CTSAs Competitive Anlaysis

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1. Executive Summary

This competitive analysis was conducted in preparation for the Harvard Catalyst website redesign. The goals of this analysis were to identify the content and functionality at competing CTSA websites, both to inform the redesign and to better understand areas of competitive advantage.

Due to time constraints, the analysis was conducted on 46 out of 62 competitor websites, with priority given to competitors in the same region as Harvard Catalyst and to UCSF, our closest competitor, followed by as many as possible of the remaining of the institutions. A complete list of competitors' profiles can be found in Section 3.

Prior to the analysis some specific areas of website functionalities that Harvard Catalyst was interested in were identified; hence, the analysis was tailored to these specific areas: design, ways of conveying information, information architecture, unique features, information visualization, accessibility, and mobile functionalities. The methodology for such tailored analysis is documented in Section 2. The analysis revealed a core set of content that was covered by all the websites, as well as unique content only available at a small subset of competing websites. Section 4 provides detailed information and examples on each of these areas.

Some particular key findings were that (1) competing websites focus on information delivery rather than website appearance, (2) public-facing materials such as news & events, ongoing research, and accomplishments are highly emphasized at competing websites, (3) while a subset of the competing websites are mobile-friendly, it is not executed well, (4) and also of note are the audience-specific approaches taken by the competitors to build a separate website for different user roles; these include content oriented to researchers and content oriented to community members or volunteers.

Examining the wide variety of website functionality that is offered by the competitors also raises a number of possibilities for the redesigned website. Notable among that functionality was:

- Membership program
- Infographics (graphical displays of statistics such as number of trials)
- Separate public-facing/researcher-facing sites
- More graphics or programs showing and engaging the community

Detailed overall insights of the analysis in a question-answer format as well as more information on redesign recommendations are documented in Section 5. And finally, Section 6 contains appendices that includes raw data collected, which can be used to for further analysis if need be.

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2. Analysis Approach

2.1 Purpose and Goals

The primary purpose of this competitive analysis was to assess the usability, content, and structure of other CTSA websites in order gain insights into where Harvard Catalyst stands in terms of competitive advantage or disadvantage. The secondary purpose was to use such data to provide recommendations for the redesign of Harvard Catalyst's website.

In particular, with such purposes in mind, the specific goals of the analysis were:

- How do other CTSAs tell users what services/programs they offer? (Wording, graphics, etc.)
- Information architecture of other CTSA websites (e.g. Organization and naming of content, menu structure, navigation flow, etc.)
- Unique features of other CTSA websites
- Do other CTSA websites utilize interesting methods for visualizing information and, if yes, what kind of information do they highlight? (E.g. # of clinical trials per institution)
- Are other CTSA websites generally behind login or publicly available
- Are other CTSA websites mobile-friendly, and if so, how are they doing it?

2.2 Methodology

A list of the CTSAs were obtained from the CTSA central website. Given the time-sensitive nature of the project, a subset of the sites was evaluated. The selected institutions' profiles are listed in section 3.3. Based on the goals outlined in section 2.1, a list of questions was created for reviewing each website and the result data was collected in a Google form that can be accessed here.

A Google form was chosen as the method of collecting data because:

- Google form has built in equations that produce visualization for raw data (i.e. pie charts, raw data analysis) once data is all collected
- Collected data is automatically organized in a clean excel sheet for optimal analysis
- Another person can easily replicate the procedures and continue future analysis

The questions on the Google form and related task are organized in the table below:

Section	Questions	Related Tasks
Background	• Institution, School Affiliation, Website, Link, Year, State	• Obtain information from CTSA central
Homepage	• At first glance of the homepage do you have a good idea what the purpose of the website is about? (If yes, please describe how they did that on the homepage) • What is the homepage trying to	• Spend 30 seconds to see if the homepage tell the users what the site is about • Make note of what features are on the homepage

Insights	accomplish? • Does the home page look modern? (If yes, why?) • On the scale of Google (1) to Craigslist (5), how much information is on the home page? • Is this way of organizing information clear? (Please define a list of objective criteria for making the evaluation that it is clear.)	• If there are Quicklinks – understand how they categorize the links (e.g. by roles? by functionalities? by stage of transitions?) • Comprehend how much information is featured on the homepage and give a score • Judge if the homepage has modern factors (e.g. flat colors, minimalism) • Understand the layout of the homepage and make judgment to see if it is clear organization
Conveying Information	• Are there any elements on the site that do a good job at telling users what a CTSA is and who they are? (If yes, please elaborate) • Are there any elements on the site that do a good job at telling the users what services/programs they offer? (If yes, please elaborate)	• Make note of ways of conveying information along the way
Information Architecture Insights	• What is the primary navigation mechanism? • What is the secondary navigation mechanism? • Overall, was it easy to navigate through the pages? • Please describe the site's information architecture (with focus on organization of pages/subpages) • Please pinpoint features (if any) in the IA design that site does very well at:	• Make note of the primary categories menu items (to see how the separate navigation) • Jump around from subpages to subpages to see how easy it is to navigate though the site • Task: try to go the deepest layer (how many clicks?) and come back to homepage
Unique Features	• Are there any tools or services that the site offers and Harvard Catalyst doesn't? (If yes, please elaborate) • Does the site have interesting methods for visualizing information? (If yes, please elaborate) • Please list all other unique features that is worth pointing out	• Make note of unique features along the way
Accessibility	• Is the site generally behind login / accessible to the public? • What is accessible to the public on the	• Check if there is a log-in form • Try to access services (e.g. sign up for events or use

	site?	tools) to see they are accessible to public users
Mobile-Friendly Insights	• Is the site mobile-friendly or has a mobile app? • If yes, please describe the navigation on the mobile site • Does the mobile site have any reduced functionality? (If yes, please describe reduced functionality) • Do complex tools work on their mobile site?	• Navigate to the site on a mobile device • Confirm with Bill's report to see if the site is mobile-friendly • If it is, try navigating and make comment on the usability of the site

3. Competitor Profiles

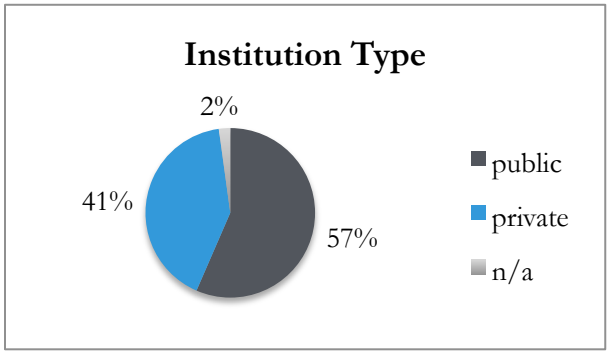
3.1 Competitors Overview

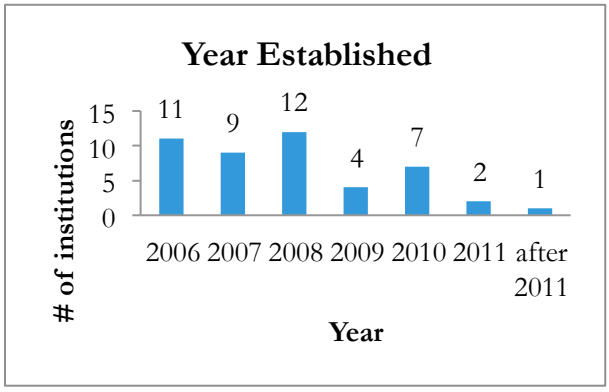
Due to the time-sensitive nature of the project, a total of 46 out of 62 competing CTSAs' websites was selected and analyzed. The priority and number of the selected schools are listed as follows:

- Boston region (5): we analyzed the institutions that are in the same region as Harvard Catalyst to give us insight into local efforts.
- Closest competitor (1): we recognized UCSF as Harvard Catalyst's closest competitor and hence want to ensure it was taken into account in the analysis.
- Additional research centers (40): we then tried to analyze as many of the rest as possible given the time frame.

3.2 By The Numbers

This section gives a visualization of the demographic information for the 46 selected CTSAs.





3.3 Individual Profiles

Group	Institution	Year	State	Type
Boston Region	Boston University	2008	MA	Private
	Dartmouth College	2013	NH	Private

	Tufts University	2008	MA	Private
	University of Massachusetts Medical School, Worcester	2010	MA	Public
	Yale University	2006	CT	Private
Closest Competitor	University of California, San Francisco	2006	CA	Public
Additional Research Centers	Albert Einstein College of Medicine	2008	NY	Private
	Children's National Medical Center	2010	DC	N/A
	Columbia University	2006	NY	Private
	Duke University	2006	NC	Private
	Emory University	2007	GA	Private
	Georgetown University with Howard University	2010	DC	Private
	Indiana University School of Medicine	2008	IN	Public
	Johns Hopkins University	2007	MD	Private
	Mayo Clinic	2006	MN	Private
	Medical College of Wisconsin	2010	WI	Private
	Mount Sinai School of Medicine	2009	NY	Private
	New York University School of Medicine	2009	NY	Private
	Northwestern University	2008	IL	Private
	Ohio State University	2008	OH	Public
	Oregon Health & Science University	2006	OR	Public
	Penn State Milton S. Hershey Medical Center	2011	PA	Private
	Rockefeller University	2006	NY	Private
	Scripps Research Institute	2008	CA	Private
	Stanford University	2008	CA	Private
	University of Alabama at Birmingham	2008	AL	Public
	University of California Los Angeles	2011	CA	Public
	University of California, Davis	2006	CA	Public
	University of California, Irvine	2010	CA	Public
	University of California, San Diego	2010	CA	Public
	University of Chicago	2007	IL	Private
	University of Illinois at Chicago	2009	IL	Private
	University of Michigan at Ann Arbor	2007	MI	Public
	University of North Carolina at Chapel Hill	2008	NC	Public
	University of Pennsylvania	2006	PA	Private
	University of Pittsburgh	2006	PA	Private

	University of Southern California	2010	CA	Private
	University of Texas Health Science Center at Houston	2006	TX	Public
	University of Texas Health Science Center at San Antonio	2008	TX	Public
	University of Texas Medical Branch	2009	TX	Public
	University of Texas Southwestern Medical Center at Dallas	2007	TX	Public
	University of Utah	2008	UT	Public
	University of Washington	2007	WA	Public
	University of Wisconsin - Madison	2007	WI	Public
	Vanderbilt University	2007	TN	Private
	Weill Cornell Medical College	2007	NY	Private

The remaining 14 CTSA websites were omitted due to time as well as the fact that they were smaller in scale, and hence would not provide as much insight when comparing to Harvard Catalyst.

4. Findings

4.1 Homepage Insights

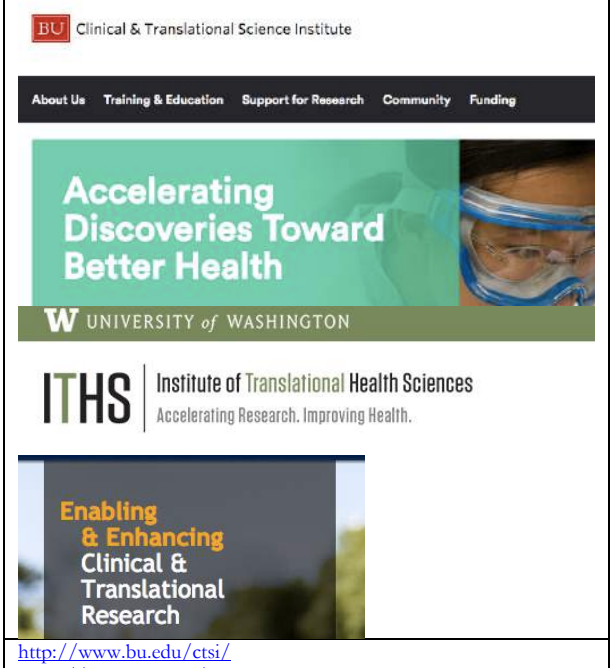
The homepage of a website says a lot about how information is organized, what information is highlighted, and design.

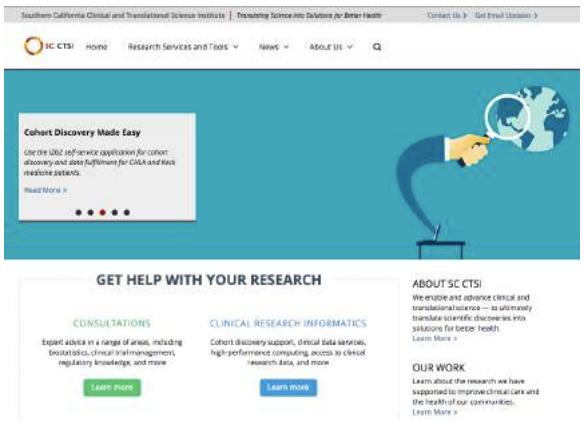
Hence, this section documents the findings related to the CTSAs' homepages:

- 60.9% of homepages do a good job of showcasing what the website is about.
- 32.1% of homepages look modern.
- 78.9% of homepages organize information clearly.
- Information complexity on homepage ranges from 2 to 4 (on the scale of 1: Google to 5: Craigslist).
- Top 3 homepage elements are: (1) Way-finding, (2) News & Events, and (3) Introduction of CTSA.

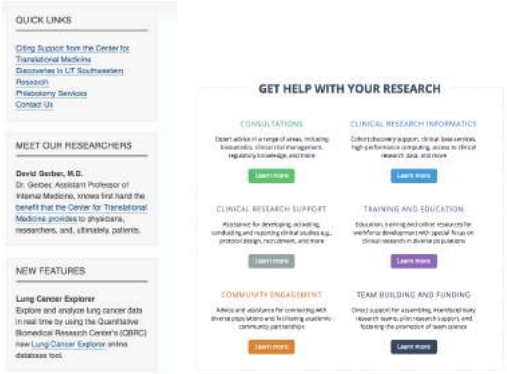
In-depth analysis and examples for each of the findings are provided below in table format.

***Finding 1*: 60.9% of homepages do a good job of showcasing what the website is about.**		
Factors	Comments	Examples
Relatable Graphics	Many sites that were successful in telling the users what their sites were about contain some sort of graphic on the homepage that • Relates to medicine or research • Is high resolution • Is large on the screen (usually first thing you see) • Uses non-stock photos (real, in action) • Showcases themes of diversity, inclusion, gender, and community	 http://www.tuftsctsi.org/ http://www.itmat.upenn.edu/

School Recognition	Many sites that were successful in telling the users what their sites were about also brand their website with their affiliated medical school. That is, by styling their logo, color, website theme, or design the same or similar to the affiliated school. This way, users who landed on their sites can make immediate connection to medicine.	 http://medicine.utah.edu/ccts/ https://ctsi.mcw.edu/ https://ccts.osu.edu/
Catchphrase/ Slogan	Many sites that were successful in telling the users what their sites were about develop a catchphrase/slogan to go with their sites. (E.g. Target: Expect More. Pay Less.) The catchphrase is usually: • Short • One-liner describing what the site offers • Eye-catching on homepage (usually very big, first thing you see) • Can be incorporated with the logo	 http://www.bu.edu/ctsi/ https://www.iths.org/ http://www.michr.umich.edu/

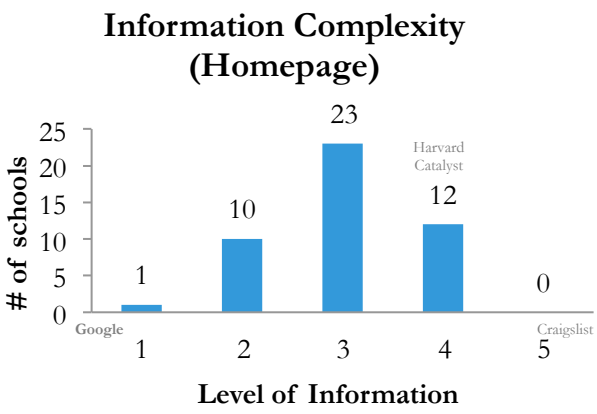
***Finding 2*: 31.1% of homepages look modern.**		
Factors	Comments	Examples
2016 Template Style	It is found that the sites listed on the right have purchased (or at least internally built their website similar to) a website template and then filled in their own content. The advantages of using a website template are that (1) it is consistent and modern throughout the entire site, (2) smooth navigation flow and animation, and (3) most templates have built-in mobile friendly functionalities. Therefore, the institution can focus on the content of their website. The disadvantages of using a website template are that (1) most templates are heavy in media and hence have relatively slow page-load, (2) templates can be expensive, and (3) the design can become outdated	http://www.tuftsctsi.org/ https://www.iths.org/ http://www.itmat.upenn.edu/ http://www.bu.edu/ctsi/ http://www.ohsu.edu/xd/research/centers-institutes/octri/ http://www.ccts.uic.edu/ http://sc-ctsi.org/ http://www.ycci.yale.edu/
Minimalism	With the growing use of mobile devices and the complications of responsive design, minimalism has become popular in modern design. Minimalism focuses on simplicity with the following characteristics: • Large fonts and buttons • Lots of whitespace • Limited color palette (usually pastel colors) • Emphasis on typography • Flat design	 http://sc-ctsi.org/ http://www.bu.edu/ctsi/

Animations	Seamless and non-distracting animations can play a role in whether or not the website is modern or not. From the modern CTSAs websites some of the following animations were observed: • Slideshow on the homepage used to showcase different services or upcoming events • Mouse over effects on certain buttons • Video introduction	http://www.tuftsctsi.org/ https://www.iths.org/ http://www.bu.edu/ctsi/ http://www.ccts.uic.edu/

***Finding 3*: 78.9% of homepages organize information clearly.**		
Factors	Comments	Examples
Consistency	Consistency in styling (fonts, section headers, separators, color…etc.) contributes greatly to clear organization of information on the homepage. Like the example on the right, we can see that information is organized in a consistent way. It can be easily inferred that there were 6 ways to "get help with your research" – and below it each "way" has a title, brief description and a button to access. The coloring coding also makes it easy to identify which button corresponds to a "way."	 https://synergy.dartmouth.edu/ http://www.utsouthwestern.edu/research/translational-medicine/index.html http://sc-ctsi.org/

Page Layout	It is found that the sites that have clear organization on their homepage use a common standard page layout (with slight variation): • Header • Navigation bar • A big banner across page (usually slideshows or big graphic with slogan) • 3 or 4 column layout • Footer In fact, ~97% of the websites that use this standard layout were reported to have clear organization (easy to spot sections on the homepage) Websites that did not use such layout (such as https://synergy.dartmouth.edu/) maintained good organization by ensuring • Good use of white space to separate different information • Clear indicators for separating different sections (e.g. lines, change of fonts)	Common standard layout:  Other Layout:  http://www.umassmed.edu/CCTS/ http://spectrum.stanford.edu/

***Finding 4*: Information complexity on homepages range from 2-4.**

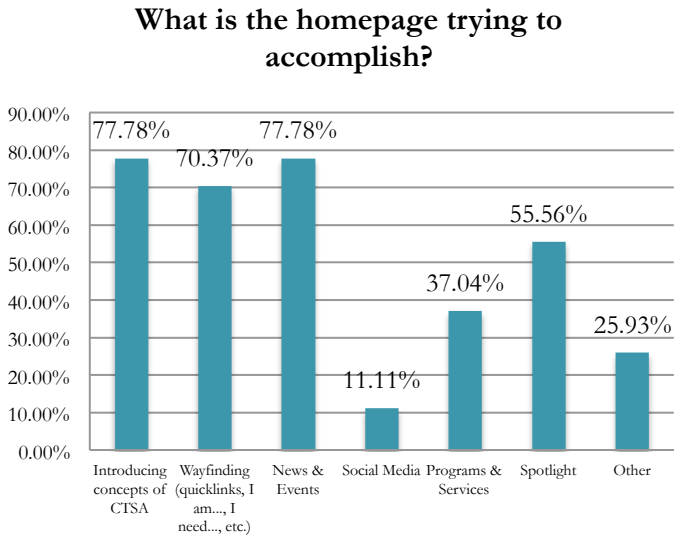


With 1 being clean and almost no information like Google's homepage, 5 being dense clusters of information and options like Craigslist's, each site's homepage was given a score. From the bar graph we can see that the level of information complexity on the homepage varies and concentrates from 2-4, with a slight majority towards the Craigslist end.

We found that it is uncommon to structure a CTSA site to just have a clean search bar since most of the sites try to communicate to the users the abundant services/programs they offer on the homepage.

Moreover, interestingly, it is found that most high performing websites (major or big research centers) focus on information delivery over having a less crowded homepage.

***Finding 5*: Top 3 homepage elements are: (1) Way-finding, (2) News & Events, and (3) Introduction of CTSA.**



We collected data on what elements were presented on the CTSA homepages to help us understand what sort of information the institutions wanted to highlight. We found that (1) way-finding, (2) news & events, and (3) introducing CTSA were the top 3 elements that most sites wanted to emphasize.

That is, overall the homepages showcase superficial (i.e. news & events) instead of in-depth content (i.e. publications, detailed description of programs & services) or social media feeds.

The "Other" elements included: Citation, Help/Ask, and Donation,

Detailed findings regarding the top 3 elements will be discussed below.

Wayfinding/Quicklinks	• Wayfinding was the top element on the homepages, which indicated that most sites found it important for existing users (investigators/researchers/community members) to be able to quickly access tools. • Some common wayfinding designs (in order of frequency observed): (1) grouped by type of services, (2) grouped by type of roles, and (3) grouped by stages of translational research. • Positive examples of wayfinding designs will also be discussed in section 4.2, *list 2*.
News & Events	• News & Events was the second most prevalent element on the homepage, which indicates most CTSA sites value showcasing their accomplishments and on-going research in the forms of stories on the homepage. • It also shows that a CTSA's website is an important gateway for users to sign up for events. • ~85% of the sites' news is directly related to the institution while the rest is related to the affiliated medical schools' news.
Introduction to CTSA	• CTSA Introduction was the third most prevalent element on the homepage, which indicates that one of the purposes of the site is to attract and educate new users. • Refer to *Finding 1* to learn about the different ways the sites are introducing themselves and CTSA.

4.2 Conveying Information

This section is meant to document methods used on the CTSA websites (not specific to the homepage) that helped contribute to conveying information to the users.

In particular, the following methods were revealed:

For conveying who they are and what a CTSA is:

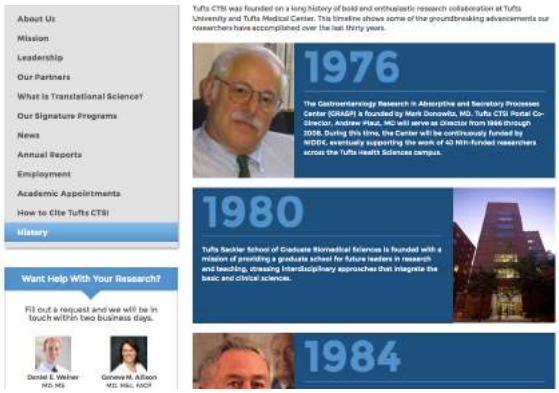
- Video
- Annual report
- History page

For conveying what services they offer:

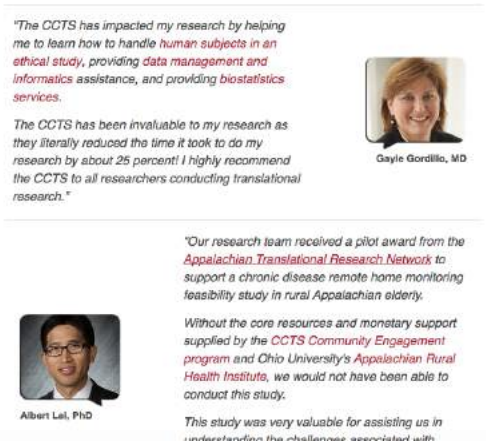
- Testimonials
- Way-finding
- All Tools Page
- Spotlight

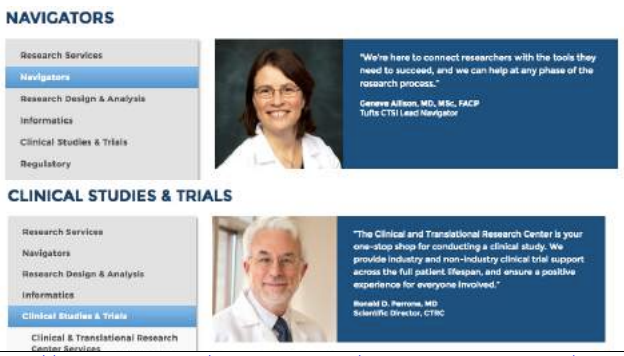
In-depth analysis and examples for each of the methods are provided below in table format.

List 1: **Methods used by other CTSAs websites to describe what a CTSA is and who they are**		
Methods	Comments	Examples
Video	Many sites, including Harvard Catalyst, embedded videos on their "about us" section or homepage to showcase what a CTSA is and who they are. Common videos' themes: • A director or principal investigator explaining the importance of their organization • An inspiring story about the importance of clinical research • Explaining the different stages of translational research (T1-T4)	 have collaborated with us to attract grant funding, build their research teams research projects forward, and engage with patients and the community.  http://www.stsiweb.org/about/ http://www.ycci.yale.edu/ https://www.iths.org/about/about-iths/

Annual Report	Another interesting way that the sites are showcasing what a CTSA is and who they are is by sharing annual reports, usually as a downloadable PDF. The annual reports describe accomplishments or new initiatives that the institution has undergone over the year. Some reports include future plans for the coming years. These reports can serve as useful material for applying for grants as well as a great go-to package to educate new users, through stories and statistics, on how the institution can help them.	 http://www.tuftsctsi.org/wp-content/uploads/2016/03/TuftsCTSI_2015_AnnualReport.pdf http://sc-ctsi.org/assets/files/SCCTSI_Report_2008_2014.pdf http://www.umassmed.edu/ccts/global-components/performance-metrics/
History Page	Under the "About us" page, some sites include a history page and list out, by year, significant accomplishments that the institution undergone. Sharing a CTSA's history gives users a sense of how much they have grown.	 https://www.dtmi.duke.edu/who-we-are/brief-timeline http://www.tuftsctsi.org/about-us/history/ http://www.rockefeller.edu/ccts/about/history https://www.michr.umich.edu/about/history

<table>
<tr><th colspan="3">List 2: Methods used by other CTSA websites to showcase their programs and services</th></tr>
<tr><th>Methods</th><th>Comments</th><th>Examples</th></tr>
<tr><td>Testimonials</td><td>One interesting way that the sites are telling the users what services or programs they offer is to provide testimonials (usually in the forms of quotes) from their users.

Testimonials are effective because they:
• Show credibility (could be from someone the users know, or may be in the same position)
• Serves as a brief intro of what the service or program does</td><td> 

*Words in red are clickable links to that service/program


http://www.tuftsctsi.org/research-services/clinical-studies-and-trials/
https://ccts.osu.edu/node/4261</td></tr>
<tr><td rowspan="3">Wayfinding Designs</td><td colspan="2">As Section 4.1 Findings 5 showed, wayfinding is the most frequently occurring element on the homepages. In fact, ~80% of the sites include their own wayfinding design. While the designs varied, they can generally be put into the 5 categories listed below. An example of each type will also be provided. Most sites have a variety of different types.</td></tr>
<tr><td colspan="2">1. Categorized by roles (i.e. I am…)</td></tr>
<tr><td>Wayfinding by roles allows users to self-identify their roles and quickly access services that are related to them.

Moreover, it is also a good way to give new users insights into what can be offered to them based on their roles.</td><td> 
</td></tr>
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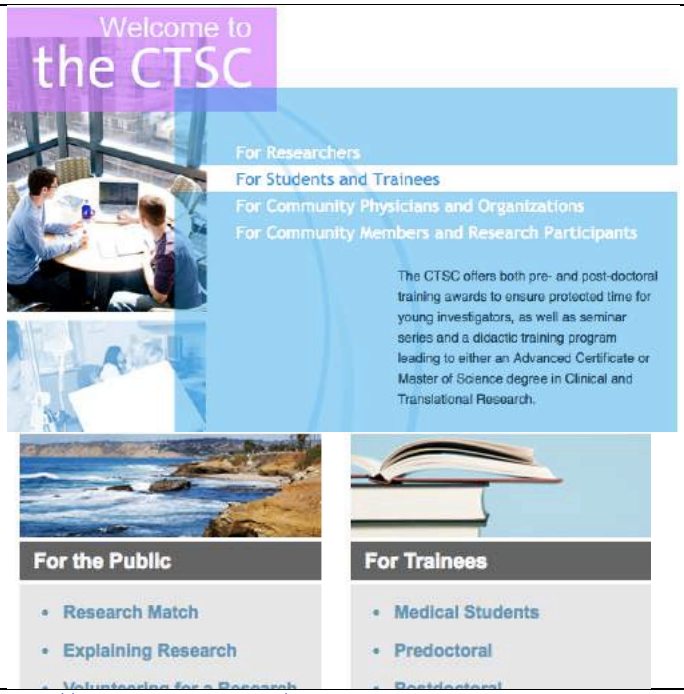
	It may cause confusion, however, for users do not have specific roles in mind.	 https://nucats.northwestern.edu/ http://ctri.ucsd.edu/Pages/default.aspx http://weill.cornell.edu/ctsc/index.html https://www.indianactsi.org/ http://ctsicn.org/
	2. Categorized by specific tasks (i.e. I need…)	
	The advantage of designing the wayfinding by tasks is to allow users to directly access the service/tools/programs based on what they want to do. It is most commonly used for services that are very popular and used by multiple roles.	

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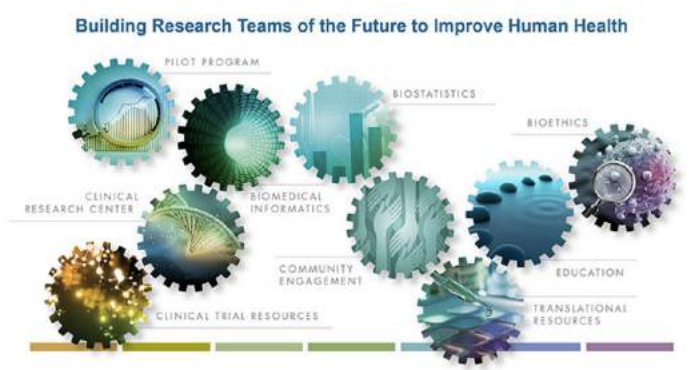
<tr><td></td><td></td><td> 

https://www.indianactsi.org/
http://ictr.johnshopkins.edu/
http://georgetownhowardctsa.org/help-me/what-we-can-do-for-you/what-we-can-do-for-you?id=08dd0084-37d8-4ec3-9853-8a6462a8f142</td></tr>
<tr><td></td><td colspan="2">3. Categorized by functional groups (i.e. types of services such a Education, Funding)</td></tr>
<tr><td></td><td>The advantage of designing the wayfinding by functional groups (or types of services) is that since most CTSAs have the same sets of groups—it is easy for the users to follow.</td><td> 

https://www.michr.umich.edu/home
http://www.ucdmc.ucdavis.edu/ctsc/index.html</td></tr>
<tr><td></td><td colspan="2">4. Categorized by steps of conducting clinical research</td></tr>
<tr><td></td><td>The advantage of designing the wayfinding by steps of conducting clinical research is that users can quickly find out what they can do</td><td> 
</td></tr>
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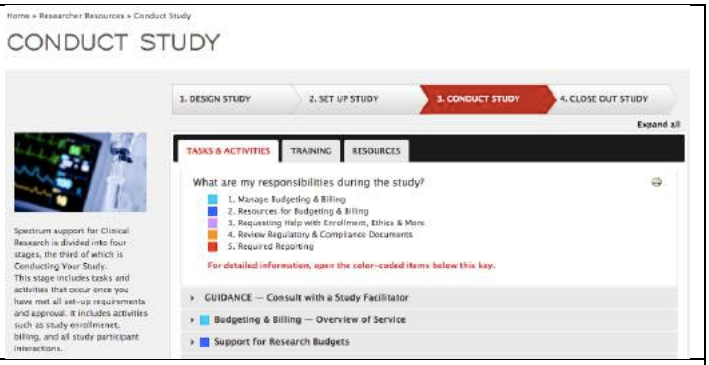
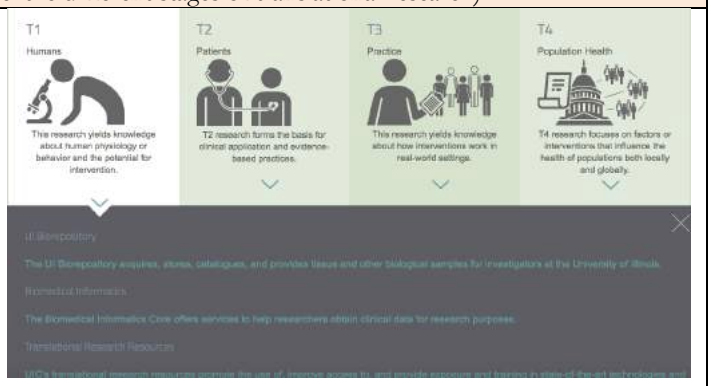
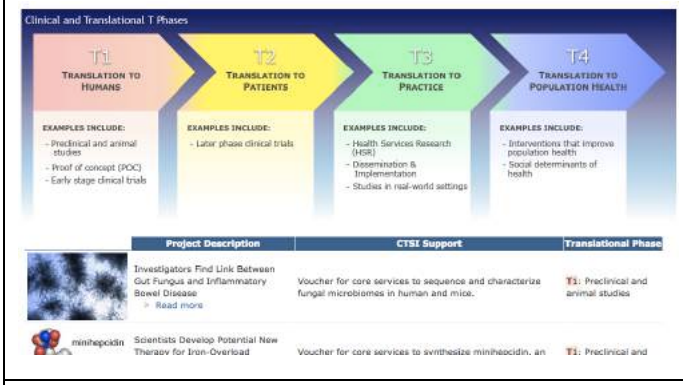
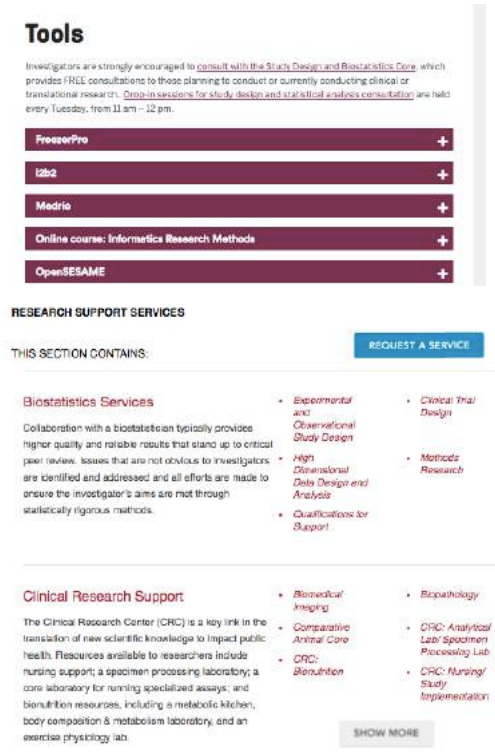
	depending on the stage of research.	 http://ctsi.ucla.edu/researcher-resources/pages/ http://spectrum.stanford.edu/accordions/conducting-study/?ch2=6
	5. Categorized by T1…T4 (i.e. the different stages of translational research)	
	This is a rather unique way of designing wayfinding—not a lot of sites have this. However, as Harvard Catalyst's pathfinder is such a design, we wanted to see if and how other institutions are doing it. In general, the advantages of T1…T4 wayfinding is the emphasis on translational research—it serves as a way to both educate users on the different stages of translation research andto showcase what services/programs the institution offers in each stage. It is rather difficult to judge whether or not such wayfinding design is functional purely by browsing the sites. We may gain more insights by talking to users to see if they actually find new services through it.	  http://www.ccts.uic.edu/ http://www.med.nyu.edu/ctsi/#panel-4 http://ctsi.ucla.edu/?

All Tools Page	Another way that sites are showcasing users what they offer is to have a page just dedicated to all the services/programs. In other words, a navigation hub containing links to access all the tools (usually listed in alphabetical order). This is a great way for users who know exactly they are looking for and can quickly access through the page.	 https://ccts.osu.edu/research-support-services http://www.bu.edu/ctsi/tools/
Spotlight	Whether it is in a form of "featured service" or slideshow banners—some sites promote their services/programs (especially new ones) by regularly featuring them as banners.	  http://ctsi.psu.edu/ https://www.iths.org/

4.3 Information Architecture Insights

Information Architecture (IA) is about organizing, structuring and labeling content in a way that enables users to find the information they need to complete a task. Since most CTSAs websites contain an abundant amount of information, having a good IA is essential for users to browse and navigate through the sites.

Hence, this section documents the findings related to components of IA (in particular, navigation bar design and information flow):

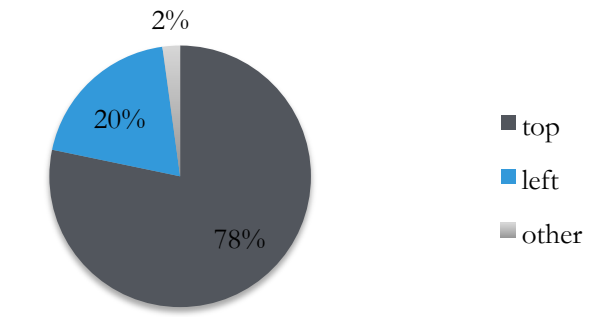
- 78% of sites use a Top Navigation Bar as the primary navigation mechanism.
- There is no clear majority for secondary navigation mechanism.
- The majority of the primary navigation bars have 5-7 menu items.
- Sites that have the same amount of menu items on their primary navigation mechanism have similar navigation combinations and grouping of the menu items.
    - For example, sites that had 4 menu items on their primary navigation, used "top + mega menu + bar" for their navigation design and "about + research + education + community" as their menu items.
- 77.3% of CTSA sites are easy to navigate.

Definitions of different types of navigation mechanism are listed below for reference:

- Primary Navigation Mechanism: usually a navigation bar is a section of a graphical user interface intended to aid visitors in accessing information across all pages.
    - Navigation Bars (Top/Left/Right): menu bar positioned on top/left/right of the home screen.
- Secondary Navigation Mechanism: the second layer of a navigation bar (usually to show the subpages of the menu pages)
    - Navigation Bars
    - Dropdown: when user hover their mouse over on one of the menu item the primary navigation, the item displays (drops down) a list of values (subpages).
    - Mega Menu: a bigger dropdown menu. Instead of a single-list, it usually has its own subsections (multiple columns).

In-depth analysis and examples for each of the methods are provided below in table format.

***Finding 1*: 78% of sites use Top Navigation Bar as primary navigation mechanism.**



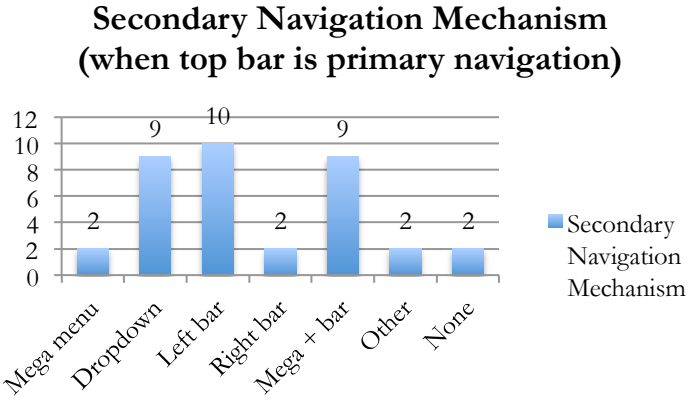
The majority of the CTSA sites (and websites in general) have a top navigation bar as their primary navigation mechanism.

A top navigation bar allows the global* items to be very visible to the users as they are always above the fold and are easier to find. It also allows more horizontal space for content.

However, due to the limited width of the menu, it does mean that fewer items can be included in the navigation bar.

*Global: means that you can access the item from any page of the website

***Finding 2*: There is no clear majority for secondary navigation mechanism.**

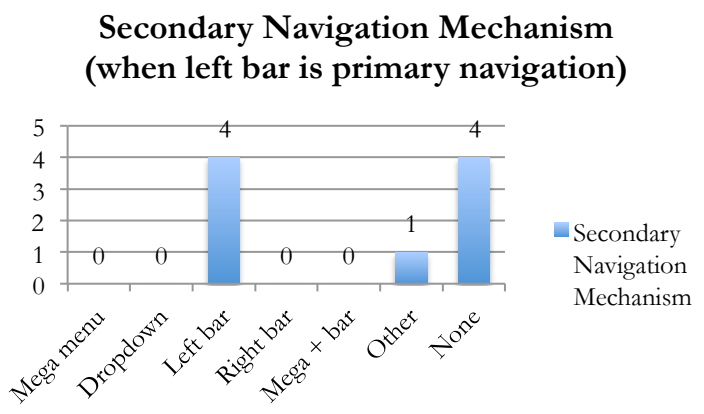


It is interesting to find that there is no clear winner for secondary navigation mechanism among the CTSA sites.

However, there are popular combinations depending on the primary navigation. As the graphs show, when the primary navigation is top bar, dropdown, left bar, and mega menu + bar are three most popular secondary navigation. On the other hand, when the primary navigation is left bar, then left bar (expandable) or none are the most popular.

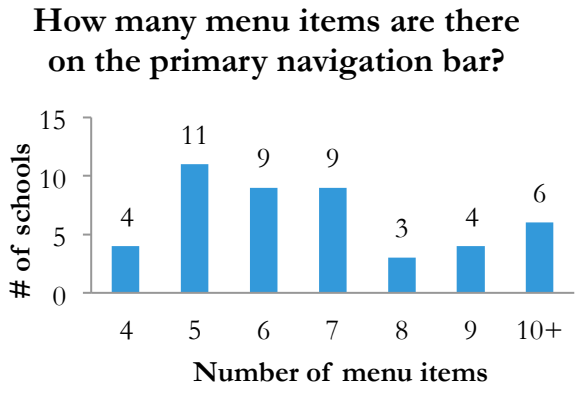
Overall, the sites seemed to be choosing secondary navigation based on how they are designing their pages. (E.g. sites that have a deeper layer of subpages prefer left navigation whereas sites that have a shallow layer of subpages may prefer a mega menu).

Hence, it can be deduced that the navigation mechanism design may play a less important role in determining whether or not a site is easy to



navigate.

***Finding 3*: Majority of the primary navigation bars have 5-7 menu items.**



As the graph shows, there is a wide range in the number of menu items on the primary navigation bar.

Some sites prefer to have fewer global menu items for the users to deep digger into specific subpages (process of elimination).

On the other hand, others prefer to have more global menu items for the users to see as many as options at first glance as possible.

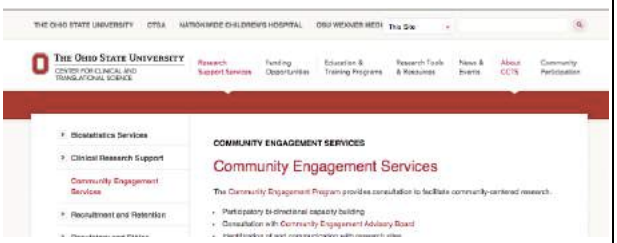
It is interesting to note that by grouping the sites by their number of menu items, we found some commonality in navigation combination and menu items combinations—which are listed below.

***Finding 4*: Sites that have same number of menu items have similar navigation combinations as well as actual menu items combinations.**

Number of menu items	Common navigation combinations		Common menu items combinations	Comments
	Primary	Secondary		
4	Top	Mega menu + Bar	About, Research Services, Training & Educational Resources, Miscellaneous (i.e. Sponsor, Request, Community)	4 is the least amount of menu items that was found in the CTSA sites. It is interesting to note that due to the fewer global items most of the navigation designs included a top bar, mega menu, and a left bar due to the abundant amount of information under each of the menu item.

			About, For Researchers For Partners, For Community Members	There are two main ways that the menu items were categorized: • By types of services (i.e. research, education…etc.) • By roles of users (i.e. researchers, community members…etc.)
5~7	Top	Left Bar Dropdown Mega menu + Bar	About, Research Services, Training & Educational Resources, Community Engagement, Miscellaneous (i.e. News & Events, Contacts)	5~7 is the most common amount of menu items that was found in the CTSA sites. There is a variety in terms of navigation design combination. However, the menu items are mostly very similar—categorized by types of services with some added pages (usually outward facing pages such as news & events).
8~9	Top	Left Bar Dropdown	Home, About, Research Services, Training & Educational Resources, Funding Resources, Community Engagement, News & Events, Contacts, Login, Miscellaneous (i.e. specific to the institution)	While not as common, some sites contain 8~9 menu items. There is a variety in terms of navigation design combination. However, it is interesting to note that most of these sites have login or profile functionality. That is, the extra menu item is commonly dedicated to a page where members of this particular site can login and manage their profiles.
10+	Left	None Other	Besides regular categories like above, menu items often include some specific services/programs and cores/facility	While not as common, some sites contain 10 or more menu items. The extra items are usually a direct link to a specific tool or facility. In general, using over 10 menu items often causes a disparity in number of subpages under each item but allows quick access to specific items. It is interesting to note that the majority of sites with 10+ menu items put their primary menu bar on the left.

***Finding 5*: 77.3% of CTSA sites are easy to navigate.**		
Factors	Comments	Examples
Consistency	In general, consistency is a big factor determining ease of use in the CTSA sites. As noted in this section's *Finding 2*, we can see that there is no one universal perfect navigation design. However, we found that as long as everything reacts in a consistent way (nothing confuses or surprises users), it really does not matter as much how you structure your information architecture.	In the section, counter examples will be given to illustrate the importance of consistency regardless of design. Yale's home menu bar, for example, has the menu items  "About Us, Clinical Trails, For Researchers, Education, Research Across Spectrum, News & Events." When users click on "About Us" or "For Researchers", they are navigated to a subpage that maintains the same navigation mechanism. However, when users click on "Clinical Trial," instead of being navigated to a subpage like users expect to, the site takes you to a completely different site titled "Clinical Trial" The inconsistency throws users off and produces a poor navigation experience. http://ycci.yale.edu/
Breadcrumbs	The CTSA websites tend to have a lot of pages; thus, use of breadcrumb navigation can greatly enhance the way users find their way around. In terms of usability, breadcrumbs reduce the number of actions a website visitor needs to take in order to get to a higher-level page, and they improve the findability of website sections and pages.	 http://www.actsi.org/index.html http://www.ctsi.pitt.edu/index.aspx https://ictr.wisc.edu/
Use of icon to indicate changes in navigation	The sites that are easy to navigate contain simple and standard icons that help indicate any changes in navigation. Standard icons meaning that they are selected for the intuitive standard use. That is, for instance, a down arrow usually indicate the button, if clicked, would dropdown to more options. In fact, for example, you can see on the right that "Research Resources" has a down arrow indicating subpages. And once that is clicked on it, the subpages show up—and then you can see that "Biobank" and "CTRC" both have right arrows, which indicates going to an	 http://www.itmat.upenn.edu/itmat/education/ http://www.michr.umich.edu/education

	external window. These icons prepare the users so that they expect changes in navigation.	
Indication of subpages overlap	Depending on the IA, it is common to have subpages that link to the same parent pages. In the example on the right, we can see that "Community Engagement Services" is a subpage of both "Research Support Services" and "About CCTS" – as shown by highlighting both parent pages in red as well as displaying a little white arrow. Many sites that were difficult to navigate neglected to find ways of indicating this. As a result, when users navigate to the overlapping subpage, they are transferred to another parent page's navigation, which easily causes confusion.	 https://ccts.osu.edu/research-support-services/community-engagement
"Sticky" Components	With the rise of responsive websites and one-pager designs, many sites have content that exceeds the length of the monitor screen and hence require users to scroll down for more information. Good sites have "sticky" components such as a "navigation bar" always fixed at top or a "back to top" icon or link always fixed at the bottom. This way, users can easily navigate to a different page regardless of how far down they are on the page.	 http://www.itmat.upenn.edu/itmat/education/ https://www.iths.org/ https://ctsi.mcw.edu/

4.4 List of Uniqueness

This section documents unique web features and initiatives that other CTSAs sites have and Harvard Catalyst doesn't:

Web Features:

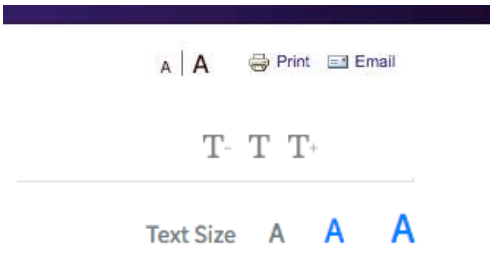
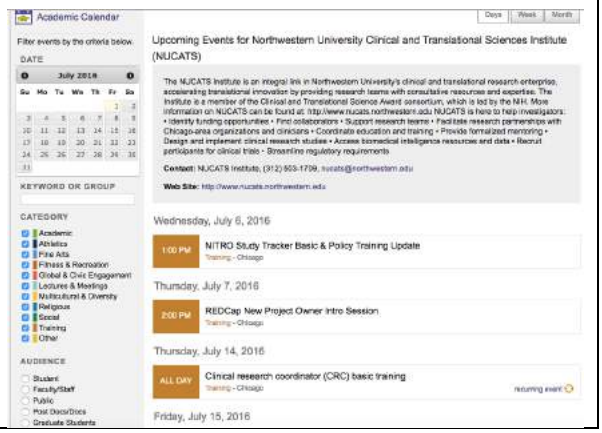
- Accessibility font controls
- Fully functional calendar
- Incorporating multimedia (e.g. apps, blogs, social media…etc.)

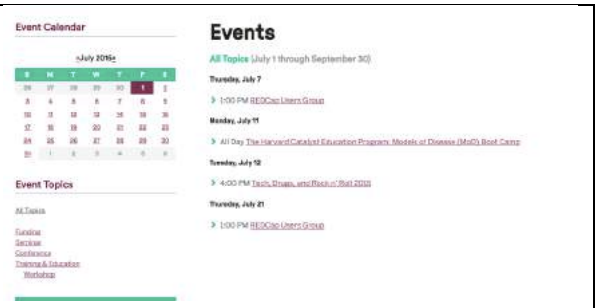
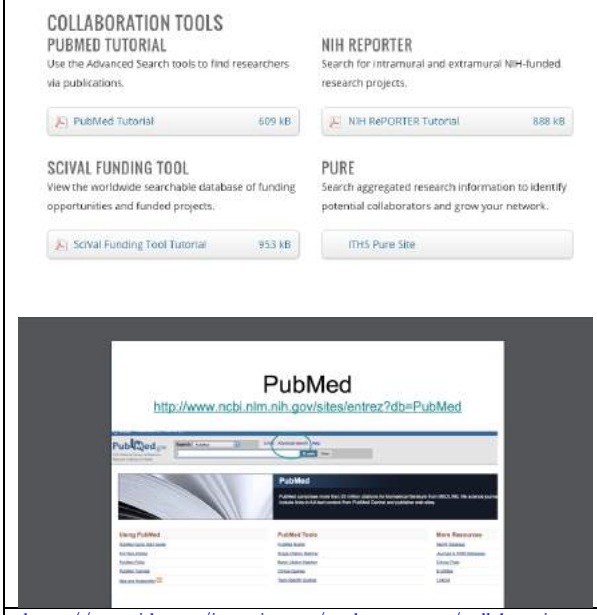
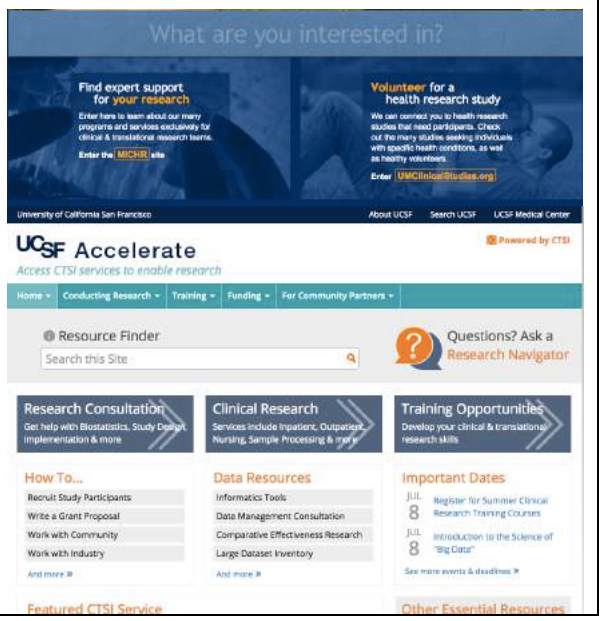
- User manuals explaining how to use tool modules
- Separate websites built for different audience (e.g. researchers, volunteers)

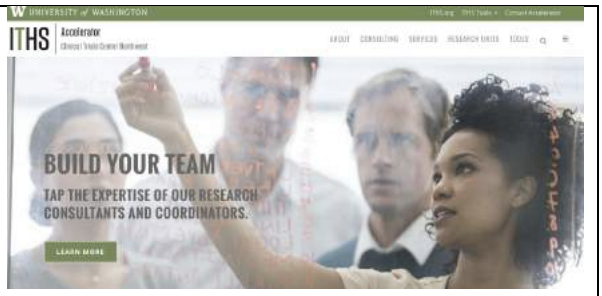
Initiatives:

- Emphasis on community engagement programs
- Membership
- Emphasis on volunteers
- Emphasis on commercializing research (e.g. entrepreneurship, competitions…etc.)
- Emphasis on sharing resources for the public eye

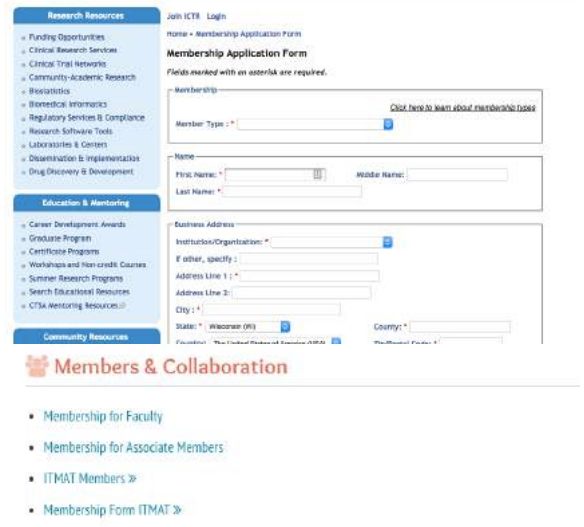
In-depth analysis and examples for each of the unique features are provided below in table format.

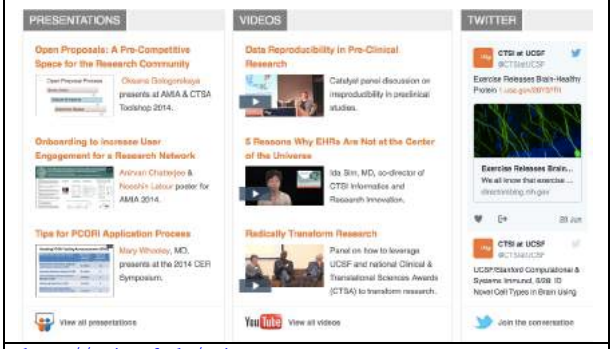
List 1: **Unique features that other CTSA sites have: Web Features**		
Features	Comments	Examples
Accessibility font controls	Some sites offer the option for users to change the font size according to their preference (e.g. individuals who may need larger fonts due to vision impairments)	 http://www.ohsu.edu/xd/research/centers-institutes/octri/ http://www.med.nyu.edu/ctsi/#panel-4 http://www.ycci.yale.edu/researchers/programs/
Fully functional calendar	Many sites offer a calendar as a way of organizing events and applications. Some sites have self-built calendars that contain functions such as filter or sort where users can, for example, see at a glance what events are under "education" section. Most other sites have a simple Google calendar plug in. (no filter/sort information).	

		 http://www.bu.edu/ctsi/events/?date=20160701 http://planitpurple.northwestern.edu/calendar/1059
User manuals explaining how to tool modules	The CTSI at University of Washington utilized a unique method for linking to individual tools. Instead of embedding the tools on the website (or having a link to an external window), they built a pdf manual that contained a link to the tool and documentation regarding how to use the tool. Although it may be an extra step for current users who are familiar with the tool, I think the pdf manual could be useful for new users to quickly understand how to access/use the tool.	 https://www.iths.org/investigators/tools-resources/collaboration-tools/
Separate websites built for different audiences (e.g. researcher, volunteers)	USCF, UMICH, and UW are three notable schools that built a separate site for different audiences. This way, researchers or volunteers can quickly access whatever services they need. The second site generally focused more on quick access and less on information content (public-facing information).	

		 https://www.iths.org/accelerator/ https://umclinicalstudies.org/ http://accelerate.ucsf.edu/

List 2: **Unique features that other CTSA sites have: Initiatives**		
Features	Comments	Examples
Emphasis on community engagement programs	Many CTSA sites focused on community engagement. Some examples include: • Using graphics relating to the theme of collaborative community/ethnicity engagement • Building a main page dedicated to community programs • Building a membership base • Separating researchers/investigators by ethnicity and creating focus groups • Free workshops/groups that offer meet-ups for community members to discuss topics relating to healthcare or research That is, the sites focus on building relationships in their local areas to empower their community. It is apparent on their websites that these CTSAs try to develop their local resources and people.	 http://ctsi.psu.edu/community-engaged-pilots/ https://www.iths.org/community/

Membership	Some CTSA sites, unlike Harvard Catalyst, built a membership for the institution. That is, users need to register a new account outside of the one provided by being part of the affiliated school. Advantages of such strategy are that the CTSA would then have data regarding who their users are and how each tool is being used by what groups of users. Accurate infographics about usage can then be produced. Moreover, it also gives a more personal feel for the users. They have the options to set up profile and maybe their own homepage as to what tools they use the most. Finally, membership gives off the feeling of authority and exclusivity—which can increase the credibility of the institution. A disadvantage of the membership is that users need to create yet another account.	  http://www.itmat.upenn.edu/itmat/membership.html https://ictr.wisc.edu/ictrmember https://www.iths.org/about/join-iths/
Emphasis on commercializing research	Some CTSA sites also see targeting the business value as one important component of accelerating clinical research. Hence, those sites organize events or programs relating to entrepreneurship (e.g. competitions where researchers can pitch ideas of how to cure a particular disease) to gather innovative ideas of how we can commercialize what it is in the lab to transition to humans.	   http://www.ctsi.pitt.edu/index.aspx

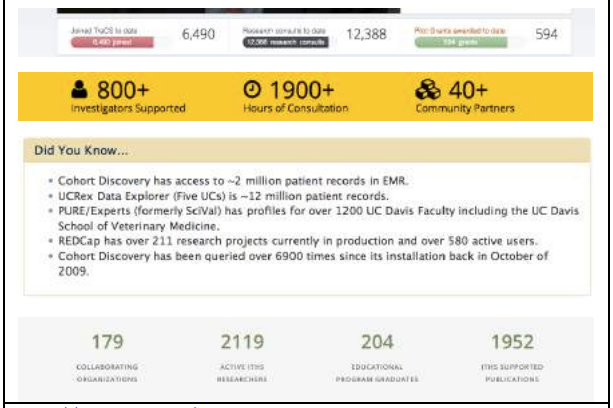
Emphasis on sharing resources for the public eye	UCSF create a dedicated page filled with different types of multiple media (e.g. apps, blogs, social media…etc.) to really share their resources and engage with the public. They did a great job educating and updating the public (or potential new users) of what resources they have this way.	 https://ctsi.ucsf.edu/voices

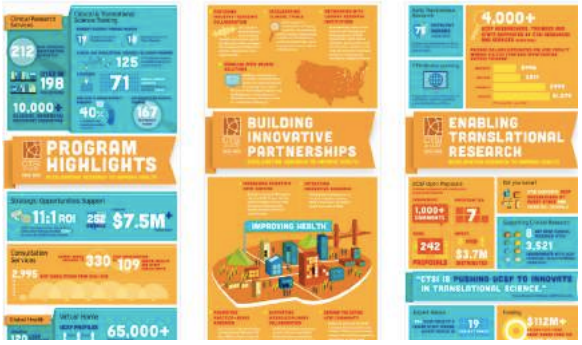
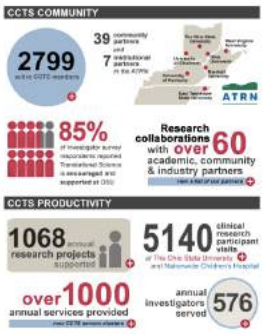
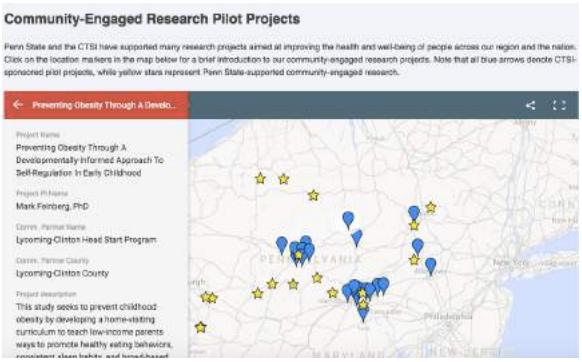
4.5 List of Unique Information Visualization Method

This section documents how other CTSAs sites visualize information as well as what kinds of information they are highlighting (e.g. # of clinical trials per institution):

- Stats bar showing accomplishments
- Infographics showing program flow, accomplishments, and others
- Use of maps to showcase collaboration efforts

In-depth analysis and examples for each of the methods are provided below in table format.

***List 1:* Methods of information visualization that other CTSA sites have**		
Methods	**Comments**	**Examples**
Stats bar showing accomplishments	Many sites use impressive statistics to showcase their accomplishments. It is a way for users to quickly find out what they have been doing and the scale of the institution. A list of common information is organized in a table at the end of this section.	 http://tracs.unc.edu/ http://www.ucdmc.ucdavis.edu/ctsc/area/informatics/index.html https://www.iths.org/ http://sc-ctsi.org/

Infographics showing program flow, accomplishments, and others	Some CTSAs created infographics to give users a graphical way of understanding their institution.	  https://ctsi.ucsf.edu/our-work/infographics http://www.umassmed.edu/ccts/global-components/performance-metrics/ https://ccts.osu.edu/infographic
Use of maps to showcase collaboration efforts	Two sites (Penn State and Duke) used an interactive map where users can see visually what projects the institution has undergone in what area. Moreover, users can click on the icons on the map to learn more about each project and what it does.	  http://ctsi.psu.edu/community-engaged-pilots/ https://www.dtmi.duke.edu/duke-ctsa/ctsa-collaborations

List 2: **Information that the CTSAs sites are highlighting**
Number of Awards
Number of Researchers/Members
Number of Funds
Ranking
Number of Projects
Grant Distributions
Number of Collaborating Institutions
Number of Educational Program Graduates
Number of Cited Publication
Number of Integrated Patient Data
Number of Visits to Services/Programs
Number of Workshops & Seminars Held
Percent Increase in Certain Data Services
Percentage of Good Feedback

4.6 Information Accessibility

This section documents findings regarding what information the other CTSAs sites are choosing to hide behind login or allow public to access.

In terms of accessibility, it is found that almost all CTSA sites are on the "open" end of spectrum. That is, almost all information regarding services, programs, events, and people is accessible to the public; however, the actual use of these services, programs, or access to events is limited to registered users or school-affiliated officials.

Below is a general list of what is behind login verses what is open to public to access:

Behind Login	Accessible to the Public

• Services/Tools require login or request form • Apply for education programs/funding • Educational materials (videos and presentations) • Membership profile page	• Happenings (news & events) • Information regarding services and programs (what it does, how to request, and success stories) • People's title and research focus (for collaboration) • Information regarding application for grants • Past award receivers • Some sample educationalj materials • Volunteering opportunities • Community programs (public workshops and talks)

4.7 Mobile Insights

This section documents the findings regarding whether or not other CTSAs sites have been building responsive sites in order to accommodate the trend of changing screen size and different devices' (e.g. mobiles, templates) functionalities.

In fact, **it is found that 37% of CTSA sites are responsive**. However, further investigation into these responsive sites reveals that these sites don't actually work well on mobile devices, because most of these sites, while responsive, kept all layout and complex as it is. That is, aside from making the content resizable according to the screen and minimizing the navigation bar to a hamburger menu (a symbol consisting of three parallel horizontal lines (displayed as ≡) that is used as a button) —these CTSA sites did not put much effort into ensuring the rest of the website worked well.

In particular, these problems were found:

- When the hamburger menu expands, due to the large number links, menu bar expands to a very long list of options on the mobile screen, which requires users to scroll all the way down to find items in the menu bar.
- Media such as flash slider, images, or videos were not optimized for mobile and thus caused long loading speed or incorrect positioning of items.
- While superficial content such as events and news were easy to browse on a mobile device, complex tools were not responsive.

These problems, can cause users to be annoyed due to a disparity between users expectation and site usability. In particular, when you have a site that appears to be built for mobile, most users expect the site to be fully functional (e.g. facebook); however, when a site is just the same site but scaled to a smaller screen, it is less usable compared to sites specifically built for mobile.

In conclusion, while we found that although we saw a trend in the CTSA sites to be responsive, the sites themselves were not fully optimized for mobile.

4.8 Notable Sites

Below is a list of CTSA sites (not in any order) that I thought overall did a good job:

Affiliated School	Website Link
Ohio State University	https://ccts.osu.edu/
Boston University	http://www.bu.edu/ctsi/
University of Illinois at Chicago	http://www.ccts.uic.edu/
University of Pennsylvania	http://www.itmat.upenn.edu/
University of Washington	https://www.iths.org/

4.9 Common Mistakes

This section documents some common "mistakes" that I found hindered my personal experience of the sites when I was analyzing them. While I realize it may be biased due to the fact that it is my personal experience, I believe it could provide insights into what to test later in the redesign project:

- As users dig deeper into the directory (subpages of subpages), they lost track of where they are in the navigation, because:
    - There was no indication of "where I am" (e.g. breadcrumbs, highlights on navigation bars)
    - Some sites link user to an external window with completely new design
- Some links that are meant to open to an external window opened the page on the current window instead. This caused slight difficulties in navigating back to the original site.
- There are broken links on the website.
- The information is completely outdated.
    - Some news & events information is from a year ago, which would suggest to the user that the institution might be inactive.

5. Discussion and Recommendations

Before we start getting into the findings and recommendations, it is important to note that while the results of our competitive analysis are valuable in showing popular trends or commonalities among the CTSA websites, it is not a strict guide that should blindly adopted or followed. Instead, each finding should still be user-tested and evaluated, because it is possible that some of the findings may seem great from a design standpoint while it is actually not practical for different user groups.

On the other hand, the findings of the competitive analysis help answer important identifying questions before diving into the redesign project:

Is looking modern an important factor in the CTSA sites?

The short answer is No; in fact, an insignificant quantity of CTSA sites are modern, and of the few ones that are, loading speed is comparatively lower due to heavy media and animation of modern designs. Since the ultimate goal of the CTSAs is information delivery in an efficient manner, most sites did not focus on keeping their designs modern.

I have sorted the data by year funded, location, and school type, and there were no significant correlation found in regards to modernity. Hence, this further proves that while it is nice for the sites to look "good," it is not an important factor in the CTSA sites.

Is there a trend to go mobile for the CTSA sites? And do we see the value in building a responsive site?

So as the findings suggest 37% of the CTSA sites are responsive in a minimal manner. However, overall the mobile user experience of these sites was not optimized—most of complex tools did not work on mobile devices. Moreover, it is also found that the majority of these site contained more superficial content (e.g. news & events) on their homepage.

Therefore, it can be concluded that although there is the global trend of making websites responsive to fit on any device, there doesn't seem to be an immediate need for the CTSA sites. That is, most of the sites that provide this functionality simply wanted to allow users to browse news, events, and information on their websites, but they did not expect the users to actually use any of the tools on their websites.

Hence, while not immediate, I see the value in building a responsive site if we understand more of users needs and ensure maintenance. That is, if a mobile site is something that we would like to build, I suggest launching more user study to see what specific materials users may expect to see and interact with on a mobile site. Moreover, for materials such as new & events, videos, podcasts, we have also make sure to have the manpower to constantly update to increase value of a mobile site.

How important is a good information architecture design for the CTSA sites? Is there a recommended IA design?

As expected, a good information architecture design plays one of the most essential roles for the CTSA sites. From analyzing the navigation bars and grouping of the menu items, it can be deduced that a lot of thought were put into the design to ensure users can navigate through different pages smoothly as well as efficiently find what they are looking for.

Overall, I found that most CTSA sites grouped their subpages in a consistent manner. That is, either according to different service categories (e.g. education, research, community) or different user roles (e.g. researchers, volunteers). I can see that since all CTSAs follow the similar grant guidelines, the services they offer are essentially the same and hence there were no surprises in terms of grouping these services. The only difference between the sites was in the variety of wayfinding designs, which suggests that although all CTSAs offer similar services, their users may have different needs. One site's consulting service may be the most popular while the other could be an educational program.

Thus, while there is no one recommended IA design for the subpages because they are all very standard (and similar to that of Harvard Catalyst), I think it would be valuable to find out from our own users and data what tools/services are being used the most, to help us understand what should be highlighted via the wayfinding. One other recommendation is also to consider the navigation design of top + mega + bar as it was the most popular combination among sites that ranked a 4 out of 5 in terms of information complexity. I found this combination to be one of the clearest ways to show case what CTSAs have to offer. The subtitles on the mega menu really helped further categorize services. And since a lot of the services require multiple subpages (or links) to further explain, that extra navigation bar facilitated navigation through those links.

Is there anything that we aren't doing and should considering adopting?

As the unique services and visualization sections of our findings have shown, there are many exciting things that other CTSAs are doing—and while some of them would be great additions, there are some factors that we need to evaluate before we adopt.

First, we should carefully consider our own capacity to see if we have the resources to do what the others are doing. For example, we know that UCSF has a page dedicated to outreach (e.g. news, events, stories, photos, presentations and videos) and public education, and while it would be beneficial to attract new users with multimedia page, it would require a large effort from the communications team to keep the page relevant and alive. If we don't have the resources to do so, then instead we should consider changes that we can do once and won't have to update for a while (e.g. one-time photo sessions with the researchers or infographics).

Secondly, looking into the next CTSA grant may also be important before deciding new additions—to know what we want to emphasize and focus on. For example, if building a local community or establishing ethnicity programs were to be a focus for the next grant, this analysis contains some examples of how we could implement such programs.

Finally, internally we should agree on the target audience: do we want to expand our user group or continue to build stronger ties with existing users? Or a mixture of both? That decision could affect the focus and scope of a redesign.

Below is a list of features that I found would be a plus to Harvard Catalyst, based on this competitive analysis; however, further analysis is needed to determine the right course of action:

- Membership program
- Infographics
- Separate public-facing/researcher-facing sites
- More graphics or programs showing and engaging the Harvard community