



## General Electric : Heuristics Evaluation and Report

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### **Group 3: Gaia Research**

Raymond Su, Nan Deng, Anand Doshi, Ru Jia, Brennan Sieck

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## **Executive Summary**

This report describes the methods, findings and recommendations of our team's heuristic evaluation for GE's websites. A heuristic evaluation is an examination performed by a designer on a user interface to judge its usability based on recognized principles.

Limiting our scope to GE.com and GE Digital's desktop as well as mobile websites, each team member evaluated the websites by applying Nielsen's 10 Usability Heuristics for User Interface Design (1994), and rated each heuristic using Nielsen's severity scale. The aggregated average of our ratings led to the following findings and recommendations:

### **Key Findings**

1. Inconsistencies in website design, architecture, and interactivity primarily related to navigation, breadcrumbs, and animated carousels.
2. Some interactions with respect to download, scrolling, search autocomplete, and career search do not map to user expectations
3. Overly minimal design of GE homepage & unintuitive mobile experience

### **Recommendations**

1. Consistent design and layout across GE websites through common style guides and standardized UI elements
2. Avoid use of technical jargon and abbreviations, especially in titles
3. GE should develop a mobile-friendly web experience by designing, testing and fixing the website for various screen sizes

These findings will need to be supported by further evaluating the rest of the GE websites, as well as performing usability tests.

## **Introduction**

General Electric is a 126 year old startup that is attempting to rebrand its identity as a industrial manufacturing company to become a top ten tech company by the year 2020 to compete with the likes of Google and Amazon.

The heuristic evaluation is a method used to test the usability of a particular design of an app, website, or piece of software. "It specifically involves evaluators examining the interface and judging its compliance with recognized usability principles. It is one of the most informal methods of usability inspection in the field of human computer interaction" ("Heuristic evaluation", 2017). Heuristic evaluations are an important and valuable process that can be done by the designer in a short amount of time. We utilize nine of the ten heuristics that have been specified in Jakob Nielsen's Heuristics Evaluation and they are as follows - Visibility of system status, match between system and the real world, user control and freedom, consistency and standards, recognition over recall, flexibility and efficiency of use, aesthetics and minimalist design, helps users recognize, diagnose and recover from errors, and lastly, help and documentation. We omitted error prevention because we find that it is not applicable.

With the use of heuristics, our team could quickly identify any glaring errors or usability issues on the website internally based upon the heuristics outlined by Nielsen's Heuristics Evaluation. Heuristics is advantageous as opposed to usability testing because it is cheaper, faster and easier to use in smaller-budget usability projects.

## **Methods**

We began the heuristic evaluation process by determining which of the evaluation criteria, as stated in Nielsen's Heuristics Guide, we wanted to use for our analysis. We selected nine of the ten heuristics criteria and came up with sub-questions for the selected heuristics criteria that were customized to the fit needs of GE's website. We omitted the heuristics 'error prevention' because we believe it is not applicable. The list was then imported into Google Sheets so that all team members could collaborate by each assigning an average rating for all of the heuristic criteria sub-questions and providing a brief explanation for rating assigned. Ratings were assigned on a numeric scale from 0 to 4. From 0, which means there is no usability problem found to 4, as usability catastrophe, or imperative to fix. Each team member will independently go through the website (for both GE.com and GE.com/digital) in 3 passes. The first pass is to get oneself acquainted with the website, and the two subsequent passes to allow our team members to look at the website critically with specific heuristics in mind.

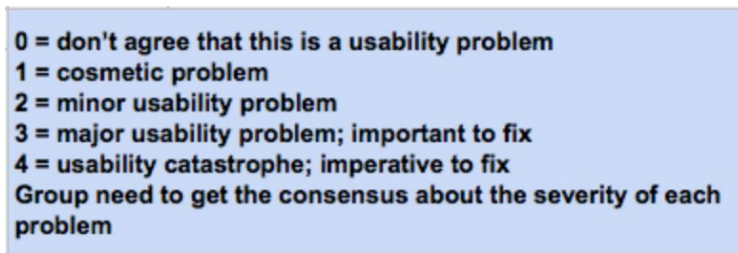
Whenever a problem is identified as per the heuristics evaluation guidelines, team members will record it and also give their best recommendations to address the problem. Sub-questions are then aggregated across all of the ratings from all team members and then averaged to give a value for each criteria. The findings are ranked based on these averaged values. Each of the the team member's identified problems and recommendations were also taken into consideration for

the analysis. The table below shows the heuristics we have identified and the sub-questions that we have added.

| Heuristics   | Sub-Questions  |
|--|--|
| <b>Visibility of the system status</b>                         | Can user know where they are in the system?  |
|  | Can user know what state the system is in?   |
|  | Does system give appropriate feedback?   |
|  | Can user understand what options are for what to do next?  |
| <b>Match between the system and the real world</b>             | Does the system use language familiar to user?   |
|  | Does the system break down the way natural to users?   |
|  | If metaphors are used, do they help or hinder interaction  |
| <b>User control and freedom</b>                                | Can the user safely abandon tasks that go awry?  |
|  | Can the user undo or revert mistaken input or paths?   |
|  | Can the user do things in the order that they want to do them?   |
|  | Can the user pause and/or cancel long-running tasks with impunity?   |
| <b>Consistency and Standards</b>                               | Does the system comply with relevant standards (universal, platform, app category)?  |
|  | Is the system internally consistent? Do similar things work similarly?   |
| <b>Error prevention</b>  | Does the system warn users when they are about to take a “dangerous (i.e. delete, remove,)” action?                                |
|  | Does the system provide guidance about legal actions/inputs to prevent errors before they happen?                                  |
|  | *The system prevents user from inputting wrong type of information?  |
|  | *User doesn't complete the task  |
| <b>Recognition rather than recall</b>                          | Does the system force users to remember obscure commands or sequences?   |
|  | Does the system expect users to remember earlier decisions/actions when completing later steps?                                    |
|  | *Does the system contain the memory for user's searching history   |
|  | *Does the system contain the memory for user's searching profile   |
| <b>Flexibility or efficiency of use</b>                        | Does the system force expert users to do things in slow, inefficient ways? (i.e. my favorite, filter, customize their interface..) |
|  | Does the system allow people with different styles/preferences to get things done?   |
| <b>Aesthetic and minimalist design</b>                         | Is there excess visual clutter and/or text that is irrelevant to users' main tasks?  |
|  | Is the visual design distracting or hard to parse, resulting in extra time to process information?                                 |
| <b>Help users recognize, diagnose, and recover from errors</b> | When errors do occur, are users made aware of them?  |
|  | Are they presented with information in a way that they can make sense of?  |
|  | Does the error message provide them with a clear course of action?   |
| <b>Help and documentation</b>                                  | Is there help or documentation?  |
|  | Can users find it?   |
|  | Is it helpful?   |
|  | Is it well written, well organized, searchable?  |

Fig 1: Nielsen's Usability Heuristics

And the following is the Nielsen's severity scale that we employed in our evaluation.



A blue rectangular box containing the Nielsen's Severity Scale legend. The text is as follows:

|          |   |
|----------|---|
| <b>0</b> | <b>= don't agree that this is a usability problem</b> |
| <b>1</b> | <b>= cosmetic problem</b>                             |
| <b>2</b> | <b>= minor usability problem</b>                      |
| <b>3</b> | <b>= major usability problem; important to fix</b>    |
| <b>4</b> | <b>= usability catastrophe; imperative to fix</b>     |

**Group need to get the consensus about the severity of each problem**

*Fig 2: Nielsen's Severity Scale*

## Findings and Recommendations

### Key Findings

#### **1. Inconsistencies in website design, architecture, and interactivity From "Consistency and Standards" heuristics - 2.93/4**

Based on the heuristic of "Consistency and Standards", we discovered many different issues stemming from the lack of consistency pertaining to the website's design, architecture, and interactivity. First, our analysis found inconsistencies in the way that the user was able to move in between various GE businesses. Almost every business has its own website (*Fig 3-6*), except for GE Digital, which is hosted under GE's main site ([ge.com/digital](http://ge.com/digital)). When selecting a business from the "GE Businesses" drop down on the main, there is no indication that the user will be forced to open a new tab in order to view it. This creates clutter and confusion for the user during their browsing experience. Second, we found that GE tends to incorporate many sliders into their pages in unexpected areas. For example, there are both horizontal and vertical sliders throughout the GE Digital Foundries page (*Fig 10 & 11*). The navigational components for changing slides are very hard to see, so if a user is skimming they may end up missing content hidden within a slider. Furthermore, some content is displayed in a manner that looks very similar to the sliders, but have not slider functionality. Due to this, it is possible that users could interpret actual sliders as just static content. Third, we found that there was an inconsistent implementation of breadcrumbs throughout the GE business websites. There is an existing implementation of breadcrumbs on the GE Digital site which are quite useful and pleasing. We could not find those breadcrumbs on any other GE business websites (*Fig 9*). Fourth, we found that the various GE business sites have different favicons. We were able to find three different favicons currently in use on various segments of GE.

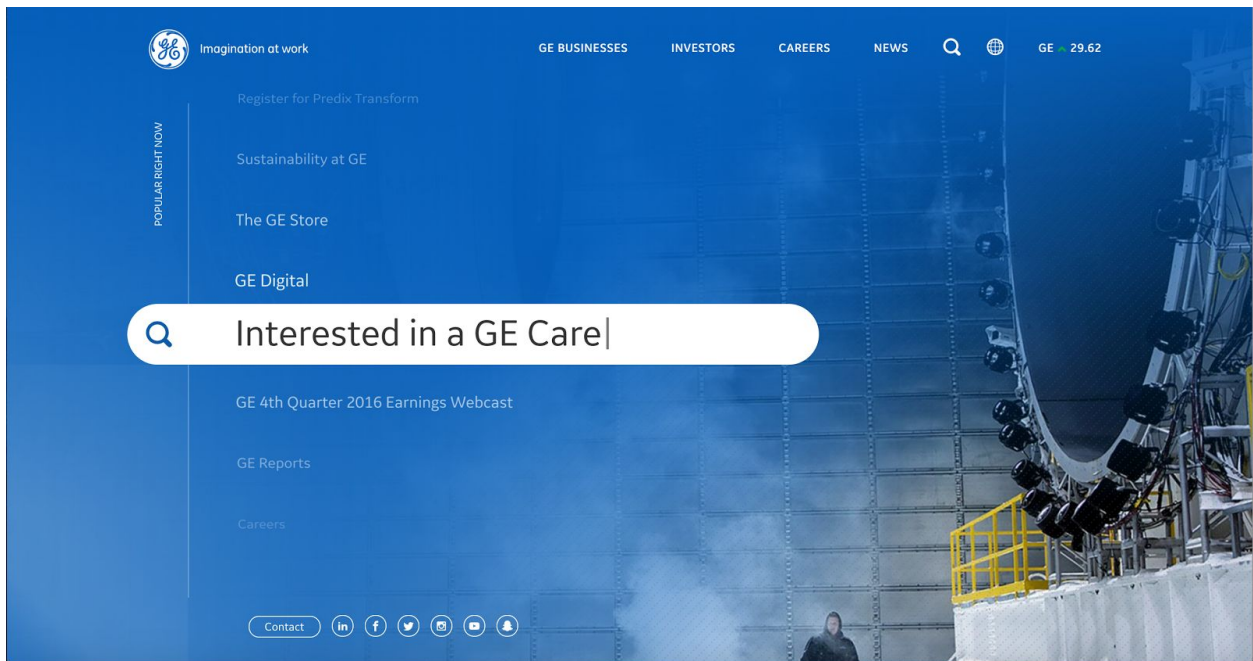


Fig 3: GE's main website

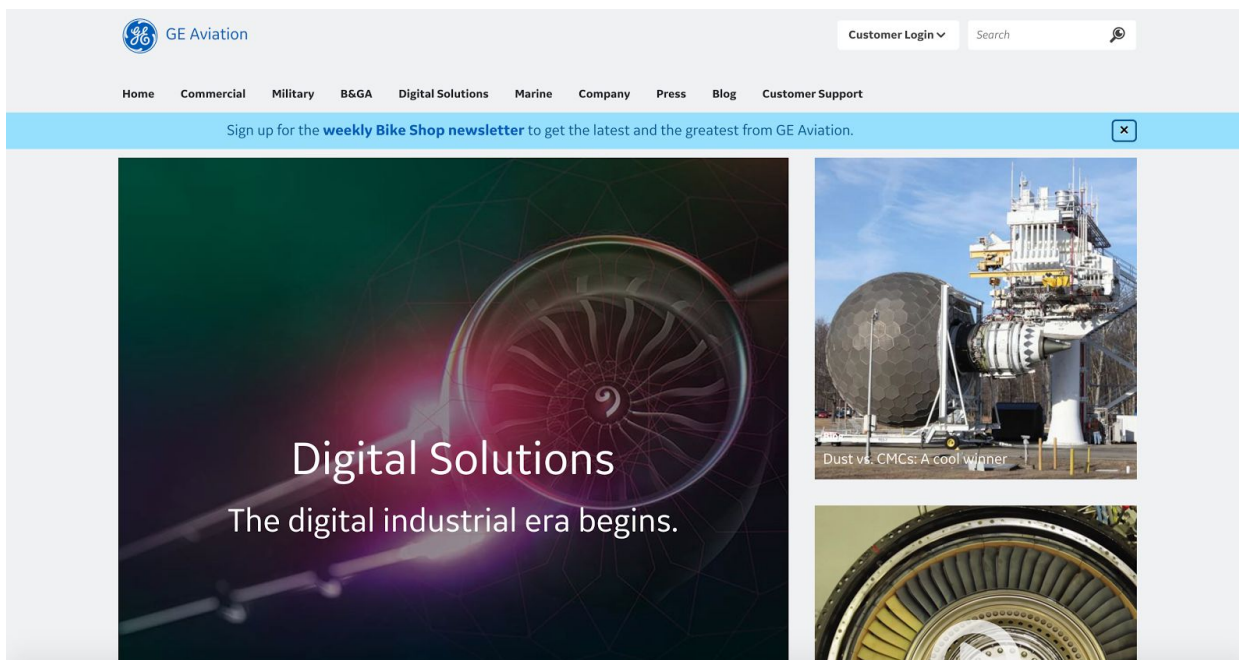


Fig 4: GE Aviation Website

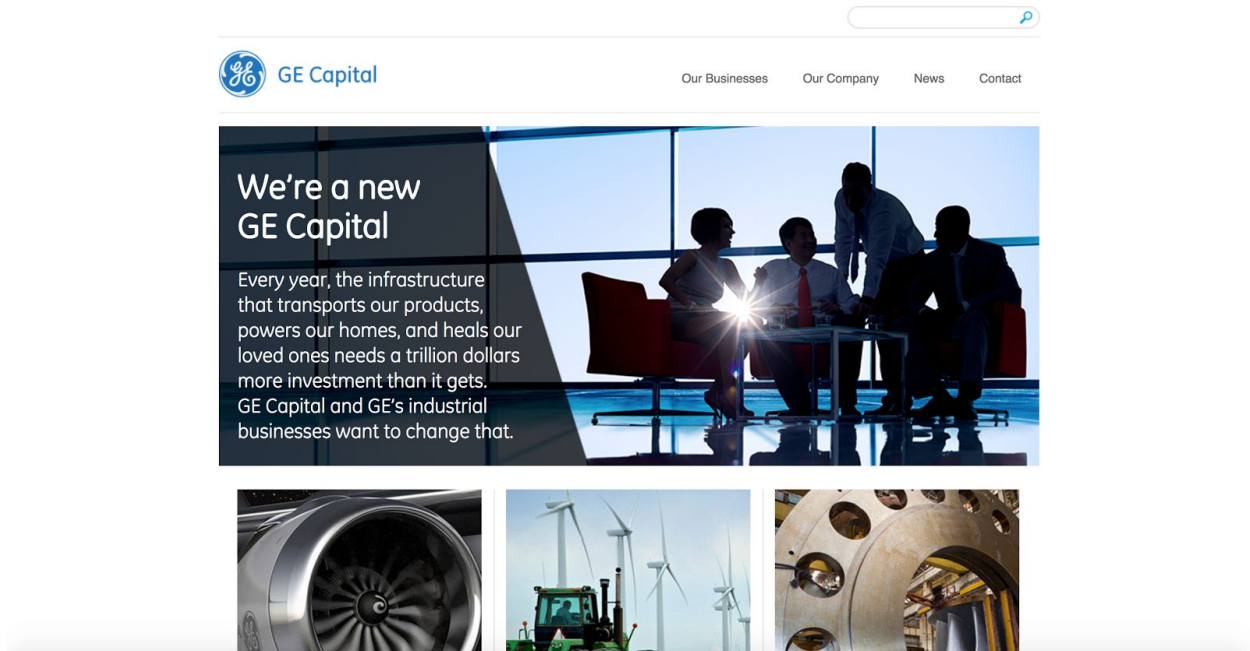
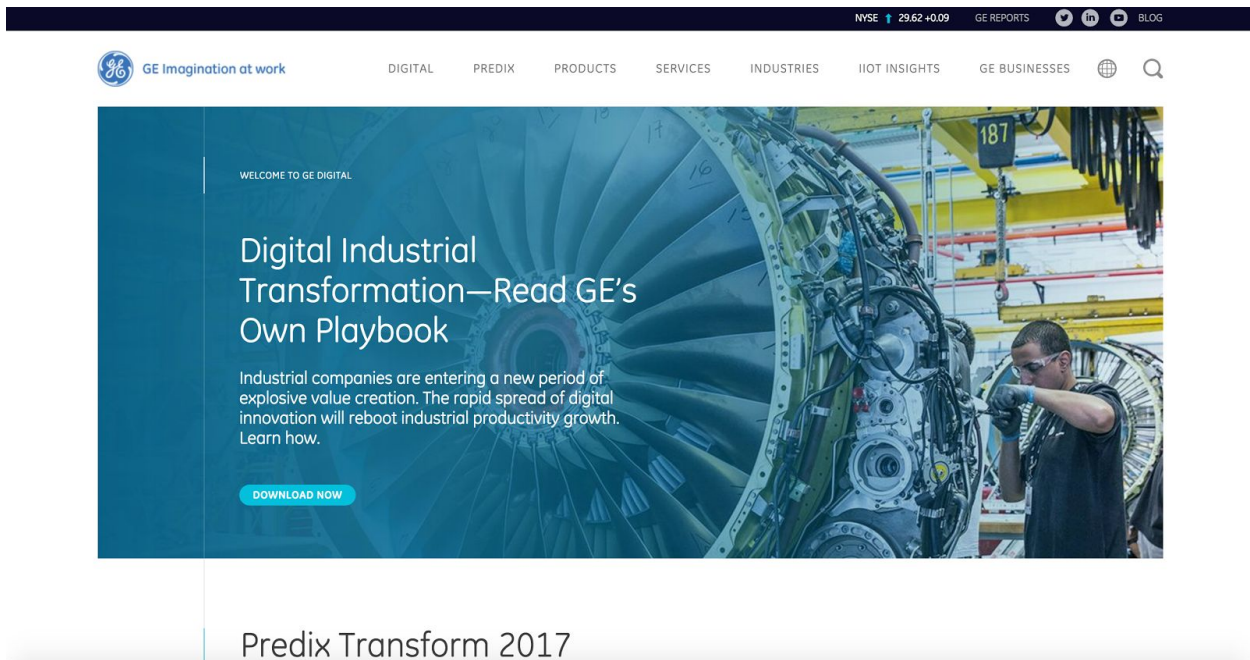


Fig 5: GE Capital Website



Predix Transform 2017

Fig 6: GE Digital Website



Marketplace

Search



Electronics

Trends & Insights Case Studies Solutions Events

IBM Industries > Electronics

# Why cognitive manufacturing matters in electronics

Activating the next generation of production success

Learn more

Contact IBM

Follow IBM Electronics

CASE STUDY: Jabil Circuits

Using IBM Analytics to understand customers at the



Fig 7: IBM Electronics



Marketplace

Search



Automotive

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IBM Industries > Automotive

# A new relationship: people and cars in the United States

Learn how U.S. consumers want cars to fit their lives

Download Executive Report

Contact IBM

Follow IBM Automotive

CASE STUDY: IBM Watson IoT and the Connected Car

Designed to be secure and



Fig 8: IBM Automotive



GE Imagination at work

DIGITAL

PREDIX

PRODUCTS

SERVICES

INDUSTRIES

IIOT INSIGHTS

GE BUSINESSES



GE DIGITAL

SERVICES

EDUCATION SERVICES

FIND A PRODUCT

Fig 9: Breadcrumbs only on GE Digital



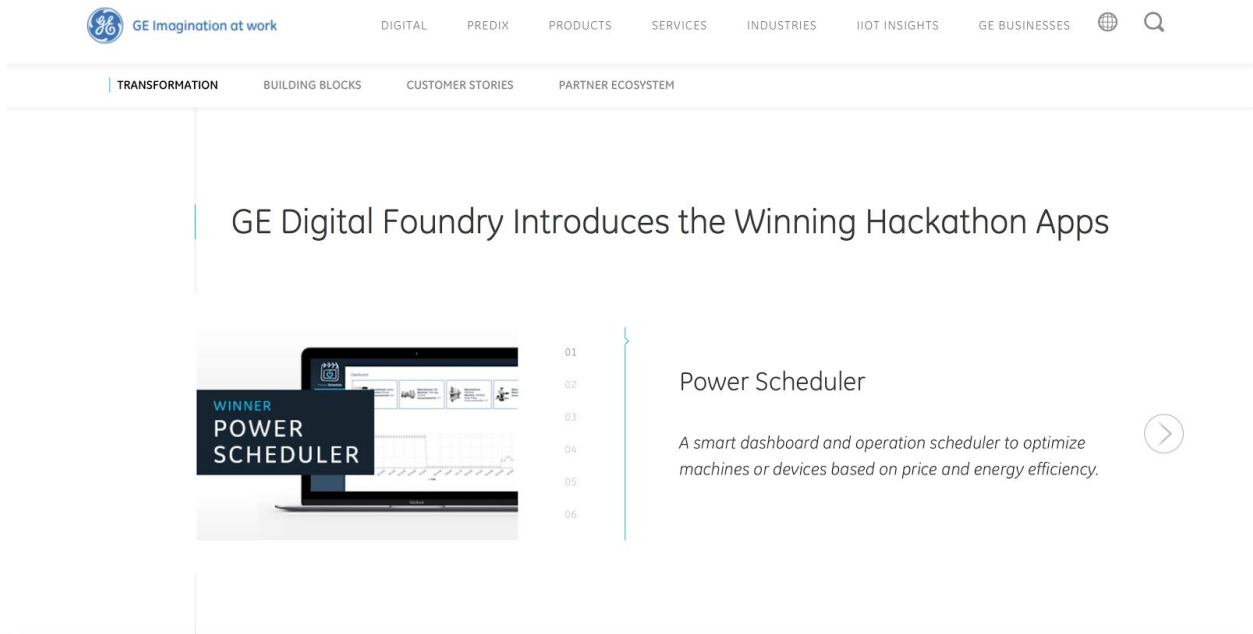


Fig 10: Digital slider example 1

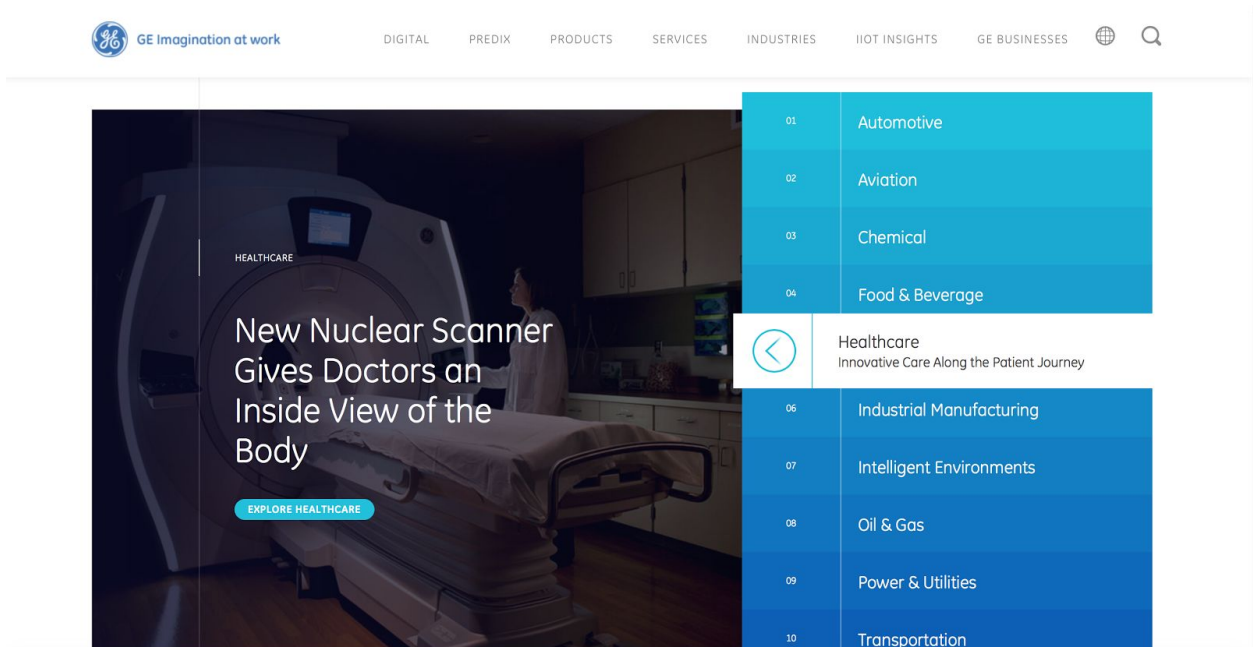


Fig 11: Digital slider example 2

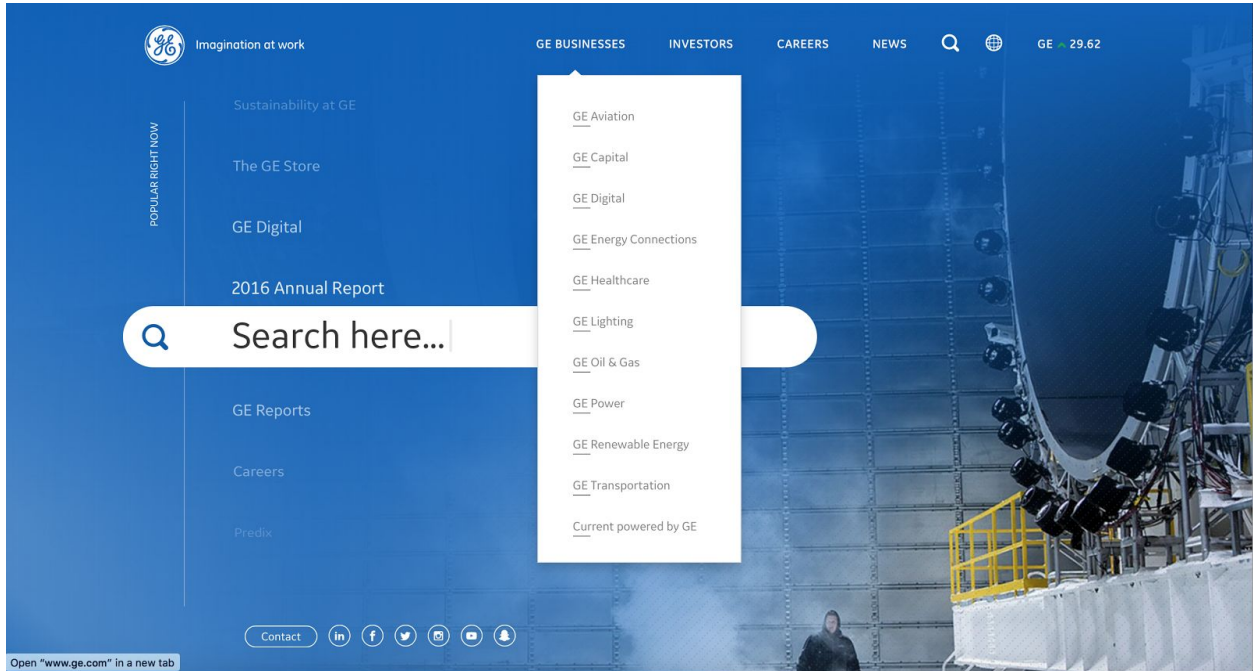


Fig 12: Opens GE Businesses in a new tab when clicked on

## 2. Some interactions do not map to user expectations

### From “Match between the system and the real world” heuristics - 2.91/4

Through our heuristic analysis, we found multiple aspects of the GE website, and its corresponding business sites that mismatch what a user expects from the system given their understanding of the real world. First, we found that when a user is presented with the option to read or view an article, they must first create an account or sign into an existing account. Following the sign in step, users must then download the article (*Fig 12*). This is a very cumbersome experience for users and creates confusion. Second, we found that the scrolling search feature on the GE homepage behaved unexpectedly when we tried to interact with it. At first glance, it appears as though the suggested search terms scrolling in the background can be controlled by scrolling, but when you hover your mouse over them, the scrolling ceases. This unexpected result leads to a confusing experience for the user. Third, we found that the search feature within the GE Newsroom site behaved in an unintuitive manner (*Fig 13*). When a search query is typed in the input box, autocomplete options appear below the search box. If a user clicks on one of those items, the term is added as a tag in the search instead of performing the search for the selected term. Lastly, we found that the job search portion of the site did not function well on mobile devices and GE recommend for users to search for jobs on desktops instead of mobile devices. This would negatively affect the experience of someone researching careers at GE on a mobile device.

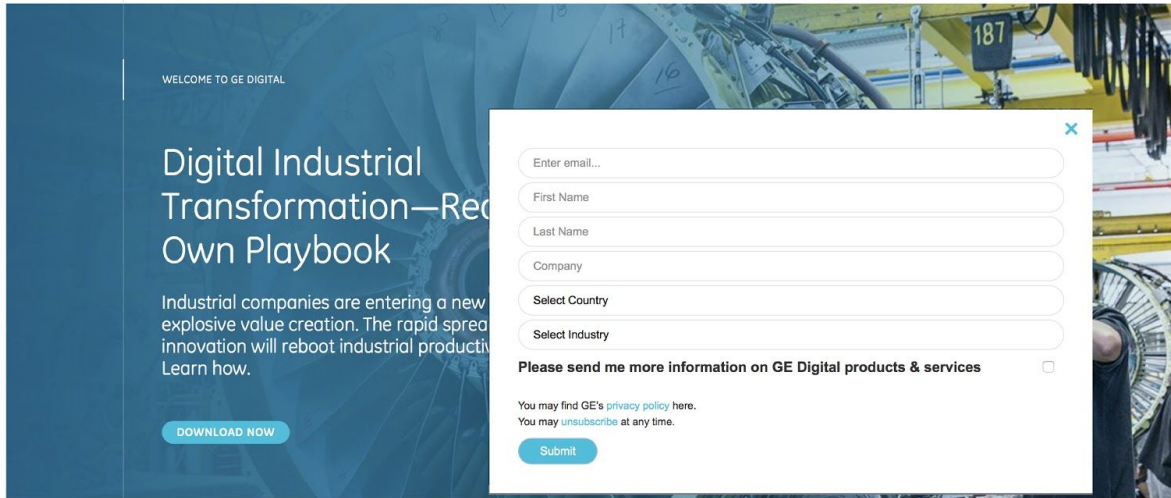


Fig 12: The registration form pops up when clicking on “Download” button on GE Digital Website

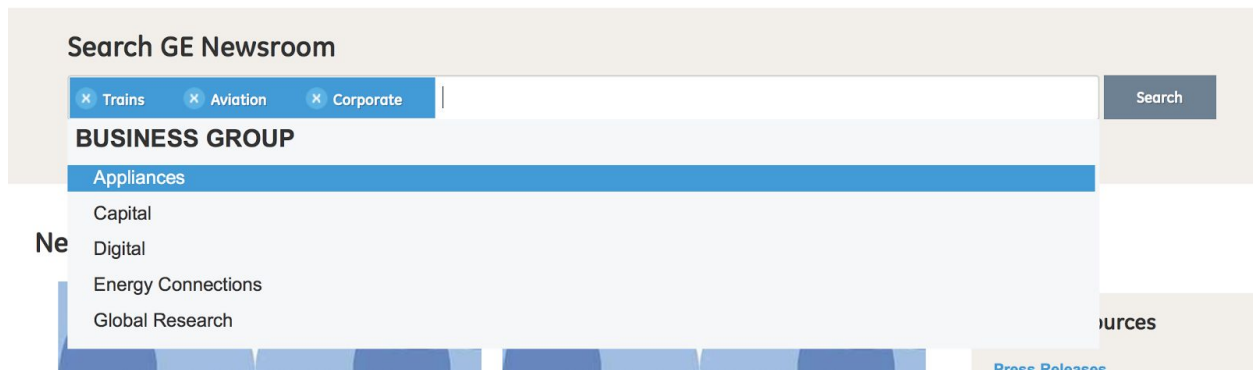


Fig 13: Selected search tags instead of search terms in search bar

### 3. Overly minimal design of GE homepage & unintuitive mobile experience From “aesthetic and minimalist design” heuristics - 2.75/4

Following our heuristic analysis, we found that GE could make a few improvements to their website to better adhere to the standards set forth by the aesthetics and minimal design heuristic. On the desktop site, we found that GE’s newsroom site repeatedly used the same feature image for multiple news articles, which gave the impression that they were all the same article. Next, we found that many of the articles have featured images with overlaid text, which depending on the background image, can make the text very hard to read. Additionally, we found that some of the interactive animations implement on the GE website, such as animated sliders and divided panels, lead to decreased usability. Specifically the scrolling search feature on the GE home page. Next, we found that the GE homepage was minimal to a fault. The lack of content and suggestion navigation paths for users left us wanting more featured items to be available on the homepage instead of just a search box and global navigation. For the mobile

site, we found that the aesthetic designed for the desktop site did not translate well to the mobile experience. Many of the elements that worked well on the desktop failed to work in an intuitive manner on the mobile site (Fig 14).

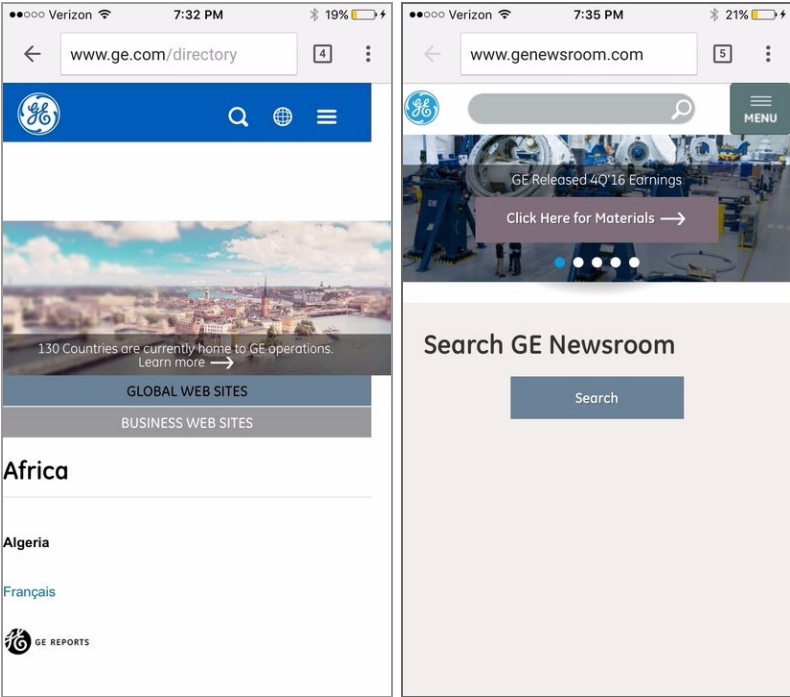


Fig 14: Web experience do not translate well onto mobile screens

## Recommendations

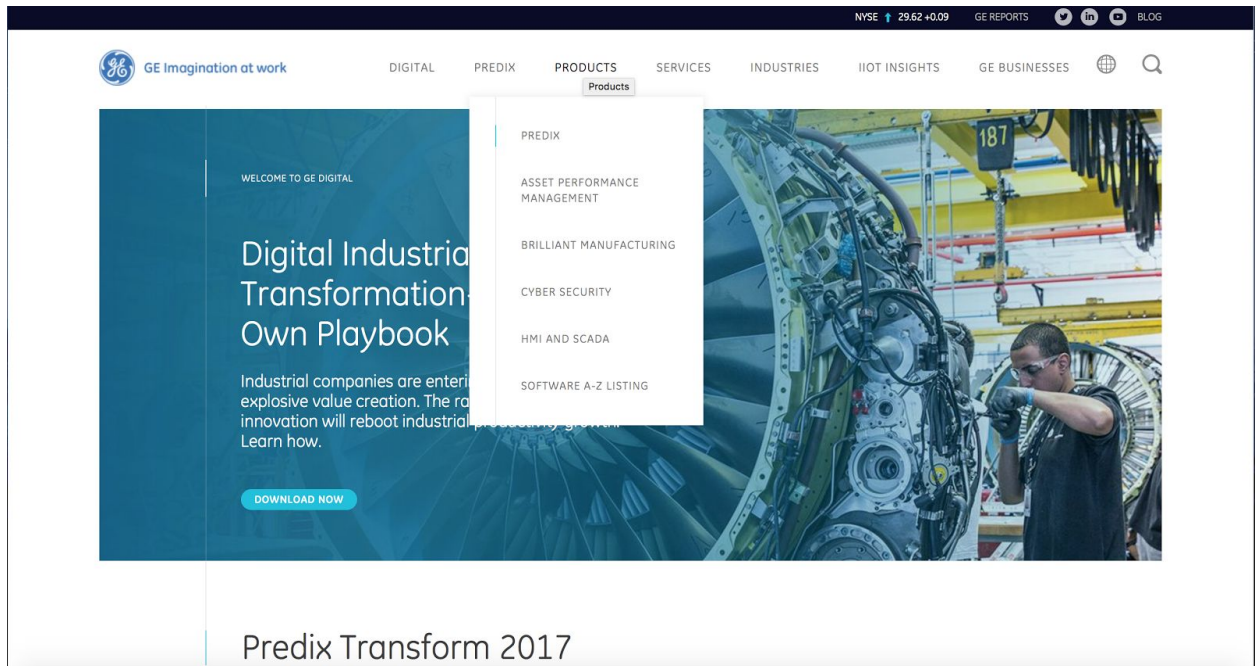
### 1. Consistent design and layout across GE websites

To address the inconsistencies that we see across all of GE’s business divisions, we recommend that there to be a singular style guide for all of the websites. Many UI elements can be standardized, including placement order of navigation buttons, page widths and types of icons used. A good example of this would be standardizing the location of the social media buttons and blog buttons, the location is different across three different divisions - GE.com, GE Digital and GE Capital. The design of IBM, on the other hand, addresses this quite well by having a consistent design layout.

### 2. Map website’s interactions to users expectations

Although GE needs to use technical jargon and abbreviations, its use can be limited to pages where expert users are expected to navigate to. Specifically, jargon should be avoided on the home pages as well as titles of pages or articles. Additionally, the registration step before the download, where not required, could be changed to an optional registration after the download or a call to follow GE on social media and increase their following. The scrolling behavior on the

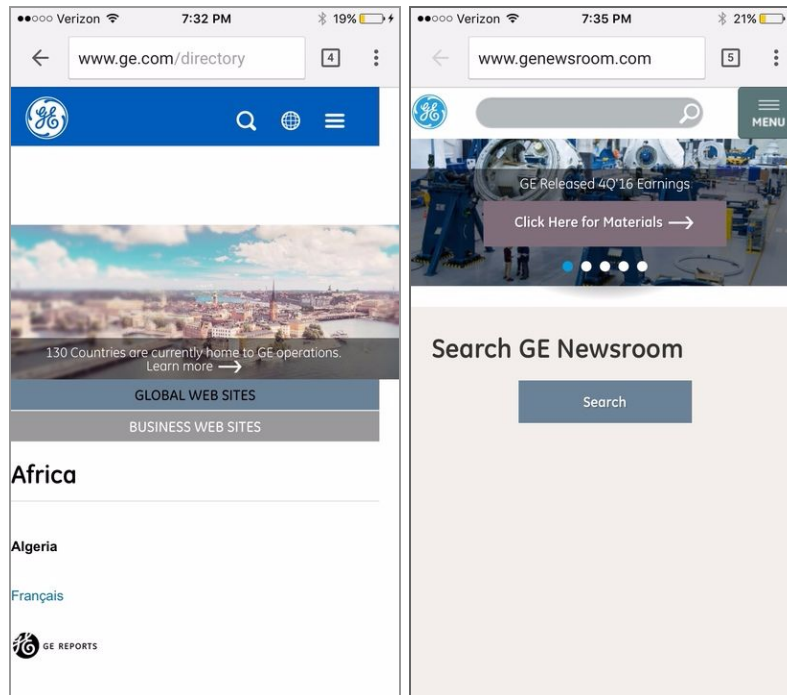
home page could instead be replaced with a static list of search suggestions or trending topics, thus getting rid of a potential misunderstanding by the user. GE Newsroom's search should be redesigned such that its search suggestions are modelled after a modern search engine's suggestions, in that the suggestions would be used as search terms on click, and not as tags to filter results by.



*Fig 15: There is a heavy use of industry jargons in GE Digital*

### **3. GE should develop a mobile-friendly web experience**

A report published by the Pew Research Center showed that 28% of American Job seekers use their smartphone to view and apply to job listings (Smith, "Searching for Work in the Digital Era", 2015). It is therefore important to not overlook the web experience for mobile devices. Currently, the website is responsive on mobile devices and it scales up and down depending on screen sizes. However, it does a poor job at scaling and does not take into account of the touch experience as many of the interactions are not conducive on mobile devices. For example, some of the pages are not scaled properly in portrait mode but work well in landscape mode. GE should consider developing a mobile-friendly web experience that takes all of the above into consideration as their mobile audience continue to grow.



*Fig 16: Web experience do not translate well onto mobile screens*

## Discussion

1. The numeric ratings values in the heuristic evaluation are subjective. For example, there are no clear distinction as to what constitutes a 3 versus what constitutes a 2. We observed that what qualifies as a major usability issue for some, may be a minor usability issue for another user. Therefore, while it is helpful to have done this exercise, it is good to know that the ratings are subjective and is up to the rater's interpretation.
2. Our next step will be to conduct a usability testing to confirm our findings from this exercise to be correct.
3. Our heuristic evaluation is also focused on the select few pages of the website, primarily on GE.com and GE Digital. We chose to do this specifically upon the request of our client and therefore may not be fully representative of all divisions of General Electric.

## Conclusion

Our heuristic evaluation identified some of the potential problems with GE.com and GE Digital's website, and suggested actionable ways to address these issues. These changes on its websites and the resulting improvement in the user experience could help GE better engage with millennials and change their perception of GE as an attractive place to work. Next, we hope to confirm these findings by performing a usability test.

## References

Heuristic evaluation. (2017, January 19). Retrieved March 23, 2017, from [https://en.wikipedia.org/wiki/Heuristic\\_evaluation](https://en.wikipedia.org/wiki/Heuristic_evaluation)

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Nielsen, J. (1995, January 1). Severity Ratings for Usability Problems: Article by Jakob Nielsen. Retrieved March 23, 2017, from <https://www.nngroup.com/articles/how-to-rate-the-severity-of-usability-problems/>

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## Appendix

### A. Group Heuristic Evaluation

| Heuristic                                   | Issues and Recommendations   | Severity |
|---|--|----------|
| Recognition rather than recall              | <ul style="list-style-type: none"> <li>○ The logo of different websites in GE.com sub categories leads to different pages.</li> <li>○ GE's website does not keep track of search history, thus users need to remember their working sequence</li> <li>○ The less structured operating system and vague navigation force users to recall the sequence of work.</li> <li>○ The system can not recognize the words for obscured terms.</li> </ul> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Have a global navigation sub-menu and also show where they are in the tree of GE websites</li> <li>○ Make frequently visited pages of the site the simplest to access</li> <li>○ Support fuzzy search</li> </ul> | 2.98     |
| Consistency and Standards                   | <ul style="list-style-type: none"> <li>○ Each GE Business has its own website with a different design and layout, and opens either in a new tab or on the current tab leading to an inconsistent experience</li> <li>○ Overuse of gallery views or sliders</li> <li>○ Missing breadcrumbs</li> <li>○ Inconsistent use of Favicons</li> </ul> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Consistent global navigation across all GE websites</li> <li>○ Consistent design language for all GE Businesses</li> <li>○ A navigation tab should either be clickable or should show menu on hover, and not both</li> </ul>   | 2.93     |
| Match between the system and the real world | <ul style="list-style-type: none"> <li>○ Use of technical jargon and abbreviations that user might not be familiar with like Predix, Scada, HMI, etc.</li> <li>○ Download button asks for registration</li> <li>○ The scrolling list around the search box on GE.com might be interpreted as something that can be scrolled using a mouse, but it scrolls on hover</li> <li>○ Some of GE's website are on a different domain than GE.com like geaviation.com or gecapital.com</li> <li>○ Search on GE Newsroom website considers selected suggestions as search tags instead of search terms</li> <li>○ The Job Search feature does not work well on mobile and</li> </ul>   | 2.91     |



|   |  |             |
|---|--|-------------|
|   | <p>suggests user to use a computer</p> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Use technical language only on portions of the site where expert users are expected</li> <li>○ Remove the registration step for downloads. Instead, add a subscribe / follow link after the download step is done.</li> <li>○ Avoid using abbreviations, especially in section titles</li> <li>○ Show a simple list of search suggestions on GE.com which is just a list of links instead of an animated list</li> <li>○ GE Businesses website should be part of GE.com either a sub-pages or sub-domains</li> <li>○ Search should consider selected suggestions as search terms and not as tags or filters</li> <li>○ GE's websites should be designed mobile first or provide a fallback for a functional mobile experience</li> </ul> |             |
| <p>Flexibility or efficiency of use</p> | <ul style="list-style-type: none"> <li>○ All users are required to register and download some files before making a preview</li> <li>○ Although responsive, some website pages are not well-structured for mobile users</li> <li>○ No tutorial for new users</li> <li>○ Users cannot change the keywords while using the filter feature on GE Digital Website</li> </ul> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Keep webpages and mobile pages design in a consistent and well-structured way</li> <li>○ Provide a customized service for users with different professionals</li> <li>○ Add a cross(x) at the right side of search bars to allow users make a quick deletion</li> </ul>  | <p>2.79</p> |
| <p>Aesthetic and minimalist design</p>  | <ul style="list-style-type: none"> <li>○ GE's newsroom reuses an image for multiple articles, and could confuse the user</li> <li>○ GE Digital uses a lot of images overlaid with text, which makes it difficult to read the text</li> <li>○ GE Digital's website uses unintuitive animations like rolling labels when hovering cursor on buttons, or pop-out animation on vertical web-sliders.</li> <li>○ GE's Homepage is too minimal, which gives users very little direction or suggestion on how to explore the site</li> <li>○ The site aesthetic is not mobile friendly and leads to confusion when viewed on a mobile device.</li> </ul> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Avoid overlaying text on backgrounds</li> </ul>   | <p>2.75</p> |

|                                 |   |      |
|---------------------------------|---|------|
|                                 | <ul style="list-style-type: none"> <li>○ Either use distinct images for each news article, or don't use images for a list of articles</li> <li>○ Use intuitive animations when necessary</li> </ul>   |      |
| Visibility of the system status | <ul style="list-style-type: none"> <li>○ Users cannot visually know if a navigation tab is a drop-down menu or is clickable</li> <li>○ Lack of breadcrumbs to indicate where the user is</li> <li>○ Search is not the best way to navigate to different parts of the GE website</li> <li>○ The carousel of trending terms on GE.com is not intuitive as primary navigation or thinking about where to go next</li> <li>○ GE.com home page does not tell you much about GE</li> <li>○ GE Digital's logo is the same as GE's logo and makes it difficult to confirm that you are on GE Digital's website</li> </ul> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Visually indicate dropdown menus by showing a down arrow besides the label</li> <li>○ Consistently show breadcrumbs for sub-pages within a website</li> <li>○ GE's home page should have content that describes GE and guide the user where to go next</li> <li>○ Have a distinct logo for GE Digital</li> </ul> | 2.64 |
| User control and freedom        | <ul style="list-style-type: none"> <li>○ Some content cannot be easily accessed, but require users to create an account and download it</li> <li>○ The lack of an overall description of website's structure hinder users to plan their working order</li> <li>○ Users cannot directly reach GE's main page from division's webpage</li> <li>○ GE digital's website as well as GE newsroom's freeze when the search takes a long time to load, but users are unable to cancel the task</li> </ul> <p><b>Recommendations</b></p> <ul style="list-style-type: none"> <li>○ Add navigations linked to GE main page in every GE division's webpages</li> <li>○ Allow users to make preview to articles before deciding whether to download a file or article</li> <li>○ Dynamically show the users where they are when they go back and forth between multiple pages</li> <li>○ Show spinner near the search button and don't freeze the screen to enable users to navigate away from the page</li> </ul>     | 2.42 |
| Help and documentation          | <ul style="list-style-type: none"> <li>○ There is a sitemap, search, terms, privacy policy, and a contact form with information on how to get in touch with various businesses at the footer of the page</li> </ul>   | 2    |

|   |  |     |
|---|--|-----|
| Help users recognize, diagnose, and recover from errors | <ul style="list-style-type: none"> <li>○ There are some industry-jargons used which can be confusing</li> <li>○ GE's 404 page shows an apology for page not found and a link to go to GE.com</li> <li>○ When there are no search results, there are no succinct or helpful suggestions.</li> </ul> <p><b>Recommendations</b><br/>Have helpful suggestions whenever a search results in a page not found.<br/>Explain meaning of technical terms or acronyms.</p> | 1.6 |
| Error prevention  | <ul style="list-style-type: none"> <li>○ We did a heuristic evaluation on this and found this heuristic to be not applicable.</li> </ul>   | 0   |

## B. Nan Deng Individual Heuristic Evaluations

| Principles                                  | Ratings | Descriptions   | Recommendations   |
|---|---------|--|---|
| Visibility of the system status             | 3       | <p>The wording of title on some pages differ from its original name that users use to reach the page. Users could get confused about which button lead them to a page. No indicator to track the state of the site, users are unable to figure out whether the site is busy or not while the loading of the page content have no explicit delay after users' clicking.</p> <p>No clear and consistent navigation for users to understand the whole procedure to complete what they aim to do in the system. What is confusing the most is the automatic scrolling list on the main page.</p> | <ul style="list-style-type: none"> <li>- Reword the description of some pages to guarantee the consistency of their names across the whole system.</li> <li>- Apply a "loading" mark at the bottom of page if its content has not finished loading as a hint for users to understand that there is still more content to reveal in certain pages.</li> <li>- Standardize the system with similar wording and structure in each sub-structure to avoid users' confusion raised by the different structures.</li> </ul> |
| Match between the system and the real world | 4       | <p>The drop down list of "Industries" and "GE business" has not only similar definition for users but they actually has totally different content, "Industries" describes distinct researches GE digital makes while the</p>   | <ul style="list-style-type: none"> <li>- Reset the font of words in the navigation part to show different level of each button; or use different colors to remind users that not all</li> </ul>   |

|                                  |     |   |  |
|----------------------------------|-----|---|--|
|                                  |     | <p>latter one is the business fields for GE company as a whole.</p> <p>The scrolling list on the main page might mislead the users that it can be swiped up and down while the truth is the opposite. Only when users hover the mouse out of the moving part, it will start scrolling again. On GE Digital site, there is no descriptive title before some parts of content. For example, for the list starting with "Automotive", each item describes How it could benefit from GE Digital, but all showed in its name is a single word.</p> | <p>navigation buttons are in the same level.</p> <ul style="list-style-type: none"> <li>- Design the navigation based on user's common sense on the use of electronic devices. Make the automatic scrolling list able to be move up and down though users' swiping on the control bar or screen.</li> <li>- Add a title at the top of the list like "What GE Digital provides" or "How our products/service work"</li> </ul> |
| User control and freedom         | 3   | The confusing words and inconsistent structure in each level of GE's websites hinder users to predict the order and make things done as they plan.  |  |
| Consistency and Standards        | 4   | Pages of some GE Business uses special symbols on its tab while others use the same one. Users need to open the page again to see which page it is instead of distinguish them in terms of its tab symbol.  |  |
| Error prevention                 |     |   |  |
| Recognition rather than recall   | 2.5 | <p>Due to the less structured operating system and relatively vague navigation, users are required to remember the sequence of how to complete certain tasks in order to minimize time wasted on similar work.</p> <p>There is no history record in the system for users to track their searching history, thus users need to remember their working sequence for later recognition.</p>  |  |
| Flexibility or efficiency of use | 3   | The system does not provide a customized version for users with different academic or professional background.  |  |
| Aesthetic and minimalist design  | 4   | The animation of rolling navigation. The use of typography makes the text harder to read.   |  |

|   |   |   |  |
|---|---|---|--|
| Help users recognize, diagnose, and recover from errors | 3 | There is a "contact us" page for users to get help or find answers for their question, but no instant help provided to users. |  |
| Help and documentation                                  |   |   |  |

### C. Raymond Su Individual Heuristic Evaluations

| Principles                                  | Ratings | Descriptions  |
|---|---------|---|
| Visibility of the system status             | 2.5     | <ul style="list-style-type: none"> <li>The top navigation bar is consistent across GE.com's main website but it is inconsistent with its division's webpages. Although one can still click on the logo to get back to the main webpage, the inconsistency can be disorienting. There is also no clear way to return to GE's main webpage from the division page. Clicking on the logo on GE Digital's pages for example allows one to return to GE Digital's web page but not to GE.com's main page.</li> <li>Site loads quickly. When user hover on selections, the selections animates and react.</li> <li>There is no clear indication of the flow of the website. The search bar is a great way to start, but it is not the best way to navigate to all the different webpages. The carousel of trending web searches is not intuitive as being the primary way of navigating the website.</li> </ul> |
| Match between the system and the real world | 2       | <ul style="list-style-type: none"> <li>The terminology used in the website is reliant on industry jargon and is technical. For example, Predix, Scada, HMI and Foundries on GE Digital. As for GE.com, the terminology is better but there are some small exceptions.</li> </ul>  |
| User control and freedom                    | 2.5     | <ul style="list-style-type: none"> <li>Users can safely return to the main page anywhere on GE.com, but not when they surfed away to its divisions' webpages. Should that happen, they can only return to GE Digital's main page.</li> <li>Not necessarily. The website encourages the user to search instead of navigating via the navigation links. The problem with search for such a highly complex website is that discoverability is harder to do. Although there are trending searches on GE.com, they are hardly representative of what GE is about. To find out about the culture of the company, this is not an accurate way to do</li> </ul>   |

|   |   |   |
|---|---|---|
|   |   | it. The search bar takes up prime real estate on the front page of the website.   |
| Consistency and Standards                               | 2 | GE.com and GE Digital's website both uses a lot of gallery. A novice user may miss out of many information because some information are hidden and it requires additional clicks on a scrolling webpage.<br>Navigation-wise, GE is quite consistent but when user move away of the site, the site's look and feel becomes inconsistent.   |
| Error prevention  | 0 | When user searched for a wrong term, the search suggests terms to search for instead. But they are of the divisions rather than providing helpful terms that would be useful to the user.   |
| Recognition rather than recall                          | 3 | Yes, to get to GE Story for example. One will have to take series of correct links to get to it. It is buried deep within the Careers section of the website.<br>No, memory of user's history but there is no need to do that. First for privacy purpose and secondly, there is no need for the user to have his or her info saved.   |
| Flexibility or efficiency of use                        | 2 | I think the website works well for those who are familiar with how the website already work. But the carousel trend searches is not the most efficient way for an expert to view all the relevant trend searches because it hides some of the words occasionally.<br>Yes, it does. The front page contains links such as 'investors' , 'careers', and 'ge businesses'. It is good but for those who are beginners or first timers to the website, they might get lost because they are unsure where to start. |
| Aesthetic and minimalist design                         | 1 | I like the overall design, I think it has very little clutter.<br>The visual design is not hard to parse, but some information may not be displayed in the most logical manner.   |
| Help users recognize, diagnose, and recover from errors | 1 | Yes. When a search term does not show up any results, the suggested search terms will be displayed instead. But the suggested terms are quite generic.  |
| Help and documentation                                  | 1 | Help information is in the form of the "contact me" at the bottom of the page.  |

#### D. Anand Doshi Individual Heuristic Evaluations

| Principles | Ratings | Descriptions | Recommendations |
|------------|---------|--------------|-----------------|
|------------|---------|--------------|-----------------|

|  |          |   |  |
|--|----------|---|--|
| <p>Visibility of the system status</p> | <p>2</p> | <ul style="list-style-type: none"> <li>● "- GE Digital's product search shows a loading indicator when the user changes the filter. (0)</li> <li>● - The buttons on GE Digital website have an unintuitive hover state where the text on a button animates in an unintuitive way. Severity Rating = 1</li> <li>● - The buttons on GE websites don't have a clicked, or active state. So it is difficult to know if the click worked or not. Severity Rating = 2"</li> <li>● - On clicking the search icon on the navigation bar on GE.com, it focuses the cursor on the search box at the center, but it isn't obvious that the cursor has moved there and gained focus. Severity Rating = 2</li> <li>● "- The top navigation bars on each website make it easy to know what are the options to navigate to</li> <li>● - The search on GE.com has a rolling list of suggestions, but it is not obvious that these are clickable. Severity Rating = 2</li> <li>● - A vertical carousel on the GE Digital website changes on hover, but if you click on it, it opens the page. So it is not clear that you are only supposed to hover and not click to see the carousel slide. Severity Rating = 3</li> <li>● - It may not be obvious that to go to certain pages, you need to click on the top navigation bar instead of hover over and and choose a specific options. Severity Rating = 2"</li> <li>● - On clicking the search icon on the navigation bar on GE.com, it focuses the cursor on the search box at the center, but it isn't obvious that the cursor has</li> </ul> | <ul style="list-style-type: none"> <li>- Have title of the section on each page to clearly tell the user where they are</li> <li>- The brand image should also be accompanied by the department name</li> <li>- Add breadcrumbs as a consistent navigation aid, to manage the complexity of the website</li> <li>- Have consistent Favicons</li> <li>- Show consistent titles on the browser tabs</li> <li>- Have clicked or focused state representation for clickable UI elements</li> <li>- Make the hover state animations on buttons intuitive</li> <li>- Either animate or highlight focus on search box on clicking the search icon, or get rid of the search icon</li> <li>- Make the navigation and carousel elements either clickable or for hover, not both</li> <li>- GE.com's search should offer suggestions on typing and show the scrolling list as a static list that is obviously clickable</li> </ul> |
|--|----------|---|--|

|  |          |   |   |
|--|----------|---|---|
|  |          | <p>moved there and gained focus.<br/>Severity Rating = 2</p> <ul style="list-style-type: none"> <li>• - The top navigation bars on each website make it easy to know what are the options to navigate to</li> <li>• - The search on GE.com has a rolling list of suggestions, but it is not obvious that these are clickable. Severity Rating = 2</li> <li>• - A vertical carousel on the GE Digital website changes on hover, but if you click on it, it opens the page. So it is not clear that you are only supposed to hover and not click to see the carousel slide. Severity Rating = 3</li> <li>• - It may not be obvious that to go to certain pages, you need to click on the top navigation bar instead of hover over and and choose a specific options.<br/>Severity Rating = 2</li> </ul> |   |
| <p>Match between the system and the real world</p> | <p>2</p> | <ul style="list-style-type: none"> <li>• - GE's home page does not have a lot of content, but it uses language that users should be familiar with</li> <li>• - GE's career page also uses language that visitors would be familiar with</li> <li>• - GE Digital uses statements like "GE Digital's APM: Next-Gen RMM Software for IoT", which users might not be familiar with (2)</li> <li>• - The search functionality on GE's home page does not provide suggestions in a way user's would expect. Instead, it has a rolling list of text that is behind the search box. (2)</li> <li>• - Some of GE's websites are on different domains (geaviation.com, gecapital.com), while some are on different paths on GE.com domain (ge.com/digital) (2)</li> </ul>                                       | <ul style="list-style-type: none"> <li>- Avoid using abbreviations in titles</li> <li>- Millennials might not be aware of Industrial IOT or complex terminology. Use simpler terms in titles and short descriptions, and ease the user by gradually introducing new terms.</li> <li>- Change the search UI on the home page by keeping the "Popular Right Now" links separate from the Search input</li> <li>- GE's other websites should either be a sub pages on GE.com or should be subdomains on GE.com, and not a separate domain like geaviation.com.</li> <li>- GE's website should be designed mobile first or fallback to a simpler mobile experience</li> <li>- Search should find the auto suggested terms instead of</li> </ul> |



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|----------------------------------|----------|---|---|
|                                  |          | <ul style="list-style-type: none"> <li>• - GE's careers page shows "Let GE Guide You..." with a "Telephone" icon. However the only help it provides is a career guide and an iPad app. (1)</li> <li>• - GE.com uses a globe icon after the search icon on the navigation bar, but it is not apparent what it means. (1)</li> <li>• - Users expect a site to work well on mobile, but GE's career search shows this: "Job Search</li> <li>• While mobile devices work well when searching for jobs, use a computer with Safari or Chrome browser for the best experience when applying for a job." (1)</li> <li>• - The search on GE's Newsroom page shows suggestions as you type, but when you select the suggestion, it gets selected as a tag instead of a search term. (4)</li> </ul> | <p>adding them as tags in the search</p>  |
| <p>User control and freedom</p>  | <p>3</p> | <ul style="list-style-type: none"> <li>• - Once on GE Digital's website, there isn't an obvious way to go back to GE.com</li> <li>• - On GE digital's website as well as GE newsroom's, if a search result takes a long time, it freezes the screen and shows a spinner, but the user cannot cancel the search (2)</li> </ul>   |   |
| <p>Consistency and Standards</p> | <p>2</p> | <ul style="list-style-type: none"> <li>• - A complex website like GE should have a system of breadcrumbs for its subpages (2)</li> <li>• - Clicking the brand image should take a user to the home page of the current domain, but in case of GENewsroom.com, it takes you to GE.com (3)</li> <li>• - Some tabs in GE.com's navbar are clickable (Investors and Careers), while others are not (GE Businesses and News) = Severity Rating = 2</li> <li>• - On opening, GE Careers page shows the top half initially, then</li> </ul>  | <ul style="list-style-type: none"> <li>- Use breadcrumbs to help users navigate the website</li> <li>- Clicking on brand image should always take the user to the home page of the current website</li> <li>- Disable click on navbar when the tab has a menu by not changing the cursor to a hand and showing a down caret besides the tab title</li> <li>- A web page should always show the first section on opening, unless someone is</li> </ul> |

|                                  |   |  |  |
|----------------------------------|---|--|--|
|                                  |   | <p>scrolls to the middle = Severity Rating = 2</p> <ul style="list-style-type: none"> <li>- The search icon on the top navigation bar puts the cursor in the search box at the center of the page, but it isn't obvious to the user that it happened, unless the user is looking at the searchbox (3)</li> <li>- A tab within a page should not open a new website like in the case of "Meet our people" on GE's careers page (3)</li> <li>- When GE's search does not find anything relevant, it shows popular terms. But, when you click on them, it opens a website instead of searching the term. (3)</li> </ul> | <p>opening a specific section intentionally.</p> <ul style="list-style-type: none"> <li>- The focus on the center search box on GE.com could be animated when the search icon is clicked</li> <li>- Avoid using in-page tabs, especially when they open different pages or different sites. Use links instead.</li> <li>- In the context of search, suggested terms should search for those terms, like it happens in search engines like google.</li> </ul> |
| Error prevention                 |   | <ul style="list-style-type: none"> <li>•</li> </ul>  |  |
| Recognition rather than recall   | 3 | <ul style="list-style-type: none"> <li>- To get back to GE.com, users have to remember that it is a separate website and you cannot reach it by clicking home (3)</li> <li>- GE's website does not keep track of search history (0)</li> </ul>   | <ul style="list-style-type: none"> <li>- Have a global navigation sub-menu that helps users navigate across GE's websites and also shows where they are in the tree of GE websites</li> </ul>  |
| Flexibility or efficiency of use | 4 | <ul style="list-style-type: none"> <li>- The search boxes don't show a cross (x) to clear a search query. To clear the search, user has to manually delete the content using backspace. (2)</li> <li>- The product search feature on GE Digital's website hides some or all the other filters, once a single filter is selected, which makes it difficult to quickly change filters and get results. (3)</li> <li>- The websites are not screen reader friendly (3)</li> <li>- Although responsive, the websites are not crafted for mobile users, and has lots of bugs rendering on mobile (4)</li> </ul>           | <ul style="list-style-type: none"> <li>- Show a cross (x) to quickly clear search query</li> <li>- Always show all filters, but show the selected ones in bold with a checkmark</li> <li>- Make the website accessible to screen readers</li> </ul>  |
| Aesthetic and minimalist design  | 4 | <ul style="list-style-type: none"> <li>- GE's home page is very minimal, however the scrolling / animated suggestions for "Popular Right</li> </ul>  | <ul style="list-style-type: none"> <li>- Reduce the animations and make it subtle</li> </ul>   |

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|   |   | <p>Now" could be considered as unnecessary (1)</p> <ul style="list-style-type: none"> <li>- GE digital's navigation menus open on hover employing a bouncy animation which is very distracting if one moves between different menus to look for a desired link (3)</li> <li>- Some of GE newsroom's most recent articles use the same image for multiple articles, often confusing the reader about which article title are they reading (3)</li> <li>- GE Digital uses a lot of images overlaid with text. This makes the text very difficult to read and does not allow a user to skim through the website. (4)</li> <li>- GE Digital's website uses animations that seem unnatural. For example, it rolls button labels on hover, pop-out animation on vertical sliders, etc. (2)</li> </ul> | <ul style="list-style-type: none"> <li>- Avoid overlaying text on backgrounds</li> <li>- Either use distinct images for each news article, or don't use images for citing articles</li> <li>- Use intuitive animations when necessary</li> </ul> |
| Help users recognize, diagnose, and recover from errors | 0 | <ul style="list-style-type: none"> <li>- GE's 404 page shows an apology for page not found and a link to go to GE.com. (0)</li> <li>- If the websites don't find anything for a search term, it shows "No results found", and also shows popular terms for the user to continue browsing. (0)</li> <li>- The error messages on 404 or no search results are succinct and helpful (0)</li> </ul>   | <ul style="list-style-type: none"> <li>- When product search shows 0 results, it should suggest users on how they can improve their search</li> </ul>  |
| Help and documentation                                  |   | <ul style="list-style-type: none"> <li>- It provides a sitemap, search, terms, privacy policy and a form to contact GE if required (0)</li> </ul>   |  |

### E. Ru Jia Individual Heuristic Evaluations

| Principles                      | Ratings | Descriptions   | Recommendation                        |
|---------------------------------|---------|--|---------------------------------------|
| Visibility of the system status | 3       | -When users go to GE career site, there is no visual change on navigation bar. Users | - Visually indicate different status: |

|   |   |  |  |
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|   |   | <p>probably do not know which page they are in. The same problem happen in GE Digital.</p> <ul style="list-style-type: none"> <li>-When users go to GE Digital homepage, the title of the page is "GE imagination at work", which is confusing in terms of what state of current system.</li> <li>-When users search a job on career page, there is no visual difference between filled search bar with unfilled ones.</li> <li>-For ge.com, users do not know which directory has a drop-down menu. They will try to hover on it one by one to find out where they should go next.</li> </ul> | <p>hover, active, or current position.</p> <ul style="list-style-type: none"> <li>- If possible, the logo should indicate the name of the site.</li> <li>- Consider the usability of search bar. Because GE is a company with complicated structure, the search function may be used frequently. There should be difference between type-in contents and default contents in search bar. Add some visual elements, such as arrows to indicate the drop-down menu.</li> </ul> |
| Match between the system and the real world | 4 | <p>Predix is hard to understand. "download" button actually leads to a page for registration. No. On GE Digital Page, "digital", " industry", "products", "service" are quite similar. Users may need to check each drop-down menu to find their way to the next page.</p> <p>The "find product" button next to the search bar on GE Digital website is not the search confirmation button. It leads to the "products list" page.</p>  | <p>Reorganize the information that could attract users. Make it easier to access. Remove the step of registration. The category names need to be easier understood and the all-caps styled navigation needs to be changed for easier readability. Differential buttons for search and "go to product page". Or optimize the whole searching experience for searching a featured product.</p>   |
| User control and freedom                    | 3 | <p>If users want to know the details about the news, they must register first and download</p>   |  |

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|   |   | the file. The big thumbnail won't lead to another page, instead, only a small button is clickable. The rolling navigation on the homepage is also had to control. It shows the most popular content of this website, but when people want to click it, it may roll away and never come back.  |  |
| Consistency and Standards                               | 4 | No. Each page of GE Business use different structure and different design style, which makes it confusing.<br>Other GE business page except GE Digital can be opened in a new page  |  |
| Error prevention  |   |   |  |
| Recognition rather than recall                          | 3 | No. When users try to type in terms in the search bar, the system can not recognize the obscured terms and may not help users to get a wanted result.<br>The links of the logo on different page in on directory may not lead to the same homepage, which makes it confusing. Users need to remember the way of how they get to the current page and try to start over again.<br>No. The system do not have memory for searching history. If users need to apply multiple jobs in GE, they need to upload their resume several times, and fill the same information repetitively. |  |
| Flexibility or efficiency of use                        | 3 | Registration and download before reading.   |  |
| Aesthetic and minimalist design                         | 4 | The animation of rolling navigation. The use of typography makes the text harder to read.   |  |
| Help users recognize, diagnose, and recover from errors |   |   |  |
| Help and documentation                                  |   |   |  |

## F. Brennan Sieck Individual Heuristic Evaluations

| Principles                                  | Ratings | Descriptions  | Recommendations  |
|---|---------|---|--|
| Visibility of the system status             | 3       | <p>There are no visual indicator to a user's current position. Certain pages (ex. IIOT Insights) feature breadcrumb style indicators, but this is not a consistent feature throughout other portions of the GE website.</p> <p>As a whole, the GE site does not stand to benefit from state indicators such as alerting the users to the loading of new content. A vast majority of GE's content is available on page load and if new content needs to be loaded, the site displays a standard 4 stacked bar loading animation. When using the GE search page, users are not given any suggestions until they press ENTER. This can lead to confusion as to what the user can search within the site.</p> | <p>Introduce the breadcrumbs that are shown on the IIOT Insights page throughout the entire GE website. This will give users the information they need to determine where they are in the system, as well as improve the design consistency of the site as a whole.</p> <p>Implement lazy loading of image and video assets so that there is no confusion as to whether or not the system is a content loading state. Additionally, I would recommend implementing a standardized loading animation so that users can become familiarized with its state declaration.</p> <p>Give users autocompleted suggestions whenever they add a character to their query. This will inspire the users to tailor their search to what they know they can find information on. This applies to general and expert users of the site.</p> |
| Match between the system and the real world | 3       | <ul style="list-style-type: none"> <li>There a points within the GE web experience where GE describes products or services in a manner that is difficult to understand. I have noticed that in place of clear and simple descriptions, GE has chosen to use more technical terms, as well as use terminology they have created themselves.</li> </ul>   | <p>Review the content on important entry point pages where a majority of non-expert users would find themselves trying to find out more about GE. Keep the technical language to portions of the site where users would expect expert level</p>  |

|                           |   |  |   |
|---------------------------|---|--|---|
|                           |   | <ul style="list-style-type: none"> <li>• In many ways, GE website, and its related business sites, behave in a manner that would be considered unnatural to the user.</li> <li>• - Not all business sites are contained under the GE website (ge.com/digital vs. geaviation.com)</li> <li>• - The home page search bar offer suggestions, but if you click one, you cannot go back to view other search suggestions without reloading the home page</li> </ul>   | <p>terminology and descriptions. Additionally, if GE decides to use an acronym or phrase that they invented, make sure to explain what it means to the user.</p> <p>Convert site architecture so that users can navigate in an intuitive manner.</p> <p>- ge.com/avation vs geaviation.com</p>            |
| User control and freedom  | 2 | <ul style="list-style-type: none"> <li>• At any point in time during the user's experience on the GE website, they can safely return to the homepage by clicking on the GE logo in the top left corner. Alternatively, users can access the footer menu in order to abandon any task that they wish. It is important to acknowledge that if a user decides to explore a particular business branch off GE, they are unable to easily return to that particular business' homepage.</li> <li>• Users are able to undo mistaken inputs or navigational steps</li> <li>• There a multiple portions of the GE website that give user the impression they can access content with one click, but then require the user to create an account and disclose information about themselves, then download a PDF. This all happens after the user is given the impression that they are going to be able to view content immediately</li> </ul> | <p>- Make use of the existing breadcrumb implementation on all pages within the GE site, as well as the various business sites, so that users can easily backtrack to a location they know. Additionally, make it possible for users to easily return to the homepage of a specific GE business site.</p> |
| Consistency and Standards | 3 | <p>The various GE business pages have inconsistent layouts when compared to each other, and to the GE homepage. The navigation feels relatively similar, but the content of pages varies quite a bit.</p>  | <p>- Make articles of interest, such as blog posts or news be readable with ease</p> <p>- Implement a consistent design language the</p>  |

|   |   |   |  |
|---|---|---|--|
|   |   |   | applies to all of GE business sites. It is important to give the users a sense of consistency when browsing pages, so that they can easily find information on whichever page they are on. Additionally, define a global navigation that is present on all GE pages so that a user can move smoothly throughout the site without having to take additional time to learn new navigation schemes. |
| Error prevention  |   |   |  |
| Recognition rather than recall                          | 3 | <ul style="list-style-type: none"> <li>• If a user wants to access a specific part of the GE site, such as the internship/co-op page, there are many navigational steps they need to take.</li> <li>• the main search feature of the GE website does not record previous searches that the user makes</li> </ul>            | <ul style="list-style-type: none"> <li>- Offer the user the ability to view the previous searches and duplicate them if they want</li> <li>- Make prominent and frequently visited pages of the site the simplest to access</li> </ul>   |
| Flexibility or efficiency of use                        | 3 | Registration and download before reading.   | Remove the need create an account and login before downloading PDFs  |
| Aesthetic and minimalist design                         | 1 | <ul style="list-style-type: none"> <li>• The website does not work well on mobile. Many of the pages break when viewed on mobile devices.</li> <li>• The overall visual design is simple and easy to grasp, but sometimes information may not be shown where the user expects it to be</li> </ul>                           | Develop a smooth and intuitive mobile experience for all of the business sites   |
| Help users recognize, diagnose, and recover from errors | 1 | <ul style="list-style-type: none"> <li>• If a user is trying to find something that doesn't exist, they search function will notify them and provide them with suggested searches instead</li> <li>• Yes, the pages of the site offer high level, and very specific levels of detail to suit various user types.</li> </ul> | Explain the meaning of more technical terms as well as acronyms  |



|                               |  |  |  |
|-------------------------------|--|--|--|
|                               |  | One issue is the use of acronyms and technical terms that the user may not know. |  |
| <b>Help and documentation</b> |  |  |  |