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## **0.0 Project Name:** CityofChicago.org: Improvement in Information Architecture

### **1.0 Abstract**

The official City of Chicago website ([Cityofchicago.org](http://Cityofchicago.org)) is an information rich website used by business owners, city residents, and visitors alike. The way the information is currently presented is convoluted and at times overwhelming. The three main goals for this project were to: 1) improve the findability of topics on the primary navigation menu, 2) increase satisfaction with the organization of the CityofChicago.org website, and 3) determine the effectiveness of our prototype information architecture. To achieve these goals we conducted a total of four tests: an initial usability evaluation of the current site, an open card sort, a formative usability evaluation of a low-fidelity (lo-fi) prototype, and an evaluation of a medium fidelity (mid-fi) prototype. Results from our usability evaluations indicated that the new information architecture is an overall improvement over the current city site architecture. Based on our findings, we concluded that it is possible to take topics that are very difficult to access and improve their findability without significantly decreasing the accessibility of commonly visited pages.

### **2.0 Project Goals**

The City website is vast and provides multiple ways for users to get information and accomplish their tasks. A user looking for a particular topic will sometimes end up on different pages depending on which path they follow through the navigation. Our project sought to create a more effective and usable information architecture for the website when using a laptop or desktop at home or at work.

With the overall goal of improving the navigation of the City of Chicago website, we had three subgoals:

- 1) Improve the findability of topics on the primary navigation menu. We measured this by recording the success/fail ratio for a given task and the path taken to find the topic without resorting to the search box.
- 2) Increase satisfaction with the organization of the CityofChicago.org website. We determined this by gathering feedback about satisfaction during an initial testing and compared that with feedback about satisfaction during usability testing of our mid-fi prototype.
- 3) Determine the effectiveness of our prototype information architecture. To do this we conducted usability evaluations of the low and mid-fi prototypes and determined sources of errors and overall satisfaction with proposed navigation.

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### 3.0 Methods

We determined that the most useful testing methods for our project would be a combination of usability tests and an open card sort (Nielsen, 2004). We conducted a total of four tests: an initial usability evaluation of the current site, an open card sort, a formative usability evaluation of the lo-fi prototype, and an evaluation of the mid-fi prototype. The card sort provided insight into how users thought the site information should be grouped, which informed our reorganization of the site's menu structures. We evaluated our lo-fi prototype with three users in order to gather qualitative data for refining the prototype's architecture before moving on to the next level of fidelity. In order to learn how our new information architecture performed in comparison to the original, we compared the results of the original usability test to those from the test of our mid-fi prototype.

#### 3.1 Usability Evaluation Tasks

We chose two main tasks for our usability evaluations: paying a parking ticket and finding information about bedbugs. During our own preliminary investigation of the site, we found that paying a parking ticket was a fairly easy and straightforward activity, but finding the bed bug information was noticeably more difficult. These tasks are realistic use cases for Chicago residents and the target pages are located in completely separate areas of the current site. The parking ticket scenario represents a common task for the city website, while the bedbug information is accessed less frequently. We wanted to ensure that our reorganization of the information architecture improved the findability of less popular pages on the site without making typical tasks like paying a citation too difficult.

#### 3.2 Initial Usability Evaluation

After developing an interview script and usability evaluation protocol (Appendix 7.1), we conducted an initial usability test using the two tasks to provide a baseline measure of usability, checking for sources of error, and gauging satisfaction. We recruited five participants and screened out anyone that had used the site in the last 30 days so that they would not be familiar with the location of the targeted information. For each task we set a five minute time limit because we did not want participants to become fatigued by the test. It is also unlikely during ordinary usage that anyone would continue to look that long for a page without resorting to the search function or abandoning the task altogether. The tests were conducted in a comfortable environment for the participant (home, office) on a computer they were familiar with.

For each task, we identified the target page that a participant would have to find in order to successfully complete the task. The City of Chicago site is designed as a matrix and as such there are multiple paths to each of our target pages. Before the tests we mapped out all of the possible paths to each target page; straying from any one of these paths was considered an

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error. We recorded the screen during the usability test and the time spent on each task. After the session ended we then reviewed the recordings to count the number of errors. To control for order bias, we made sure that two of the five participants started with a different task than the other three.

### 3.3 Open Card Sort

We recruited 11 students, colleagues, and friends to participate in an open card sort using OptimalSort. In preparation for the open card sort, we conducted a partial content inventory of the webpages involved in the site’s overall composition, focusing in particular on those pertaining to our test tasks. This process yielded over 150 cards; to reduce the potential for participant fatigue we reduced the number of cards to 104 by eliminating redundant pages and removing cards that would have been too difficult for participants to understand without context.

Each participant was asked to sort the cards into sensible groups and then name their groups. The card sort was unmoderated and completed remotely on the participant’s device. We analyzed the results using OptimalSort’s Best Merge Method dendrogram and Similarity Matrix and worked as a team to optimize the number and content of the user proposed groupings in a shared spreadsheet (“Interpret your card sorting,” 2017).

### 3.4 Lo-fi Prototype Evaluation

After further combining groups of topics and determining a new information architecture from the open card sort, we created a [low fidelity \(lo-fi\) wireframe](#) (Appendix 7.5) using the software Axure. We focused on building the main navigation menu and organizing the topics into logical submenus (Figure 1).



Figure 1: Current website navigation (top) and the Lo-fi prototype navigation (bottom)

To create the top navigation menu and the groupings within them, we followed the large menu grouping guidelines outlined by the Nielsen Norman Group (Nielsen, 2009):

- Chunk options into related sets, keep a medium level of granularity.
- Use concise, yet descriptive labels for each group.
- Differentiate labels.
- Order the groups.

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- Show each choice only once.

The lo-fi prototype allowed us to quickly test the new navigation for the two tasks. We used a similar evaluation protocol to our initial usability test for consistency. However, to validate the new architecture we also asked the participants to find some additional, commonly accessed pages. These tasks were: (1) looking up building permits, (2) reporting a pothole, (3) applying for a job, and (4) getting a business license.

### 3.5 Mid-fi Prototype Evaluation

Alternative page layout sketches (Appendix 7.4) were created to help us produce the layout of the prototype site. The color scheme was based upon palettes pulled from our mood board. We incorporated the feedback from the lo-fi testing which included adding a side navigation menu similar to the one on the current city site. We went through several iterations and updates to our prototype, including updating pages that are on the correct navigation path with appropriate content. The end result was this [medium fidelity \(mid-fi\) prototype](#) (Appendix 7.5) also built using Axure.

#### Mid-Fi Prototype

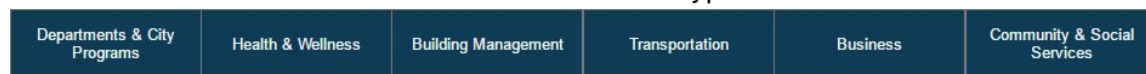


Figure 2: Our Mid-Fi Prototype Menu

We reused relevant content from the City of Chicago website and incorporated thematically appropriate images to make the prototype more realistic. The same protocol as the initial site usability test was used and participants were assigned different task orders. Our tests were conducted in the same environmental conditions as previous rounds.

## 4.0 Results and Findings

This section summarizes the results and findings from the four tests. For each test, we also include the implications for design.

### 4.1 Initial Usability Evaluation Results

All five participants were able to finish the parking ticket task quickly (four of five in less than 30 seconds, with an average time of 27.4 seconds) and none of the five were able to find the bed bug information within the five minute time limit. However, two of the participants actually followed the right path to the bed bug information by navigating to the Public Health Department page, but failed to notice the bed bug icon present there and thus continued onward to more pages. One of those participants commented that "bed bugs seem like a public health issue." The participants grew increasingly frustrated as they navigated through

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the menus, stating "this site is terrible." One participant even started to question, "is this even possible?"

An error was defined to be the participant taking the wrong path. Incorrect clicks that occurred within already incorrect pages were not counted, including clicks back to the homepage. Participants did not make any errors in navigating to the parking ticket page. There were many errors for the bed bug task with the number ranging from 6 to 12 with a median of 7.

All participants thought the parking ticket task was "very easy" and the bed bug task was "very hard." The responses to the question about understanding of the site were mixed. Participants were satisfied with the navigation to the parking ticket page but not to the bed bug information (Appendix 7.2).

#### 4.1.1 Implications for design

Some of the suggestions that we received as part of the follow-up questions were used in the lo-fi design. Specifically these were that the site needed "better phrases or target words" and that it should "list bed bugs under different categories." These comments affirmed the need for new menu labels and the reorganization of content.

#### 4.2 Open Card Sort Results

There was a total of 11 participants for the open card sort and all completed the activity. The completion times ranged from 7.5 minutes to 1 hour and 27 minutes; the median time was 21 minutes. Several participants commented that the number of cards was "overwhelming." The number of groups created by participants ranged widely from 8 to 20 with an average of 12. This large number of groups from the card sort did not lead to a clear-cut menu organization. The lack of a most popular grouping meant that the results needed vigorous review. This required us to use OptimalSort's tools and our expertise to judge where some ambiguous cards should be placed. We also referred to the City website for more context about the content of the pages.

The Similarity Matrix was examined to understand how participants grouped various pages; this showed that the strongest associations for bed bugs were with "Public Health" related topics. These were the only cards that bed bugs were paired with by more than half of participants. The Best Merge method dendrogram suggested that this grouping should be labelled "Health" or "Health and Wellness" (Appendix 7.3). The next topics most commonly grouped with bed bugs were home repair and mattresses, followed by condo ordinances, renting, and safety. According to the Similarity Matrix, the parking ticket page was grouped with other transportation topics most often. Interestingly, it was paired in the same category with "Pay Water Bill" by 4 out of 11 participants, which pointed to the possible utility of having an additional navigation menu organized by task. The dendrogram revealed that participants named these groups "Transportation" and "Parking & Transportation."

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#### 4.2.1 Implications for design

The new organization of the main navigation menu is based on a specific group of users: regular citizens. The official city website reflects a structure based on government names and hierarchy (Fig. 1). Though important to consider, we felt our approach (derived from the card sort results) would be more understandable and therefore more learnable for the typical city resident or visitor. The result was a more consolidated grouping of pages, with six main categories and each of those containing two to four subcategories. The new categories we created are shown in our mid-fi prototype main navigation menu (Fig. 2).

#### 4.3 Lo-Fi Prototype Evaluation Results

Three participants reviewed the lo-fi prototype and all were able to complete the two tasks quickly and without errors. Additionally, all participants indicated in the post-task questions that the navigation was understandable. For two of the three participants there was a slight delay in determining that the parking ticket task would be under the main navigation menu category “Transportation.” However, all of the participants were able to determine that given the menu alternatives, “Transportation” was the most sensible location for the page. The average completion time for this task was 21.3 seconds. Completion of the bed bug task was markedly easier for participants while using our prototype. The average time on task for finding the bed bug information was 15.6 seconds. It was obvious to the participants that this topic was located in the “Health & Wellness” menu.

There was general satisfaction with the prototype layout and navigation to the target pages. Participants were also able to locate the pages for finding out about building permits, reporting a pothole, applying for a job, and getting a business license. One participant commented that he was able to deduce where the desired page would be found because he could “compare the menu categories easily.” These results suggested that our design was an improvement from the original city site.

##### 4.3.1 Implications for design

One of the participants was also part of the initial city website evaluation; during that test he had used the side navigation (titled “I Want To ...”) to quickly find the page to pay the parking ticket. The lo-fi prototype did not have this sidebar menu, so he was initially slowed by looking for it. The participant did complete the task successfully by using the main navigation menu, but mentioned that he thought it was a lot faster using the side navigation menu. Based on this feedback, that side navigation menu was added to the mid-fi prototype.

#### 4.4 Mid-fi prototype evaluation

All five participants were able to complete both tasks successfully. The order of the tasks had

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no bearing on the results.

Four participants completed the parking ticket task in less than 30 seconds and one completed it in less than a minute. The person who took the longest had followed the wrong path initially. This was the only error for this task. He looked for “Police,” reasoning “that’s who writes the tickets.” When that path did not end with the parking ticket page, he turned his attention to the left side of the page, where he saw the “Parking Ticket” choice in the side navigation menu and followed that path successfully.

Two of the participants completed the bedbug task in 20 seconds or less, the other three took between one minute and one and a half minutes. The two quick results were because the participants looked in the right menu (“Health & Wellness”) first. They chose that menu item because “bedbugs are a health problem.” The other three looked in different menus (“Community” or “Building Management”) because their first instincts were to think of bed bugs as a housing or social services problem. There was a total of 6 errors between three participants on this task. Two participants each committed one error and one participant committed three errors. After not finding any links to bed bug information in the “Community” or “Building Management” pages, these participants returned to the home page and followed the path through the “Health & Wellness” menu, finding the bedbug information page.

Though the users were successful with both tasks their satisfaction level with finding the pages was not as high as expected. Two people had a “Neutral” response regarding how easy or hard it was to complete the parking ticket task. The other three thought it was “Easy” or “Very Easy.” The bed bug task had a respondent that rated it as “Hard” (Appendix 7.2).

Four of the five thought they had a good understanding of the site and reported overall satisfaction (“Satisfied” and “Very Satisfied”). The prototype’s limited functionality and detail on the “wrong path” pages may have contributed to the less than fully satisfied responses. Participants expressed desire to see a more fully functional prototype, where all of the links are active and the menus behave like a finished website.

#### 4.4.1 Comparing the original site to the mid-fi prototype

All participants were satisfied to highly satisfied with our mid-fi prototype, compared with only half of participants who were satisfied with the original website. There was also an improvement in understanding of how the site functions. Every participant indicated that it was very hard to find information about bed bugs on the current city website, but that same information was easier to find in the mid-fi prototype’s architecture. Some participants thought that finding the parking ticket page was less easy on our prototype than it was on the original site; however, none of them rated the task as “hard” or “very hard” (Appendix 7.2).

Time on task for the parking ticket page was similar between the original site and the prototype, with four out of five participants completing it successfully in under 30 seconds.

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One participant, while successful in completing the task, committed an error using the prototype for this task. There were no errors for this task on the original site. While all participants failed to find the bed bug information in the five minute time limit while using the original city site, all were able to find it on the prototype in under one and a half minutes. There were 12 errors while attempting this task on the city website compared with 3 while using the prototype.

#### 4.4.2 Qualitative feedback on prototype and suggestions for improvement

All of the participants generally liked the design, and one commented positively on its “open” feeling. In future iterations of our prototype we would include additional (contextually appropriate) paths to important pages. For example, we would create a path to bed bug information through the “Building Management” menu because several participants thought of bed bugs as a housing issue. Feedback from participants also suggests that we should increase the visibility of the side navigation menu, which we could achieve by making this menu a separate color from the rest of the page.

## 5.0 Conclusions

We saw an improvement over the results of the initial usability evaluation conducted on the original website, where no participants were able to complete the bed bug task (Appendix 7.2). Thus, our results suggest it is possible to take topics that were very difficult to access and improve their findability without significantly decreasing the accessibility of commonly visited pages. However, not all the results were entirely positive. Even though the parking ticket page remained findable in our new organization, participants did think it was harder to complete the task. In the future we would further explore the tradeoffs involved in balancing the findability of popular and less popular content.

Initially we considered whether the new design should include the secondary navigation menu present on the current version of the city website. Our lo-fi prototype did not contain a side navigation menu, and user feedback indicated that this was indeed a useful part of the original site that needed to be reincorporated. After adding it to the next iteration, we observed that the secondary navigation menu (organized by task) improved the usability of our mid-fi prototype design. Therefore, this large, complex site benefitted from design patterns such as quick links that provide easy access to many topics without overwhelming the user.

Our card sort was less instructive than we had anticipated. Due to the smaller sample size and participant fatigue from working through such a large card sort, the results did not always indicate strong or exclusive group relationships between the cards. Group card sorting may have been a more effective approach for this project. The unmoderated testing environment meant that we missed out on participant comments that could have given their groupings more context. Understanding why participants thought certain content belonged together could have



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ameliorated the process of translating the results into a new architecture (Nielsen, 2004).

## **6.0 Considerations for Future Work**

There are a number of additional tasks we would do if we were to continue developing a new information architecture of City of Chicago website. First, speaking to internal and external stakeholders in order to collect more detailed information on the site would help us get a better understanding of the content of the site as well as the traffic flow. We would also perform a site-wide content audit in order to remove redundant, out-of-date, and trivial content that is currently impairing findability (Boag, 2015). Furthermore, conducting a competitive analysis would also help us understand what kind of presentation of content is being used across other sites.

With such an immense website, there probably is not one best way to organize the information architecture. We would want to create and test a secondary navigation design, specifically organizing the content by user groups.

There would also be benefits in doing usability tests with a broader audience, as well as include more tasks. This could increase the confidence with generalizing the task results to the rest of the information architecture. We would also iterate on the mid-fi prototype, developing it into a hi-fi version for additional testing.

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## 6.0 References

Boag, P. (2015). Dealing with redundant, out-of-date and trivial (ROT) content. Retrieved from <https://www.smashingmagazine.com/2015/06/dealing-with-redundant-out-of-date-trivial-rot-content/>

Nielsen, J. (2004). Card sorting: how many users to test. Retrieved from <https://www.nngroup.com/articles/card-sorting-how-many-users-to-test/>

Nielsen, J. (2009). Mega menus work well for site navigation. Retrieved from <https://www.nngroup.com/articles/mega-menus-work-well/>

Optimal Workshop. (2017). Interpret your card sorting results. Retrieved from <https://www.optimalworkshop.com/101/card-sorting#openResultsAnalysis>

## 7.0 Appendix

### 7.1 Interview protocol – initial usability test and mid-fi prototype test

The following pages include the interview protocol that we followed for the usability tests.

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Screener to be asked before consent form: How many times have you used the City of Chicago website in the past 30 days? [Terminate interview if they have used the site within the past 30 days.]

### **Consent Form for Participation in Research Study**

#### **Interview – City of Chicago usability test**

**Principal Investigators:** Carolina Barrios, Tim Grabacki, Lauren McLeod

**Institution:** DePaul University, USA

**Faculty Advisor:** Harold Streeter

We are conducting an interview regarding the usability of the City of Chicago website. I'll ask you some questions about using the City's site specifically and government websites in general. I'll also ask you to do a couple of tasks on the City's website.

This activity will take about 20-25 minutes of your time. Your information will be confidential. Your participation is voluntary, which means you can choose not to participate. There will be

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no negative consequences if you decide not to participate or change your mind later after you begin the study. Once you submit your responses, we will be unable to remove your data later from the study because all data is anonymous and we will not know which data belongs to you.

If you have questions, concerns, or complaints about this study or you want to get additional information or provide input about this research, please contact Carolina Barrios at [cbarrios@stetson.edu](mailto:cbarrios@stetson.edu) , Tim Grabacki at [tim.grabacki@gmail.com](mailto:tim.grabacki@gmail.com), Lauren McLeod at [renmcleod@gmail.com](mailto:renmcleod@gmail.com)

If you have questions about your rights as a research subject you may contact Susan Loess-Perez, DePaul University's Director of Research Compliance, Office of Research Protections in the Office of Research Services at 312-362-7593 or by email at [sloesspe@depaul.edu](mailto:sloesspe@depaul.edu). You may also contact DePaul's Office of Research Protections if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

***You may keep [or print] this information for your records.***

Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Date: \_\_\_\_\_

### **City of Chicago – Interview Protocol/Moderator's Guide**

Session Date: \_\_\_\_\_ Moderator Name: \_\_\_\_\_

Participant Name (first only): \_\_\_\_\_ Participant Age: \_\_\_\_\_ Employed? \_\_\_\_\_

#### **Introduction**

My name is \_\_\_\_\_. Thank you for talking with me today.

We are doing a class project to understand how easy or difficult it is to use the City of Chicago website. We have created a prototype of a new navigation of the City website to make some task easier to do.

We are testing this redesign of the City website, not your ability to navigate through it. We would just like to observe you doing two tasks in the manner you typically would. There are no

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right or wrong answers to my questions; I just want to watch how you do that and hear what you have to say.

This interview is voluntary. You have the right not to answer any question, and to stop the interview at any time or for any reason. Your responses will be confidential and only used to help us in our study of how usable the City website is.

Though I am involved in this redesign of the City website, I really want to know your honest and objective feedback. This prototype is a simple re-creation of the City website and doesn't look finished. Your input will help us make it better, so please share that with me. Any questions? If not, let's begin.

### **Warm-up questions (note answers below each question)**

If you've used the City of Chicago website? What did you go there to do?

Were you successful? Can you describe your experience?

Have you used any government websites recently/ever? To do what – find something, do something?

Were you successful? Can you describe your experience?

=====

### **Tasks and testing guidelines**

1. *Present participants a PC/Mac with a web browser open to the prototype home page <http://vr3w59.axshare.com/home.html> and read Scenario Statement (below) to them.*
2. *Time the how long it takes for the participant to get to the correct page.*
3. *Take notes on if they ask for help, any particular pain points in the process.*
4. *Also take notes if they are unable to complete the task, and the degree to which the participant felt they were successful in completing the task.*
5. *If participants give up completing the task due to confusion, make note of the failure and ask them to describe their difficulty while taking notes.*
6. *Limit the time to complete the tasks to 5 minutes.*

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### **Scenario and Evaluation statement: (to be read verbatim to participant)**

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You will be asked to do two tasks on the prototype website.

“Your **first/second** task is to act out this scenario: You have received a parking ticket from the City of Chicago. You want to pay the parking ticket and go to the City’s website. Without using the search function, please navigate to the page where you can enter your ticket info and pay the ticket.”

Start screencasting app and then say “Please begin”

**Task 1 or 2 (circle the order of the tasks)**

Was the participant able to get to the page to pay the parking ticket? (circle one)  
 YES NO

Total time taken to get to target page \_\_\_\_\_ (in minutes and seconds)

Number of times help was requested \_\_\_\_\_

When:

Any notes regarding potential failure:

Where were the pain points in the process? (describe)

Total number of errors: \_\_\_\_\_

On a scale from 1-5 (1 being very hard to 5 being very easy), how easy or difficult was it for you to use the website to pay the parking ticket?

1 - Very Hard 2 - Hard 3 - Neutral 4 - Easy 5 - Very Easy

**Task 1 or 2 (circle the order of the tasks)**

“Your **first/second** task is to find information about bedbugs. Imagine yourself as a resident of the city and you have found bedbugs in your apartment. You want to find information about bedbugs. Without using the search function, please navigate to the page that has that information.”

Start screencasting app and then say “Please begin”

Was the participant able to get to the page with the bedbug info? (circle one) YES NO

Total time taken to get to target page \_\_\_\_\_ (in minutes and seconds)

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Number of times help was requested \_\_\_\_\_

When:

Any notes regarding potential failure:

Where were the pain points in the process? (describe)

Total number of errors: \_\_\_\_\_

On a scale from 1-5 (1 being very hard to 5 being very easy), how easy or difficult was it for you to use the website to get the info about bedbugs?

1 - Very Hard 2 - Hard 3 - Neutral 4 - Easy 5 - Very Easy

“Thank you, I appreciate your help in evaluating our prototype. Now, I’m going to ask you a few wrap up questions.”

### **Wrap-up questions**

*At the end of the tasks, ask these questions and circle the participant’s answer on the form.*

1. On a scale from 1-5 (1 being strongly disagree to 5 being strongly agree) I understood how to use the City website.

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

2. On a scale from 1-5 (1 being very dissatisfied to 5 being very satisfied), OVERALL how satisfied are you with this website?

1 - Strongly Dissatisfied 2 - Dissatisfied 3 - Neutral 4 - Satisfied 5 - Strongly Satisfied

3. Did you feel you were successful in completing both tasks?

4. What could be made better on the site to make either of the tasks easier to do?

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## 7.2 Comparison of results of the initial and mid-fi usability tests

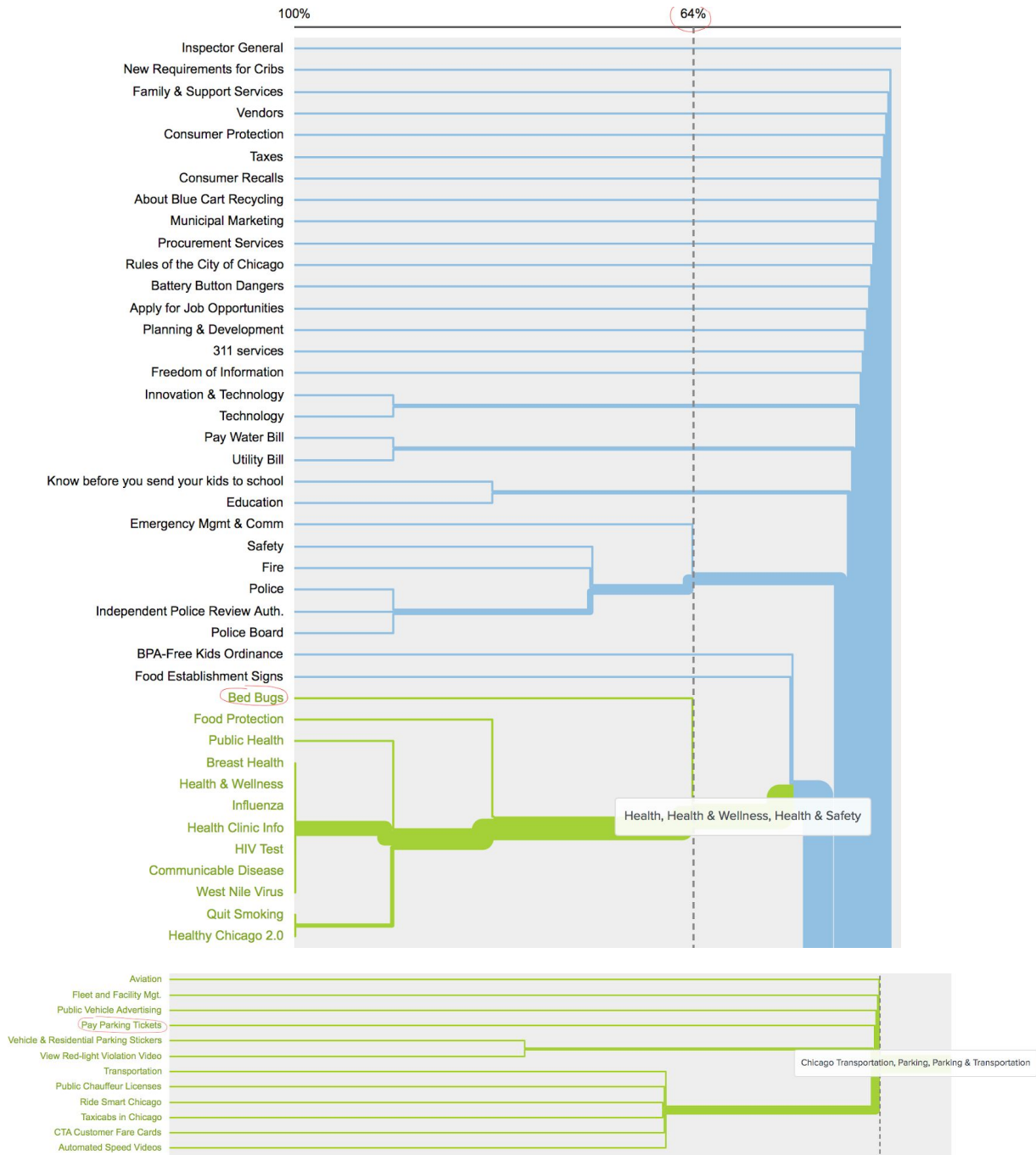
Parking ticket	1 Very Hard	2	3	4	5 Very Easy
Initial Test				1	4
Mid-Fi			2	2	1

Bed bug task	1 Very Hard	2	3	4	5 Very Easy
Initial Test	5				
Mid-Fi		1	2		2

Understanding of site	1 Totally Disagree	2	3	4	5 Totally Agree
Initial Test		2	2	1	
Mid-Fi			1	1	3

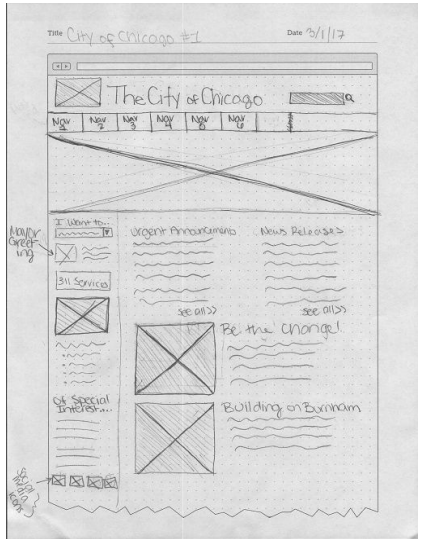
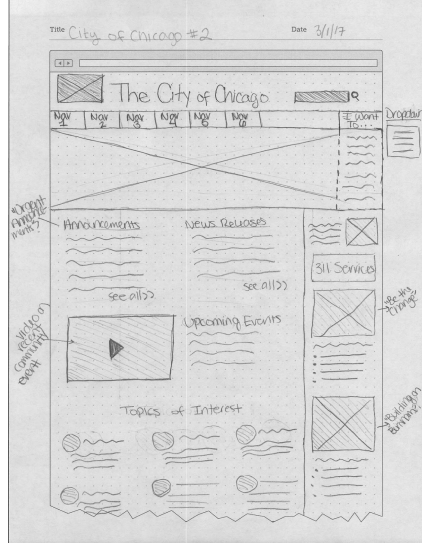
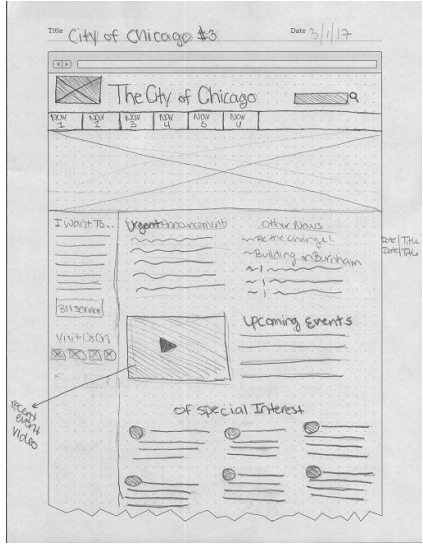
Overall Satisfaction	1 Very Dissatisfied	2	3	4	5 Very Satisfied
Initial Test	1	2		2	
Mid-Fi			1	3	1

### 7.3 Open Card Sort Dendrogram





### 7.4 Layout Sketches



### 7.5 Axure Prototypes

Lo-fi prototype - <http://kei3qd.axshare.com/home.html>

Mid-fi prototype - <http://vr3w59.axshare.com/home.html>