone) actually have a BlackBerry onto which they can upload a mobile application.
- Overall, many users indicated that ordering from Grainger and searching for Grainger products is complicated for them and that they would prefer a quick, simple, straightforward program.
- Some users said that they would find this application useful for their work while others didn't.
- The following features were also suggested:
  - Storing orders until the user can get a purchase order number (with the option of printing purchase order via Bluetooth connection and/or emailing the order)
  - Using a camera phone to scan SKU numbers and identify products
  - Ability to call Grainger's customer service from the application
  - "Quantity-on-Hand" and "Available for Pickup" at nearby Grainger locations with each product description

The quantitative results we received allowed for us to appreciate our potential users' preference to a greater degree.

- Figure 1 shows the average ratings for the general design features we asked to be rated. As you can see, users considered all six general features to be relatively important.
- Figure 2 shows the average ratings for the homepage features we asked to be rated. Users clearly believe the "Searching for Items" feature would be important to them, and the "Find Nearest Grainger Branch" feature seems to not be considered as important. (See Figures 4, 6, & 7 and their descriptions for a more detailed evaluation of user preferences concerning finding their nearest Grainger location.)
- Figure 3 shows the average ratings for the main, general features we asked to be rated. We chose to further evaluate the features with standard errors reaching less than 2.5. (See Figures 4-7 and their descriptions for further evaluation).
- Figures 4-7 shows the ratings per user for Interactive GPS Map feature. To take into account each user's individual rating method, each user's 1-5 rating was divided by his/her average.
  - As you can see, for Figure 4, no users thought an Interactive GPS Map was of more than average importance.
  - In Figure 5, all but one user also found that to browse most popular searches was not of more than average importance in their line of work.
  - As Figure 6 and 7 shows, most users also thought that searching for the nearest Grainger location and finding a Grainger branch by a City/State/Zip Search was of less than average importance to them
Our team believes that the trend that users do not prefer finding a Grainger location may be due to a few different factors. Many users may already know their nearest Grainger location, and other might choose to see their nearest Grainger location via a GPS map on their mobile phone or computer.

- Figure 8 shows that all users believe searching for their items is of better than average importance to them in a mobile Grainger application.
Figure 1. Average rating of general design features. The data was organized in ascending order to make the difference between average ratings for different features clearer.

Figure 2. Average rating of homepage features. The data was organized in ascending order to make the difference between average ratings for different features clearer.
Figure 3. Average ratings of main design features. The error bars correspond to the data's standard error. The data was organized in ascending order to make the difference between average ratings for different features clearer.
Figure 4. Ratings per user for Interactive GPS Map feature. To take into account each user's individual rating method, each user's 1-5 rating was divided by his/her average.

Figure 5. Ratings per user for Browse Most Popular feature. To take into account each user's individual rating method, each user's 1-5 rating was divided by his/her average.
Figure 6. Ratings per user for Nearest Grainger Branch Search feature. To take into account each user's individual rating method, each user's 1-5 rating was divided by his/her average.

Figure 7. Ratings per user for Grainger Location City/State/Zip Search feature. To take into account each user's individual rating method, each user's 1-5 rating was divided by his/her average.
Figure 8. Ratings per user for Search Items option. To take into account each user's individual rating method, each user's 1-5 rating was divided by his/her average.

**Conclusions**

In general, we made the following general decisions after evaluating user feedback:

- Searching for items is very important to users, especially if the search is done in a clear, simple, straightforward manner.
- Additional features can be added to our initial design that might make ordering from Grainger more convenient for some.
- We should concentrate on the "Search for Items" and "Order List"/"Shopping Cart" portion of our design, and not focus as much on the "Find Nearest Grainger Location" portion of our design.
- To make the program simpler, we can incorporate the "Search for Items by Item Number" portion of our design within the "Search for Items" portion (since more users do not plan to use this option), making the "Search for Items" portion of our design our new main design frame.

These conclusions will be incorporated in our final design.
APPENDIX D: Final Design

General Process

Welcome back, [user name].

- Search for products
- Order products
- View recent purchases
- View saved order form
- Edit account information

Sign In

User ID

Password

Go

Recent Purchases

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit Price</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolts</td>
<td>$20.00</td>
<td></td>
</tr>
</tbody>
</table>

Add to Order

Edit account information

- Change password
- Change default shipping information
- Change default payment information

Order Form

<table>
<thead>
<tr>
<th>Items</th>
<th>Qty.</th>
<th>Unit Price</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolts</td>
<td>1</td>
<td>$20.00</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal: $20.00  *Items will be saved until final purchase.

Update Cart | Send as Email | Print Order | Go to Shipping
Search Process

Search by number
Search by categories

After clicking on an item the user will go to the product details page as in the process of search by number.
Order Process

Order Form

Orders can be printed from Bluetooth-enabled printers. Please select a detected printer.

- Printer A
- Printer B
- Printer C
- Printer D

Please enter the recipient’s email address:

edc@northwestern.edu

Confirm Shipping Information

P.O. # or AMEX #: 

P.O. Release: 

Project/Job #: 

Requisition Name: 

Department #: 

Phone Extension: 

Attention/Delivery Instruction:

In Store Pick-up

The nearest store found to have all of your purchased items in inventory can be found here:

Street: 6045 River Dr.
City: Morton Grove
State: IL
Zip Code: 60053-2851
Phone: (847) 965-7600
Fax: (847) 965-3479

Confirm Payment Information

Credit Card Type:

Credit Card #: 

Expiry Date: MM/YY

Name: 

Billing Address: 

State: Zip Code: 

Change to Other Store | Confirm Order
Thank you for your purchase!

Your order #1234567890 is now being processed.

An email will be sent to your default address confirming this purchase. Additional recipients can be sent copies by selecting the option below.
Appendix E: Design Review Summary

The following is a summary of the feedbacks and suggestions by instructors and class members during design review.

General Feedbacks

- Visually
  - Good use of Grainger's color
  - Easy to read font, avoid small text
- When a “Back” button is pressed halfway entering some information, will the information be saved or lost?
  - Credit card information - include a pop up to ask if the user wants to save it or not
  - Other - the information will be lost
- Put “Back” or “Cancel” button on screen
- Locate buttons on top instead of at the bottom
- Keep button at the bottom always visible
  - The screen is separated into two parts; the bottom part includes the buttons that are controlled not by scrolling, but by the buttons on BlackBerry
- Make sure the application is easily navigated using BlackBerry's small keyboard and a scroller with just two thumbs
- Scrolling is annoying but necessary
- Change “scroll down for more” to an arrow
- Very intuitive

Product Search Process

- Product search process is awesome
- Multiple search option is good
- Searching using categories and subcategories is a good way to present products in an organized manner that does not require much scrolling
- Product details
  - “More” - change to “More details”
- Have a search option on top while shopping – similar to Google search box on some websites
Product Ordering Process

- Product ordering process is good
- Email
  - Smart search - the application will show an email list once a few alphabets are entered
- Edit Shipping Address
  - Includes save as default address button
- Closest store
  - Includes contact information (telephone #) of the store
  - Includes "change to other store" option (button)
- Thank you for your purchase!
  - Auto-send email
- After order form, includes a new screen for user to choose to pick up in store or to ship it somewhere
- Order form
  - Allow quantity change
- Includes payment information screen after shipping information screen