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The Impact of Organizational Structure on Design Practices and Outcomes: A Case Study

by

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Abstract

The way we use something impacts 1) what we are able to get out of it, 2) our feelings about it, and 3) our willingness to continue using it. This qualitative exploratory case study investigated the impact of an astronomy research institute's organizational structure on the design practices of its teams and the design outcomes of its projects. Multiple factors impact interorganizational communications, workflows, and resource distribution, which are the building blocks of any organizational structure. The factors in question primarily exist on a macro level, making them a difficult subject to study, which provides some explanation for the existing research gaps. To begin to fill these gaps, this study's research questions were as follows:

- *How does an organization's structure (i.e. its interorganizational communications, workflows, and resource distribution), or lack thereof, shape the deliverables (i.e. products and/or services) they provide and maintain?*
- *Further, how does this structure impact the way end-users interact with and feel about the deliverables they make use of?*
- *Finally, how does this structure affect an organization's employees (especially user-experience designers) with their varying tasks and priorities, both in terms of their collaborative capabilities and in terms of how they feel about their work?*

The experiences of the institute's employees and end-users were gathered and analyzed to this end. There was overwhelming agreement that the institute's navigation overall was confusing and frustrating. This institute's organizational structure creates, contributes to, and/or exacerbates deficiencies experienced in navigation. This applies to both the way end-users navigate their interfaces and the way employees navigate their day-to-day workflows. Since this institute has not yet centered its users and UX design methodology in its processes, these related challenges in navigating interorganizational communication, resource allocation, interfaces, individual webpages, and menus persist.

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I would like to thank all of my former colleagues who participated in or otherwise championed this research. This project would not have been possible without them. I would also like to thank all of my friends who supported me in overcoming the many walls I hit throughout this project. There are far too many to individually list them all, and I feel very fortunate for that. A couple of them, however, require recognizing. As one of the few people I know who has multiple master's degrees, Ben Loucks was perfectly situated for me to talk, and sometimes grumble, about this process while he nodded knowingly. He has repeatedly reached out when I have gone dark for long stretches of time due to this project. He also acknowledged me in his thesis, so I am under contractual obligation to return the gesture. I am also eternally indebted to Cayla Schellin, who has dependably been a source of solace, strengthened my resolve, and given me so much to look forward to each and every day. ♥

I am deeply grateful to Todd Harper for all the guidance and encouragement he has provided me, starting well before I had even conceived of this thesis project. His contributions as my secondary reader have improved the cogency of this research and ultimately helped me cross the finish line for this degree. Finally, I could fill entire pages with my appreciation for my endlessly patient and supportive advisor, Bridget Blodgett. In the interest of brevity, I will simply say that she has continuously alleviated my impostor syndrome and made me feel more confident and coherent as a researcher, writer, and designer.

DocuSign Envelope ID: F43D90D7-BEDE-4A70-9703-D921C546A0FD

Table of Contents

DocuSign Envelope ID: F43D90D7-BEDE-4A70-9703-D921C546A0FD

DocuSign Envelope ID: F43D90D7-BEDE-4A70-9703-D921C546A0FD

Chapter 1: Introduction

User experience (UX) design offers a comprehensive framework for analyzing the creation and use of tools. As a field of study, user experience design has been around since the 1940s. It focuses on the interactions between humans and the tools they use within a given system or environment. Meanwhile, the field of astronomy has been around in some form since 3114 BC. Astronomy provides a framework for analyzing the creation and existence of our universe. These two fields have had multiple decades of interplay with each other, there is still much to be learned about the relationship between the two.

We have progressed well past the point of observing the heavens with the naked eye, as we have many created many space telescopes and observatories that are used to examine the known universe. These have captured an unimaginable amount of data over decades, and they continue to do so to this day. The ability to sort through this data quickly and easily is essential to astronomers. UX design's role in the realm of astronomy is to create order from chaos, namely the unimaginable amount of data at hand. Impediments to this are not merely preventing individual astronomers from doing their jobs; they actively impede scientific progress toward a deeper comprehension of the universe. To this end, this qualitative exploratory case study investigated the impact of an astronomy research institute's organizational structure on its projects and teams.

Multiple factors impact interorganizational communications, workflows, and resource distribution, which are the building blocks of any organizational structure. The factors in question primarily exist on a macro level, making them a difficult subject to study, which provides some explanation for the research gaps here. To begin to fill these gaps, this study's research questions were as follows:

- *How does an organization's structure (i.e. its interorganizational communications, workflows, and resource distribution), or lack thereof, shape the deliverables (i.e. products and/or services) they provide and maintain?*
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- *Finally, how does this structure affect an organization's employees (especially user-experience designers) with their varying tasks and priorities, both in terms of their collaborative capabilities and in terms of how they feel about their work?*

To answer these questions, data was collected through semi-structured interviews, document analysis of pre-existing work-related data sets, and participant observation, due to my employment with this institution as a UX designer for a little over a year. The findings from these methods were then triangulated in order to extract the most potent patterns and themes.

Most users who participated in this research communicated a desire to better understand this institution's many websites. In the absence of a clear and unified navigation system, these users conveyed feelings of bemusement and disappointment in their experiences. The institute's main site's primary and secondary navigation systems were scrutinized and redesigned based on user feedback. While this study has multiple limitations, some suggestions for short-term and long-term improvement are posed, both in relation to the specific navigation systems that were redesigned as part of this project and in relation to this organization's overall structure. The potential benefits of these recommendations are discussed.

The heart of this research concerns the far-reaching implications of systems and what could happen when they are improved as opposed to what will likely happen if they are not. The deficiencies in social organizations tend to get embedded in their technical artifacts (Winner 1980). It is not merely about identifying and applying better design principles. There is a need here to rethink not only the principles at play but the policies as well. Establishing well integrated collaborative systems can result in reductions in employee turnover, resources used, time spent, and interfaces abandoned by users.

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Chapter 2: Literature Review

This research study draws from three primary areas: computer supported collaboration, interorganizational communications, and interaction design. These are the areas that that help establish an understanding about the interplay of technology, social dynamics, and structural power in the workplace. To begin building this understanding of an organization's structure and the impacts of that structure, developments in these foundational fields must be reviewed.

2.1 Computer Supported Collaborative Work

Collaborative work, particularly computer supported collaborative work (CSCW), was already ubiquitous before the arrival of COVID-19. The rise in opportunities and expectations pertaining to telework have necessitated a re-examination of this unique kind of collaboration, which has not been without its challenges. "For the purpose of designing usable and useful computer systems for cooperative work settings, we need to know what makes work situations complex to competent actors and how computer systems may be of assistance to reduce or otherwise cope with this complexity" (Carstensen 1999, p. 18). The assumption being made here is that computer systems are or eventually will be able to minimize or help users cope with various complexities. However, some complexities evade helpful mediation facilitated by computers. "Effective support for multiple users, groups, or organizations requires a deep understanding of interactions between technology and complex social, political, and motivational dynamics; complexities that have been described as being almost insurmountable to meaningful, generalizable analysis…" (Wallace 2017, p. 1). Despite the seemingly insurmountable nature of these complexities, there is a recognition of the importance in both attempting to make sense of them anyway and the consequences of failing to do so.

As Ackerman puts it, CSCW needs "…a fundamental understanding of how people really work and live in groups, organizations, communities, and other forms of collective life. Otherwise, we will produce unusable systems, badly mechanizing and distorting collaboration and other social activity" (2000, p. 199). Ackerman goes on to say, "CSCW exists intellectually at the boundary and interaction of technology and social settings. Its unique intellectual importance is at the confluence of technology and the

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social, and its unique potential lies in its recognition of and attention to both" (2000, p. 198-199). Underpinning Ackerman's observations are a sociotechnical understanding of CSCW and an acknowledgment that any improvements in CSCW will require a deeper probing of the social aspect. This acknowledgment in particular is one that is mirrored within this very research study. It seems relatively commonplace for structures containing both technological and social elements to neglect reckoning with the latter, potentially due to misunderstanding the consequences in doing so.

Deepening the collective understanding of CSCW's social aspect was expressed by Grudin well over a decade prior: "We need to have a better understanding of how groups and organizations function and evolve than is reflected in most of the systems that have been developed" (1988, p. 90). Grudin continues, "If we are going to support groups that include any diversity at all, we will have to learn much more about how different kinds of people work" (1988, p. 91). As demographics in workplaces have shifted and continue to do so, this point remains relevant. It is reasonable to assume that as workplaces have diversified, so too have the values and goals held by members within a given workplace. Schmidt "…view[s] organizations as a coalition of individuals motivated by individual interests and aspirations and pursuing individual goals" (1992, p. 27). This individualist perspective may lack some nuance and recognition of more collectively held interests and goals in an organization, how those are formed, and to what extent they are carried out.

That said, it is still certainly worth examining the ways in which interests and goals diverge within a workplace and the cause(s) of that divergence. "Most of the information generated and processed in organizations is subject to misrepresentation because it has been generated, gathered and communicated in a context of goal incongruence and discord of interests and motives" (1992, p. 27). This is a noteworthy addition to studies in this field, and it is important to recognize that the word "misrepresentation" is not inherently meant to convey negative or antagonistic intentions (although it certainly can reference this). Rather, "misrepresentation" is used here to convey both the passive and active instances of misinterpreting or misunderstanding information. According to Schmidt, there is a view "…among many designers of information systems that information is something innocent and neutral. This view

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implies that to design an information system for a company one need only to consider the data flows and files existing in that company" (1992, p. 27). While Schmidt's observation here focuses on how the flaws in this perspective could result in a poorly designed information system, it can also be applied on a much broader scale. That is, the processes in which information is gathered, analyzed, synthesized, and shared are not without bias.

Acknowledging the existence of bias in these processes is an important first step to reach before even identifying how many biases are in play, whose biases diverge and why, and where they might find common ground. In accordance with this, the authorial bias within this very research study was made clear in the introduction. Further, the way different participants' biases impact both their feelings about their experiences with the institute in question and their view of the larger organization will be discussed at length later in the Data and Analysis section.

Along with issues of bias pertaining to information, Schmidt also discusses issues of ownership. "Problems of information-ownership, and the responsibility for its upkeep and dissemination to others, have been neglected in much of the information systems literature" (1992, p. 27-28). It is possible that this has been neglected within the literature as a result of being neglected within many workplaces themselves. Multiple participants in this research study commented on not knowing which of their coworkers had ownership, over what exactly (e.g. a given project, team, images, other assets, etc.), and where this ownership was being exercised (e.g. Google Drive, Box, other available content management systems, etc.). This results either in duplicate work as employees take ownership of things on an ad hoc and sometimes redundant basis, or in a lot of wasted time trying to track down and gain access to resources. Schmidt concludes, "These realities of organizational life must be investigated seriously if CSCW is to be turned from a laboratory research activity into an activity producing useful real world systems" (1992, p. 28). This is an area that would be benefited by more participant observation research, including this research study. An outside researcher's ability to assess and understand a given organization will inevitably be limited compared to a researcher who already exists within and navigates that system.

A growing number of organizations are having to manage collaboration not only among their employees, but also between their employees and their end-users. "The

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involvement of service users is highly desirable in the development of new research areas, as they are the ones who experience the impact of structures and processes on outcomes" (Willumsen 2012, p.6). Despite this desirability, many organizations, including the one at the center of this research project, still fail to integrate end-users into their processes. Willumsen goes on to say, "…in order to shed light on service integration, one needs to capture user perceptions about the accessibility of relevant information and the design of the service. Interprofessional collaboration concerns trust between users and professionals, as well as their motivation" (2012, p.6). While this study does highlight a lack of established trust between this organization's employees and end-users, more research is certainly needed on the efficacy of methods used to create, maintain, and even repair trust between these groups. Willumsen echoes this: "…there is still insufficient knowledge of the complex area of collaboration, and the interprofessional literature highlights the need to develop adequate research approaches for exploring collaboration between organizations, professionals and service users" (2012, p.1).

In contrast to Schmidt's earlier statement about individuals and their respective interests, Holmlid has "…shown how a focus on the individual is not enough when aiming for developing an organisation's design capability or to integrate design in organisations" (2018, p. 10). This emphasizes the core of this research study, concerning how structural issues necessitate a structural lens and, eventually, structural changes. Holmlid continues to explain how managers do not "…learn how to require design in development, nor to learn how to prepare resources and processes to work with design when being part of development" (2018, p. 9). This failure at a managerial level has a wide-reaching impact on the designers, developers, and the end-users, as demonstrated by this research study. "Design culture, seen as the provisions for an organisation to have design as an integrated practice, is heavily dependent on how design is presented, understood and nurtured in the multitude of discourses in the organization" (2018, p. 9). This is an important addition from Holmlid that can be seen reflected in the practices of the organization in question.

A divergence or absence of understandings about design held by varying employees with differing backgrounds has ultimately resulted in a disconnected design

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culture. “Communication in interdisciplinary design teams is a major problem for HCI [human-computer interaction] practitioners” (Borchers 2000, p. 376). Since UX design can be such an interdisciplinary process, this makes clarity of communication both more important and more challenging. Borchers continues, “To create successful interactive systems, user interface designers need to cooperate with developers and application domain experts in an interdisciplinary team. These groups, however, usually miss a common terminology to exchange ideas, opinions, and values” (2000, p. 369). While these groups may lack a common vocabulary at other organizations, this research study found that the UX designers and developers at the institute have little to no communication with each other. That in and of itself is very illuminating about this organization’s design practices. Further research is needed to determine whether these two groups would be able to effectively communicate with one another given the opportunity.

2.2 Interorganizational Communication

The field of interorganizational communications goes well beyond CSCW. “The study of interorganizational communication has its origins in sociology and management. Over time, interest in the topic has expanded, not only in organizational communication, but also in community psychology, implementation science, social work, public administration, and organizational psychology” (Shumate 2017, p. 2). Shumate goes on to say that it “…includes not just organizational leaders and employees. In addition, a host of stakeholders, or people who are invested in and/or affected by organizations, receive and co-construct messages about organizational affiliation. These stakeholders both enable and constrain relationships among organizations” (2017, p. 2). This rang true within the findings of this research project, although several factors prevented studying the specifics of the relationships between the research site, its parent organization, and the consortium that operates the research site on behalf of the parent organization. “The overlap between micro-level and macro-level networks speaks to the human nature of organizing and how it is especially apparent in *interorganizational* relationships” (Doerfel 2010, p. 156). Further research is certainly needed on complex nature of interorganizational relationships such as these.

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Doerfel continues, "…communication flows in and around a system and does not appear to deplete, per se, the way tangible resources do" (2010, p. 157). This is an interesting and disputable point, because while communication may not exactly run out in the same way that money or time can, it can still experience constraints much in the same way as other resources can, as identified in this research. "As a relational competency, communication takes on the quality of a 'quasi-public good' in that it tends to increase in value when used and shared and, thus, fosters 'positive-sum' benefits…" (Paulraj 2007, p. 57). This is also debatable, since sometimes an increase in communication can contribute to burnout, especially in this post-COVID-19 world. It follows that people within a system who feel burnt out by that system would not communicate as clearly or collaboratively as people working within a system that energizes them, or at a minimum does not deplete them. More studies are needed on the impact of the COVID-19 pandemic on communication and collaboration in the workplace and in general.

"Because the participants assign meaning and the researcher is the primary measurement device in the study, there are many possible interpretations of qualitative data. It is the job of the researcher, however, to derive theoretically sound and consistent conclusions..." (Doerfel 2010, p. 134). This echoes the previous sentiment about information not being neutral; qualitative data in particular is subject to a variety of interpretations. A researcher undertaking a study like this one has the intricate responsibility of recording, analyzing, and operationalizing both the communications themselves and the abstract concepts and feelings expressed within said communication in order to convey the interplay of diverse perspectives fairly.

On the matter of diverse perspectives, a persisting theme both within this research study and within the literature is the disconnect between those who do not practice UX (often managers) and those who do. "Successful UX integration necessitates close cooperation between UX and non-UX practitioners to ensure common goals" (Kashfi 2019, p. 37). It can be a source of strain when those who do not practice UX are dictating the work and priorities of those who do. Kashfi continues, "…organizations need to increase knowledge and awareness about the role of UX in the above topics and emphasize that UX is not only about GUI design and aesthetics but also directly related to value delivery to customers and end-users" (2019, p. 26). It is a common

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misconception that UX design is synonymous with graphic design and therefore primarily concerned with what something looks like. Whether this misconception is a cause or an effect of poor UX design integration would require more research to discern.

Ultimately, a lot of work is needed, both at the organization in question and more broadly, in order to establish adequate communication within and between different teams comprised of different roles, all in service of a suitably integrated UX design process. "It is expected to observe a power-struggle among various groups of practitioners concerning the ownership of UX" (2019, p. 37). While Kashfi may assert that this is an expected phenomenon, it is not necessarily an inevitable one. There are existing organizations with entire offices dedicated to UX design, and multiple research participants referenced that working in these environments previously. While this is not a necessary arrangement for every organization (or even an attainable one, depending on the available resources), it indicates that a power-struggle over UX is not inevitable. In fact, as mentioned within this research study, part of why different people at this organization assume that UX is their responsibility is precisely because the UX design process has not been made clear. "…successful integration of useful and user-friendly HMI [human-machine interaction] requires organizational aspects such as the development of a strategy based on a company's existing maturity level" (Lodgaard 2020, p. 221). Once an appropriate strategy has been implemented at this organization, additional research will be needed to determine whether power struggles do surface, between who, and why.

2.3 Interaction Design

"While the pervasiveness of the interface might present a minor challenge for the majority, for those with little previous knowledge or accessibility limitations the challenge can be insurmountable" (Blair-Early 2008, p. 85). Interaction design is extremely reliant on communication, both between the various parties involved in creating an interface and between the designers and the end-users. If the end-users do not "speak the same language", in a sense, as the designers do, they will be severely limited in their use of a given interface. "As the number of interfaces and the diversity of users grow, the need for effective interface design increases" (2008, p. 85). Blair-Early makes

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another salient point in favor of workplaces integrating more effective design procedures. "Despite mimicry, creativity, new technology, and a steadily growing need, interfaces are mired in paradigms established decades ago at a time when user interface was more a computer novelty than a part of everyday life" (2008, p. 85). This point resonates strongly with this research study, as the organization in question was established over four decades ago, and some of their interfaces really show it.

The interfaces housing the designed interactions are sometimes known as boundary objects. "Boundary objects are artifacts, processes, concepts and other entities that provide bridges across boundaries and act as shared references that are meaningful for learners and collaborators with different backgrounds" (Fominykh 2015, p. 85). This is an especially fitting term for the interfaces from this institute, since most of them are used to sort through astronomical data, which was itself gathered by bridging boundaries across our universe with various tools.

Now that data can be manipulated to various extents using this organization's interfaces, which could also be referred to as its artifacts. "An artifact-centric approach can capture design practices that could be transferred and reused in other contexts, e.g. as tools and recipes that can be incrementally incorporated in projects, rather than as a whole design process" (Vuillemot 2021, p. 10). Such an approach could benefit an organization in the short-term, especially one like the research site which already houses several projects and has many more actively and simultaneously in progress. Ultimately, "…design disciplines such as interaction design have to develop and *foster their own designerly approach for education and practice*" (Stolterman 2008, p. 63). However, the interaction design process and its integration are carried out at this organization moving forward will be a reservoir for further research.

2.4 Conclusion

While additional qualitative studies in this area may pose additional corresponding challenges, they are also necessary for uncovering insights and solutions to the persisting issues and gaps in and across these related fields. This study provides an initial step to filling these gaps in order to arrive at a more developed understanding of

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how an organization's social, technological, and structural components interplay and inform one another.

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Chapter 3: Research Methodology

The purpose of this research study is to investigate the impact that organizational structures can have on the projects and teams that operate within them. A review of the relevant literature revealed multiple areas pertaining to organizational structure that could benefit from additional research. These gaps include how interorganizational communications, workflows, and resource distribution are impacted by a variety of complex factors. The factors in question include bureaucracy, structural power, social positioning, integration (or lack thereof), funding, the persisting COVID-19 pandemic, and the way that all the above can further complicate one another. While addressing these factors is well outside of the scope of this project, this study does provide an exploration of the aforementioned gaps and a justification for deeper investigations in the future.

3.1 Research Questions

With many people having spent the last 2 years teleworking because of the pandemic, myself included, it is essential to deepen our understanding of how workplace organizational structures can help or hinder us and our work, even and especially remotely.

The goal of this research project is to empower those operating within these structures to closely examine and interrogate them, in pursuit of identifying necessary changes for the benefit of their work and wellbeing. After all, issues must first be recognized and articulated as such before they can be resolved. This research addressed the following questions:

- *How does an organization's structure (i.e. its interorganizational communications, workflows, and resource distribution), or lack thereof, shape the deliverables (i.e. products and/or services) they provide and maintain?*
- *Further, how does this structure impact the way end-users interact with and feel about the deliverables they make use of?*
- *Finally, how does this structure affect an organization's employees (especially user-experience designers) with their varying tasks and priorities, both in terms of their collaborative capabilities and in terms of how they feel about their work, individually and collectively?*

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These questions inhabit the complex and evolving intersection of technology, social dynamics, and structural power that can be found within many workplaces, including ones in the academic and scientific spheres such as the research site that is the focus of this study. This is a qualitative exploratory case study of a scientific research institute concentrated on astronomy. Employees' and end-users' experiences at and with this institution have been collated and analyzed with respect to the stated research questions.

3.2 Data Collection

The data for this study was collected and analyzed over a year and a half. A few different data collection techniques were used to build the foundation for this case study: 1) semi-structured interviews with 10 individuals and one focus group, 2) document analysis, and 3) participant observation.

3.2.1 Overall Study: Case Study

The particular interest in the perspectives of user-experience designers is due to my prior role as a UX designer at the institute in question. This institution was selected because of the compelling structural interplay I observed and operated within during my employment, which lasted a little over a year. Furthermore, multiple coworkers voiced a need for this research in my time there, and the relatively straightforward access (COVID-19 notwithstanding) to research participants and datasets was a huge asset. Although, that access did not always translate to actual participation in this study due to already erratic schedules being made even more so by the pandemic.

Case studies are an ideal tool for examining the complexity of interacting factors within a given context (Yin 2018). These interactions simply would not be comprehensible without analyzing the conditions that they take place in. They might not even take place at all without said conditions, so the two are inextricable. Case studies are "research based, inclusive of different methods and evidence-led" (Simons 2009). Perhaps Patricia Leavy said it best: "There is a further reason why I continue to advocate and practice case study research and evaluation to this day and that is my personal predilection for trying to understand and represent complexity, for puzzling through the

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ambiguities that exist in many contexts and programs and for presenting and negotiating different values and interests in fair and just ways" (2014). The aim of this study is to do just that, present the similarities and differences in the values and priorities of distinct yet overlapping stakeholders in fair ways.

3.2.2 Method 1: Interviews

Semi-structured interviews were conducted to gather both empirical information and personal perspectives from employees about their involvement within this organization. Each participant was invited to share their experiences in a one-on-one question and answer session, a typical interview format (Mason 2002). In preparation for these conversations, an interview guide was created to act "as a checklist during the interview to make sure that all relevant topics are covered" (Patton 2015). With this protocol prepared beforehand, discussions could unfold more organically while still being tailored to the specific goals of this research. Due to the pandemic, these interviews were conducted virtually and recorded over WebEx. Then the interviews were transcribed in Microsoft Word, anonymized, and analyzed for emerging patterns.

Interview participants were selected from pertinent stakeholder groups who create, maintain, and use many of this organization's deliverables. The three categories represented in these interviews are scientists, designers, and managers, though it is worth noting that there can be some categorical overlap. Being a scientist or a designer does not preclude someone from also being a manager. However, there was no overlap found between the scientist and designer categories. These categories were selected because of how the creation and maintenance of this institute's deliverables are hinged upon their triangulated collaboration. In addition, all the scientists at this organization are also end-users of its various deliverables, whereas the designers are not. These deliverables are used by a much larger group than just the scientists employed at this institute, and thus, more outside end-user feedback needed to be considered and analyzed to minimize any potential bias from the employed scientists.

Individual interviews would not have been an efficient or effective way to gather these perspectives. Fortunately, pertinent user surveys had already been conducted at the

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institute, and permission was received to use and analyze these datasets for this research, which will be discussed at greater length in the following section.

In addition to the 10 one-on-one interviews, a focus group was also conducted and recorded via WebEx. “Focus group interviews are well suited for exploratory studies…because the dynamic social interaction that results may provide more spontaneous expressions than occur in individual interviews” (Leavy 2014). The focus group lasted a little over an hour, which was two or three times the length of one individual interview. There were a dozen participants in the focus group, and their interactions with one another provided insights that would not have been possible to glean from a one-on-one interview. While there was not any overlap in the focus group participants and the individual interview participants, the same three job categories of scientist, designer, and manager were represented. The same process of transcribing, anonymizing, and analyzing the data for patterns and themes was implemented.

3.2.3 Method 2: Document Analysis

A document is understood as any written or electronic record that contains information or evidence. Additional institute documents, referred to throughout this paper as pre-existing work-related studies and secondary data sets, were also used for this research, including surveys and usability testing conducted during my time at this organization. In both the surveys and the usability testing, the participants involved were end-users of this organization’s deliverables. The usability testing participants were predominantly employees. Since the user surveys were anonymous in nature, it is not possible to tell how many, if any, respondents were also employees. Based on information revealed within many of the responses (e.g. living in an area that would preclude employment, working for an entirely different organization, etc.), it seems reasonably safe to suppose that the majority of those who took the surveys were not employees, thus providing the desired effect of offsetting any potential employee bias. The anonymous user surveys were conducted using SurveyMonkey, exported into Microsoft Excel, and then coded and analyzed. There were three surveys, each focused on a different institute deliverable, with a total of 167 responses. There were nine individual usability testing sessions focused on yet another deliverable. These sessions

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were recorded on and exported from WebEx. The same process of transcribing, anonymizing, and coding the interviews was used for these as well.

There is an inevitable limit to the scope and application of these secondary data sets due to the differences in the numbers and categories of participants, their focuses on different deliverables, and the differing modalities of the mediums (i.e. oral communication versus written communication) which shaped the nature of the user feedback given. "The technical properties of any medium…tend to create natural units of analysis…" (Herring 2004). While the units of analysis here may be bound by the limits of their varying mediums and focuses, there were still several coinciding patterns and themes that emerged across all data sets in relation to this study's research questions. It is worth noting that the focus group and each individual interview also encompassed discussion about multiple different deliverables, as this organization houses a vast array of projects, and most employees are working on more than one at any given time.

3.2.4 Method 3: Participant Observation

While the bulk of this study does focus on data collected from other employee and end-user, I myself was immersed with them and their work as an employee at this institute. Thus, I was viewed as an insider by my interviewees, which contributed to their candor. I also possess insider knowledge through my prior employment that helps me unravel and examine the complex context of this case study on a deeper level. These are some of the advantages of using participant observation as a method (Kawulich 2005).

I cannot understate the personal investment I have in this research, both as a UX designer and as someone who worked with this organization for over a year. My personal observations and experiences are offered as part of this study with the intent of further supporting the other evidence-based methods and empirical data. Furthermore, I had established working relationships with the majority of volunteer participants before beginning on this project, so my personal experience is inextricable both from the topic and goal of this study and from the sampling methods used to gather data.

3.2.5 Sampling and Coding

This study used a combination of convenience, purposive, and snowball sampling methods for the interviews and focus group. Convenience and purposive sampling were

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initially used for gathering the most readily available, willing, and interested participants. Using my knowledge of my coworkers' schedules and their relationships to various institute deliverables, I invited participation from people based on their calendars, their deliverable involvements, and their membership within the three primary categories (scientists, designers, and managers). In order to expand the initially limited reach of these methods, snowball sampling was introduced to identify additional potential participants. In practice, this involved asking the original sampling of participants for recommendations of who else to ask for voluntary participation (Mason 2002). This helped with reaching participants who I did not have prior relationships with. These are all non-probability sampling methods. Thus, they do not yield a sample that is statistically representative of the population they were sampled from (Trotter and Schensul 1998). Convenience and purposive sampling were also used for the user testing sessions and in formulating the focus group. The anonymous surveys used convenience sampling, which involved linking to the surveys directly from their respective deliverables of focus.

Along with a mixture of sampling techniques, this project used a combination of coding methods. Coding was implemented through the steps of grounded theory (Charmaz 1996). Open coding was used to separate the data into discrete parts: in this case, each individual question and response asked across the individual interviews, focus group, user surveys, and usability testing sessions. Then, axial coding was used to draw connections between each of these. Finally, selective coding was utilized in identifying the predominant, central connection among these and the essence of this study. Based on my experiences as an employee, I did have some preconceived notions about the data, so the coding was initially deductive in nature. Upon additional examinations of the data, themes and patterns emerged that I did not foresee, so an inductive coding approach was introduced.

3.2.5 Reliability and Validity

In this research, reliability was established through methodological triangulation, or using multiple different sources of data gathered from a diversity of respondents (Mason 2002; Patton 2015). The implementation of three different methods for data

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gathering allowed for findings to be corroborated across modalities. Furthermore, my coding is consistent throughout, being the only person who coded the collected data.

Since an individual's perspective of this institute's organizational structure may vary based on their position or involvement, data was gathered from multiple different people within the relevant groups. This thorough sampling boosts the validity of this study by offsetting any potential bias of one group.

3.3 Evaluation Criteria

The two major criteria for assessing qualitative research are reliability and validity. The criterion of validity encompasses construct validity, internal validity, and external validity (Yin 2018). Construct validity was strengthened in this study by using multiple methods to collect and triangulate the data. Internal validity was boosted through data triangulation as well, along with the thorough sampling of different groups from different backgrounds who possess different goals and perspectives. The overwhelming similarity of their experiences and feedback that emerged in the findings, despite all these differences, reinforces internal validity. External validity was promoted by using the same process of analysis with each data set. Reliability was established through recording the procedures used during this project. The consistent use of protocols in this project also furthers the reliability of this study, enabling this research to be replicated in the future.

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Chapter 4: Data and Analysis

As a qualitative exploratory case study, this research examines the complexities of the workflows, communications, and access to resources that take place at the organization in question. The purpose of this study was to investigate the impact of organizational structures on the teams and projects that reside within said structures. As a science research institute primarily concerned with astronomy, the organization in question is continuously working toward a more comprehensive understanding of our universe and our place within it. As a non-profit that operates on behalf of the National Aeronautics and Space Administration (NASA), this organization can be gripped by all manner of bureaucracy, a theme that was referenced or alluded to repeatedly throughout the available data sets and in my time as an employee. This section teases apart some of the complexities at this institution that surfaced from the gathered data, although these complexities are not unique to this organization. As such, it is important to note that the emerging themes and patterns cannot simply be attributed to issues within or concerns of this one group; there are, as always, much larger societal factors at play. Therefore, more research is needed on organizational structures within the ever-changing landscape of work and "workplaces", an increasingly nebulous notion with rise in remote and gig employment, which was a trend established well before the pandemic caused an even greater surge.

4.1 Semi-structured Interviews

10 individual interviews and one focus group interview were conducted as part of this study. The one-on-one interviews had an average length of 27 minutes, while the focus group lasted about an hour. The questions focused on identifying underlying issues within this organization's structure, pertaining to its employees' workflows, communications, and access to resources.

4.1.1 Individual Interviews

10 employees took part in semi-structured individual interviews for this study. Half of them were scientists and the other half were designers. Two interview participants were also managers, one scientist and one designer respectively. The following table helps illustrate just how many commonalities were found between these groups.

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Designers	**Scientists**	**Managers**
• 5 participants • Low sense of agency • Confused about decisions from leadership (e.g. budget, resources, work assignments, project prioritization, etc.) • Disconnected from design process	• 5 participants • Low sense of agency • Confused about decisions from leadership (e.g. budget, resources, work assignments, project prioritization, etc.) • Disconnected from design process	• 2 participants (1 scientist & 1 designer) • Low sense of agency (only nominally higher than non-managers) • Confused about decisions from leadership (e.g. budget, resources, work assignments, project prioritization, etc.) • Disconnected from design process

The original research plan involved conducting about twice as many interviews and having a higher proportion of managers represented. Scheduling and communication difficulties brought on by the pandemic limited the scope of this project. That said, there was a still strong consensus of perspectives that emerged from these 10 interviews, and the results paralleled that of the other examined data sets which are discussed in subsequent sections.

Using the interview guide, these employees were given the same seven prompts. Those prompts were as follows:

1. Describe the workflows that you navigate within your work.
2. Describe any workflow inefficiencies you've experienced that impact your work.
3. To what extent are you able to address the source of these inefficiencies within your role?

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4. To what extent do the resources available to you meet your needs?
5. Describe the process of how resources are acquired and allocated.
6. What changes would you like to see to this process (the acquisition and allocation of resources)?
7. Describe the communication involved in navigating your work.

After these, the group of five designers were asked an additional five questions. The rationale for these additional questions, as well as their contents and responses, will be discussed in the following section.

The interview prompts were purposefully worded with two goals: 1) setting an impartial, conversational tone and 2) inviting a broad reading of the prompts themselves, depending on each participant's unique combination of roles and responsibilities at this institute. The first three prompts focus on workflow processes, and the next three prompts are centered on resources. Only one prompt was given about communication after these, because it seemed inevitable for the topic of communication to be, at the very least, implicit within the responses to the prior prompts. This was substantiated by the responses.

The prompts pertaining to workflows and resources are similarly framed. The first prompt in each set aims to capture a relatively neutral and general picture of these individuals' experiences with these two facets of their work. Something that was not anticipated when creating this interview guide was that, in answering the first workflow prompt, every respondent identified workflow challenges in their reply. Rather than rendering the second workflow prompt about inefficiencies redundant, this served as an opportunity to delve more deeply into the stated inefficiencies and how these employees feel about navigating them.

4.1.1.1 Describe the workflows that you navigate within your work.

These employees' descriptions of their workflows can be distilled as follows: "complex", "undefined", "variable", "antiquated", "clunky", "time-consuming", "unintuitive", "informal", "big learning curves", and "an unclear game of hot potato". Consensus also emerged that centered on feelings of confusion and frustration about

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puzzling and unexpected changes made to their work assignments and priorities, who was making the decisions behind these changes, and for what reasons. As one of the managers put it, “Branch members doing the day-to-day work are able to identify issues that are not really thought out at the highest levels.”

4.1.1.2 Describe any workflow inefficiencies you’ve experienced that impact your work.

After establishing the broad strokes of their experiences, the second workflow prompt invited further reflection upon the challenges exist within their workflows. Multiple participants expressed frustration with communication issues, including the too frequent and yet too insubstantial back and forth involved within and across all the simultaneous institute projects. As one respondent commented, “It never feels like all of this is under one roof.” Another shared, “Some of the inefficiency seems built into the process.” This emphasizes both the structural nature of the issues at hand and these employees’ clear awareness of that fact. Importantly, all the UX designers mentioned dissatisfaction with the implementation of UX design in response to this prompt. The designer-specific responses to this first set of prompts are discussed at greater length in the following section.

4.1.1.3 To what extent are you able to address the source of these inefficiencies within your role?

The third question in each set was intended to invite solution-minded answers from these employees for the problems they had articulated. There is a meaningful distinction in the way they are worded. In the workflow set, the primary interest was determining whether these individuals felt they had enough ownership or control of their workflows to implement solutions. Virtually every respondent indicated that they had already repeatedly tried voicing their concerns and suggesting solutions to the powers that be with little to no success. A few stated that they were continuing to do so, despite the discouraging results. The rest conveyed their resignation to the current state of things. These responses exemplified the structural nature of the issues at hand.

4.1.1.4 To what extent do the resources available to you meet your needs?

In response to the first resource-related question, several respondents, including both managers, did mention some satisfaction with the available professional

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development and technological resources. However, there was a universal acknowledgement of insufficiency, described as “limited”, “lacking”, “inadequate”, “short”, and “not enough”. One scientist shared, “My team is always short on resources, even after hiring new people.” This is a notable comment due to a theme of feeling understaffed that emerged from these interviews. While there are certain issues that can be resolved by bringing on more people (which will be discussed in more depth later, especially where designers are concerned), there are other issues that are not impacted, or sometimes even made worse, by expanding a team. These include issues of knowing who has ownership over what and who to talk to about various things, which are already existing issues at this organization. According to some of the interviewees, these issues are, in part, due to continually hiring for more positions with skillsets that are redundant or tangential to what is actually needed. Another scientist’s answer embodies the organizational structure’s impact on the available resources: “The main thing is that there's too much work and not enough time and not enough people."

4.1.1.5 Describe the process of how resources are acquired and allocated.

The second resource-related prompt was intended to reveal the level of understanding these employees have about this larger resource acquisition and allocation process that has such an influence over their work. Nearly all the responses were quite candid in sharing their unawareness about this process. Notably, both managers answered with a bit more of an authoritative response, although there was still a discernable lack of clarity. One said, “It's complicated. There are different funds for different projects, and they operate under different guidelines. The decision makers are usually scientists.” The other shared, “The people with control of the funding make most of the decisions. Sometimes managers can weigh in and make suggestions.”

The first of these two responses exemplifies the multifaceted nature of this institute and the inevitably complex landscape within which all of this work takes place. This response also affirms that designers are not usually the decision makers. Notably, it is not clear whether the statement “It’s complicated” was intended to keep this response concise for the sake of time or if this was an underlying admission of ignorance about just how the many factors involved in this complex process interact. The second manager’s

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response is also remarkable. By virtue of holding more authority than their non-managerial colleagues, it seemed a given that these managers would both feel and demonstrably possess a level of authority distinct from that of non-supervisory employees. In practice, while there may be some additional responsibilities and employment benefits (e.g. increased pay, job security, prestige, etc.) bestowed by a managerial role, both at this institute and in general, the people in these positions share many of the challenges and perspectives expressed by the employees they manage.

The fact that "managers can weigh in and make suggestions" only some of the time reveals that they are far from being the central or principal actors within this structure. This organization has its own director and team of associate directors. There is also a consortium that manages and operates this organization on NASA's behalf. To my knowledge, I had no communications with anyone from the board of directors, the consortium, or NASA during my time as an employee, and this was true for most of my coworkers. The impact of these intertwined hierarchies on this institute and its employees is not entirely clear. An examination of the relationships between middle management and the highest leadership, either in this case or in general, would be an intriguing subject for future study. Clarifying the misconception of who possesses power, and what that power actually means and looks like in practice, was also an important outcome of this study.

4.1.1.6 What changes would you like to see to the resource acquisition and allocation process?

As for the third resource question, these individuals felt little to no ownership over the resource allocation process. This question was phrased in a way to invite thinking about potential solutions beyond the limitations of their circumstances. As expected, their responses were overwhelmingly focused on making changes at the structural level, with proposed solutions including synthesizing the institute's deliverables to establish cohesion and consistency, contextualizing project plans with a holistic perspective (of both this institute and the larger astronomy community), increasing budgets, hiring more employees, and improving the transparency and inclusivity of the high-level decision-making processes. The first of these, synthesizing the deliverables, was also something that came up in the results of the user surveys,

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usability testing, and focus group. The rest were also referenced in the focus group, though in a more wishful manner that conveyed a sense of stoicism about the current structure.

4.1.1.7 Describe the communication involved in navigating your work.

Finally, after repeatedly alluding to patterns of and issues with communication throughout the interviews, these employees were able to discuss their experiences with communications unambiguously in response to this prompt. All the participants agreed that they felt their fellow employees were generally helpful, patient, and kind in their interactions. This was predominantly my experience as an employee as well. The expressed communication-related concerns included confusion around who to talk to about different things, siloing teams and projects, burnout from meetings and particularly virtual communications, schedule management, loss of institutional knowledge when employees leave, insufficient integration of scientists and designers, disparate employee backgrounds, and frustration around lack of transparency and hearing things secondhand.

Every one of these issues is structural in nature, and I experienced most of them in my time as an employee. With no centralized employee directory and little clarity of project ownership or membership, it is inevitable that these employees would feel unsure of who to talk to about various topics. Teams and projects becoming siloed is also an inevitable outcome of not knowing who works on what and in what capacity, even when they share similar goals, resources, needs, and users. The burnout that these employees expressed from virtual communications apparently was somewhat present before the pandemic, and after moving everything online due to the onset of COVID-19, it greatly intensified. Importantly, the concern was not with the act of virtual communication itself; rather, it was with the plethora of platforms used to communicate slightly different, and sometimes redundant, things in slightly different, and sometimes redundant, ways.

It is not known exactly how many applications and platforms are being referenced here, especially considering that different teams might use entirely different ones in addition to those used more generally throughout the institute. There were at least 10 that I used to some extent as an employee, and it is unclear how many different teams I contributed to in that time. Some of these employees referred to this network of

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communications as “a labyrinth” and “maze-like”, and this likely contributes to the sense of low transparency and the frustration with inevitably hearing things secondhand. It also plays a part in the issue of schedule management. Meetings are a predominant form of communication at this institution, which is a common workplace norm. While many were scheduled through the email client that provided access to everyone’s schedules, not all of them were. As such, some employees’ availability according to their calendars was not accurate, and meetings were often repeatedly rescheduled, further postponing communications and often work as a result. With nothing akin to a centralized repository of institutional knowledge, it is understandable that employees feel a widening gap every time someone retires or moves on to a different opportunity. This is both a result of lacking communication on a structural level and a cause of additional communication issues for the relevant team(s) affected by the employee leaving.

Both the scientists and the designers expressed that their roles and work were not integrated with one another. All these employees indicated earlier on in these discussions that the institute is understaffed for the number of projects it houses. While some issues could potentially be alleviated by hiring designers with an astronomy background and scientists with an understanding of design, there is no way to know if or when those hires will take place. A greater effort to integrate the current employees, who possess valuable expertise in their own right, is both possible and necessary.

4.1.2 UX Designer Specific Questions and Responses

As mentioned in the previous section, the designers were asked a specific set of questions that would not have been pertinent to the scientists. These questions served multiple purposes. They provided insight into how UX design as a practice is treated and implemented at this institution. Related to this, they illuminated the conflicting feelings these designers have about the importance of their work in relation to a workplace that does not seem to know what to do with them. This was an important perspective to gain for this study, and it underscores how this is a matter of organizational structure rather than that of individual designers, tools, projects, or workflows. While these findings do later include redesign recommendations that can resolve some issues in the short term, it is questionable whether these recommendations could even be implemented within the

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current structure. These designers both feel and demonstrably are limited by the circumstances of their workflows, access to resources, and interorganizational communications. To further explore this, the following five questions were asked:

1. How early in the process are you brought in to do design work for a given project?
2. To what extent are you involved in a “finished” project’s maintenance?
3. To what extent are end-users involved in a “finished” project’s maintenance?
4. How frequently does your design work not get implemented?
5. What changes would you like to see to the design process here?

The questions specifically for the designers were a bit more varied than the general interview prompts. These five questions aimed to capture the entire life cycle of these designers’ work. The purpose of the quotation marks around the word “finished” in two of these questions was meant to convey a unique misapplication of both language and thought that UX designers have to navigate. Essentially, in its most ideal form, UX design is both foundational and perpetual. One’s work is never quite “finished” because user bases, their interests, and their needs are always evolving. While it may be a common expectation for projects to have defined endings, this expectation is not necessarily shared by UX designers. This mismatch of expectations was explicitly discussed in these interviews.

Before delving into the responses to these five questions, it is worth revisiting the previous set of general employee questions. The previous section omitted responses that specifically pertained to UX design, as those felt more germane to this section. Listed below are a baker’s dozen quotations from the designers that feel essential to this study.

“There’s no formal process for UX here.”

“UX is usually missing or thrown in at the end.”

"It can be confusing sometimes since everyone thinks they're in charge of UX, saying 'I think it should be like this', just arbitrary opinions not based on any research.”

"There's no main repository or central area where all of our images and assets go. Someone else may have resources, but you have to hunt them down to find out. Things could be better organized and better communicated."

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"You create work that is presented by someone else, not a designer, to a decision maker, also not a designer, who may like the idea but not the execution. That's the peculiarity of not being at a design agency."

"One of the most inefficient things you can do is make a website before you really understand what you're trying to make. Circumstances often drive us to make these premature decisions."

"Our manager's background is in print and video. They're not really involved with the web work. So our UX designers don't know how to bring their problems forward because of the limiting structure here of web versus traditional design."

"I would like there to be a creative director, or somebody overseeing the web work from a design, content, and development perspective. Everything is changing and modernizing, and we want to keep up with all of that!"

"The majority of our web work is problematic because we don't have any front-end developers. I'm completely unaware of the decision making that goes into hiring developers. They always hire back-end developers."

"All of our websites share the same development team so we're always vying for development time."

"The designers are very separate from the developers, we don't really communicate. There was a previous manager of the web team who had some issue with designers and developers working together. The pains of the past still haunt us."

"The code is a mess. You make one change and you have no idea what it's going to affect. So we designers have to spend a lot of time testing things to make sure they won't break."

"I wish more people here would recognize how important UX is. Our methodology should start with our audience/users."

Throughout these responses, the impacts of this institute's organizational structure are apparent. There is discernable confusion and frustration, especially concerning the lack of necessary resources and team members with the expertise to comprehensively implement UX design, the communication breakdowns stemming from misunderstandings of UX design, and the absence of a clear UX methodology. Previously

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in this section, there was a brief discussion of the impact that hiring new talent can have on existing issues at this organization. As previously mentioned, hiring additional scientists may not be having a noticeable effect, but that is a difficult thing to explore further when only one scientist remarked on this. Meanwhile, all of the designers expressed a desire for front-end developers and a creative director to be hired. They also conveyed that, in the absence of these hires, UX design work will continue to be lacking at this institute. As design experts who already had substantial design careers before coming to work at this institute for years, their perspective on this matter is unambiguous.

4.1.2.1 How early in the process are you brought in to do design work for a given project?

As for this second set of questions, all the designers shared that there is inconsistency concerning what stage they are brought in. While one respondent shared that they are often brought in from the onset, the rest indicated that this is a rarity, with the norm being somewhere in the middle or even just for maintenance after a project has been "finished" (or rather, gone live).

4.1.2.2 To what extent are you involved in a "finished" project's maintenance?

Most of the designers reported being involved in the maintenance of various projects, regardless of whether they had any involvement with said projects before they went live. One mentioned, "Management thinks that once the website is built, it's over. But there's always maintenance and changes." This emphasizes how the mismatch in expectations stems from issues in organizational structure.

4.1.2.3 To what extent are end-users involved in a "finished" project's maintenance?

The designers also all reported that there is no process for coordinating with end-users and collating their feedback. A couple designers mentioned that a few vocal users have taken it upon themselves to show initiative in this area. One shared, "Some users will reach out via email to let us know if something is broken or to make suggestions. But there's no formal user testing or user focus groups." Another mentioned, "Some volunteer to help with certain things, but there's no formal process for user testing at all." It is remarkable that even without a system in place to receive or implement their feedback, these individuals have reached out to share their thoughts anyway. While this may be a

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bit on the nose, centering users and their experiences is intrinsic to UX design. Deficiency in this area has an undeniable impact on the ability to conduct UX design work. These designers expressed disappointment about this point.

4.1.2.4 How frequently does your design work not get implemented?

As for the frequency of their experiences with their conducting design work that did not end up getting implemented, this is where their responses varied the most. One stated "rarely" while another declared "pretty often". The other few used percentages in their answers: 5%, 25%, and 30% of the time respectively. Most of these answers indicate that this happens a minority of the time. While this group of five is not a statistically significant sample size, it is still worth noting that answer of 5% came from the manager. If these responses are to be taken at face value, then the other designers are having their work scrapped at least five times as often as the designer in a managerial role. This reflects how the organizational structure of this institute produces a stratification of outcomes, where employees may unanimously report having an issue while experiencing it to varying degrees of severity.

4.1.2.5 What changes would you like to see to the design process here?

Finally, all the changes that the designers expressed a desire for are structural in nature. These included involving UX designers from the beginning of every project's planning stage, integrating designers with developers, creating a role akin to a creative director, hiring more employees (namely the creative director, designers, and front-end developers), exercising more control over which teams and projects they commit to, building a unifying style guide, and clarifying project requirements and schedules from the onset.

The trends that emerged from these designers' responses reflect my own observations and experiences as an employee. These designers all too aware of how the lack of mindful UX design implementation is encumbering end-users and wasting the institute's time and money, while they themselves are rendered mostly unable to change either of these outcomes.

In retrospect, this set of extra questions for the designers could have been adopted for the scientists, since they are also end-users of this organization's deliverables. Perhaps

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their responses would have provided further confirmation of the designers' experiences. Or perhaps their responses would have illuminated an unawareness of the way the design process unfolds at this institute. Future research could investigate this, and the questions could be along these lines:

1. At what stage are designers brought in to do design work for the projects that you also work on?
2. To what extent are you involved in a "finished" project's maintenance as a user of that project?
3. To what extent are other end-users, especially those who aren't employees, involved in a "finished" project's maintenance?
4. To your knowledge, how frequently do designers do design work that does not get implemented?
5. By the same token, how frequently does any of your own work not get put into effect?
6. What changes would you like to see to the design process here?

4.1.2 Focus Group

12 employees took part in the focus group, including one designer (apart from myself) and one manager who was also a scientist. The rest of the participants were scientists. Notably, the consensus that emerged from this discussion was more ideological in nature. Participants agreed on basic principles and goals, namely improving accessibility, consistency, integration, and the general UX process. However, they had many disparate ideas about how to prioritize these things and carry them out.

Using the interview guide, these employees were given 4 prompts to discuss. Note: thus far, this study has used the words "deliverable", "project", and "website" with a degree of synonymity. In these prompts, the word "interface" is used to convey the same subject. The prompts were as follows:

1. What improvements would you like to see to the process of learning about all the available data featured across our different interfaces?
2. What improvements would you like to see to the process of learning to use all our different interfaces to access that data?

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3. Which particular interfaces or interface features would you like to see simplifications to?
4. What other changes or improvements would you like to see to our interfaces?

When formulating these questions, there was less of an emphasis on unbiased language. Participants were informed ahead of time that that the topic of this focus group would be improving upon the existing websites. The language was also tailored to these employees, who are already seasoned users of the institute's vast network of websites and even more vast databases that they tap into. However, these websites are public facing and allegedly intended for public use. This makes their impenetrable nature, at least to those not already equipped with expertise in astronomy, even more remarkable.

Importantly, this focus group was conducted before any of the individual interviews. At this stage, there was an interest in potentially focusing this project on one specific interface. The goal of this focus group was to establish consensus about which interface would be an appropriate subject for this project. It was evident that no such consensus existed, at least not within this group. In retrospect, these questions could have been formulated to better serve this end. This early stage was also one in which a significant amount of input from a couple middle managers was being received. This input was presumably intended to steer this project in a manner that would aid both the institute and myself. However, it resulted in constraints that did not align with the project goals or serve the stated research questions. This experience demonstrated how conflicts of interest can develop in research of a given workplace where the researcher is also an employee. This is a challenge to bear in mind in future research. Ascertaining the desired improvements in accessibility, consistency, integration, and UX process across the institute's entire collection of sites was the major takeaway from this focus group.

4.2 Document Analysis of Secondary Data Sets

The secondary data sets from the pre-existing work-related studies that were incorporated into this project included nine one-on-one usability testing sessions and three surveys that were run through SurveyMonkey.

DocuSign Envelope ID: F43D90D7-BEDE-4A70-9703-D921C546A0FD

4.2.1 Usability Testing

The subject of this usability testing was the institute's main website. Nine one-on-one sessions were conducted remotely and recorded on WebEx. All participants were both employees and scientists. They were given 14 tasks that involved navigating throughout the site. Then they were asked follow-up questions about any difficulties experienced. They were also asked more general questions about their experience of the site(s). The usability testing questions with a direct application to this research study are as follows:

1. What feedback do you have about how all of the institute's interfaces are organized?
2. How do you feel about the organization of the menus and individual pages?
3. To what extent were you able to keep track of where you were on the site(s)?
    a. What aspects of the user interface, if any, helped you orient yourself?
4. Was there any functionality or information you expected to see that wasn't readily apparent?
5. Were you aware of the available sidebar menu? (This was asked of participants who did not make use of this navigation feature, which was most of them.)
6. Were you aware of that the sidebar menu could be used to complete all the tasks you were given?

Importantly, while this testing was intended to focus navigating the main site, most users ended up navigating to multiple other institute websites in their attempts to complete certain tasks. Several even abandoned the main site entirely in favor of completing the given tasks with Google searches.

There was unanimous agreement among participants that assortment of sites and the way they're connected (or disconnected) is overwhelming and frustrating. While all of these participants are end-users of one or maybe a handful of interfaces, none of them were seasoned users of every single one. Some of them were not even aware of the existence of certain interfaces.

The top three takeaways from these testing sessions were that users expect recognizable and logical component behaviors, simple and accessible content navigation,

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and concise language used consistently throughout the site(s). All these takeaways were echoed by the findings from the focus group, user surveys, and my own personal observations. More participants found the user interface to be lacking rather than helpful. Most did not even notice the sidebar menu or recognize the comprehensive extent of its contents. Most participants also did not notice or understand the available breadcrumbs, which is shorthand for the secondary navigation system that aids users in understanding the connection between the page they are on and its parent pages, the ones higher up in the information hierarchy that ultimately lead a user back to the homepage. Importantly, while breadcrumbs are used on the main site, they are not used universally across all of this institute's interfaces. That combined with their small size and awkward placement on a given page makes overlooking them understandable. These elements, along with the major takeaways underpinning them, are explored in more detail in the Recommendations section at the end of this chapter.

4.2.2 User Surveys

Three anonymous surveys were conducted via SurveyMonkey, each focusing on a specific institute website. These surveys were promoted on the respective websites with the intent of inviting feedback from the most pertinent users. The surveys were live for 5 months and yielded 24, 27, and 116 respondents respectively, with the highest number of responses submitted predictably for the survey on the interface with significantly more traffic than the other two. Each survey included a few questions with very specific language tailored to their respective interface. 10 questions were the same across each survey. They were as follows:

1. How do you find the performance of this site?
2. What kind of information are you looking for on this site?
3. How easy was it to find what you were looking for?
4. How often do you use this site?
5. What steps did you take to learn how to use this site?
6. Describe any barriers you experienced while learning to use this site.
7. How helpful do you find the documentation for this site?
8. What are your favorite aspects of this site?

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9. What are your least favorite aspects of this site?
10. What capabilities would you expect to see on this site that are not present?

Analyzing the results of these surveys echoed the experience with the focus group. While there is a wide variety of opinions on what changes are needed and which ones of highest priority, there was consensus about basic principles. These users indicated that their experiences of these sites were confusing, time consuming, and frustrating. There was an explicit lack of understanding around the relationship between these interfaces and the larger astronomy community, with many users indicating that other similar websites run by other corresponding organizations are superior in various way. There was also an expressed uncertainty about how to find certain information, both in general and within a specific institute interface.

This data set is unique from the rest due to the solicited feedback being written and asynchronous rather than oral and synchronous. This invited deeper probing since respondents could take time to think about their answers and type them out at their leisure, rather than having to respond in real time with schedule constraints.

The shift in focus away from institute employees and toward other end-users who are not represented elsewhere in this research also distinguishes this data set from the rest. Related to that, these surveys allowed for a greater diversity of skill levels among users to be represented. As previously mentioned, none of the institute employees possess encyclopedic knowledge of all its interfaces, but they do all have some familiarity with at least a couple of them. They also have decades-long careers under their belts, which likely helps to inform their decisions when using certain interfaces to meet certain goals. Meanwhile, some of the respondents to these surveys disclosed that they were unfamiliar with astronomy and/or rather young compared to the average institute employee. All of these respondents expressed a desire to better understand this information contained within these interfaces and how to access them.

The prevailing takeaway from this data set was that the aforementioned challenges experienced by employees using these interfaces are experienced to a much higher degree by end-users who are not employees, especially those who are younger and less experienced in the field of astronomy. A major part of this institute's mission is

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astronomy outreach, so the public's documented experiences with struggling to use or even begin to understand their websites is remarkable.

4.3 Participant Observations

Pertinent observations from my time as an employee at this institute have been included throughout the previous sections where relevant. In summary, I noticed the challenges that end-users experienced, including confusion, frustration, and sometimes abandonment of a given interface, in my time as a UX designer working at this institute. I also noticed and in equal part experienced the challenges that my colleagues shared as part of this study, including convoluted workflows, lacking resources, and disjointed communication.

4.4 Triangulating and Redesigning

Having amassed such extensive feedback about a handful of different deliverables, a decision needed to be made about what exactly would be this project's focus for a redesign. As previously referenced, input on this part of the project was received early on from multiple coworkers, including managers. From every individual came a different answer. Sometimes these answers diverged entirely, focusing on completely different deliverables. Others were more subtle in their distinctions, like when multiple people suggested focusing on the same deliverable, but they all had different ideas about which component(s) to focus on and the extent of the potential changes. Ultimately, there was not any consensus that emerged from these more informal suggestions.

Though not immediately obvious, consensus did eventually emerge from these data sets, despite their disparate nature. The predominant theme that was repeatedly emphasized across data sets was that of confusion and frustration with the institute's navigation, both from an employee perspective and a user perspective, both on its main site and between its various other sites. It is not clear from the main site just how many other websites there are or how to access all of them. That coupled with the lacking visual and functional cohesion across deliverables ultimately obfuscates the institute's very ownership of said deliverables.

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The crux of this research study concerns the impact of this organization's structure on its navigation at every level. The deficiencies in the way that UX design implementation, interorganizational communication, resource allocation, interfaces, individual webpages, and menus are navigated at this institute are all 1) intertwined with one another and 2) informed by the underlying organizational structure, which has yet to center users and UX design in its operations.

Navigation is the determining one's position and then planning a route to subsequently follow. It is the driving force that not only moves users throughout websites, but also employees throughout their workplaces and careers, and people throughout their lives.

Navigation is a systemic problem at this institution, and most employees who participated in this research have already made multiple attempts at addressing it, especially the UX designers who arguably have the most to lose from maintaining the status quo.

As observed in the usability testing sessions, the oldest data set in this research study, people rarely used the sidebar menu on the main site, either because they did not notice it or because they assumed it would not provide them with the information they were looking for. For those who did use the sidebar menu, they were confused by both the scope of its content and the component behaviors within it. They also rarely made use of the breadcrumbs, and they would quickly lose their place and feel disoriented. These fundamental issues had an unquestionably negative impact on the users' experiences, both in terms of their ability to complete tasks and their feelings toward the site itself. While negative experiences could certainly be identified across the institute's other websites, navigation is too inescapably foundational (especially on the main site) for the focus of this project's redesign to be anything else.

4.4.1 Navigation Redesign Recommendations

A more thorough examination of the design issues and redesign recommendations can be found in the appendix. Below is a summary of the design issues that were expressed by the end-users as being the most problematic, accompanied by suggestions for redesigns per the users' feedback.

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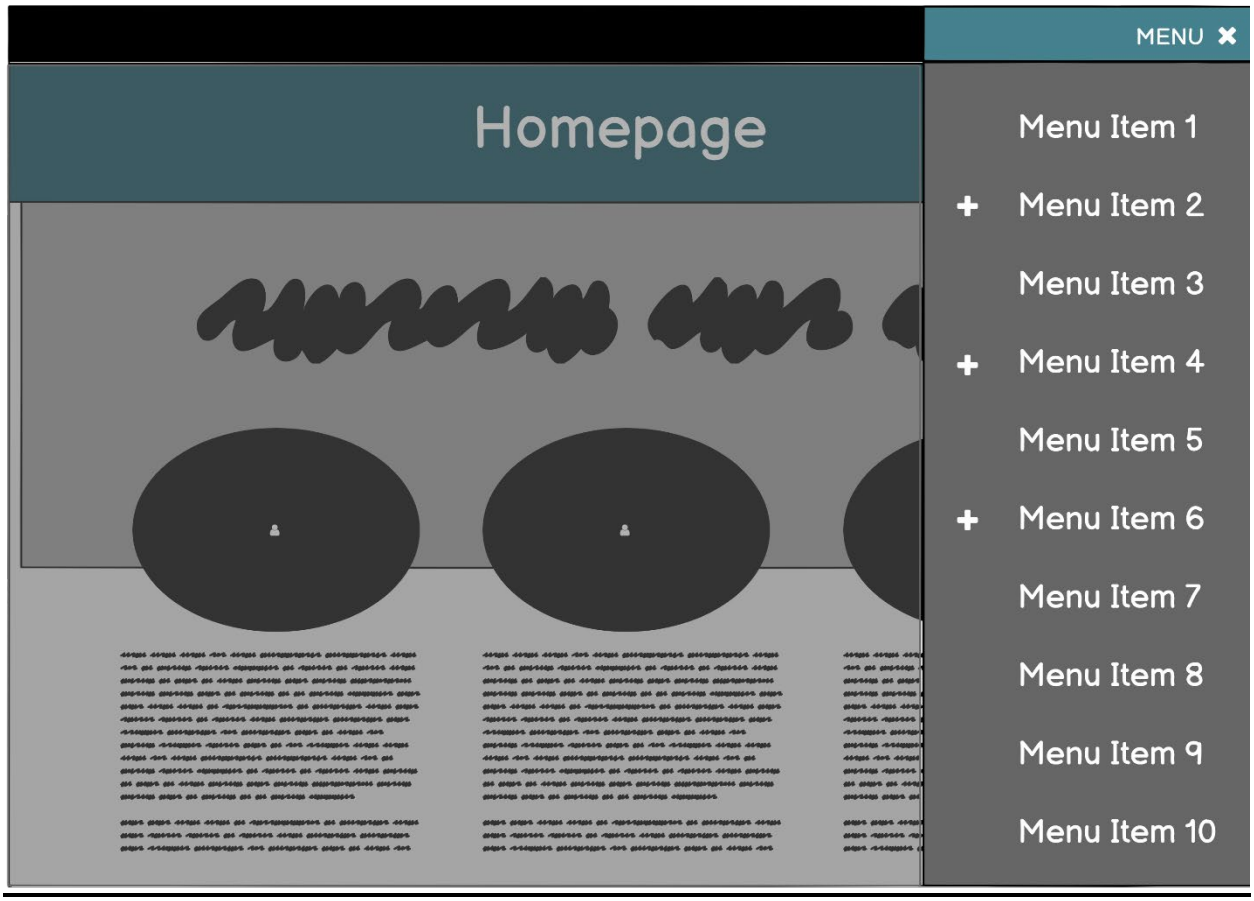
4.4.1.1 Examining the Sidebar Menu on Homepage



Above is a wireframe of the organization's homepage and open sidebar menu in their current state. Clicking the menu button causes all the menu options to expand. Upon selecting this menu, a semi-transparent gray layer appears over the rest of the page and any elements on the page outside of the menu stop being interactable. Clicking either the 'X' next to the word 'Menu' or anywhere outside of the menu causes the menu to collapse. Users have expressed a desire to allow for this menu to remain expanded while exploring a given page. They have also expressed a preference for seeing this menu on the lefthand side of the page, in alignment with other interfaces and tools that they use with lefthand menus.

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4.4.1.2 Examining the Sidebar Menu on Any Other Page (example: Menu Item 3)

When opening the menu from any page besides the homepage, the page that the user is currently on is highlighted with a subtle change in text color (which has been made more distinct in this wireframe). In this example, this user is on the webpage Menu

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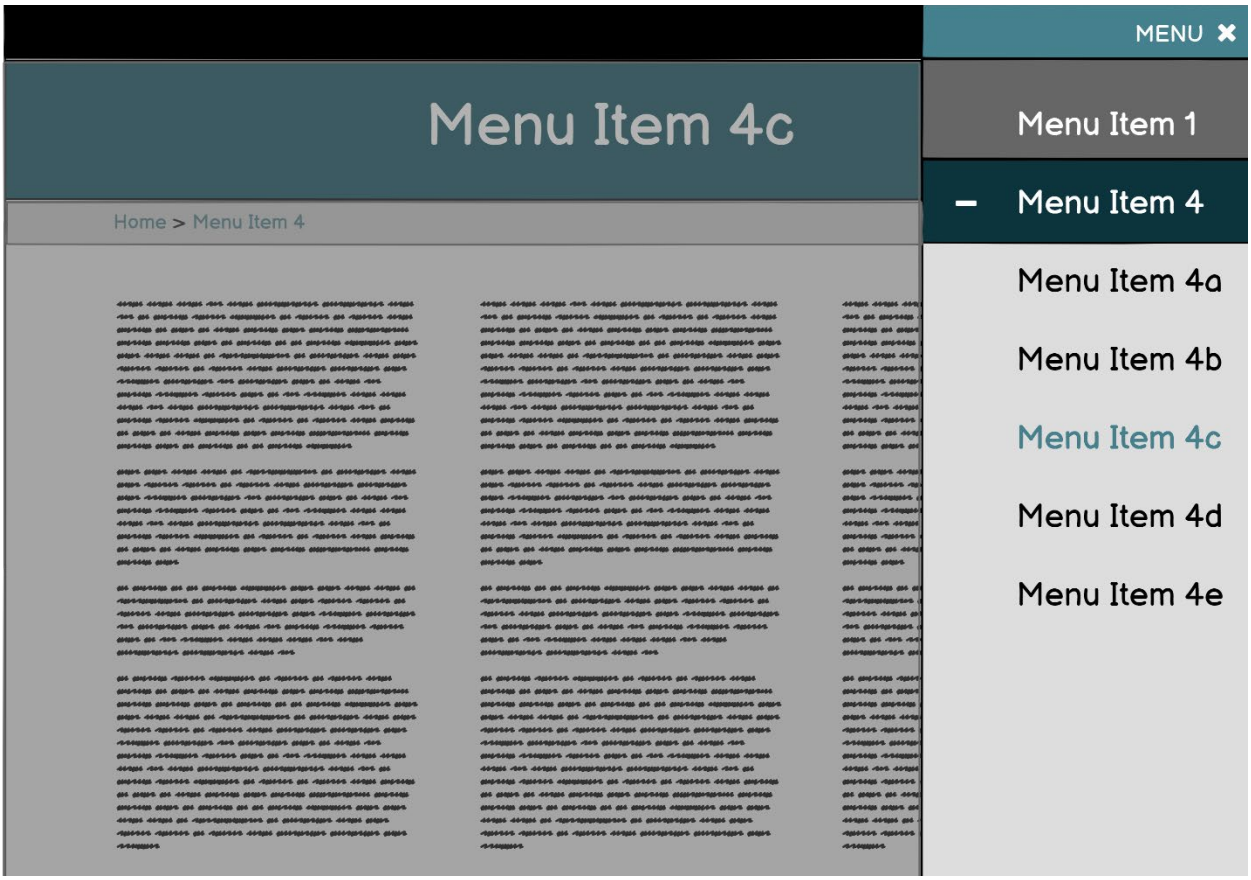
Item 3, so that is now indicated in the menu. This new color does not contrast enough with the background of the menu, which poses an accessibility issue. In addition, this color is used whenever a user mouses over a different element in the menu to indicate that element is interactable. This increases the scope of the accessibility issue. Also, the dual meaning of this color in this example is confusing to users, and different indicators ought to be used to demonstrate what page a user is on as opposed to what elements on that page are interactable.

4.4.1.3 Examining the Sidebar Menu on Any Other Page Continued (example: Menu Item 4c) and the Secondary Navigation Tool "Breadcrumbs"



This is an even more in-depth look into how this menu behaves as a user gets deeper into the site's hierarchy. Because this user is on the page Menu Item 4c, when they go to open the sidebar menu, it immediately shows them the expanded options under Menu Item 4, which are collapsed on the homepage. Furthermore, with the current menu

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structure, this submenu obfuscates all of the other menu options apart from the first one (which is a link to the homepage). If a user were to minimize the Menu Item 4 submenu to navigate to a different part of the menu and then accidentally click somewhere outside of the menu, their progress would be lost. This is how the menu looks every time it is opened, regardless of where the user was in the menu when it was closed. Finally, this page showcases the site's current use of breadcrumbs. While it may appear as though they have their own dedicated banner, this banner only appears when the sidebar menu is open. Also, the breadcrumbs do not list the current page that the user is on. In this example, a user may believe that they are actually on the page for Menu Item 4 rather than 4c.

Users have expressed a desire to not have menu options obscure each other. They have also expressed a desire to have more control over pinning their place in the menu, similar to how one can open and close folders within Windows File Explorer without actually entering into those folders. Furthermore, they have expressed wanting more clarity concerning their navigation options, such as the breadcrumbs that lack the current page they are on. Finally, they have identified accessibility issues, including text that is too small or too low contrast, that they would like to see rectified.

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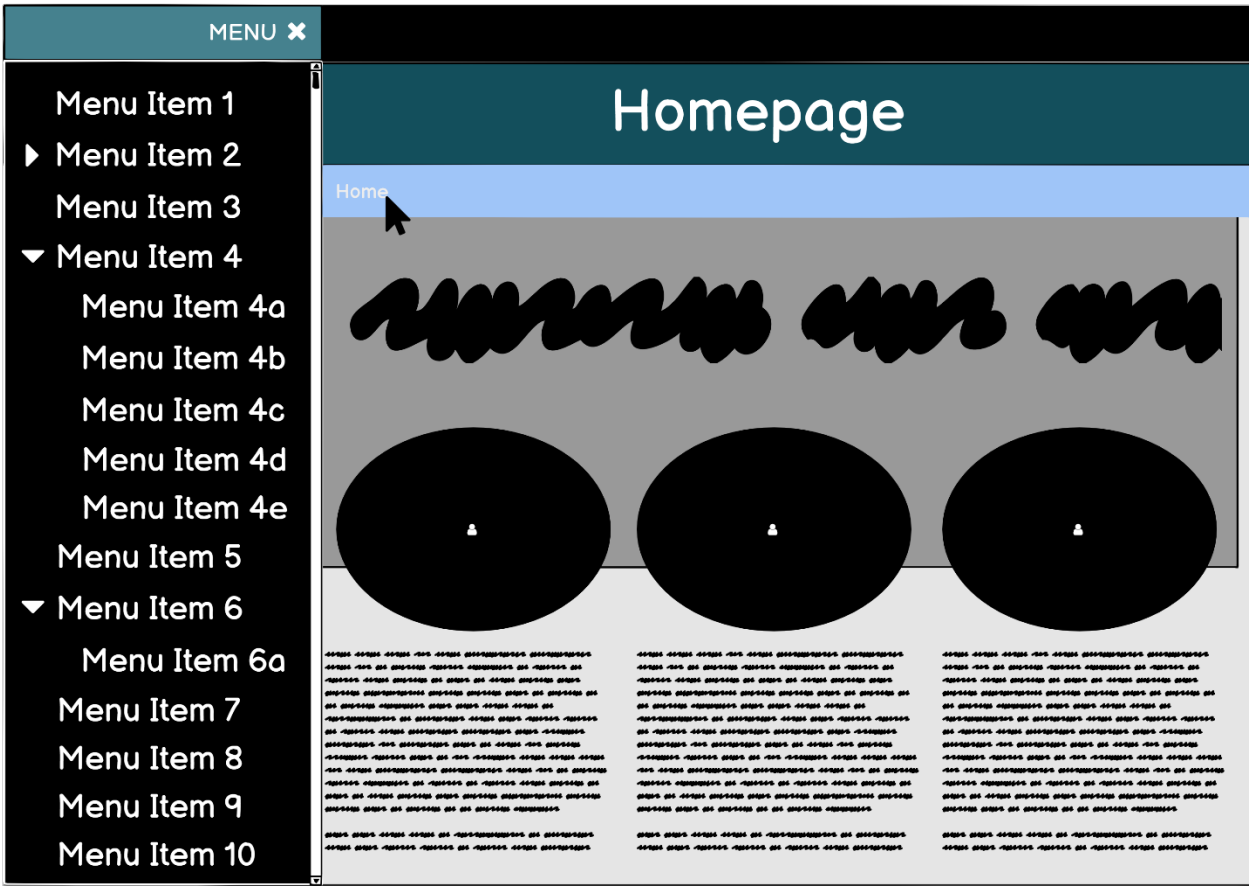
4.4.1.3 Redesigned Sidebar Menu and Breadcrumbs



This is a proposed redesign of the sidebar menu and breadcrumbs on the homepage. Notably, the current site does not have any indicator of breadcrumbs on their homepage, which contributes to users not knowing what they are or what they do when they finally do encounter them. As such, I have suggested priming users for the breadcrumbs throughout the site by including a distinct banner with the word ‘Home’, which would be a clickable link on any page apart from this homepage.

As for the sidebar menu, opening one submenu should not obscure other menu options. Larger text and colors that have a higher contrast should be used to address the current accessibility concerns. Moving the sidebar menu to the lefthand side of the page would also align with users’ expectations better than the current menu.

While these recommendations are more difficult to feature with a simple wireframe, it is strongly recommended to allow users to leave parts of the menu

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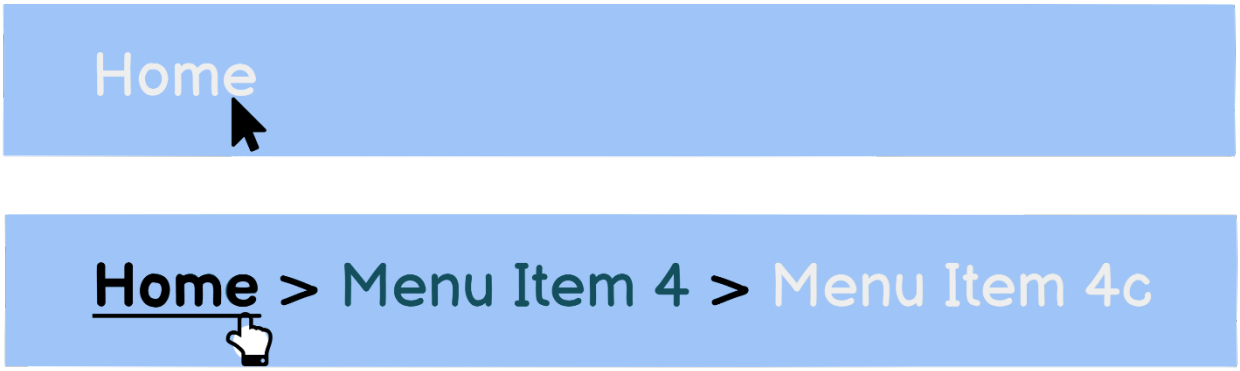
expanded if they so desire, and to leave the entire menu open while they navigate the site if they so choose, forgoing the current implementation of a gray transparent layer that covers the page when the menu is open.



To further illustrate the previous point about breadcrumbs not including the current page, this is a very basic wireframe of what it would look like to include that. It would be best for this text to not be clickable (similar to the Home breadcrumb on the homepage) as that would simply refresh the page, which is known to frustrate users. Furthermore, this wireframe also demonstrates an additional indicator, an underline, that could be used throughout the site to emphasize when text is clickable.

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Chapter 5: Conclusion

As previously stated, the impetus for this qualitative exploratory case study was to examine the impact of a particular organizational structure on the projects and teams contained within it. Three basic tenets of organizational structure that were analyzed in this study were workflows, communication, and resource allocation. This organization was found to have inconsistencies and obfuscations embedded in each. Thus, its structure was found to have a negative impact on its work, its employees, and its end-users. Examining and recognizing these structural issues through the perspectives of employees and end-users is ideally a first step toward resolving them.

Upon inspecting the pertinent literature, a few different gaps in the current understanding of these topics emerged. A multitude of interrelated factors impact interorganizational communications, workflows, and resource distribution, and these factors primarily exist on a macro level. Addressing all of these factors is not within the scope of this study, but this project does offer an exploration of some as a way to begin filling these gaps in the literature. Areas for potential future research due to the limitations of this study are also identified throughout.

This study aims to empower the individuals and groups operating within a given structure, both the one that is the focus of this project and any organization experiencing similarly systemic complications. Ideally, this research will help highlight and emphasize changes that may be necessary to improve these structures for all involved.

The project's research questions occupy the space where structural power, technology, and social dynamics converge. They were as follows:

- *How does an organization's structure (i.e. its interorganizational communications, workflows, and resource distribution), or lack thereof, shape the deliverables (i.e. products and/or services) they provide and maintain?*
- *Further, how does this structure impact the way end-users interact with and feel about the deliverables they make use of?*
- *Finally, how does this structure affect an organization's employees (especially user-experience designers) with their varying tasks and priorities, both in terms of their collaborative capabilities and in terms of how they feel about their work, individually and collectively?*

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The research site for this project which was a scientific research institute concentrated on astronomy. This institution is a non-profit that is operated by a consortium on behalf of NASA. The experiences of this institute's employees and end-users were gathered and analyzed to this end. Importantly, the themes that emerged from this research cannot be isolated to this one institution, as the identified structural challenges can be found at other organizations within other contexts. Additional research is required to round out the perspective offered by the exploration of this one institute.

There was overwhelming agreement that the institute's navigation overall was confusing and frustrating. This was held to be true regardless of who this perspective came from (i.e. scientists, designers, managers, end-users, and people who occupy multiple groups). People almost entirely avoided using the navigation options available to them due to not understanding how they could help, not believing in their capacity to assist, and/or not realizing they were present. Without a clear navigational tool guiding them, most users expressed feeling disoriented by and dissatisfied with the institute's main site. As such, the main site's primary and secondary navigation systems were redesigned, both with short-term and long-term suggestions, based on user feedback.

This institute's organizational structure creates, contributes to, and/or exacerbates deficiencies experienced in navigation. This applies to both the way end-users navigate their interfaces and the way employees navigate their day-to-day workflows. Since this institute has not yet centered its users and UX design methodology in its processes, these related challenges in navigating interorganizational communication, resource allocation, interfaces, individual webpages, and menus persist. According to those who participated in this research, multiple attempts to resolve these challenges have been made by many people spanning a variety of roles, teams, and projects. These attempts have yielded little to no success. Meanwhile, this institution only stands to benefit from addressing these underlying structural issues. The outcomes of rectifying these problems include reclaiming countless misspent hours and dollars, preventing such waste in the future, and increasing both the retention and satisfaction of their users and employees. They also could gain a strengthened brand presence by having a more aesthetically and functionally unified collection of interfaces, which would naturally follow from the aforementioned structural improvements.

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The way we use something impacts 1) what we are able to get out of it, 2) our feelings about it, and 3) our willingness to continue using it. Any institution concerned with retention, that of its users and its employees, has a vested interest in shaping its operations and processes with those groups at the center. Continuing to treat these groups peripheral will only yield more of the same: wasted money, irreclaimable time, and dissatisfaction from all parties involved.

5.1 Limitations

This project was conducted by a former employee of the research site. The entirety of this research study was conducted virtually due to the COVID-19 pandemic. The pandemic also impacted the schedules of potential research participants, which limited the number of one-on-one interviews that were conducted. The secondary data sets used in this study are also limited in their application due to the differences in numbers and types of participants across each, the different interfaces that were focused on in each, and the differing mediums used to collect participant feedback (i.e. oral versus written communication).

5.2 Future Research

This study and future research in this area would likely benefit other users, designers, and researchers. For designers, this study serves as an important reminder that users want to have their feedback heard, and they will find a way to do so even in the absence of a formal user-centered process. It would be worthwhile to study the level of success that designers have with more ad hoc approaches to UX design. For users on the other hand, this study showcases designers who very much want to implement user feedback, even without that structural support. Another interesting area for further research would be advocacy on the part of users – that is, to what extent users have been able to incite more user-centered thinking and processes behind the scenes of the tools they use. Finally, for researchers, this study acts as an example of both the advantages and disadvantages that come with conducting participant observation research in this area.

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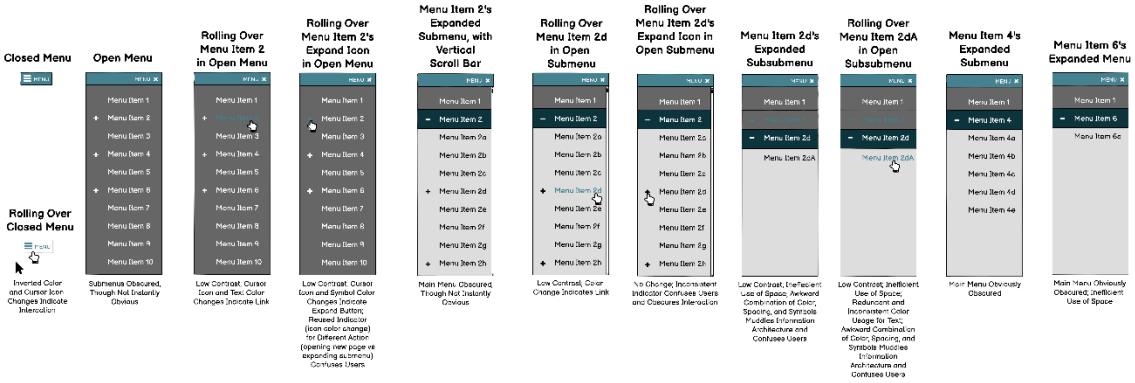
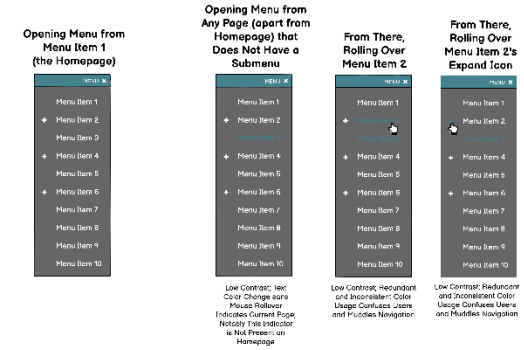
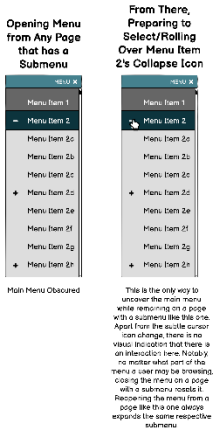
Appendix

Current Main Sidebar Menu Navigation: Functional and Aesthetic Observations



Current Main Sidebar Menu Navigation: Impact of User's Current Page on Menu Functionality and Aesthetic





Short Term Suggestions to Aesthetically and Functionally Improve Current Navigation:

Decrease spacing between each menu item to make better use of space

Increase contrast to improve accessibility

Align icons and text to clarify the relationship(s) between the two

Employ uniform padding to prevent looking disorderly

Vary color usage to clarify information architecture and component behaviors

Combine more indicators to drive home available interactions (e.g. highlight effect, underline, etc.)

Long Term Suggestions to Aesthetically and Functionally Improve Current Navigation:

Reconfigure menu so that opening a submenu does not obscure other options, leading to unnecessary clicking back and forth between submenus and subsubmenus

Establish consistency with interaction indicators for different kinds of interactions to build trust and credibility with users and improve their experience

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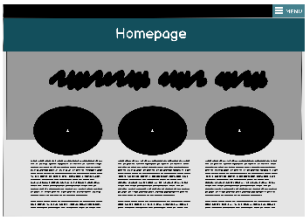
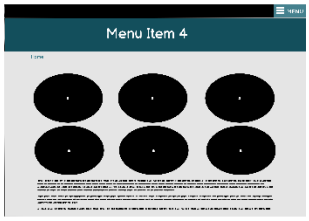
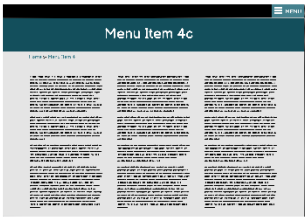
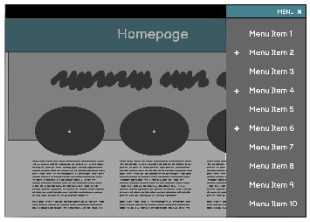
Current Breadcrumbs/On-Page Navigation: Impact of Open Sidebar Menu on Functionality and Aesthetic

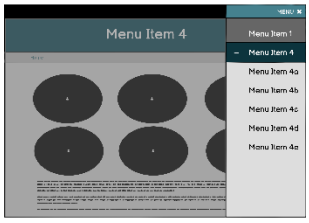




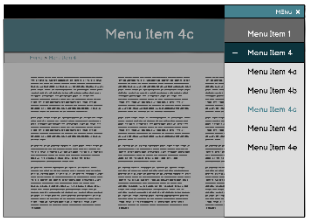




No Breadcrumbs Preview on Homepage



Main Menu Obviously Obscured; Opening Menu Disables Interaction with Rest of Page; Menu Cannot be Pinned Open While User Navigates Site, Despite this Functionality Existing on the Much Less Frequently Used Mobile Site; On Page Navigation/Breadcrumbs are Slightly More Visible with Menu Open, which seems to Trigger a Subtle Banner, but They Cannot Be Selected While Menu is Open



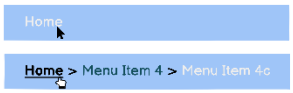
On-Page Navigation/Breadcrumbs and Their Interaction Indicators are Too Small and Subtle, Current Page is Omitted from this Navigation Bar, Which Confuses Users and Muddles Information Architecture

Rolling Over Any Page in the Current Breadcrumbs Changes the Text to Black; Combination of Small Size, Awkward Placement, and Subtle Text Coloring with a Low Contrast Rollover Text Change Makes This Interaction Hard to Notice

Short Term Suggestions to Aesthetically and Functionally Improve Current Navigation:

Enlarge breadcrumbs to improve accessibility

Place breadcrumbs inside visibly distinct banner that exists regardless of whether the menu is open to boost visibility



Include grayed-out current page within the breadcrumbs to clarify where users are in the site hierarchy

Combine more indicators to emphasize that the breadcrumbs are clickable (e.g. highlight effect, underline, etc.)

Add a grayed-out current page breadcrumb to the homepage to prime users for breadcrumbs throughout the site

Cut the height of the page headers/banners in half, as these currently take up ~20% of the screen, which pushes the breadcrumbs down to an awkward spot nearing the middle of the screen

Long Term Suggestions to Aesthetically and Functionally Improve Current Navigation:

Unify organization and styling of this company's various sites so that breadcrumbs can be tracked throughout, rather than suddenly disappearing on certain pages

As an extension of the above point, it is unclear what is considered an internal versus external link across the various sites. Moreover, many links across these sites use a new tab/external link icon, despite the fact that they open in the same tab and often do not lead to an external site. The opposite is also true - many links that open in a new tab and/or lead to a new website do not have the accompanying icon to visually indicate this is the case. The inconsistencies are widespread on every level.

Long Term Suggestions to Aesthetically and Functionally Overhaul Sidebar Navigation:

Move menu to the left side of screen per employee and end-user feedback

Allow menu to be interactable without impeding interacting with the rest of the page

Employ a model akin to Windows File Explorer for easy viewing and navigating; keep all menu options visible and interactable rather than burying most of them when a submenu is opened

Use widely recognized iconography for expanding and collapsing menu options, such as arrows or carets

Related to the above point, avoid reusing iconography that is infused with another meaning elsewhere (plus and minus signs are associated with adding and removing conditions from search queries across multiple sites under this org)

Utilize indenting/spacing to further visually indicate hierarchy of pages