Enabling Equitable Design in Architecture: Tool Development for Actionable Information

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Abstract

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In response to the COVID-19 pandemic and Black Lives Matter movement, architecture firms nationwide have committed to more equitable practice. Discussions on diversity in the architectural profession have become common, indicating industry-wide intention for change. However, how to push these equitable intentions into action has been unclear. Many firms lack experience and struggle to find relevant resources. Additionally, there are no tools currently available to aid this process that are specific to architectural projects. This research proposes a web tool that audits a project's design decisions to bring equitable design to the project level. This tool generates customized equity-improving action reports to the user and links relevant resources for further reading. To better understand the feasibility of this tool in practice, this research completed small-scale user testing with practicing architects. Users immediately saw ways to implement this tool in practice, suggesting that equitable design information is easier to implement when it is customized to a project. Their feedback also suggests that there is a role for tools and computational design in complex social problems.

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Introduction

Amidst the already turbulent COVID-19 pandemic in 2020, America underwent a period of mass protest following the deaths of George Floyd, Breonna Taylor, and countless others at the hands of law enforcement. Black Lives Matter became a mainstream ideological movement, and as such, garnered statements of solidarity throughout the architecture industry. Nationwide, architecture firms reckoned with the fact that they too had been actors in the system of exclusion and racism in this country, whether through biased hiring practices or the gentrification of neighborhoods. This research seeks to understand how equitable design is implemented by architects, as well as understand where the current data or discussion is lacking.

Following the initial protests, a glut of information was, and continues to be, published online as resources for inclusionary practice by professional organizations such as the American Institute of Architects as well as individual firms and actors. While the understanding of racial and socioeconomic discrimination in the built environment is becoming more widely known, incorporating this knowledge into existing practice has not been straightforward. Information gaps still exist, often due to lack of information or oversight by architects, and current efforts largely focus on internal practices like recruitment or diversity training.

Focusing on the design projects themselves, this research proposes a web tool to help identify these areas and facilitate decision making. By bringing up relevant questions on the many facets of inclusive design, the tool aims to generate discussion and show those in practice the strengths and weaknesses of decisions made. Additionally, while tool development for more equitable design is small compared to the enormity of the problem itself, it is also a relatively unexplored area of research. As user research has found, many architects and their firms are struggling to push their equitable intentions into action. The presence of a tool may help with these efforts, as tools like carbon calculators have helped combat climate change. Widening the scope of inquiry even further, this work will consider the role of technologies in complex social

problems like equity in architecture. Is there a place for computation in these very “human“ problems?

Research Context

Many would describe 2020 as a year of crisis in America. The COVID-19 pandemic reached every corner of the world, with America leading the charts for total infections. In December 2020, the United States accounted for 22% of total global infections despite only holding 4% of the world population.[1] Accompanying this public health crisis, lockdowns and quarantines sent many into financial hardship. Per the December 4th, 2020 update from the Center on Budget and Policy Priority’s COVID Hardship Watch, “26 million adults—12 percent of all adults in the country—reported that their household sometimes or often didn’t have enough to eat in the last seven days”, more than triple the previously reported pre-pandemic rates. The severity of financial hardship fell along America’s typical lines of racial inequality, with Black and Latino adults twice as likely to report that their household did not get enough to eat compared to white adults.[2] Women had been disproportionately affected by this crisis as well, as they were 1.8 times more likely to lose their job and were far more likely to be burdened with childcare at home.[3]

As daily life has become more home-centric than ever before, those with the social and financial agency to adapt their space or convert extra bedrooms into offices have fared better. Extra square footage, once a luxury, has become more of a necessity for well-being in lockdown. In an April 2020 study of college students (N = 8177) at the University Institute in Milan, three weeks after the COVID-19 outbreak in Italy, researchers investigated the socio-ecological effects of lockdown.

> With regard to the considered architectural parameters, students with moderate-severe and severe depressive symptoms significantly lived in

[1] (*United States Census Bureau: U.S. and World Population Clock*, n.d.; Wolfson & Wilson, Originally published: March 11, 2020)
[2] (Center on Budget and Policy Priorities, 2020)
[3] (Fawcett Society, 2020)

apartments with small portioning, with an unusable balcony, poor quality of indoor area, and a poor quality view from the apartment.[4]

Many at home are facing the stress of a singular space for working, eating, sleeping, and socializing, significantly affecting the mental health of the occupants. Beyond the immediate public health threat of the virus itself, COVID-19 has created and exacerbated domestic crises worldwide.

Then came the second crisis: massive civil unrest following the death of George Floyd on May 25th, 2020.[5] The graphic footage of his arrest and murder by Officer Derek Chauvin of the Minneapolis Police Department proliferated through social media. This injustice also brought attention to the countless number deaths of other Black Americans, such as Breonna Taylor, who was killed by police in a botched drug raid of her Louisville apartment, and the killing of Ahmaud Arbery, who was chased and shot by white residents while jogging in his Florida neighborhood.[6] In this moment of reckoning, many Americans found themselves discussing Black Lives Matter online with coworkers or having frank and possibly uncomfortable talks with family at home. In June 2020, two thirds of adult Americans reported that they supported the Black Lives Matter movement.[7] (This number has since fallen to 55%, polled in September 2020.[8]) Possibly aided by the emotional vulnerability that has come with the COVID-19 pandemic, serious discussions on race have become more commonplace, whether it be about complacency and benefitting from a racist system, contributing to the system itself, or experiencing the effects of racism firsthand. Even Cosmopolitan, a magazine and lifestyle website known for beauty and style tips, posted an article titled “How to Talk to Your Parents About Black Lives Matter.”[9] Nationwide demonstrations demanding “Justice for George” and blackouts across social media were some of the many signs of the largest public acknowledgement of modern systemic racism in America since the

[4] (Amerio et al., 2020)
[5] (The New York Times, 2020)
[6] (Fausset, 2020; Oppel et al., 2020)
[7] (Kim Parker & Anderson, 2020)
[8] (*Support for Black Lives Matter Has Decreased since June but Remains Strong among Black Americans*, 2020)
[9] (Hsieh, 2020)

Civil Rights movement. Attitudes toward this topic are still rapidly changing as news of injustices like these, both past and present, become more widely known.

Within the architecture world, statements of solidarity with Black Lives Matter became ubiquitous. Discussions on the intersectionality of race, exclusion, and the built environment became common topics in office-wide remote meetings. NOMA NW, or the National Organization of Minority Architects Northwest Chapter, put out a Call-To-Action pledge endorsed by both AIA Seattle and Planning in Color. This pledge included commitments like conducting office-wide EDI (equity, diversity, and inclusion) training to benchmark a firm's current cultural competencies, acknowledging the historic anti-black sentiment America has been built upon, and openly stating that Black Lives Matter.[10] On the academic side, ACADIA 2020, in their first ever online conference, featured more human-centered talks than in previous years, such as a keynote on data biases and a panel on culture and access.[11]

Those involved in architecture are well aware of the complexity inherent to this field. It's far more than just building a structure. There are a multitude of factors an architect considers, from communities and stakeholders to materials and building performance. The sum of these decisions make up the fabric of American cities and towns—and that fabric has historically benefited white, male Americans over others. To say that architecture cannot be exclusionary would be ignorant of redlined neighborhoods, "separate but equal" water fountains, and park benches with dividers down the center. Whether intentional or not, the architect too has played a role in the construction of inequity in this country. "The built environment is characterized by man-made physical features that make it difficult for certain individuals—often poor people and people of color—to access certain places."[12] Architecture is a form of regulation as its design regulates how an occupant interacts with a space. While the law has rectified some explicitly restrictive legislation, like racial segregation, it has not addressed less overt exclusionary design tactics. Addressing this is at the discretion of the architect.

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[10] (*NOMA NW 2020 Call-to-Action*, n.d.)
[11] (*ACADIA 2020 Conference Schedule*, 2020)
[12] (Schindler, 2015)

This research does not purport to solve these crises. Rather, this work stems from the need to address systemic inequities and design disparities highlighted by the COVID-19 pandemic and the Black Lives Matter movement.

Problem Statement

To capitalize on the opportunity created by 2020's ideological upheaval and to stoke the fire for lasting change, this work seeks to develop a tool to funnel this fervor into design discussion and day-to-day decision making. Current efforts around equity, diversity, and inclusion in architecture have largely focused on internal issues such as recruitment, retention, and racial sensitivity training. However, the path to acting on these values and integrating EDI at the project and design level is relatively unexplored. This research looks into tool development as a means of guiding the architect through this process and funneling equitable intentions into equitable design.

The role of digital tools in social problems

The architect's toolset is as interdisciplinary as the architect's role. Tools for design, like Edward Bustow's ellipsograph, and tools for construction, like Filippo Brunelleschi's specialized joint and hoist system, are prime examples of architects developing tools to respond to challenges created by their own designs.[13] These past developments have also largely answered definable problems: how might we draw complex curvature or assemble this structure? As computers became integral to the architectural design process, computer-aided design and carbon calculators have become indispensable in addressing more modern questions, like digitizing designs or reducing a building's carbon footprint. No tool specific to equitable design in architecture currently exists, so tool development to tackle this problem is the next logical step.

However, the quantitative approach used to develop carbon calculators does not readily translate to the qualitative complexity of designing for equity—or put more

[13] (Witt, 2010)

simply, designing for people.The limitations of computation should be clarified before it is assumed to be a panacea to these issues.

What computation cannot do

There is no way that computation alone can fix racism and exclusion. Firstly, human beings are not fully quantifiable. Every person is unique in their makeup, with an infinite variety of characteristics, priorities, and lived experiences. Consequently, it would be impossible to build a tool that guarantees a project is not exclusionary in some way since digital tools are unable to adapt to the fluidity of human life.

In Rittel and Webber's *Dilemmas in a General Theory of Planning*, the authors describe societal issues as "inherently wicked." Wicked problems, in this case the challenges in the pursuit of equitable design, are defined by the following:

1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule.
3. Solutions to wicked problems are not true-or-false, but good-or-bad
4. There is no immediate and no ultimate test of solution to a wicked problem
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly
6. Wicked problems do not have an enumerable set of potential solutions, nor is there a well described set of permissible operations that may be incorporated into the plan
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered the symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The planner has no right to be wrong.[14]

[14] (Rittel & Webber, 1973)

It is because of these “wicked” characteristics that computation cannot be regarded as a magical solution for exclusionary architecture. There is no such thing as a perfectly equitable project or explicitly correct quantitative solution to a qualitative problem. There will always be trade-offs. Maybe one group benefits here with this decision, but another can benefit elsewhere. The art of balancing these trade-offs cannot be captured by computation and is better left to the human architect.

Additionally, technology itself can encapsulate and perpetuate racism and exclusion. Inequities can be coded into systems by their creators under the guise of an efficient catch-all solution to modern day problems. Some technologies even go so far as to claim “bias minimization”; for example, allowing a computer to sort through job applications instead of having a human do it.[15] However, as sociologist and professor Ruha Benjamin writes, “the outsourcing of human decisions is, at once, the insourcing of coded inequity.”[16] She further elaborates, “These tech advances are sold as morally superior because they purport to rise above human bias, even though they could not exist without data produced through histories of exclusion and discrimination.”[17] Even the most powerful computer cannot be assumed to always make a fair and unbiased choice when it pertains to equity. All human beings are biased, and the technologies created by them carry these biases as well.

What computation can do

With these caveats in mind, this research acknowledges computation’s inability to rectify the qualitative issues surrounding equity and human experiences. Rather, this work proposes that this tool take advantage of computation’s quantitative abilities to help an architect navigate the challenges around designing for equity.

The first place that computation can help is scale. Equity is an enormous, nebulous topic and there are a seemingly infinite number of questions an architect should be asking themselves, their stakeholders, or their clients. Coupled with short

[15] (Benjamin, 2019)
[16] Ibid.
[17] Ibid.

timeframes, tight budgets, and implicit biases, many questions go unasked. Computational databases can help manage the sheer number of factors to be considered in the design process.

The next place computation can help is facilitation. In this digital age, the Internet gives access to an abundance of information. It is much easier to find and share information than ever before. The Internet also enables communication between people, regardless of location. The same connections responsible for the rapid digital spread of outrage following George Floyd's death also connect participants nationwide to AIA Diversity Roundtable meetings.

Lastly, computation can help with evaluation. It can track progress and provide metrics around equitable design. Data sets such as census data can help architects determine if an area has undergone gentrification or experienced environmental displacement. Metrics can also help internal evaluations, such as finding the relationship between project hours spent on community engagement and client satisfaction. Again, with the understanding that there is no such thing as a universally equitable project, there are still trackable outcomes that can inform future decision-making.

Computation alone cannot help the qualitative "wicked" problems equitable design presents. The designs and decisions made are still fully the responsibility of the architect. However, computation can have a role in managing the scale of the problem, facilitating connections between resources and people, and evaluating progress and metrics.

Methodology

To begin, this research will review existing literature on equitable design processes. This literature review will establish the theoretical framework of this thesis and investigate the role of digital tools in complex social problems, focusing on user-centered design principles, gamification, and their impacts on tool engagement.

This information will then inform the development of an equity, diversity, and inclusion pathfinder web tool prototype, designed in Adobe XD. To understand its potential application in professional practice, this research will run a small-scale (n < 20) qualitative interview with several practicing architects on their current equitable design practices and test the feasibility of this web tool with them. Following user testing, this research will then discuss its findings and consider the feasibility of future developments of the web tool.

Literature Review

This literature review will first define the key concepts of equity, diversity, and inclusion in the context of this research. It will then look at the historical challenges in pursuit of equitable design as well as a case study of an existing project. Following this, it will evaluate existing resources and tools for improving equity in architectural design. Lastly, it will identify and explore knowledge gaps hindering the current EDI efforts in the architecture industry.

Definitions

It is important to define the concepts this research relies upon. This work will begin with the definitions of equity, diversity, and inclusion from the AIA Guides for Equitable Practice.

Equity

> Equity is the state in which everyone is treated in a manner that results in equal opportunity and access, according to their individual needs. Equity in the workplace requires identifying and eliminating barriers that have disadvantaged nondominant identity groups to assure that all individuals receive equitable treatment, opportunity, and advancement regardless of identity; it also means that some individuals will need more support than others. [18]

[18] (American Institute of Architects, 2020)

Equity in architectural design operates similarly to equity in the workplace. It means that the barriers faced by community members have been identified, and the design minimizes the impacts of or eliminates the barriers entirely.

It should also be noted that equity is different from equality. Equality is the idea that everyone gets a “fair” chance or is offered the same opportunities, regardless of individual barriers, whereas equity acknowledges the background of an individual and how that affects their lived experience. Equity entails a customized response, whereas equality does not. For example, a housing development based on equality would give everyone identical homes, while a design based on equity would customize a home’s layout and features to meet its occupant’s needs.

Beyond the moral case for equity in architecture, equity can also lead to happier clients and stakeholders—and arguably more successful projects. Community engagement processes that value the input of the community as “expert citizens” increase feelings of ownership, belonging, and satisfaction in a space.[19]

Diversity

Social diversity as defined by the AIA Guides is the presence of “a mix of people with a wide range of visible and invisible personal and group characteristics, backgrounds, experiences, and preferences.” Tied to equity, diversity is the range of factors that change an individual’s lived experiences and gives premise to the barriers that may be present to them. This could be anything from race, income level, able-bodiedness, or sexual orientation.

Diversity also includes diversity of thought. Architecture as a field has been dominated by the white, cisgender, able-bodied male architect. This dominant perspective has led to lack of design diversity since these people have designed spaces that suit themselves. Incorporating diversity in design means increasing the diversity of the architects themselves as well as embracing the diversity of the people designed for.

[19] (Jurkovič, 2014)

Additionally, assuming that success in an architectural space is in part defined by the presence of people, diverse spaces can be more successful. Expressions of cultural diversity, such as businesses and festivals, are becoming increasingly popular in America. While interactions with culturally diverse sets of people does not necessarily guarantee full acceptance of these communities, the commodification of diversity can be a resource for both cities and citizens.[20]

Inclusion

"Inclusion is manifested in an environment in which everyone feels welcomed, respected, supported, safe, and valued. In the workplace, inclusion generally results in everyone developing and contributing to the best of their ability. Inclusion is distinct but related to equity and diversity." [21] When applying this concept to design, it means listening to the communities designed for and incorporating their input.

In understanding inclusion, it is helpful to understand its opposite: exclusion by design. Sometimes called "hostile architecture", it is any design that excludes or deters a person's presence in a space. One of the most infamous examples is Robert Moses' Long Island Parkway overpasses, designed to be so low that public buses could not pass through. This created a socioeconomic barrier to Long Island, excluding people who did not own their own cars from entering and participating in the other public works he had developed on the island.[22]

[20] (Rath, 2017)
[21] (American Institute of Architects, 2020)
[22] (Groeger, 2016)

Figure 1: Low overpasses on a Long Island freeway. Source: Doug Kerr via Flickr

However, exclusionary design is not always as overt as low overpasses or park benches with armrests down the middle, nor is it always intentional. For example, an architect may choose an ornate door for aesthetic reasons, but find out later that the door is heavy and difficult for children and elderly patrons to use. The risk of exclusionary design is persistent and pervasive, furthering the argument that community engagement and inclusive discussion should be standard practice.

Challenges in the pursuit of equitable design

With the definitions of equity, diversity, and inclusion established in the context of this research, this review will now consider the challenges of furthering these concepts in architectural design.

Acknowledgement of exclusion and privileged designers

The first challenge in addressing exclusionary and inequitable design is simply the ability to identify and acknowledge it. Having a built environment that was designed by and for privileged architects makes it difficult to see the difficulties of others. Published in The Yale Law Journal, Professor Sarah Schindler writes, “The exclusionary built environment—the architecture of place—functions as a form of regulation; it constrains the behavior of those who interact with it, often without realizing it.” She later writes, “[It] is characterized by man-made physical features that make it difficult for certain individuals—often poor people and people of color—to access certain places.”[23] While America has resolved most explicitly restrictive legislation such as racial segregation by law, it has not addressed less exclusionary design tactics. Identifying exclusion via design falls to the architect, as “potential challenges, courts, and lawmakers often fail to recognize architecture as a form of regulation at all, viewing it instead as functional, innocuous, and prepolitical.” [24]

Contributing to the lack of ability to identify exclusionary design is the role of historically privileged architects. White, cisgender, able-bodied men have established the foundation for modern day architecture. Their privilege has shaped the status quo—what a building should look like, how it should perform, who it should cater to—and their privilege has determined the metrics for success.

One of the most egregious examples of this is Steven Holl Architects’ Hunters Point Library in Queens, New York. The architect’s website touts six awards, including the 2020 AIA New York Design Award, the 2019 Sara Award for Excellence in Civic Architecture, and the 2017 Progress Architecture Award Citation.[25] However, this library has also garnered lawsuits from disability rights activists, as its $41 million design includes major sections of the library inaccessible to wheelchair users and others with limited mobility.[26]

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[23] (Schindler, 2015)
[24] Ibid.
[25] (Steven Holl Architects, n.d.; *The Pride of Queens*, 2020)
[26] (Spivack, 2019)

Figure 2: Hunters Point Library stairs. Source: Jane Dobkins, Gothamist

In terms of regulation, Hunters Point Library was treated as an assembly space, with elevator accessibility provided to the top and bottom of the building. Instead of providing access to the middle of the space, a system for librarians to fetch books for patrons was established. Despite the disparate experience for library patrons who cannot walk up the stairs to the middle sections, Hunters Point Library meets ADA code.[27] While the extent of community outreach cannot be determined from online sources, it is clear that legislation like ADA codes cannot be used in lieu of proper community engagement. Inclusive design can only be achieved through discussion with community members, including the differently-abled. Legislation simply cannot encompass the range of perspectives that should be considered. It is for this reason that this research will argue the change must stem from the architect themselves.

[27] (*Accessibility by the Book: The Case of Hunters Point Library*, 2020)

It is also the privileged who also shape the education of future architects. Higher education lauds the accomplishments of white men, partly because they were the ones that were allowed to do the work, partly because they were the ones whose work was recorded, and partly because they did genuinely advance the field of architecture. The works of the privileged are not without merit. However, when the privileged white man's linear "yardstick" is what all other works are compared to, the breadth of work from more diverse voices goes unnoticed. Moving even further up the chain, non-white children are less likely to be exposed to architecture as a profession and consider it a viable field of study. Efforts like NOMA's Project Pipeline, a camp that focuses on introducing black students to architecture, hope to diversify the field and produce more licensed black architects.[28] Addressing the root causes of exclusionary practice is vital, but will also take years to bear fruit. While the demographics of the designer and the designed for are beginning to change to more proportionately reflect the makeup of America, those entering the workforce face an uphill battle to change an industry they could not make the rules in.

By understanding the nature of the challenge before architects and how white privilege has woven itself deep into every corner of practice, discussion and subsequent change can begin in earnest. Architecture has a history of adapting to the shifting needs of the built environment, and as understanding of social and racial inequities becomes more common, it is the moral imperative of the architect to reflect this in their work.

Case Study of Success: Grant High School

While the events of 2020 made EDI a hot topic in firms nationwide, some firms were already implementing these principles in their work. In contrast to the designs seen in Hunters Point Library, this work will examine projects that have gone above and beyond to make their designs inclusive.

Grant High School, a modernization project done by Mahlum Architects in Portland, OR, provides examples of this process.[29] Mahlum conducted over 100

[28] (*Project Pipeline*, n.d.)
[29] (*Grant High School Modernization*, n.d.)

community engagement meetings with current students, faculty, and alumni, and found inequities pervasive in the existing architecture. With this information, the project architects intentionally redesigned this school to address the exclusions this historically significant school building from the 1920s presented to its occupants.

Figure 3: Community engagement sessions at Grant High School. Source: Mahlum Architects

One of the most major redesigns was the sole basement cafeteria. Low-income students receiving free lunch went down to the dimly lit stairs to get food and eat, whereas other students ate upstairs or went off-campus for meals, establishing a spatial rift between students of different economic backgrounds.

Figure 4: The former entrance to the cafeteria used only by students receiving free lunch. Source: Mahlum Architects

Figure 5: New common space open to all students on ground floor. Source: Mahlum Architects

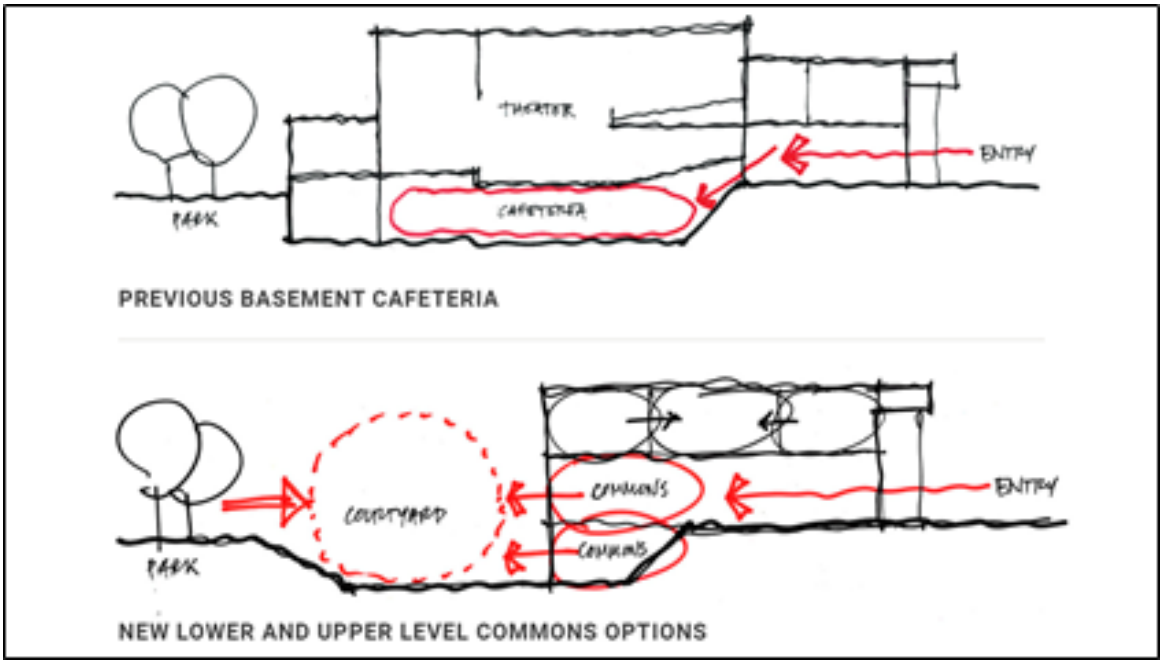

Figure 6: Section sketch of common space redesign. Source: Mahlum Architects

The modernization created a daylit common space on the ground floor for students to eat, socialize, and study. The former cafeteria space was excavated and connected to the courtyard, bringing in daylight on both sides. This area now houses a maker lab, establishing a creative space and resource available to all students. In a discussion with Joann Wilcox, the design principal for this project, she stated that “We took the one space that only the students that had to go there [the basement cafeteria] went there and turned it into the one space that everybody and every program wants to go to.”

Other dated designs like gendered, single-entrance bathrooms created unsafe areas for gender non-conforming students. One student anonymously reported during the community engagement phase, “I did not drink liquids from the hours of 6:00 am and 3:30 pm… I would rather feel kind of unpleasant than terrified in the men's bathroom.” Recent studies have found that lack of access to public facilities that correspond to a person’s gender identity result in increased rates of urinary tract infections and dehydration, as well as physical and verbal harassment.[30] Beyond the typical bullying that can occur in isolated areas like the bathroom, these gendered bathrooms were an active health hazard for some students. However, unlike more

[30] (Peterson, 2018)

obvious safety hazards like wet floors in the hallway, this information was only uncovered through community engagement and discussion.

Figure 7: Gender neutral bathrooms at Grant High School. Source: Mahlum Architects

The redesign implemented gender neutral bathrooms with fully enclosed toilet rooms and shared sinks. Grant High School Principal Carol Campbell reported that “The all-user restrooms have eliminated the safety concerns related to having large restroom areas behind closed doors. Students and adults are saying that the restrooms are private and safe.” [31]

The intention for more socially just practice does not have to stop at the end of a firm’s quarterly cultural competency training. The inclusive design features seen in the Grant High School modernization are evidence that equitable values, in this case held by both the architect and the client, can push through to the designs themselves. In

[31] (Mahlum Architects, n.d.)

terms of finding more examples of this type of work, however, the information and design features in the Grant High School project are not readily searchable. Knowledge of this project is more likely to be heard by word of mouth, meaning that this strong example of equity in design may not reach as many people as it should, creating another barrier to information and action.

Existing equitable design resources

AIA Guides for Equitable Practice

Looking towards resources specifically written for equity in architecture, the AIA Guides for Equitable Practice are arguably the most comprehensive resources currently available. Spanning nine chapters and a glossary, this resource offers guidance on topics like developing intercultural competence, recruiting more diverse architects, and negotiating for equity both internally and externally.[32] The AIA website hosting the Guides also links the resources referenced in each chapter, guiding readers to further reading if wanted.

A majority of the information both linked from and within the guides focuses on equity and its role in architecture as a profession and career. While these writings are a valuable resource to those looking to advance EDI internally at their workplaces, this research is focusing on the external social impacts of architectural design itself at the project level. Chapter 8 of the Guides: Engaging Community, begins to elaborate on this topic. It reads,

> "Since the majority of the work produced by architects affects communities of different kinds and scales, it becomes important to imagine the design with all stakeholders—client and community—in mind as each project progresses. Knowing how to engage with communities respectfully and with a disposition towards learning is essential to ensure successful end results." [33]

[32] (American Institute of Architects, n.d.-a)
[33] (American Institute of Architects, n.d.-b)

For an architect looking to push equitable intention into action, this chapter provides the most information on implementing inclusive design practices. It thoroughly describes what community engagement is, why it matters, and—most relevantly to this research—how to follow through with this at the project level. The section aptly named "Act" lists things like "engage with community members as partners", "make your expertise intelligible", and "link your project to the community economy if possible." The information provided by this resource is the design-focused information that this research hopes to become ubiquitous knowledge in practice.

However, despite the wealth of information available in this chapter, the AIA Guides for Equitable Practice do present some barriers to access and implementation. Firstly, for a user unfamiliar with this resource, finding the Guides may be a challenge. Manually navigating the AIA site shows this the Equity, Diversity, and Inclusion page that hosts the Guides under "About AIA" rather than "Practice" or "Advocacy".

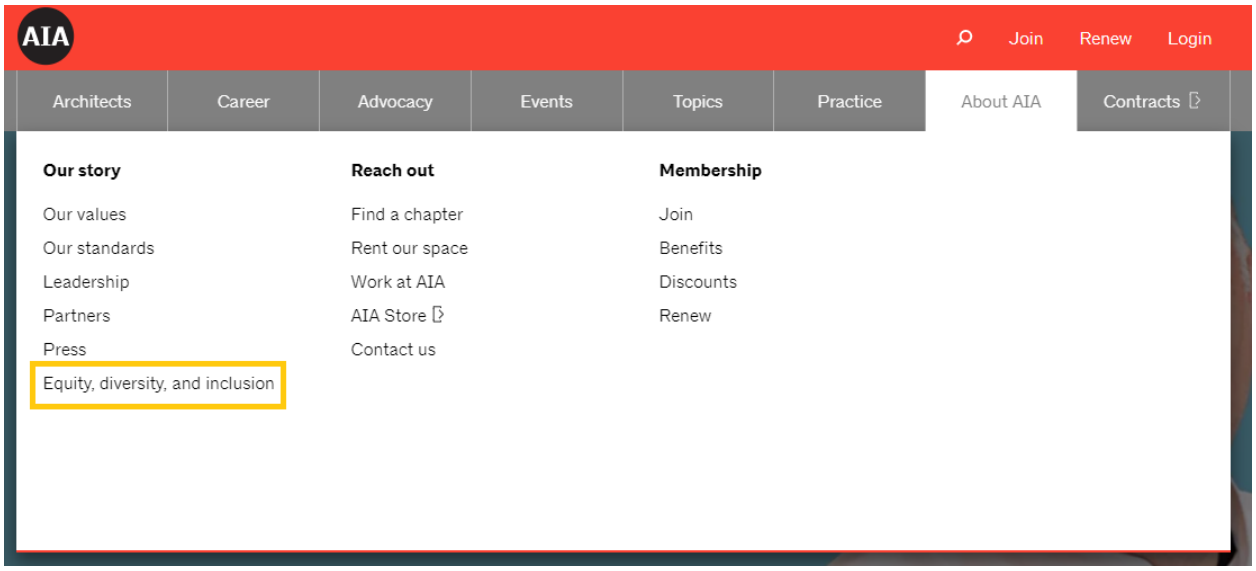

Figure 8: Web navigation to AIA Guides for Equitable Practice, edited by author. Source: AIA.org

Secondly, the AIA Guides for Equitable Practice, while comprehensive and succinct in comparison to the enormity of equity in architecture as a whole, are a large resource and take a significant amount of time to read and take in. While one may hope that architects and their firms are so driven by the moral imperative to design more equitably

that they set aside time to read and reflect on the Guides, the reality is that most are time- and resource-starved. Users will utilize the information most readily available to them. From a user interaction standpoint, this resource offers high quality content but not necessarily an intuitive or efficient user experience.

City of Seattle Racial Equity Toolkit

The Racial Equity Toolkit, developed by the City of Seattle, "lays out a process and a set of questions to guide the development, implementation, and evaluation of policies, initiative, programs, and budget issues to address the impacts on racial equity." [34] This toolkit is formatted as a PDF worksheet, freely available on the City of Seattle website without need for login or user authentication.

Figure 9: Racial Equity Toolkit instructions. Source: City of Seattle

[34] (City of Seattle, 2012)

While the tool does not mention architecture explicitly, its neighborhood-focused questions on racial demographics, community members, stakeholders, and identifying the root cause of racial inequities are all relevant to architectural practice. It says the tool should be used early in the development process, and by those with different racial perspectives.

Since the tool is outcome-focused, it also asks the user how they will evaluate and be held accountable for the racial equity impacts of their work. At the end of the tool, it lists example equitable outcomes, such as “increase transit and pedestrian mobility options in communities of color”, information on identifying stakeholders and listening to communities of color, and links to additional resources. Lastly, there is a glossary defining common terms in the tool.

The Racial Equity Toolkit offers an interactive experience for the user. While the tool cannot provide customized feedback, the self-evaluation can still provide valuable information to the user. The City of Seattle webpage hosting the tool also lists examples of the form completed on past projects so users can see how the tool has been used in the past. However, as this toolkit is intended to audit “policies, initiative, programs, and budget issues”, there are no examples of architectural projects. This tool faces similar barriers to access like the AIA Guides for Equitable Practice. The web page hosting the Racial Equity Toolkit is not easily found unless the user knows the resource by name.

Both the City of Seattle’s Racial Equity toolkit and the AIA Guides for Equitable practice show that information on equitable design features and processes exists. However, neither tool provides customized feedback and were somewhat difficult to find on their respective websites. These resources also touch on community engagement and equitable design more broadly and do not offer many specific examples of it in practice.

International Living Future Institute's Just program

Figure 10: Example Just label. Source: International Living Future Institute

The Just program, described as a "nutrition label for socially just and equitable organizations", is an increasingly common way for firms to show they are engaged in social justice issues. [35] Designed to benchmark and evaluate existing policies at a firm, this program reports on "measurable accountabilities in order for the organization to be recognized at four levels of performance, which are summarized elegantly on the label." [36] The process of obtaining and developing a Just label requires significant resources, in terms of both time and finances. Pricing for this platform is determined by firm size, with

[35] (*About Just: Make Social Justice Your Business*, 2016)
[36] Ibid.

the scale ranging from $500 for a firm with fewer than 25 employees up to $25,000 for firms with more than 15,000 employees.

With regards to this research, the Just program focuses largely on practices internal to firms, such as charitable giving or pay-scale equity. Only the “Purchasing and Supply Chain” evaluation is explicitly focused on project-level equity.

NOMA NW Call to Action

The NOMA NW Call to Action is an effort from the National Organization of Minority Architects NW chapter and AIA Seattle to spur action towards a more diverse industry. Before signing, all participating firms must conduct office-wide EDI training to benchmark their firm, openly state that Black Lives Matter, acknowledge the role of systemic racism and inequality in America, and be an active supporter of BIPOC (Black, Indigenous, and People of Color) colleagues. Following this, firms must make foundational and ongoing commitments focused on actively supporting underrepresented BIPOC professionals and students through diversity training and other organization-level actions.[37] The language of the Call to Action is specific and clear, but like several other resources available to architects, it is mostly focused on internal practices. It does list providing pro-bono design or consulting services to communities of color as a commitment, however, it does not go into further detail on how to begin that process.

This Call to Action is a strong example of actionable, qualitative information for EDI in architecture. Additionally, NOMA NW themselves will track each firm’s progress, instead of relying on the potentially subjective self-evaluations that are common for other resources.

Carbon Calculators

Diverging from resources around social equity, this research will also consider the functionality of tools in enacting change in other topic areas. Carbon calculators,

[37] (*NOMA NW 2020 Call-to-Action*, n.d.)

which calculate the carbon footprint of a design from factors including materials, construction methods, and operation, are an example of this. These carbon calculators can come in a variety of forms. EC3, or the Embodied Carbon in Construction Calculator, is a cloud-based web tool.[38] Tally, another commonly-used life cycle assessment tool, is a Revit plugin.[39] Firms have also created their own internal tools for this type of evaluation in the form of Excel spreadsheets, checklists, and Python scripts. Development and implementation of tools like this allow architects to save time by automating the data gathering previously needed to find this information.

The popularity and widespread adoption of carbon calculators show the effectiveness of interactive and customized information. Users, especially time-crunched architects, can most easily utilize information that is immediately relevant to them. Tools like carbon calculators greatly simplify the search process and enable architects to further sustainable design. This research will lean on the success of carbon calculators and utilize similar tool development principles as a path to adoption of future tools like the EDI Pathfinder.

Literature Review Summary

This literature review has elaborated on the historical challenges surrounding equity in architecture: namely the role of the privileged, white, male architect in determining the status quo. It has then identified some of the resources and tools available to architects with regards to equitable design at the project level. The content of these resources is valuable, but the user experience of accessing and utilizing this information can be improved. For architects looking to design by example, finding project examples of well-executed community engagement and equitable design is largely dependent on word of mouth. Knowledge of these works tends to be internal to firms or individual architects and are not easily searchable. Since architects are most likely to design with the information already at hand, they are at risk of unintentionally perpetuating exclusionary design features. If the information is not readily available, it risks going unused.

[38] (*Embodied Carbon in Construction Calculator (EC3) Tool*, n.d.)
[39] (*Tally*, n.d.)

User Interviews

Discussions with practicing architects

Following evaluation of existing resources available on this topic, this research conducted qualitative interviews with practicing architects to understand their firms' stances on racial and social equity in the built environment. As this is a rapidly developing topic, it is important to note that these interviews were conducted remotely over video in April 2021, ten months after initial Black Lives Matter protests. In total, 13 participants were interviewed.

Participants were found through mailing lists and word of mouth, including connections through the AIA Diversity Roundtable and NOMA NW. Due to this, these participants were better-versed on equity, diversity, and inclusion than the typical architect. Participants were from a range of firm sizes and all were based in large cities. Most showed up alone and a few participants brought coworkers to join the discussion. In one instance, one participant who was higher in seniority in the firm left the call to allow more frank discussion among his colleagues.

Discussions were approximately 1 hour long and followed a loose script. The following questions were asked:

1. What is your role in your firm?
2. What types of projects do you typically work on?
3. What is your personal comfort level discussing EDI?
4. What is your firm's comfort level discussing EDI?
5. How has your firm integrated equity into practice?
6. Has equity been a factor on the project level?
7. Have you or your firm worked on any projects that you feel incorporated equitable design well?

8. Can you explain your firm's response to last year's Black Lives Matter protests? What was said internally? What was said externally?
9. Are there any other ways your firm has advanced EDI in their work? Are there ways you want them to?
10. What is the easiest thing you feel your firm can do to advance EDI?
11. What are some barriers you've encountered to this type of work?
12. Do you use any tools to help with this?

Despite the sensitive topic, responses were frank and thoughtful. All participants felt that there was much more work to be done in this area.

When asked about their firm's reactions to Black Lives Matter protests, participant responses were mixed. One participant from a medium-sized firm said of their leadership, "They took an immediate stance that this (systemic racism) is not something that we condone and promoted us taking action and participating as a firm in the [BLM] marches." Several firms, including this participant's, closed for a day to allow employees to protest or process events. Following the rise in anti-Asian hate crimes and the subsequent Stop AAPI Hate movement later in early 2021, this participant explained the vulnerability displayed by their leadership.

> One of our partners is Asian… he called an all office meeting with all 160 of us. And he just publicly cried in front of all of us saying, 'I don't feel safe. I don't want to think that my family is not safe. I want you as my employees to stand behind me.'

In stark contrast to this however, one participant with a majority-white leadership team said,

> The Monday after George Floyd was killed, it was really weird… We had this all-office meeting, and no one said anything. I brought it up because I was really disturbed by it and felt that it needed acknowledgement.

While no firms were actively anti-protest, some did not issue statements of solidarity or took a significant amount of time to do so.

All of these participants felt comfortable discussing equity, diversity, and inclusion in the workplace but noted that colleagues who were not involved with various boards or initiatives were more difficult to engage. A participant from a small firm said “We’re never gonna know everything. And so I’m trying to get everybody to be comfortable with that and still voice [their] opinion.” Having these conversations with their firms' leadership to justify the need for action was difficult for several participants as well, with one participant succinctly saying “They don’t know what they don’t know.”

The most common action firms took following the protests was establishing an EDI committee if one there was not one already. These groups discuss topics like cultural competency in the workplace and frequently hire EDI consultants to host training sessions. Nearly all participants noted the need to diversify the industry pipeline, and several said they were refocusing recruitment efforts to reach underrepresented groups. One participant at a large firm said “We realized a lot of our recruitment practices were based on word of mouth and established connections… and frankly, that were predominantly white.” Shifting recruitment strategies was also the most common response to the question on easy actions a firm could take to advance EDI. Several participants also said their firms were completing or considering the Just certification as well as signing the NOMA NW Call to Action.

When it came to bringing EDI efforts to the project level, participants generally felt that this was client driven. Even participants that frequently worked on public-facing projects such as schools or parks relied on the client to request additional resources for community engagement. One participant that worked on primarily private projects, like high-end residential, said they were unsure of what “more equitable design” even looked like. Some clients valued community engagement and were willing to pay more for it, while others would do the bare minimum. However, this participant noted that a majority of projects fell in between.

> On other projects where maybe [the client] would be open to it, but haven't thought about it… we realize that those are situations where we need to be more prepared, both with proposals and also just in terms of our own database, our own information.

This puts architects in a difficult position, as many noted that they are just now beginning to educate themselves on these topics. Additionally, since white male privilege has shaped the typical architectural education, it is unlikely that many practicing architects have the existing knowledge to guide clients in these situations. Participants also mentioned that community engagement may be required by jurisdictions, but policies varied from city to city.

Following project completion, several participants mentioned the difficulty of finding appropriate metrics for evaluation. One user asked, "What elements are considered data? … There's percentages of individuals and cultures, but what elements do you feel are trackable?" Another said their self evaluations became too subjective and led to competition for high marks between project teams at their firm. Accompanying evaluation and metrics was the risk of failure. One participant familiar with NOMA NW Call to Action said, "A lot of firms were hesitant to join on to the CTA (Call to Action) because they felt like they weren't hitting every item [on the list] already. So they felt like they didn't want to fail."

In terms of resources and tools utilized by participants and their firms, most mentioned the AIA Guides for Equitable Practice as well as information provided by the Just certification and the NOMA NW. A few participants mentioned the City of Seattle's Racial Equity toolkit, and one participant was in the process of developing their own tool.

Summary of barriers to action

Overall, participants said the major barriers to action were lack of experience and time. One participant stated "We still have to serve our clients and our projects. [EDI work] comes out of our personal time." Convincing others to act, especially those within their firms that held decision-making power, was also a common problem. Unless

leadership was actively committed to more equitable practice, as was the case for the user whose leadership openly expressed vulnerability and cried on camera, many participants said their leadership thought enough was already being done.

User Journey

The common experiences identified in the user interviews were aggregated to develop a user journey map. Journey mapping is a common tool in user experience design that describes a typical user's relationship with a process or interaction and is helpful for identifying pain points. This research will use a racially-conscious architect as the typical user. They have committed to more equitable practice but are unsure of how that is reflected in design work.

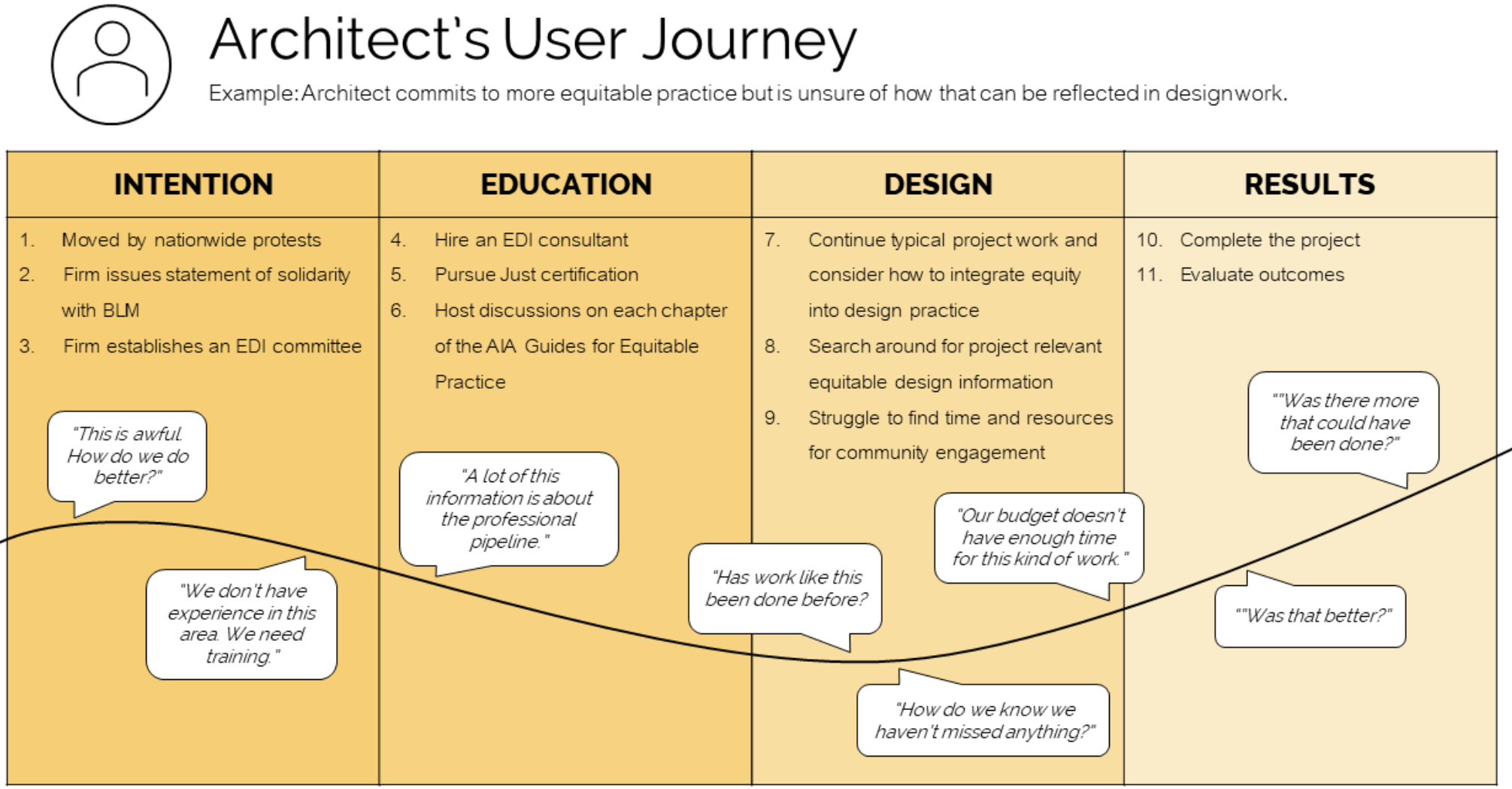

Figure 11: User journey map generated from user interviews. Source: author

The first part is the intention. Motivated by nationwide protests, their firm has issued a statement of solidarity and established an EDI committee. To educate themselves, they have hired an EDI consultant to host training seminars and are pursuing Just certification. Their firm has started a monthly discussion group to go over each chapter of the AIA Guides. Then, this user continues on with their typical design work and may be considering how to integrate EDI into their projects. They may search around for project-relevant information and possibly struggle to find the time and resources for community engagement. Finally, they may want to evaluate the outcomes after project completion.

EDI Pathfinder

User interviews and journey mapping have identified the main barriers to action as lack of experience, time, and convincing others to act. It has also identified client motivation as a key driver in advancing EDI at the project level. Building upon these findings, this research proposes the EDI Pathfinder, a web tool that provides project-level, actionable information on advancing equity, diversity, and inclusion in architecture. This tool audits a project's design decisions and generates customized action items reports for the user. While it does ask about internal firm-wide actions, such as completing cultural competency trainings, the tool seeks to integrate EDI into the design process and consequently contribute to a more just built environment.

Theoretical Backings

UI/UX Design Principles

The design of this tool leaned heavily on user interface (UI) and user experience (UX) design principles. These principles emphasize effective, intuitive, and easy-to-use interfaces as the key factors in likeable user experiences. All human-computer interactions run the risk of being unintuitive or difficult to use. Since the content of this tool is vital in the development of a more equitable environment, it was vital to create an

experience that users would want to return to. Adobe XD, the platform this prototype was developed on, elaborates on “The 4 Golden Rules of UI Design” on their website. [40]

1. Place users in control of the interface
2. Make it comfortable to interact with the product
3. Reduce cognitive load
4. Make user interfaces consistent

The EDI Pathfinder gave users control of the interface by making actions “forgivable”, allowing them to click back to previous questions or navigate to the Home, About, or History screens at any time. The audit utilized typical interface directional convention, with buttons on the middle and right advancing the questions and buttons to the left sending users back to previous screens. A progress bar at the bottom provided visual cues to the user on how many questions remained and gave the user feedback that the tool had successfully accepted the response to the previous question. The interface aimed to reduce visual clutter and reduce cognitive load by asking questions one at a time, allowing users to focus on the content of the current question rather than the question that had come before or was about to come. Interactive elements like the “Next” or “Get Started” buttons contained simple wording and changed color when hovered over, indicating that the user could click on it. Lastly, the tool maintained a consistent visual style throughout, seen in color schemes, fonts, and illustrations, to reassure the user the functionality of the tool would be similarly consistent.

UI/UX principles design look beyond designing for functionality. They aim to make the interaction an enjoyable one and increase user loyalty to the tool.

Gamification Theories

This tool also drew from gamification theories to enhance user engagement and give the user an emotional stake in the tool. Gamification is defined as “The process of adding games or gamelike elements to something (such as point scoring or tasks) so as

[40] (*The 4 Golden Rules of UI Design*, 2019)

to encourage participation." [41] In the case of the EDI Pathfinder, the "score" is the data visualization generated and the "tasks" are the action items.

As a concept, gamification can be broken down into three parts:

1. The implemented motivational affordances
2. The resulting psychological outcomes
3. The further behavioral outcomes [42]

The rapid feedback and customized results are the motivational affordances. Users engage with the tool because they are incentivized by the results they will get. The customized results establish the psychological outcome and indicate that responses the user gave had a direct effect on the outcome. Furthermore, the user's agency over the outcome gives them an emotional stake in the tool and also encourages the tool's reuse.

Prototype Screens

The following images are screenshots of the EDI Pathfinder prototype, developed in Adobe XD. Users were shown an interactive version of this, with functional navigational buttons and scrolling as if it were a live web page.

[41] (*Merriam-Webster: Definition of Gamification*, n.d.)
[42] (Hamari et al., 2014)

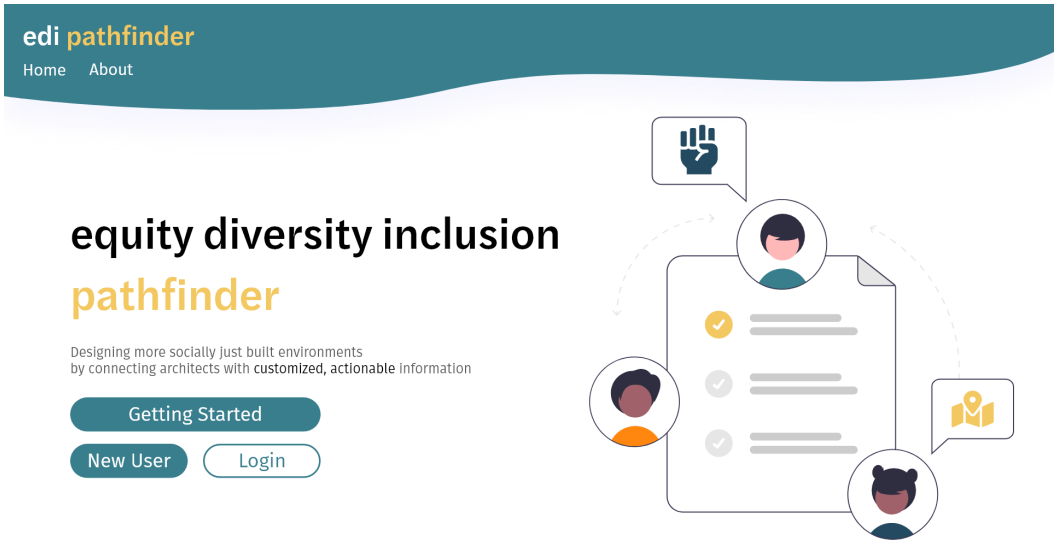

Figure 12: EDI Pathfinder start page. Source: author

Above is the Start page, the first thing a user sees when entering the site. When the user selects “Getting Started”, it takes them to the onboarding screen.

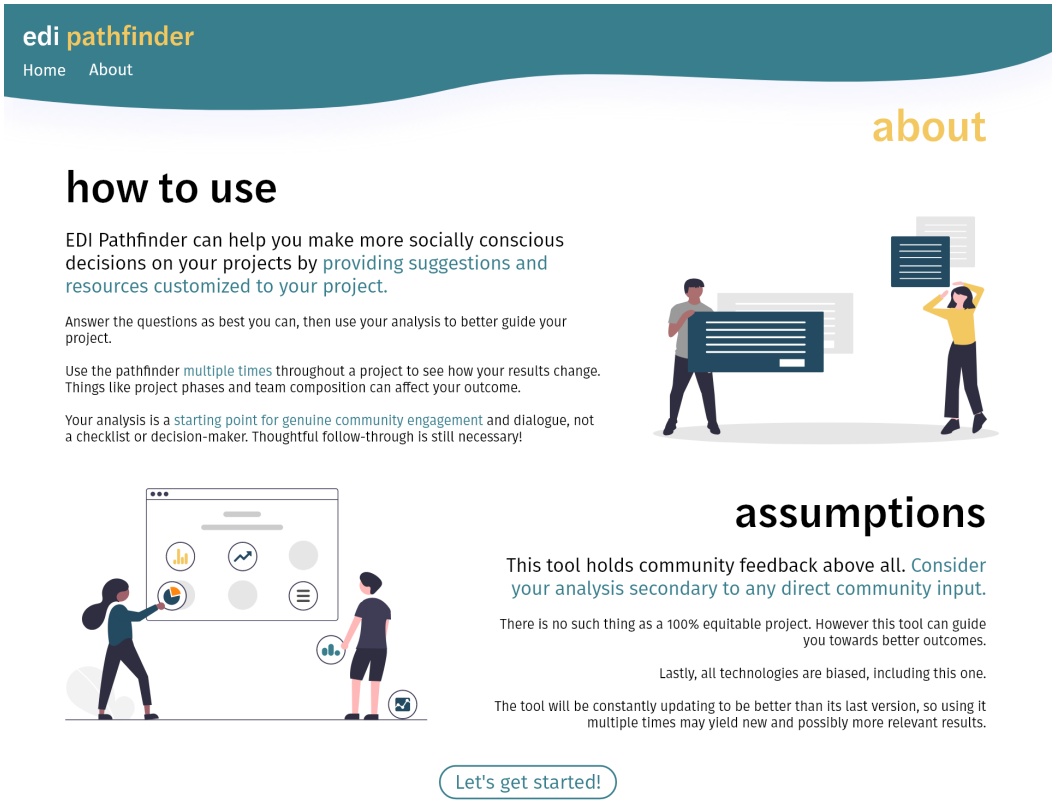

Figure 13: Getting Started page. Source: author

This onboarding screen explains the premise of the tool. The EDI Pathfinder will ask the user a series of questions concerning their project. From these responses, the tool will generate a report of actions the user can take to further advance these values in their work. The EDI Pathfinder is designed to be used multiple times throughout a project, allowing the user to see the development of their community impacts as their project progresses. These reports are to be used as a starting point for dialogue, both internally within a project team and externally with stakeholders, clients, and community members.

This screen also explains the tool's assumptions. Firstly, the tool assumes the user will hold community feedback above all and consider the analysis secondary to direct community input. It also clearly states that there is no such thing as a "100% equitable project" or high score. Lastly, it acknowledges that technologies, including itself, are biased, and may update with more accurate information in the future.

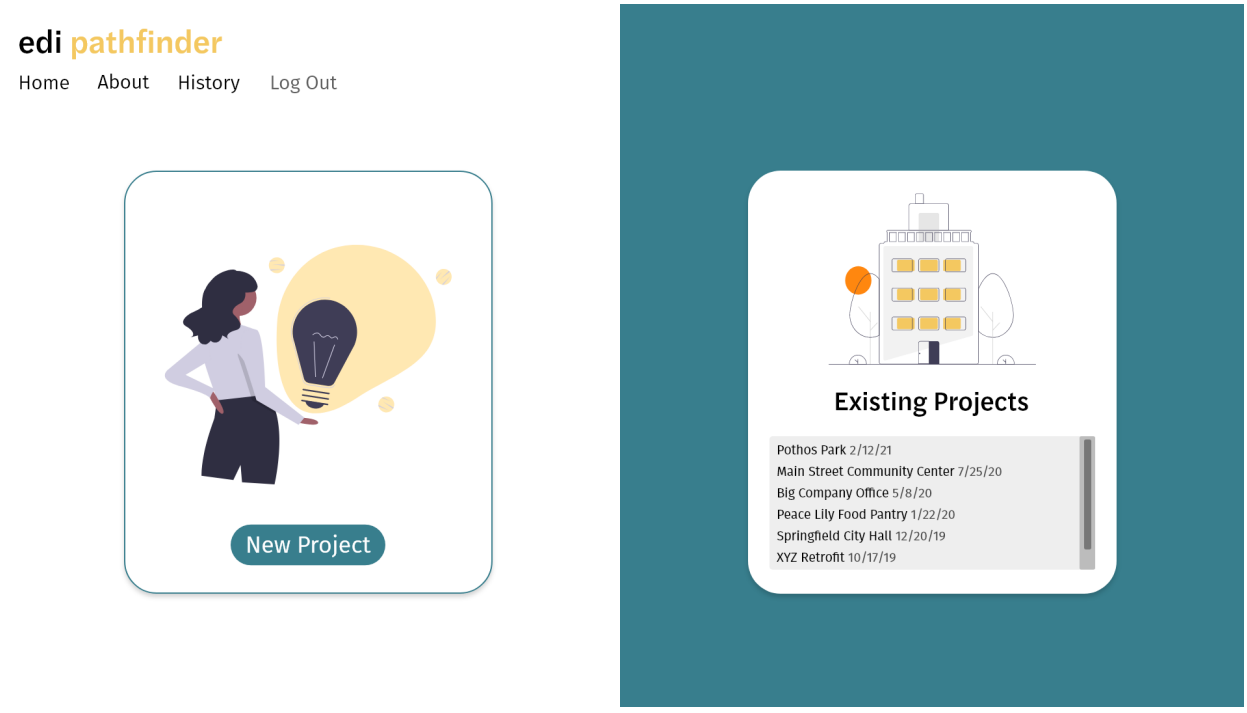

Figure 14: Home page. Source: author

This is the home screen a typical user would see. It gives the options of starting a new project or updating existing projects.

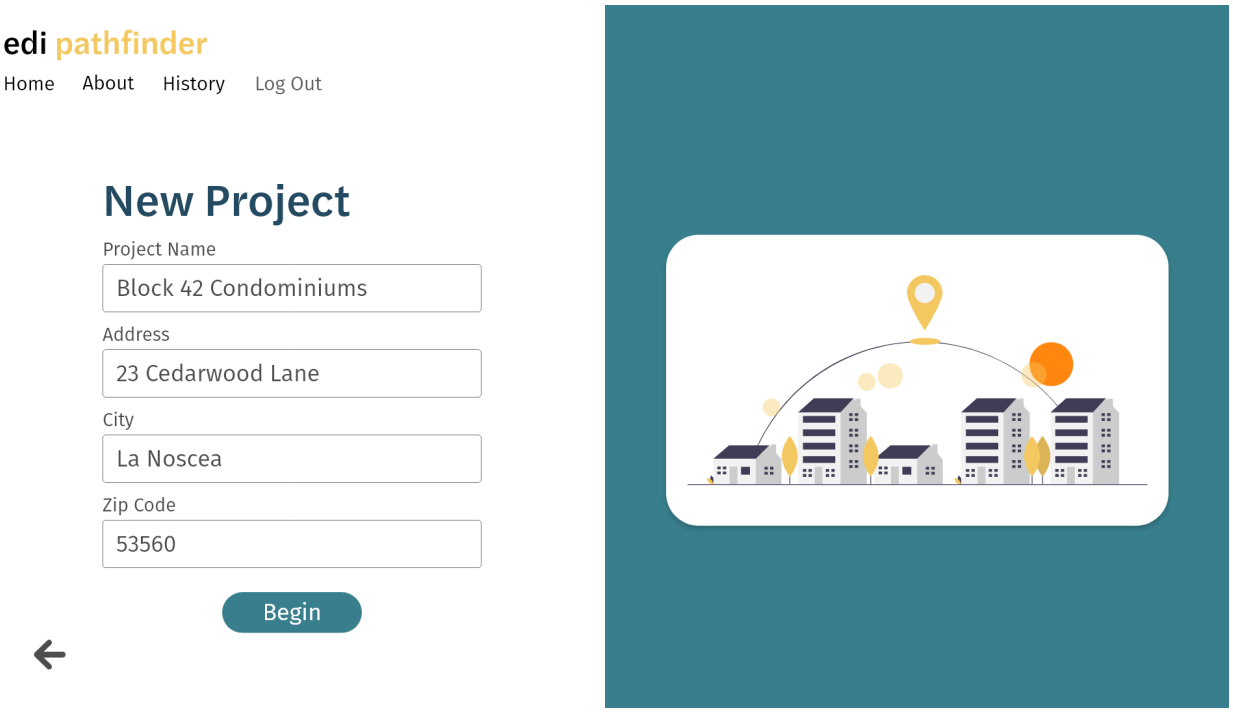

Figure 15: New project page. Source: author

If the user starts a new project, they will enter the address and project name, then go through a series of questions to audit the project.

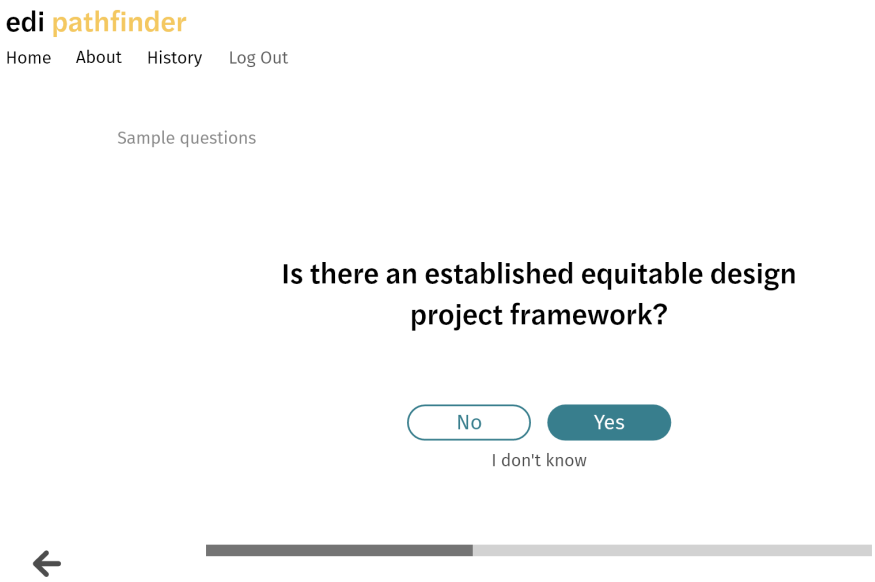

Figure 16: Sample question page. Source: author

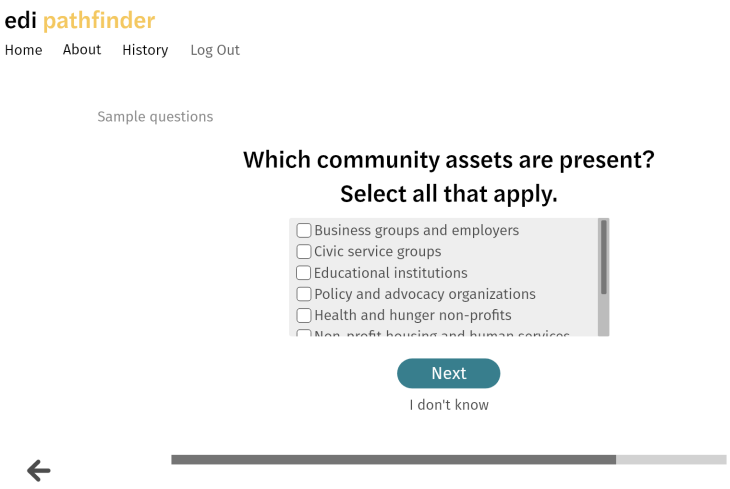

Figure 17: Sample question page. Source: author

These questions are sourced from a database with all potential questions the tool may use to calculate the final results. Questions given are determined by answers to previous questions and will not ask things irrelevant to a project. For example, if a user responds to a question saying they do not have a community representative on their team, the tool will not ask if the community representative is compensated for their time.

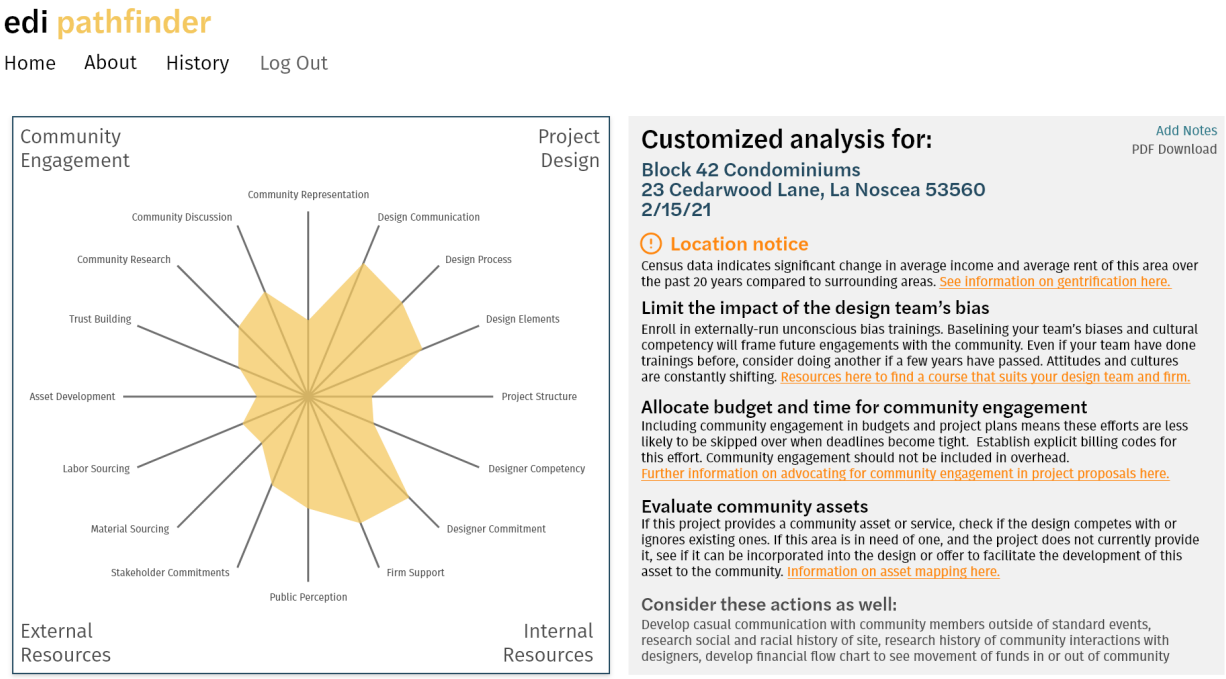

Figure 18: Example EDI Pathfinder results page. Source: author

This is a sample report generated by the tool. On the left is a data visualization of the project's results, grouped into four major categories: community engagement, project design, internal resources, and external resources. This will allow a user to quickly see where their project's strengths and weaknesses are. For example, in this image, a user will see that their project could improve upon community representation, asset development, and project structure.

On the right are the customized actions and resources for this project. The tool will use the address input to pull from census data and bring up any location specific information, such as gentrification, and provide relevant resources for designing around these factors. The analysis will then give the top three action items a user can take to improve the equity of their project, along with links for diving deeper into those topics. The information in this section is structured similarly to the "Act" section of the AIA Guides for Equitable Practice: Engaging Community. Lastly, the report will show the other actions that a user may take to improve equity but that were ranked lower in terms of potential impact by the tool.

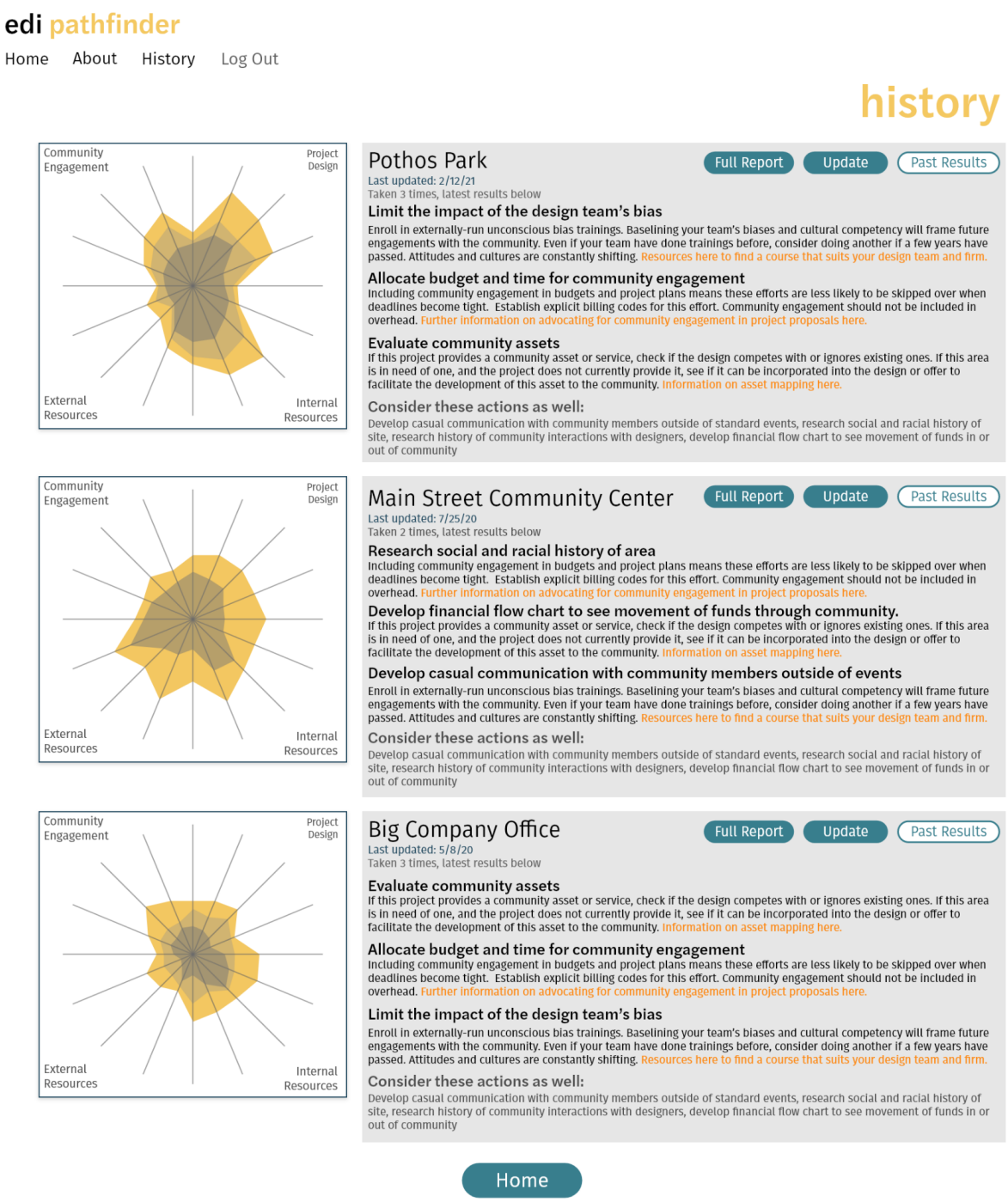

Figure 19: Sample History page. Source: author

The tool also provides a History page of all completed analyses. These comparisons can show the user progress over time as well as allow them to compare between projects to see if there are patterns in their design processes.

A key feature of the EDI Pathfinder tool design are the “soft” metrics given to the user. The design purposely does not display numerical feedback to avoid the establishment of pass/fail metrics or competition between analyses. If this tool were to be fully functional, numbers would be needed to generate the results and visualization, but this information remains hidden to the user. If a user’s visualization is approaching the end of the graph axis, the graph would then scale up to show there is more room for growth. In that instance, it would be necessary to show the graph scale if the user were comparing between projects, however the scores along individual axes will still not be shown.

User Testing

This research ran user testing with the same 13 participants that had been interviewed previously. Users were talked through the prototype and encouraged to ask questions or raise concerns throughout. Following this, users were asked:

1. What are your overall thoughts on the tool?
2. Could something like this be implemented in your current design processes?
3. What changes or improvements would you want to the content, interface, or results?
4. Do you think a tool like this could advance EDI efforts in architecture?

User responses were overall positive, with all users agreeing that a tool like this could help advance EDI efforts in architecture. When asked how they saw the tool being used in their current processes, the responses generally fell into the following categories:

Motivating colleagues and facilitating internal discussion

One user said the tool’s results would be very appealing to some of her colleagues motivated by metrics and visualizations. They said,

> “We have at least one person who is really into metrics. This would really appeal to him because he could see what he’s doing and how it’s evolving. So I think the

> tool would kind of meet different people where they're at and what they're looking for."

This user touched on some of the gamification principles implemented to encourage use. By seeing the visualization grow as the project progresses, this user's colleague would see they had agency over their results and would be motivated to take more EDI focused actions to further grow out the graph.

The tool also provides a framework for internal EDI discussion. Users liked having specific feedback and data, rather than trying to tackle a larger, more ambiguous question like "How do we fix inequities in architecture?" One user who felt it was difficult to speak to their firm's leadership about these topics said,

> "If you have something to talk around, that makes the conversation easier. Rather than just bringing it up out of the blue. But if you had something like this, then it's like 'Oh, well we can talk about these concrete things that already exist' and this provides the framework."

Communicating with clients

Users saw great potential in using this tool to communicate with clients. As seen in the user journey and barrier identification, client motivation is a key factor in integrating EDI at the project level. One user from a small firm said,

> "I think it would definitely allow us as project architects and managers to [share progress] in a more efficient and digestible way. We can share [it] with everyone and say, 'Hey, at this milestone here's where we're at, moving forward we need to shift our focus as it relates to equity in this area.'"

Since clients are expecting architects to educate and guide them through this process, these EDI Pathfinder reports provide both progress reports and talking points for client engagement.

Project Example: Grant High School

This user testing also included discussions with JoAnn Wilcox, the design principal for the previously referenced Grant High School modernization. In this discussion, she reiterated that the clients were entirely supportive, with the Portland Public Schools project manager once saying “I would rather have gender-neutral bathrooms than a roof on this school.” This project manager was also involved with the community engagement efforts herself, having been the one to learn how low-income students were sequestered in the basement through a tough conversation with a student. Wilcox said following this, “We started the conversation internally and kept it going, just around the prioritization of removing the ability to separate the school in any way.”

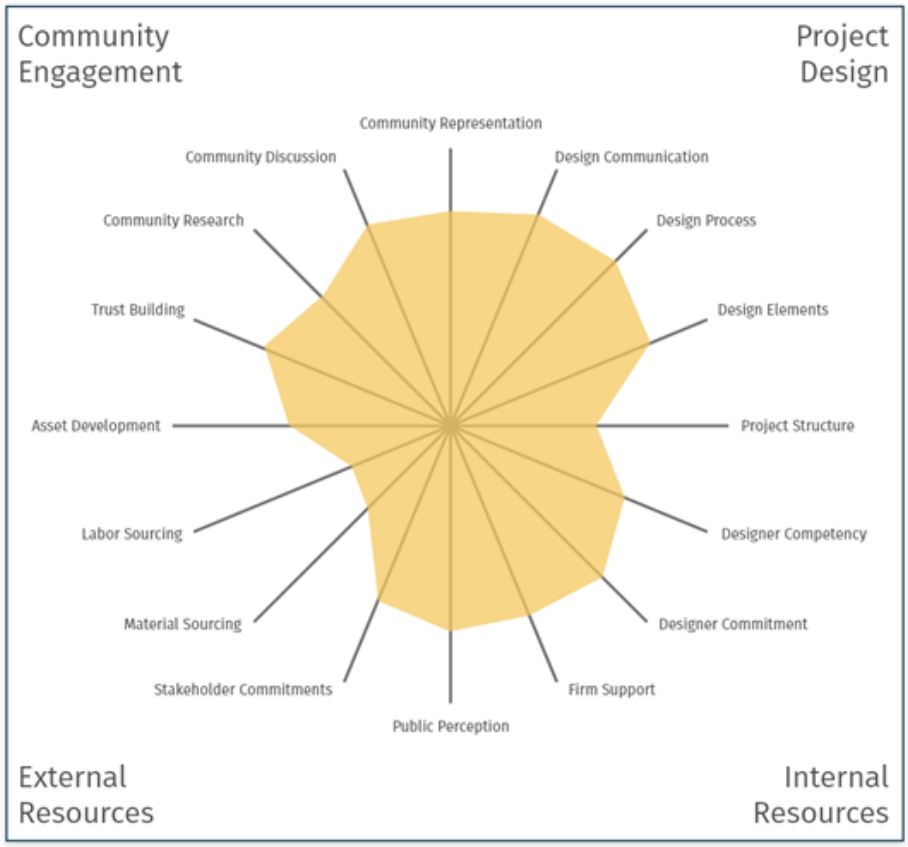

Figure 20: Results from Grant High School, based on information by design principal. Source: author

After going through the user testing process and learning more about the EDI Pathfinder, Wilcox went through the data visualization axes and assigned the Grant High School project its own scores. She thought that more could have been done to link the project's economy to the labor and material economy of the community, resulting in a lower score in the external resources section of the graph. This shows that even for projects where inclusive design is prevalent, there is still plenty of room for improvement.

When discussing the potential functionality of the tool itself, she said "I would love to have the data that demonstrates that a project structure built around listening actually allows design teams to get to the right solution faster… for Grant, we only ever proposed one solution." At the 50% milestone, the project team was still hosting community discussions, concerning some that later project phases would be compressed to make up for it. However as Wilcox saw, these extensive discussions allowed them to design a single solution much quicker than showing multiple options and waiting for feedback.

The caveats of tool prototype testing

The scope of this research includes only the feasibility of a tool to advance EDI in the architecture industry. This does not include the study of the EDI Pathfinder's functionality. This posed an issue for some in prototype testing, as users needed to imagine how a tool like this would work, rather than see the tool actually generating customized reports. Therefore, they were unable to properly judge the accuracy of the results.

One user also mentioned that pulling from census data would be an exceptionally large data science effort and was hesitant to say this tool was fully feasible without knowing if it was possible. While existing research has been done in aggregating census data, such as "Visualizing Equity: Data Science for Social Good Tool and Model for Seattle", investigating how to integrate these methods into the EDI Pathfinder was beyond the scope of this research.[43] Additionally, users wanted to know if this would

[43] (Berney et al., n.d.)

bring up location-specific resources. For example, if a user was designing a project in Portland, they would want to see relevant links from the City of Portland and local community organizers rather than the City of Seattle or elsewhere. While this could definitely be useful to users, it would require an even larger data collection effort than pulling from census data. Local resources are not uniformly formatted like the census is and may be inconsistent in terms of content quality, accessibility, and message.

User requests

When asked about improvements to the EDI Pathfinder, user requests fell into two categories: more information and more functionality. With regards to more information, several users mentioned that they would like to click on terms for better definitions, have the tool bring up completed projects as examples, and see even further information on how to engage clients, community members, and stakeholders. In terms of additional functionality, users mentioned that they would like to evaluate completed projects to have a baseline of their current processes, contribute to the database, compare projects at the firm, city, and national levels, and have a client-facing version of the tool.

Users found the interface and process simple to understand, and had no requests for changes there.

Summary of testing results

In terms of the EDI Pathfinder's feasibility, users thought that the tool covered a genuine gap in existing efforts and encouraged further development. There was encouragement for future development, with several users mentioning that they had tried to develop something like this internally but lacked the resources. One user was further along in this process and had a list of their own questions they were developing to evaluate projects, but still felt the interactivity and customization provided by the EDI Pathfinder was a unique and valuable experience. This user testing has also confirmed that customized information was seen as more actionable information by users.

Future Work

If this work were to be further developed into a functioning web tool, it would utilize Django, a Python-based web framework, and an SQLite database to house the questions and result resources. Some code has already been written to set up the models and framework for questions, however full development was outside the scope of this research. Development of this tool would require a similar effort to development of carbon calculators, involving software developers, data scientists, and researchers to curate information. Additionally, a system for users, whether they be architects, community organizers, or engaged clients, to submit their own resources and examples would need to be set up. As all technologies are biased, establishing an open source database can help cover some of the data biases the tool currently has.

Outside of EDI Pathfinder development, architects can take the project-focused equity approach proposed by this work and begin to aggregate their own evaluative questions and resource database. Being prepared for questions at the project level can help firms guide clients towards more equitable design decisions. This work also highlights the importance of speaking with other architects about equitable design, as these types of features and outcomes are not readily searchable and may be hidden within projects, firms, or individual people.

Conclusion

In conclusion, this work has built upon the fervor and emotional vulnerability displayed during the COVID-19 pandemic and Black Lives Matter protests to further the discussion of equity, diversity, and inclusion in architecture. Inequity and exclusion in architecture is systemic and pervasive, with the biases of the privileged white male architect shaping both architectural education and the built environment itself.

Because EDI efforts and resources have largely been internal to organizations, this work proposed a web tool, the EDI Pathfinder, focused on equity in projects and design processes. Tool development to overcome barriers in EDI and architecture is a

small but relatively unexplored portion of this problem. Computation alone cannot fix racial and social inequities, but it can help with scale, facilitation, and evaluation.

User interviews confirmed that integrating equity into existing design practice was difficult, with the major barriers being time, experience, and convincing others to act. This research has also found that client motivation is a key factor for further equitable development and that most clients are open to being educated on these topics by the architect. User testing of the EDI Pathfinder prototype also indicated that it is a feasible approach to enabling more equitable design in architecture. Last but not least, this research has shown that with consideration of the risk of quantifying the human experience, there is a place for computational design methods to address larger social issues.

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