Database Creation for

Habitat for Humanity

Metro West / Greater Worcester

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WPI

Habitat for Humanity®

Database Creation for Habitat for Humanity MetroWest/Greater Worcester

An Interactive Qualifying Project
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE

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May 5, 2023

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Abstract

Our project created a database for Habitat for Humanity MW/GW to organize information on their homeowners. We collected input on the database structure through interviews with the staff and feedback from testing the database. We delivered a Microsoft Access database to track data on homeowners, properties, and mortgages. We found that: Habitat Affiliates across Massachusetts use different software but organize information similarly; it is difficult to standardize database fields for every unique homeowner; and creating a database is an iterative process. Based on our findings, we recommend Habitat for Humanity MW/GW continue improving upon this tool by adding more data topics like repair history and editing the homeowner application to guarantee smooth data entry.

Executive Summary

Today's Housing Affordability

Americans are struggling to afford housing. Homeownership in the United States has decreased since the 1980s due to static income, while housing prices have increased, as shown in Figure 1. The federal government cut appropriations for housing assistance by more than 75% during the 1980s (Moore & Hoban-Moore, 1990), leading to an increase in homelessness and decreased affordability and quality of rental housing.
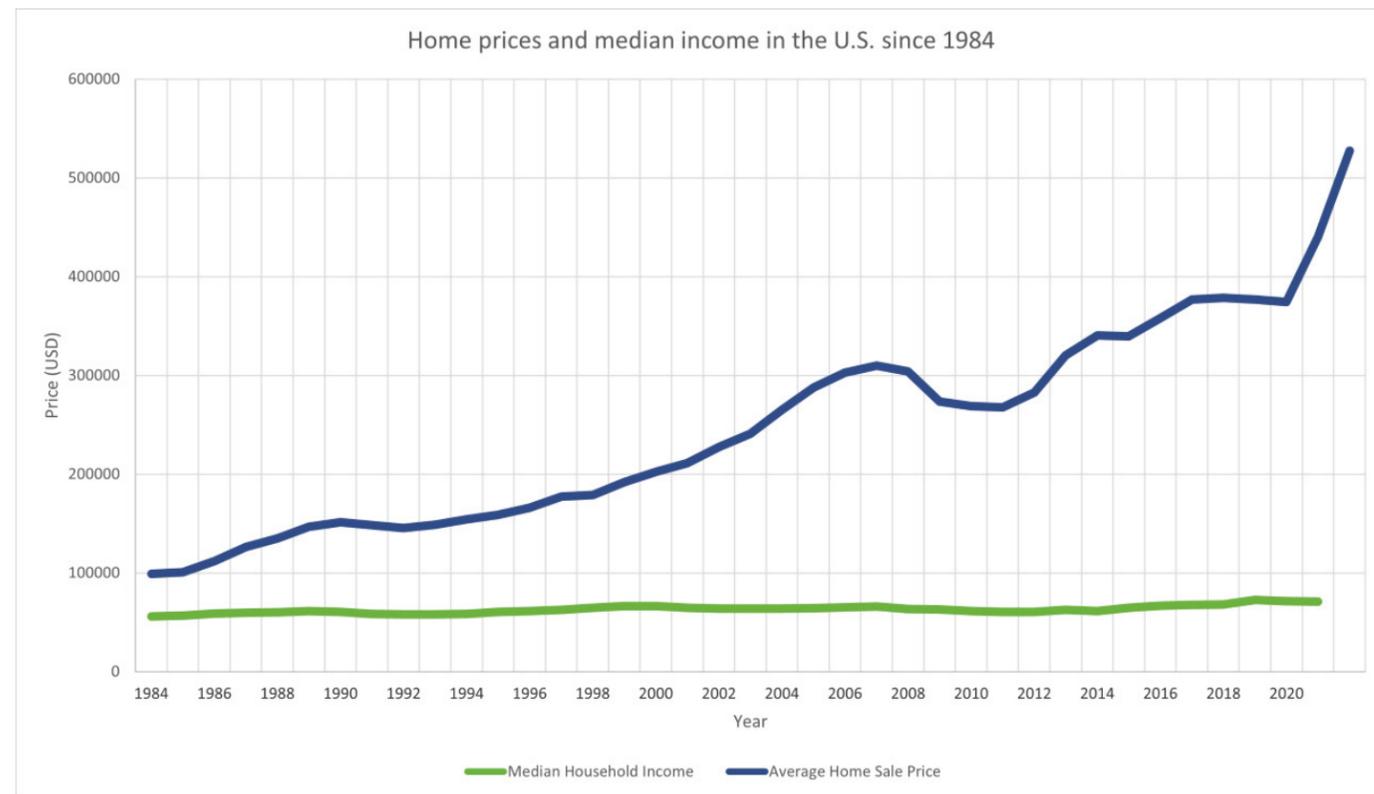

Figure 1. Home Price and Income in the US
Source: Federal Reserve Bank of Louis

This long lasting crisis has had a significant impact on American families, to the point where today the average household spends more than half its income on housing. This unaffordability has led to homelessness, poverty, and other social problems for all families, especially low-income ones (Joint Center for Housing Studies of Harvard University, 2022).

The situation worsened during the post-COVID-19-pandemic economic downturn, and correspondingly low interest rates contributed to a rise in house prices (Layton, 2021). The pandemic also caused a need to work from home and create more socially distant housing in rural and coastal locations, raising the demand for housing (Beck, 2022).

While this crisis is a national issue, Massachusetts is struggling compared to other states, with typical house prices being 143% higher than the national average (Cowperthwaite, 2021). In Worcester, the second-largest city in Massachusetts, over 50% of households are in the "lower income" range, as seen in Figure 2 (Worcester Regional Research Bureau, 2022), and rent has nearly doubled in the past decade, as seen in Figure 3.
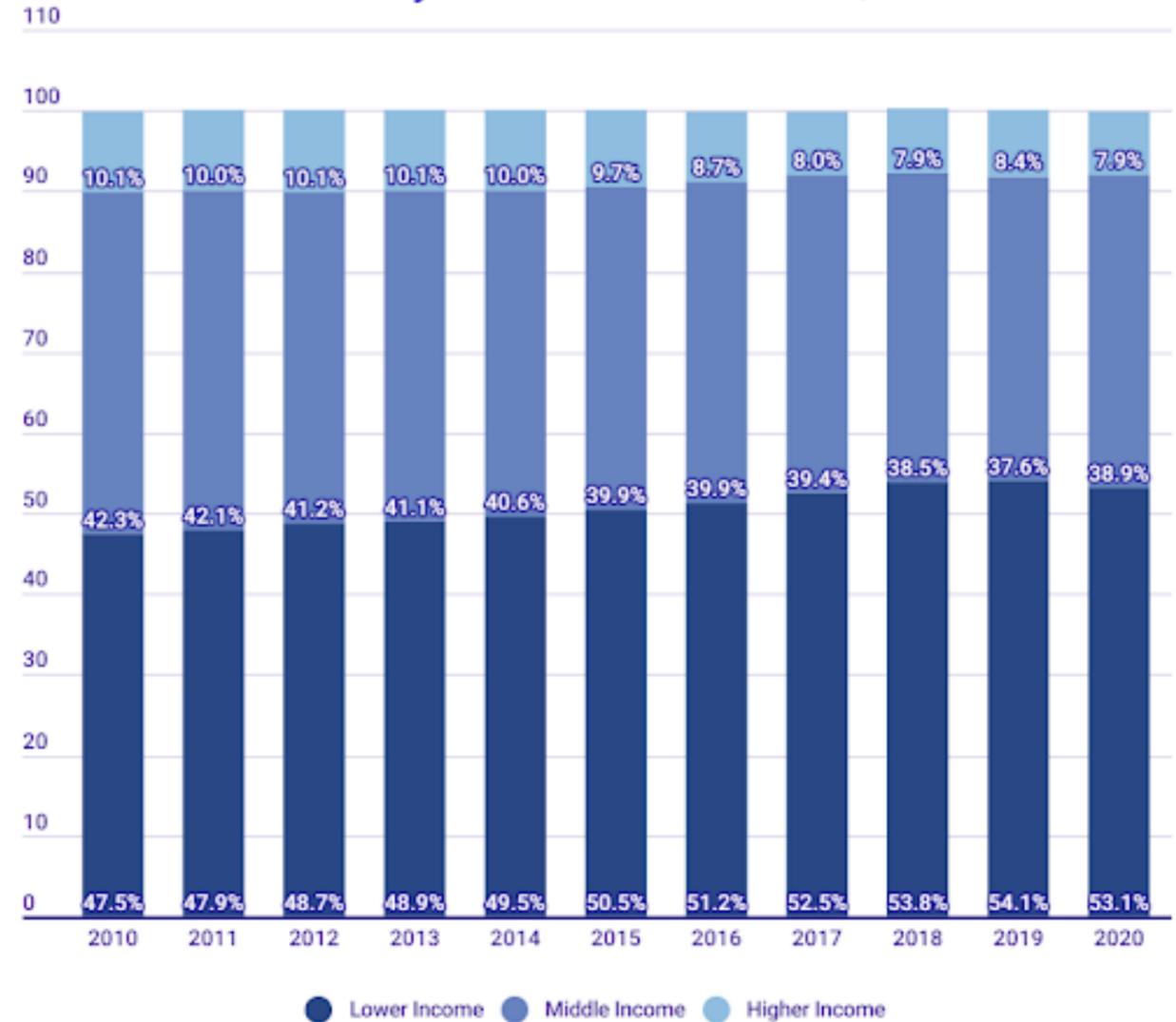

Figure 2. Percent of households by income level in Worcester from 2010 to 2020.
Source: U.S. Census Bureau, 2020 5-Year American Community Survey Estimates.
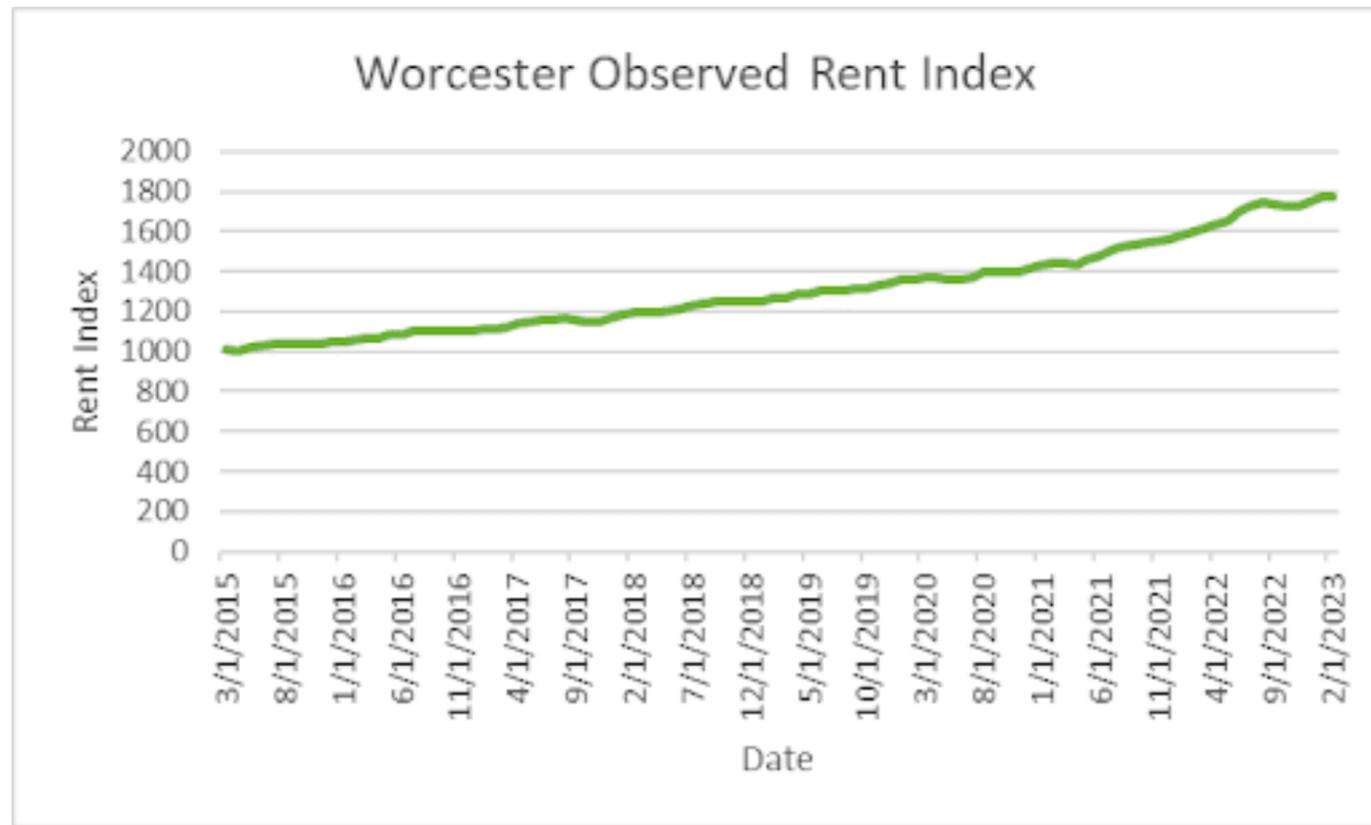
Figure 3. Observed Rent Index in Worcester MA.
Source: Zillow Observed Rent Index

One organization combating this crisis is Habitat for Humanity, an international non-profit organization that works to create better living conditions by building and selling affordable housing. Their Worcester affiliate has built 52 homes in the MetroWest/Greater Worcester (MW/GW) area since 1985 and received a $3.5 million donation in 2022. As their organization grew, Habitat for Humanity MW/GW had concerns over keeping their homeowners' information organized and provided an opportunity for this project.

Methodology

We created a centralized database to increase the accessibility of homeowners' legal, financial, property, and personal information and save Habitat for Humanity MW/GW workers' time and energy. We outlined four main objectives:

1. We examined Habitat for Humanity MW/GW's existing filing system. We conducted two initial interviews with the directors to understand their motivations for the database and discuss the existing system. We identified the main data categories, subcategories, and connections between them. We used these to develop the Entity Relationship Diagram (ERD) shown in Figure 4. We then created the database based on the ERD.
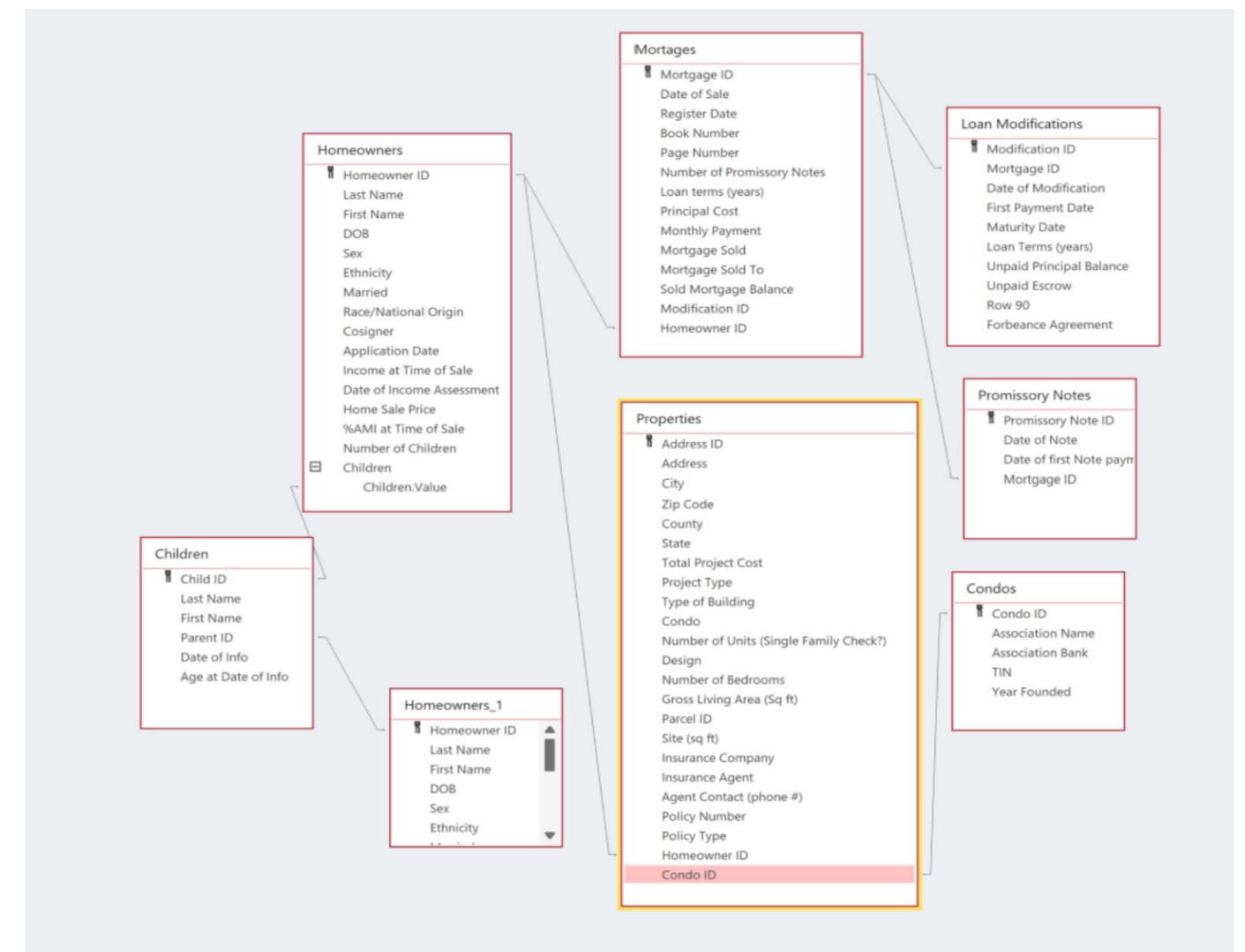

Figure 4. The first ERD of our database

2. We investigated how other Habitat for Humanity branches manage homeowner information. We contacted several Habitat branches in Massachusetts to learn what tools they use to store homeowner information, and we received responses from two of them. In these inquiries, we asked about any software used for data management and what data was being recorded.

3. We designed and tested the database system for Habitat for Humanity MW/GW. We used Microsoft Access, archival research, unstructured interviews, and participant observation to learn about database creation and structure. We used proper database design principles to create relationships between objects and followed the Third Normal Form to avoid storing the same information repeatedly. We used an iterative design process to improve the database as we got new feedback from the staff.

4. We developed documentation and tutorials to help Habitat for Humanity MW/GW employees and volunteers learn how to use the system. We accomplished this by using interviews and help from the WPI Academic Technology Center.

Findings

Throughout our project, we made some key discoveries that influenced our direction. Interviews with Habitat Affiliates in Massachusetts showed that they used different software to store their data but had similar categories in which they structured their information. We used these findings, in addition to interviews with our sponsors, to categorize the information we would track. We also discovered that other affiliates recorded information during the application and homesale processes that was not being tracked by Habitat for Humanity MW/GW. Therefore, the team added the necessary fields for this data in the database, stressing the importance of including the data in future homeowner folders.

We also found that database creation benefits from being an iterative process. With each weekly meeting with the staff, we discussed adding more fields, which was followed by restructuring the database and returning to homeowner files to find the new information. Additionally, while looking through these homeowner files during the data entry process, we found a lack of standardization among them. Some files were missing information, such as income reports or applicant information.

As the project progressed, we realized the importance of a front-end system for easily viewing and filtering the stored information. This required learning additional functionality in Access to design forms and macros. We shifted our focus away from data entry to add this functionality to the database within our timeline.

Testing our database documentation with staff and volunteers helped fix issues with the initial tutorials. Some steps were unclear and had to be explained in more detail. We also added sections for more advanced features. Moreover, we added the video tutorials to include all the added information in the manual, omitted the long pauses, and made sure the final product was engaging.

The final database included tables for personal information, properties, mortgages, and related financial documents. All tables were linked so that homeowners could be associated with their properties and mortgages. Additionally, we designed several forms, as shown in Figure 5, for easy search and filtering through the stored information and provided a step-by-step guide on how to create queries for data not found by the forms.

Figure 5. Screenshot of one of our database forms

Overall, the project was successful in creating a database for Habitat for Humanity MW/GW that streamlined their data storage and management. However, the development process was not without its challenges, particularly in dealing with the differences in homeowners' information. Despite these challenges, we were able to create a unique database design that effectively met the organization's needs.

Recommendations

We have a number of recommendations for how the database can be improved and expanded. Listed are 5 actions we think would be the best way to proceed further with this project:

1. Habitat for Humanity MW/GW expressed interest in the inclusion of home repairs in the database, which can be achieved with the addition of a few fields and tables. We recommend using the properties table to hold home repair properties, with a field to indicate if it was a repair project. An additional table could include repair information, such as the type of repair, recipient information, or cost of the project.

2. We suggest standardizing the collected information as much as possible during the homeowner application to streamline the data entry process. Income verification for all homeowners and recording this as well as the Area Median Income (AMI) in a standard format would also help with future data entry.

3. Autocorrect within Access automatically corrects "misspelled" words without asking the user first. Thus, during the data entry process, the data should be double checked by a different person to ensure everything in the database is accurate. Moreover, the book and page numbers of official documents could be confusing, so double checking on the deed registry website will be helpful.

4. Habitat for Humanity MW/GW staff would like to have automation for inputting data and filling out external forms with information from the database. They initially hoped we would achieve this during our project, but we determined it was outside the scope due to time constraints. We recommend looking into more ways to speed up data entry through automation and the additional capabilities of Access.

5. The last consideration is to shift the database to cloud-based hosting instead of being stored on the Habitat for Humanity MW/GW network drive. The maximum amount of data that can be stored in an Access database is two gigabytes, but if the database is expanded to contain scanned versions of documents like deeds, mortgages, or home-owner applications, size would likely be an issue. We did some preliminary research into the use of Microsoft Azure cloud hosting and the use of Microsoft Dataverse, but not enough to come to a conclusion.

Conclusion

We believe this database will have a lasting effect on Habitat for Humanity MW/GW, and we hope it will be used and improved upon for many years. From our time spent at the Habitat for Humanity MW/GW office, we have seen the impacts that affordable housing has had on people within our community, and we are happy to have helped Habitat for Humanity MW/GW work towards their goal of providing affordable housing. We learned much about database creation and interpreting documents that are associated with homeownership. The staff at Habitat for Humanity MW/GW were very friendly and helpful in our design process, and we would like to thank them all for their assistance.

Acknowledgements

We would like to thank all the staff at Habitat for Humanity MW/GW for their kindness and assistance with our project. We would like to thank Brian for helping us understand all the documents we looked at and answering our many questions. The feedback we got from Brian, Debbie, and Sara on the database was very helpful for the success of our project. We would also like to thank our advisors, Laura and Michael, for their guidance throughout ID2050 and the project.

Authorship

Each topic discussed was split evenly among our team members to be researched individually. Once all the research was complete, we created a bulleted list of information we wanted to include in each topic. Larger parts of the paper were split up into subsections for each of us to write individually based on our research. Once the first draft was done, we edited each other's parts so we could learn about all aspects of the project.

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Chapter 1:
Introduction

It may be difficult to imagine returning from work to a house that is too small, unsafe, or run-down, but this is a reality for many Americans. An estimated 3.7 million people in the U.S. reported some form of housing insecurity (National Alliance to End Homelessness, 2021). Housing is necessary to live a healthy lifestyle. However, it has slowly become a luxury in the modern United States. Homeownership has decreased among young adults as housing continues to become less affordable. The growing disparity between monthly housing payments and average income makes finding affordable housing for low-income individuals very challenging. The stress this creates and navigating a way to find affordable housing can take an intense toll on one's mental health and negatively affect one's relationship with their family and children.
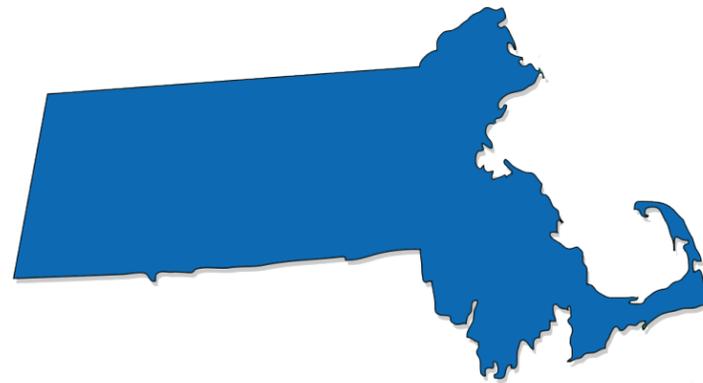
Massachusetts is especially notorious for high house prices, which is one of the causes that has left around 15,507 people in the state homeless (Stebbins, 2023). Our sponsor, Habitat for Humanity MetroWest/Greater Worcester (Habitat MW/GW), is working to counteract this by increasing the availability of affordable housing for low-income families and interrupting the generational cycle of poverty through successful homeownership. Habitat for Humanity works to help families build strength, stability, and self-reliance through their housing services.

Habitat for Humanity MW/GW needed help organizing and digitizing the information they have on their homeowners and properties. Their physical file storage system before this project led to much time spent looking for files spread around the office. This was inefficient because, as a non-profit organization, Habitat for Humanity MW/GW already has limited staff to deal with data-mining. Our project created a centralized database to digitally store information on homeowners' mortgages, legal documents, home construction, and demographics. We conducted semi-structured interviews with our sponsors to learn more about the current system and ensure we deliver the solution they are looking for by developing a relational schema for the database. Additionally, we contacted other Habitat for Humanity branches to learn how to improve our database design. Finally, we tested our design, drafted documentation, and created tutorials on navigating the database so current and future staff can easily adjust to the new system.

The following chapters will take the reader through our background, methodology, and findings sections. The background will continue to dive into the housing situation in America, the problems it causes, how Habitat for Humanity works to fight it, and how our project helped Habitat for Humanity MW/GW in their endeavors. After the background, in the methodology chapter, we justify how we planned to succeed in our objectives and the strategies we intended to use to gather the data we needed. Next, in our findings section, we talk about what we did and what we learned during our project term. Finally, we dedicate a section to our recommendations, to talk about potential changes and improvements that could be done in the future.

Habitat volunteers at work

Chapter 2:
The State of Housing

2.1. Housing Crisis in the US

Affordable housing becoming highly scarce characterizes a housing crisis. The U.S. has been experiencing this crisis, particularly over the past few decades. According to the U.S. Department of Housing and Urban Development (HUD Archives, n.d.), a general rule for what is considered 'affordable housing' is that the occupant is paying no more than 30 percent of their gross income for housing costs, including utilities. The state of affordable housing in the U.S. has been worsening since the 1980s. Homeownership began to fall steadily around this time and has only seemed to worsen in recent years. Both housing prices and the cost of living have gone up while family income remains stagnant, as shown in Figure 1.

Home prices and median income in the U.S. since 1984
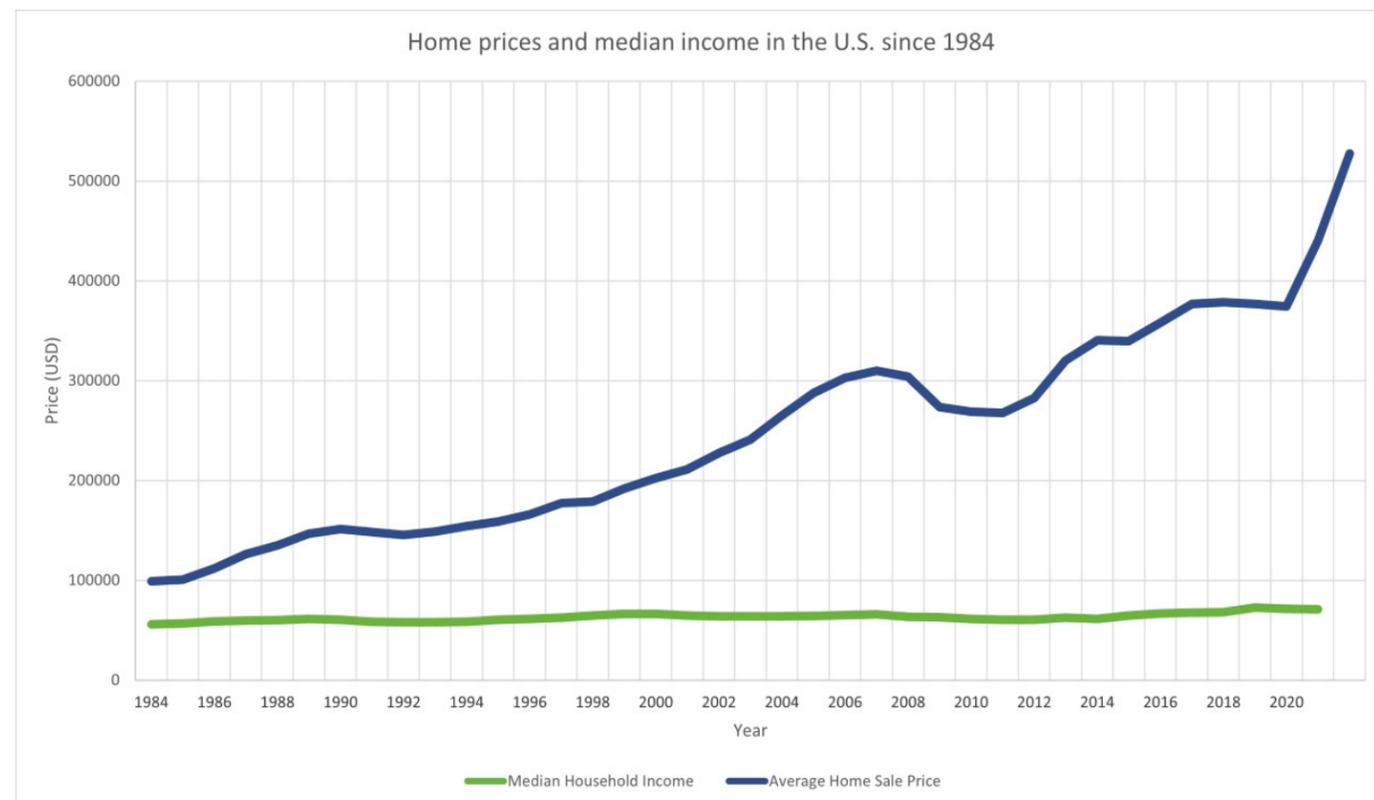
Figure 1. Home Price and Income in the US
Source: Federal Reserve Bank of Louis

Despite this situation, during the decade of the 1980s, the federal government cut all forms of appropriation for housing assistance by more than 75% (Moore & Hoban-Moore, 1990). Housing assistance aided groups such as the elderly, handicapped, Native Americans, and farmers find affordable housing. It helped prevent raising rent for all low and moderate income tenants in assisted housing. This lack of housing assistance contributed to an increase in homelessness during this decade and to a decrease in the affordability and quality of rental housing.

2.2. Today's Housing Affordablity

Housing affordability has become a significant issue in the US in the past few years, affecting both homeowners and renters. According to Dworkin (2019), housing has become less affordable than it has been in over a hundred years and is continuing to get worse, which means that many Americans are struggling to afford housing and cannot purchase a home of their own. And for those who manage to purchase a home, the financial burden is significant.

The average American household spends more than half its income on housing. The typical house price in the US reached $354,649 by 2022, while the median income was $67,521 (Joint Center for Housing Studies of Harvard University, 2022). This lack of affordability is having a major impact on American families, as many cannot purchase a home and need to rent, and low-income families must choose between housing and other necessities.

Furthermore, mortgage costs have increased for Americans who do own their home. Mortgages take up an average of 30.7% of these homeowners' income, which has significantly increased in recent years, according to the National Association of Realtors (2022). This high cost of housing contributes to rising levels of debt and poverty, putting a strain on the economy as a whole (Dworkin 2019).

On top of that, housing affordability is also affecting renters. The crisis has contributed to the shortfall of available units and, consequently, the increase in rent prices nationwide (Joint Center for Housing Studies of Harvard University, 2022). This increase in rent prices and shortage of units leads to homelessness, poverty, and other social problems for all families, especially low-income ones.

2.3. Post-Pandemic Housing Market

The post-pandemic economic downturn has compounded the housing affordability crisis in the United States, consequently raising house prices. In early 2020, the Federal Reserve lowered interest rates to counteract the economic slowdown due to the pandemic. Ultra-low interest rates have played a crucial role in the rise of house prices (Layton, 2021). In March 2020, mortgage rates fell to a historic low of 3.29%, which boosted mortgage applications by 10% (Howley, 2021), and even though these rates have slightly risen in the post-pandemic period, they are still low. These low-interest rates have made borrowing money to purchase a home more accessible, leading to an increased demand for housing and making it more profitable for investors to buy properties. Additionally, the pandemic caused an overall reduction in the economy, leading to a housing production shortfall and fewer houses for sale (Layton, 2021).

The low interest rate, along with the housing shortage, has driven up the demand for houses and contributed to the current demand-pull inflation, causing house prices to rise. The housing production shortfall has also contributed to the rise in house prices (Layton, 2021). Furthermore, the decline in the number of houses on the market has exacerbated the supply shortage and contributed to the rise in house prices, as many homeowners choose to stay put rather than sell and relocate.

Moreover, the pandemic boosted housing demand by increasing the need to work from home and creating more socially distant housing in rural and coastal locations. The pandemic has altered people's perceptions of their homes. The sudden need to work remotely and the desire for socially distant living caused families to allocate a higher budget to housing, expedited the acquisition of second homes, and increased housing demand in general, resulting in an increase in house prices (Beck, 2022).

2.4. Housing Crisis in Massachusetts

While the housing crisis is a national issue, Massachusetts is struggling compared to other states. The typical house prices in the state are 143% higher than the national average (Cowperthwaite, 2021), reaching an amount of $611,819 (Caporal, 2022). The difference in house prices can be measured by the Federal Housing Finance Agency House Price Index, which tracks the change in price of repeat sales of properties (FHFA, n.d.). As seen in Figure 2, the home price index in Massachusetts has increased rapidly compared to the U.S. average. This high cost of housing has placed a considerable burden on Massachusetts homeowners, with mortgage payments taking up 43% of their monthly income on average (Caporal, 2022). As of 2022, the median household income in Massachusetts was $89,026 (U.S. Census Bureau, 2022).
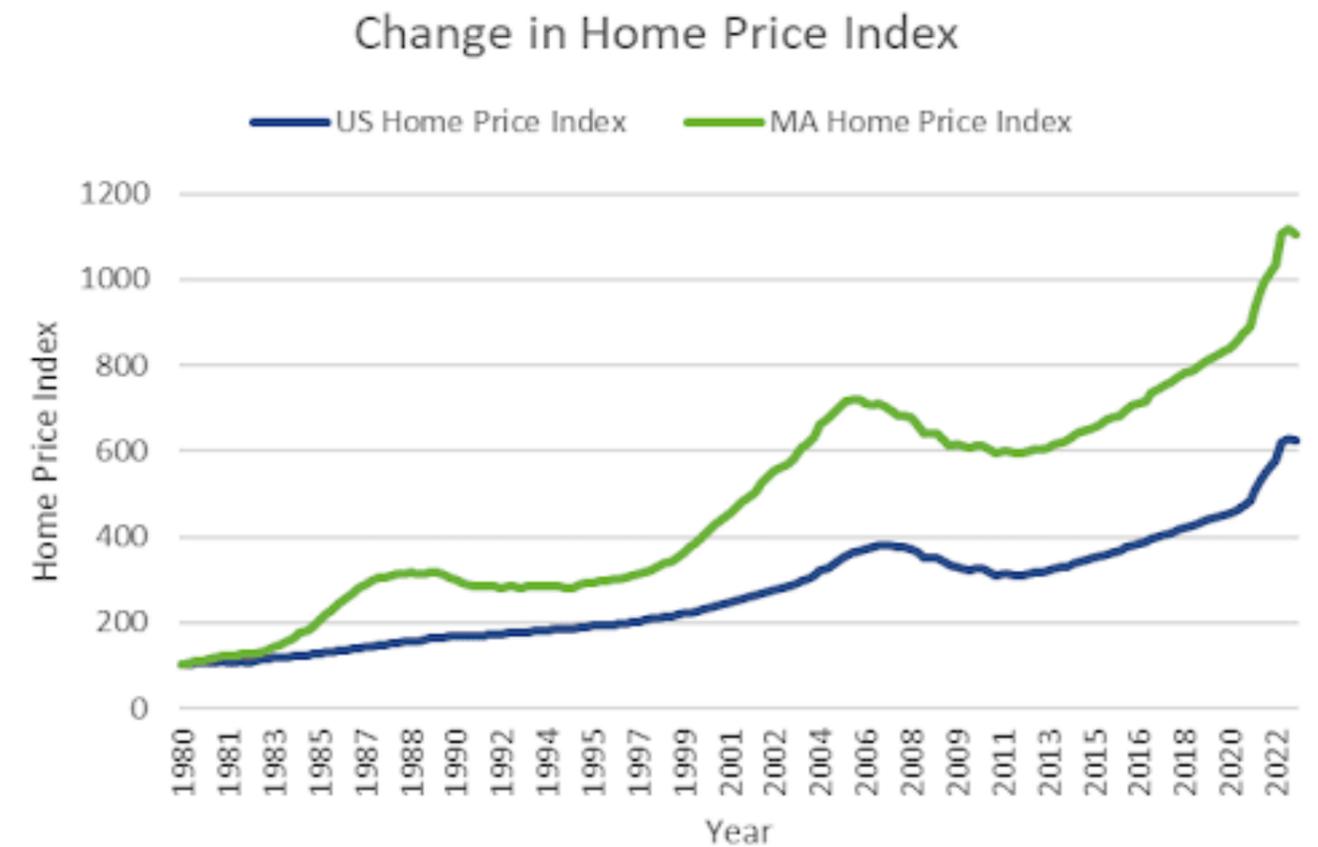

Figure 2. Change in Home Price Index Between US and Massachusetts
Source: Federal Housing Finance Agency, house price index

The high cost of housing in Massachusetts results from various factors, such as zoning regulations, lack of housing permits, and the high demand for living in the state's cities and suburbs. This high cost has created a situation where many people are priced out of the housing market and forced to live in overcrowded or substandard housing (Cowperthwaite, 2021).

The number of housing permits issued in Massachusetts has declined significantly in recent years, further exacerbating the housing crisis (Cowperthwaite, 2021). This has resulted in a shortage of new housing units, making it even more challenging for people to find affordable housing. Annual housing permit data is visualized in Figure 3. This trend is particularly concerning because a lack of new housing units makes it difficult to accommodate the state's growing population, leading to overcrowding and homelessness (Joint Center for Housing Studies of Harvard University, 2020).

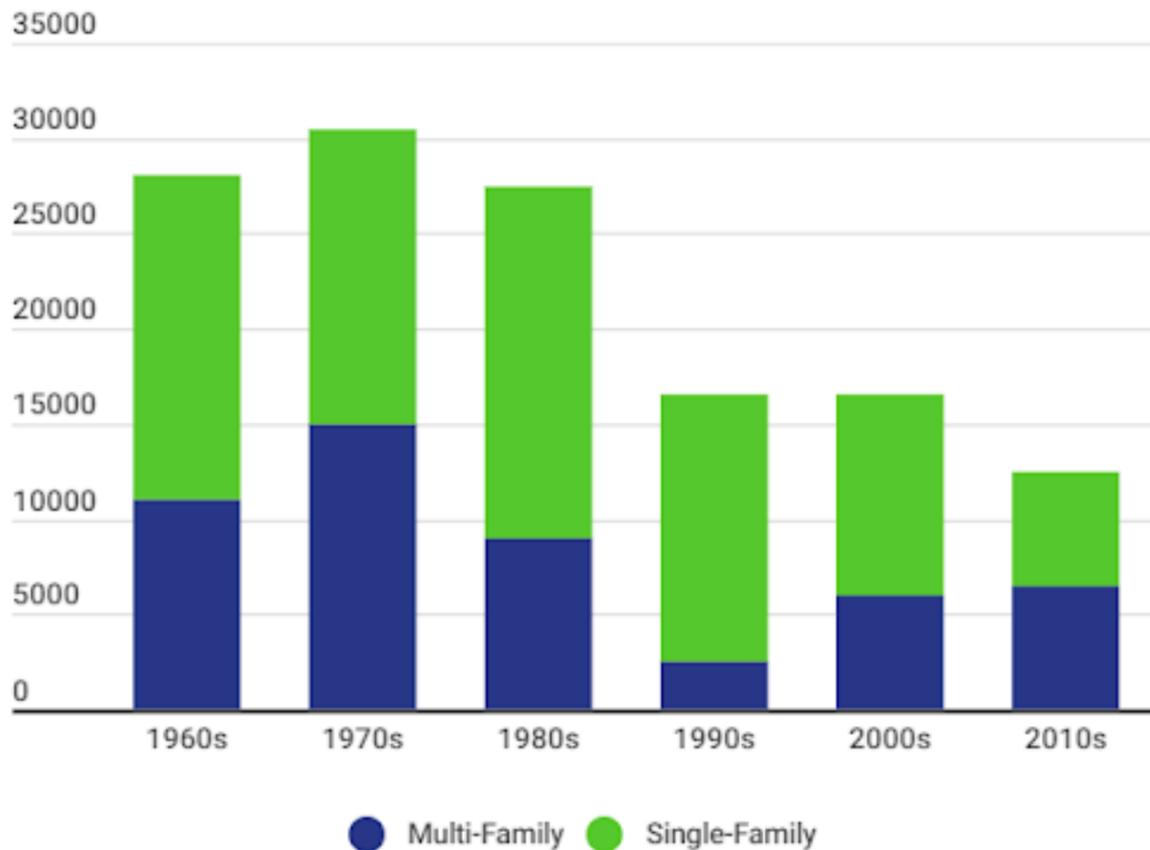## Average annual housing permits by decade in Massachusetts

Figure 3. Average annual housing permits by decade in Massachusetts.
Source: U.S. Census Bureau

High housing costs also force people to move out of their communities. For example, housing unaffordability in Boston has pushed residents to move to farther-out communities, such as Brockton (Ranalli & Cornelissen, 2022) and Worcester. This creates ripple effects of displacement, causing house prices in Brockton to increase. Many homebuyers in Brockton (especially first-timers) use mortgages insured by the Federal Housing Administration (FHA), but they struggle to compete against buyers with conventional loans. In this tight housing market, FHA borrowers often lose out during competition (Ranalli & Cornelissen, 2022). These ripple effects also impact cities like Worcester, as people are forced to move out of areas like Boston and metro Boston, where housing prices are significantly higher.

2.5. Impact in Worcester (Median, Salary and Rent Price)

The housing situation in Worcester is of great importance for the success of our project. Worcester is the second-largest city in New England, with a population of 206,518 (U.S. Census Bureau, 2020).

The housing crisis has dramatically impacted Worcester and the greater Metrowest area. Compared to the rest of the state, Worcester residents are suffering financially, with the city having a poverty rate of 19.7% compared to Massachusetts' average of 9.8% (Worcester Regional Research Bureau, 2022). As seen in Figure 4, over 50% of households in Worcester are "lower income" which means they have a yearly income of less than 67% of the median income of Massachusetts. The median household income in Worcester has risen only 15% since 2010 (Worcester Regional Research Bureau, 2022).
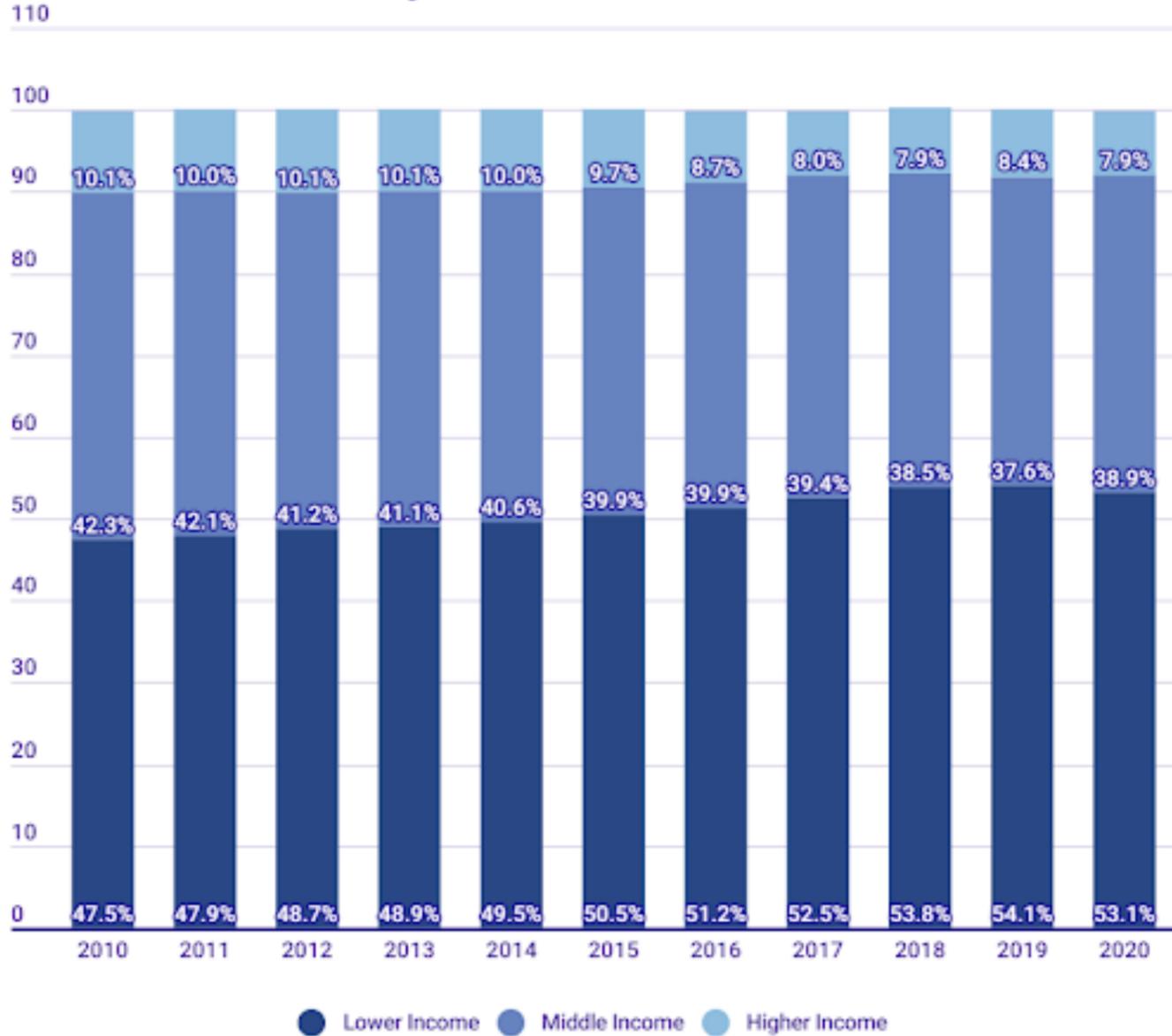
Figure 4. Percent of households by income level in Worcester from 2010 to 2020.
Source: U.S. Census Bureau, 2020 5-Year American Community Survey Estimates.

In addition to these low-income levels, Worcester's typical market rent rate has risen dramatically over the past few years, from around $1,100 in 2014 to $1,900 in 2022 (Worcester Regional Research Bureau, 2022). The typical rent rates since 2015 are shown in Figure 5. The rising cost of living has put many people out of their homes, with the city having a homeless population of 1,400 as of 2020 (Central Mass. Housing Alliance, 2020).
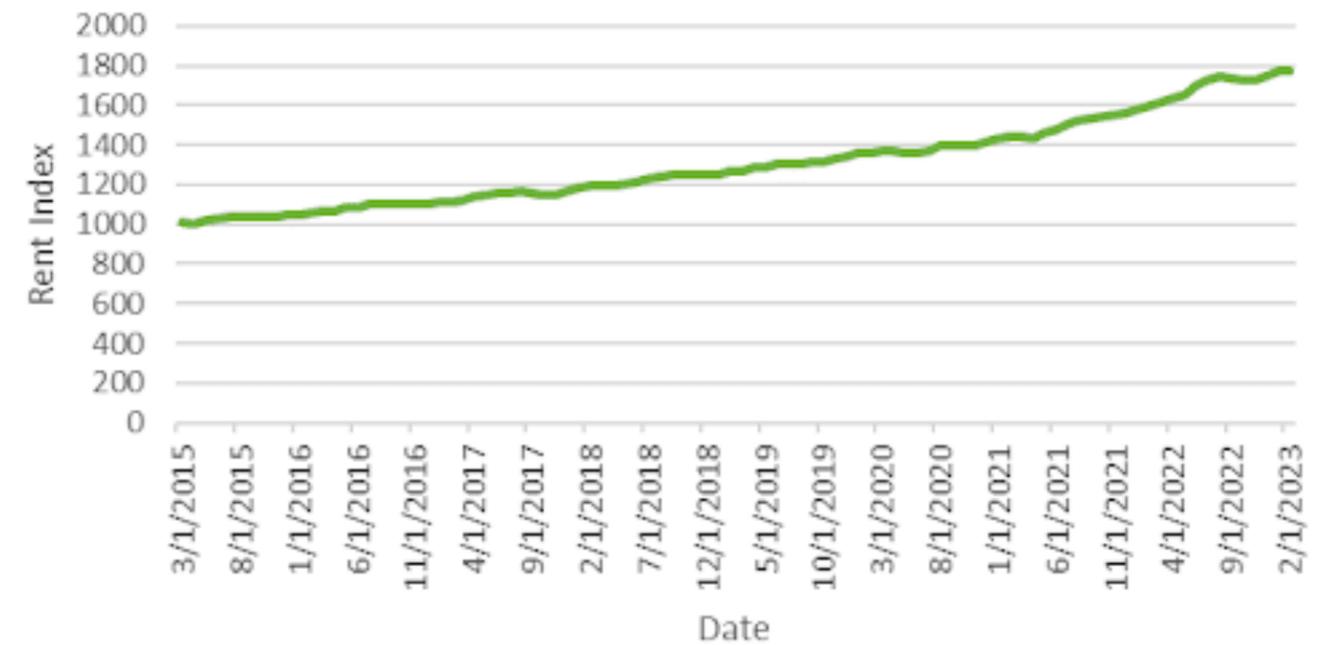
Figure 5.Observed Rent Index in Worcester MA.
Source: Zillow Observed Rent Index

2.6. Impacts of Homelessness on Families

The housing problems stated above negatively impact the health and development of families. Lack of housing stresses parents and can lead to a negative relationship with their children. A child must develop caring attachments; when disrupted or inconsistent, the child will suffer in the long term (Murran & Brady, 2022). Murran and Brady found that most homeless families were made up of mothers with one or two children. The study reported that single mothers in particular face high stress levels and emotional exhaustion, which leads to inadequate parental guidance.

Over 50% of families in homeless shelters have children under the age of three (Gubits, 2017). A lot of a child's world is formed at this age as their brain is rapidly growing. Thus, when a child is moving from place to place due to the unpredictable homelessness situation and often leaving pets, possessions, and friends behind, Murran and Brady found that it impacts the child's sense of belonging in the world and negates a safe space. The study also showed that this unpredictable lifestyle heavily affects a child's education. A stable school environment is crucial in allowing children to learn and expand their social skills. School can bring balance to a homeless

child's life as it gives them assurances of where they will be for a certain period of time. However, Murran and Brady show that because of families' inability to transport their children to the same schools after relocating, this part of a person's childhood can be filled with unpredictability. Children require structure, and parents dealing with homelessness can struggle to maintain daily routines. The researchers found these living conditions lead children to view their situation with embarrassment and can cause increased anxiety and behavioral challenges.

2.7. History of Habitat for Humanity

One organization that is working to combat these issues in Worcester is the MetroWest/Greater Worcester branch of Habitat for Humanity (Habitat MW/GW). Habitat for Humanity is a multinational non-profit organization that creates better living conditions for as many people as possible. The organization was established in 1976 by Linda and Millard Fuller while they lived on Koinonia Farm. Koinonia is a Christian based community farm located in Georgia, which values equality and community. The Fullers, along with others at Koinonia Farm saw the poor housing conditions in their area, and had the idea that people who need shelter can work alongside volunteers to build safe, affordable homes. This concept inspired them to form Habitat For Humanity, which now works in over 70 countries and has helped over 46 million people improve their living conditions (Habitat for Humanity International, n.d.). They do much more than just build houses, including renovating and repairing existing homes; responding to housing needs created by natural disasters; providing financial education; increasing minority homeownership; collaborating with communities to revitalize neighborhoods; and operating Habitat for Humanity ReStores. ReStore centers accept donations of furniture and other home goods and sell them at significantly discounted rates. This helps to divert hundreds of tons of waste out of landfills and they use the proceeds from the sold items to build more homes and pursue more projects in the community.

One of the localized branches of the multinational Habitat for Humanity organization is Habitat for Humanity MetroWest/Greater Worcester (Habitat MW/GW). Since 1985, they have built 52 homes in the 42 cities and towns that make up the MetroWest and Greater Worcester regions, which can be seen in Figure 6. Habitat MW/GW has five current build sites where its

staff and volunteers are building new homes. This region also has two ReStore locations, one at 640 Lincoln Street in Worcester and another at 310 Pond Street in Ashland.
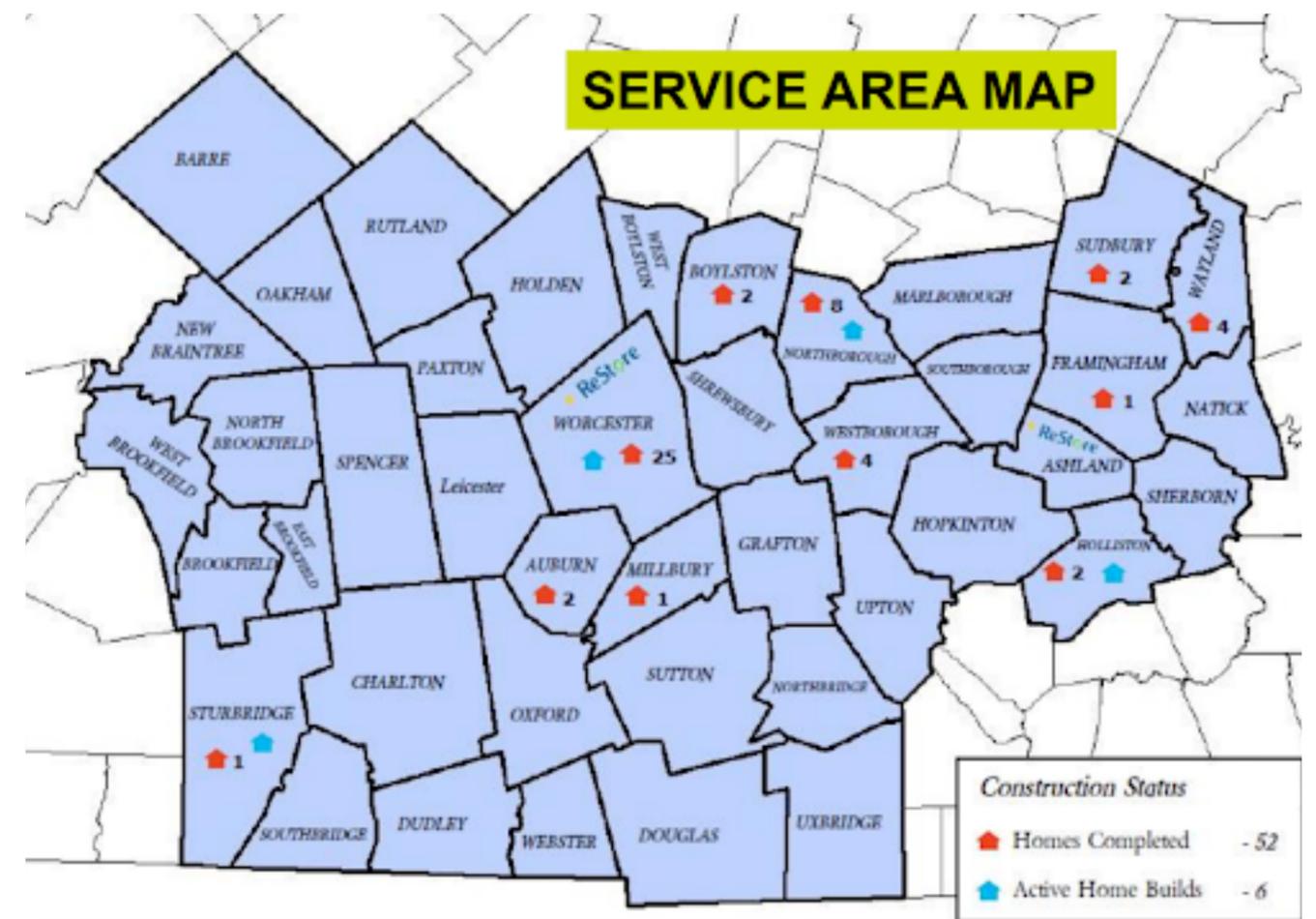
Figure 6. Habitat MW/MG Service Area and home builds, 2021.
Source: Habitat for Humanity MetroWest / Greater Worcester

Habitat for Humanity MW/GW has been making significant changes in the lives of its homeowners, who have described previous living conditions in apartments with poor heating and trash-filled yards (Habitat for Humanity, 2021). Thanks to Habitat for Humanity, these families now have a safe and affordable place to call home.

Besides creating new multi-family homes, Habitat for Humanity MW/GW works to increase the quality and affordability of housing in the MetroWest and Greater Worcester areas. In 2022, they received a $3.5 million donation from philanthropist MacKenzie Scott (Lemmon, 2022), which they have used to progress their five current build sites ("Current and previous builds", 2021) and repair local homes. They make an effort to encourage young people to volunteer and help improve their communities, as can be seen in their partnerships with local colleges

such as Worcester Polytechnic Institute, Berkshire Community College, and other local universities. Through these partnerships, they can spread their message to the next generation and educate them about the importance and severity of the housing crisis. They also continue to help the local community, such as by repairing veteran John Burke's roof after it started leaking (Holt, 2022). Through the funds from donations and local ReStores, they are able to provide these repairs at very minimal cost to the homeowners. Despite the phenomenal impact that Habitat for Humanity MW/GW has had on the Greater Worcester communities, they still seek improvement in the hopes that they can help more people.

2.8. Reason for the Project

Habitat for Humanity MW/GW directors have expressed concerns over keeping their homeowners' information organized in a way that allows employees to quickly and easily find the information they need. This information includes information on mortgages, legal documents, properties, and demographics. Habitat for Humanity MW/GW needs to keep information organized because they keep track of mortgages and properties for many years. Easily accessible information will allow Habitat for Humanity MW/GW to create statistics on their homeowners. Currently, Habitat for Humanity MW/GW stores documents in several locations, which has slowed their workflow. Organizational efficiency is essential for keeping a non-profit organization like Habitat MW/GW operating. They need to be able to respond quickly when information is requested by other organizations, and provide reports of the impact they have on the community. With their file organization before the project, the volunteers and full time staff have struggled to find relevant information in the collection of files in a timely manner. Prior to our project, they were already working with another intern to gather all of the data into a spreadsheet to help streamline the data collection process.

The goal of our project was to create a database that would improve the workflow by allowing employees to effortlessly retrieve the information they need. This would allow them to focus their time and energy on the more important things instead of spending their time looking through filing cabinets.

Habitats cabinet and file system of finding homeowner infomation

Chapter 3:
Methodology

3.1. Objectives

This project created a centralized database to increase the accessibility of homeowner's legal, financial, property, and personal information and save Habitat for Humanity MW/GW workers' time and energy. In order to achieve this goal, we outlined four main objectives. We investigated Habitat for Humanity MW/GW's existing system for information storage and management. Then, we learned from other Habitat for Humanity branches about their data storage systems. Next, we designed, created, and tested a database system for Habitat for Humanity MW/GW. Finally, we provided documentation and tutorials about how to use the system.

3.2. Investigate the Existing Data Management System at Habitat for Humanity MW/GW

The first step of this project was to examine Habitat for Humanity MW/GW's data management system. Prior to the start of our project, we conducted an initial interview with the directors of Habitat for Humanity MW/GW, particularly Executive Director Debbie Hoak and Accounting Associate Brian Smith. We chose this interview-based approach to understand the motivations, perspectives, and ideas of the individuals who desire a better system. The interview data was collected using note-taking and audio recording. The questions that guided this interview can be found in Appendix A. This interview gave us an understanding of the situation and the need for a digital database.

In the second week of our project term, we conducted another interview on site with our sponsors. The questions discussed in this interview can be found in Appendix B. In this interview, we discussed the existing data management system, we asked to observe how long the data gathering process took, and noted where the homeowner documents were physically stored and how they were organized. Considering our sponsor's requirements and looking through the files, we identified key elements that we needed to include in the database. Then, going through each homeowner folder gave us a good understanding of the specific data we had to record, such as the tables (categories) and fields (subcategories) we would be entering into our Access database and the interrelationship among these fields.

Using the data collected from this discussion and the information in the intern's spreadsheet, we brainstormed possible connections between the main categories and potential subcategories. This planning helped us start the development of our first Entity Relationship Diagram (ERD). ERDs show the different objects that will be stored in the database, the specific pieces of information about the objects that the users want to keep track of, and the relationships between objects. We based our database design on relationships between objects by learning about homeowners and all of their associated documents. For example, each homeowner will be linked to their house. Most homeowners will have mortgages that they took out to purchase the house, and those mortgages will have promissory notes associated with them to specify the terms of repayment. Once they are repaid, each mortgage will then receive a discharge document stating that the mortgage has been repaid. The first version of our database was made by creating a table based on each object in the ERD constructed in our first sponsor meeting during the project term. The fields for those tables came from the pieces of information about each object type, and the relationships between objects became the relationships between tables. Our initial ERD planning gave us a blueprint on how to build the database and allowed us to get started on our third objective.

Personal

Legal   **Financial**

Our main categories of data

Note: The final ERD used in our database is shown in Figure 11.
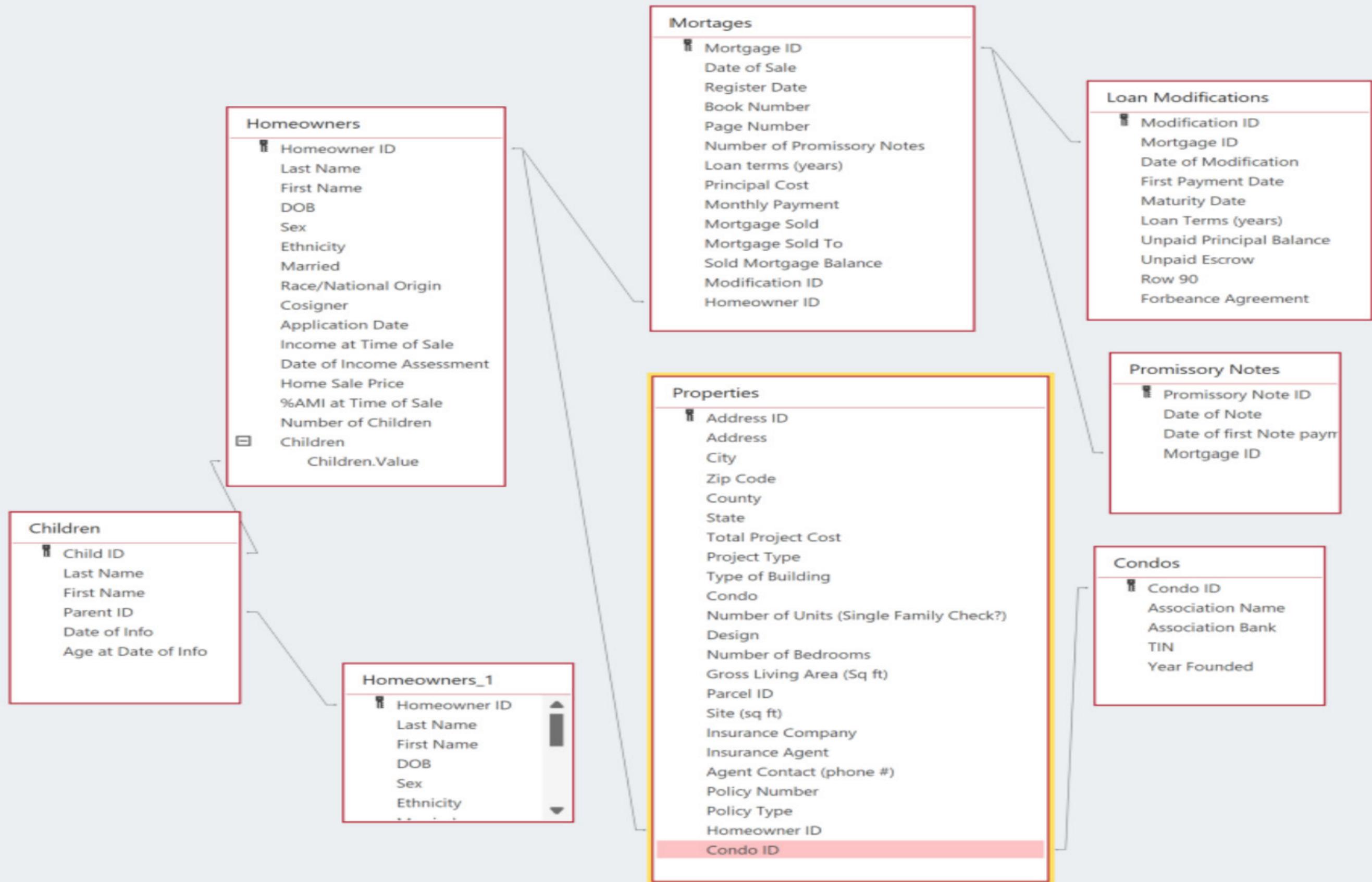
Figure 7. The first ERD of our database

3.3. Connect with Other Habitat for Humanity Branches

Our second objective was to investigate how other Habitat for Humanity branches manage their homeowner information. To achieve this, we connected with other Habitat for Humanity branches around Massachusetts via email. In the emails, we attempted to schedule meetings to discuss their data management. We also included the questions we planned to ask in case some branches were more open to emailing their responses instead of meeting over Zoom. Habitat for Humanity has sixteen locations in Massachusetts, so there were many people we could consult with to learn about how they organize data. We coordinated with our sponsors to contact other Habitat for Humanity directors for answers to our questions. We reached out to the Cape Cod, Lowell, Berkshire, and Springfield branches and received responses from two of them. The branches that responded were Cape Cod and Springfield and the questions we asked in our emails can be found in Appendix C. This method allowed us to use direct questions to ask about how these branches organize their information, what data they are tracking, how they chose their current system, and what roadblocks they might have encountered.

3.4. Design and Test a Database System

Our third project objective was to design and test the database system for Habitat for Humanity MW/GW to use. As our project goal outlines, this database stores information about homeowners, mortgages, and houses. We created the database using Microsoft Access, which we chose because most Habitat for Humanity MW/GW workers and volunteers are familiar with other Microsoft 365 software and because it is included in Office 365 at no additional cost to the organization. We combined archival research, unstructured interviews, and participant observation to achieve this objective. To learn about the fundamentals of Microsoft Access, database creation, and the basics of database structure, we used online tutorials, videos on Microsoft Access, and information from Professor Wong's CS 3431 Database Systems course at WPI. A part of the lecture is depicted in Figure 9.

MA State Affiliates

- Buzzards Bay
- Cape Cod
- Central Berkshire
- Fall River
- Greater Boston
- Greater Lowell
- Greater Plymouth
- Greater Springfield
- Martha's Vineyard
- Essex County
- MetroWest/Greater Worcestor
- Nantucket
- North Central
- Northern Berkshire
- Old Colony
- Pioneer Valley
- South Shore

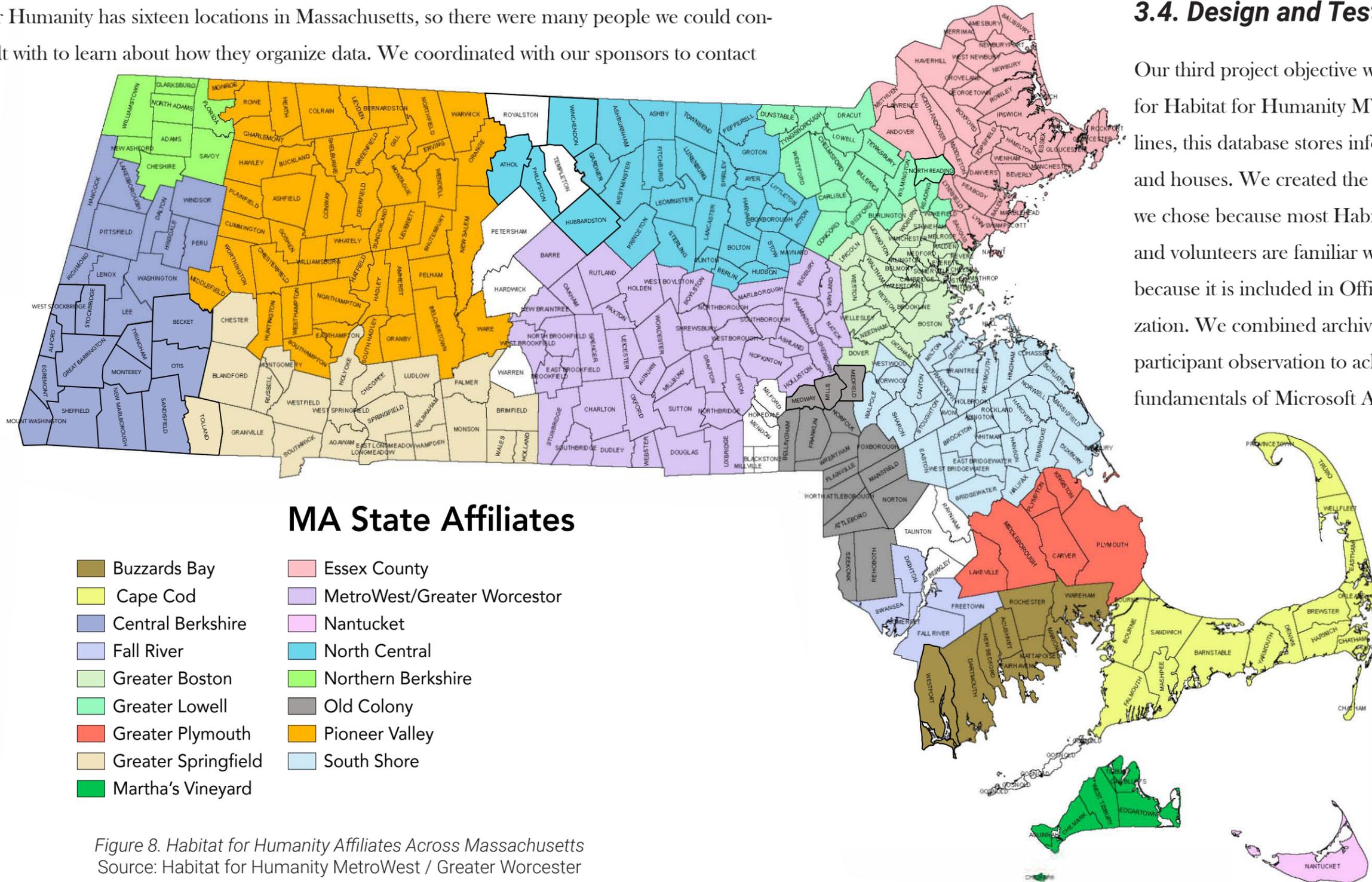*Figure 8. Habitat for Humanity Affiliates Across Massachusetts*
Source: Habitat for Humanity MetroWest / Greater Worcester

Figure 9. Lecture on Relational Model
Source: Professor Wong's CS 3431 Database Systems course at WPI

The most basic idea of database design is to store information about objects that relate to each other in a way that connects them through relationships but keeps their unique object information separate. This is done by creating a table for each object type. In our case, that meant we needed a table for homeowners, properties, mortgages, etc., which would represent the main categories of the data we collected. Each table had to have fields, which is the technical term for 'subcategories' in Access. These fields could be of various data types, such as strings, integers, doubles, dates, and more. Some examples of fields in a homeowner table are fields such as the homeowner's first name, last name, date of birth, and occupation. Each table needed to have a

primary key, which is a piece of information that is used to identify each record, or instance of an object, from the others in that table. Primary keys must be unique, but they can be formed as a single field or as a combination of fields. In our table of properties, we could not have the towns that the properties are located in as the primary key because habitat MW/GW has created multiple homes within single towns. However, a combination of the street address and the town could be used as the primary key because you can't have duplicate street addresses within the same town. Fields in tables can also be references to data from other tables. These fields are known as foreign keys. Foreign keys form links between tables that mirror their real life relationships. This makes it easy for the user to understand what objects are associated with each other, and it creates a natural flow between the objects. One example of a foreign key is that each property has a field called "homeowner." This field shows who owns each property and connects the Properties table to the Homeowners table.

Outside of those basic elements, we had to remember to follow proper database design principles, such as not violating the Third Normal Form, as shown in Figure 10. Third Normal Form is a design approach that is used to avoid storing the same information multiple times. This was helpful for our database design, where sometimes we got confused about data storage versus data display. We realized that we were violating the Third Normal Form when creating relationships between parents and kids. Originally, we were linking parents to kids and kids to parents, but we realized that these relationships achieved the same result and stored unnecessary data. Being able to see both of those relationships and other similar two-way relations may be beneficial for Habitat for Humanity MW/GW. However, they can also be displayed through database queries that join the tables in a more efficient way. Mistakes like these were found through the use of an iterative design process, where we constantly reexamined our previous work to make sure that it was as efficient as possible while storing the information that we had agreed on with our sponsors.

Figure 10. Lecture on Third Normal Form
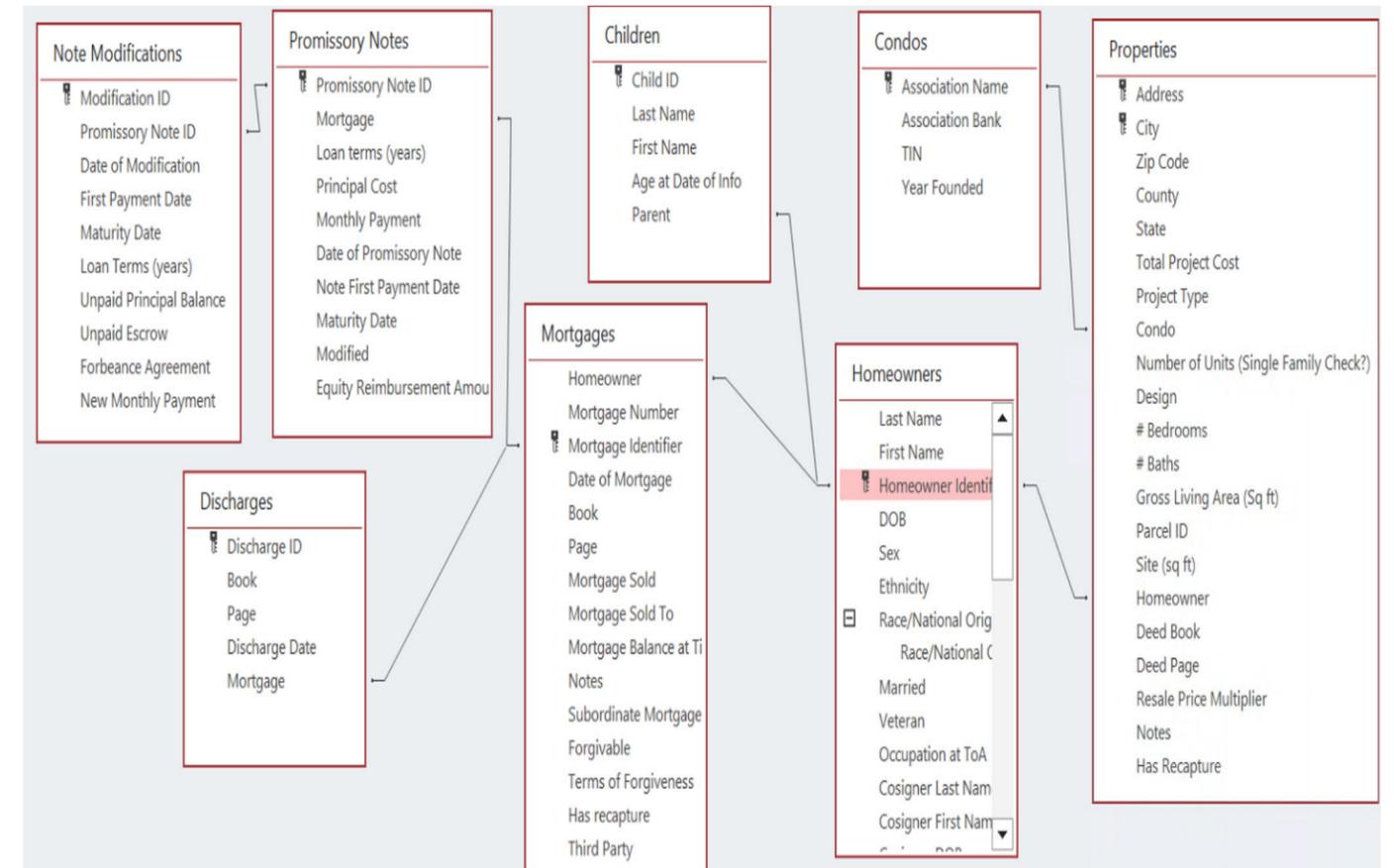Source: Professor Wong's CS 3431 Database Systems course at WPI

Figure 11. Entity Relationship Diagram (ERD) of our Access database

Throughout our design process, we discussed with Brian, Debbie, and other Habitat for Humanity MW/GW staff about the specific fields they wanted to track. Some meetings involved going through the homeowner files to learn what information each document contained and find any information that was desirable to have in the database. We updated our Entity Relationship Diagram (ERD). The final ERD of our database is shown in Figure 11. Then, once we created a functional prototype, we presented it to the staff to get their feedback.

After this prototype, we began an iterative design process to improve it. During our weekly meetings with our project sponsors, we reviewed the database and the information it was keeping track of to get feedback on the current structure as well as learn about new items that they wanted to be included in the database. Some of the guiding questions during these meetings are included in Appendix D. Due to the variety of homeowner situations, our database designs had to be updated many times to account for new cases that did not fit into the previous design. We also had conversations with the staff throughout the work week to address our questions about the nature of documents and discuss the relationships in the database and how they could connect

other fields of information. One example of this was a discussion about the idea of tracking various recapture agreements, regardless of whether they came from a mortgage, deed rider, or other source. This was different from our previous structure of grouping information by document type, but it would be beneficial for Habitat for Humanity MW/GW.

Next, we conducted semi-structured interviews with the Habitat for Humanity MW/GW staff working with our database. In these interviews, we asked about how the database has impacted their workflow and for any suggestions they might have. These interviews helped us understand their thoughts on the system. Interview questions can be found in Appendix E. We used their feedback to make the changes and improvements they recommended in the database, although some were outside the scope of the project. Through frequent contact and feedback, we tailored our project to Habitat for Humanity MW/GW's specific needs. We also used observation by having the staff demonstrate their use of the database to retrieve any necessary information. This method showed exactly how the staff interacts with the database, which aided us in making further improvements and during the documentation process.

3.5. Provide Documentation and Tutorials

Our final objective was to develop documentation and tutorials to help Habitat for Humanity MW/GW employees and volunteers learn how to use the system. After our project concluded, we wanted Habitat for Humanity MW/GW to continue using our system and increase the system's capabilities to expand with their growing needs.

We used the interviews conducted during our design process to collect information for system documentation, including which system features they view as the most confusing and which features first-time volunteers might need help understanding. We also worked with the WPI Academic Technology Center (ATC) to create useful documentation. The ATC has employees that have experience creating guides for technology use and were a great resource for us. We conducted research on best practices for creating documentation. Additionally, during the database testing process, we supervised the staff's interaction with the manuals and made notes on revisions that needed to be made to the database. From these methods, we learned to create clear and concise documentation to ensure that our project would be usable by the organization. This objective went hand in hand with designing the database, as it helped fuel a cycle of design, testing, implementation, and feedback until we had a product our sponsors were happy with. Accomplishing this objective alongside the database creation process ensured that the documentation covered everything that users might have questions about to make the database usable and flexible to the needs of various Habitat for Humanity MW/GW staff.

We did a second round of testing in the seventh week of the project term as part of our continuous efforts to improve the efficacy of our instructional materials. We chose a more complete approach to the documentation resources this time, focusing on the manual and video tutorial testing sessions rather than the database itself. The purpose of this testing was to assess the effectiveness of our adjustments, in addition to receiving input from staff members. We observed the staff members utilizing our lessons during the testing period and recorded any improvements or areas that required improvement. We also solicited their views and opinions on the guides' clarity, usefulness, and general quality. This allowed us to improve the tutorials and make them as useful and efficient as possible.

One potential challenge with this approach was that the final documentation required a complete product. Any feedback we received about confusing aspects would not be as helpful if we changed the design the following week. To avoid this, we met with the ATC staff twice. The first meeting was to learn about general best practices for tutorial design, and the second meeting was to finalize our documentation once we had a more finalized product. We also followed a strict timeline and started the documentation of the database system within the first three weeks of the project term. As a team, we held each other accountable to complete key milestones on time.

WPI Academic Technology Center
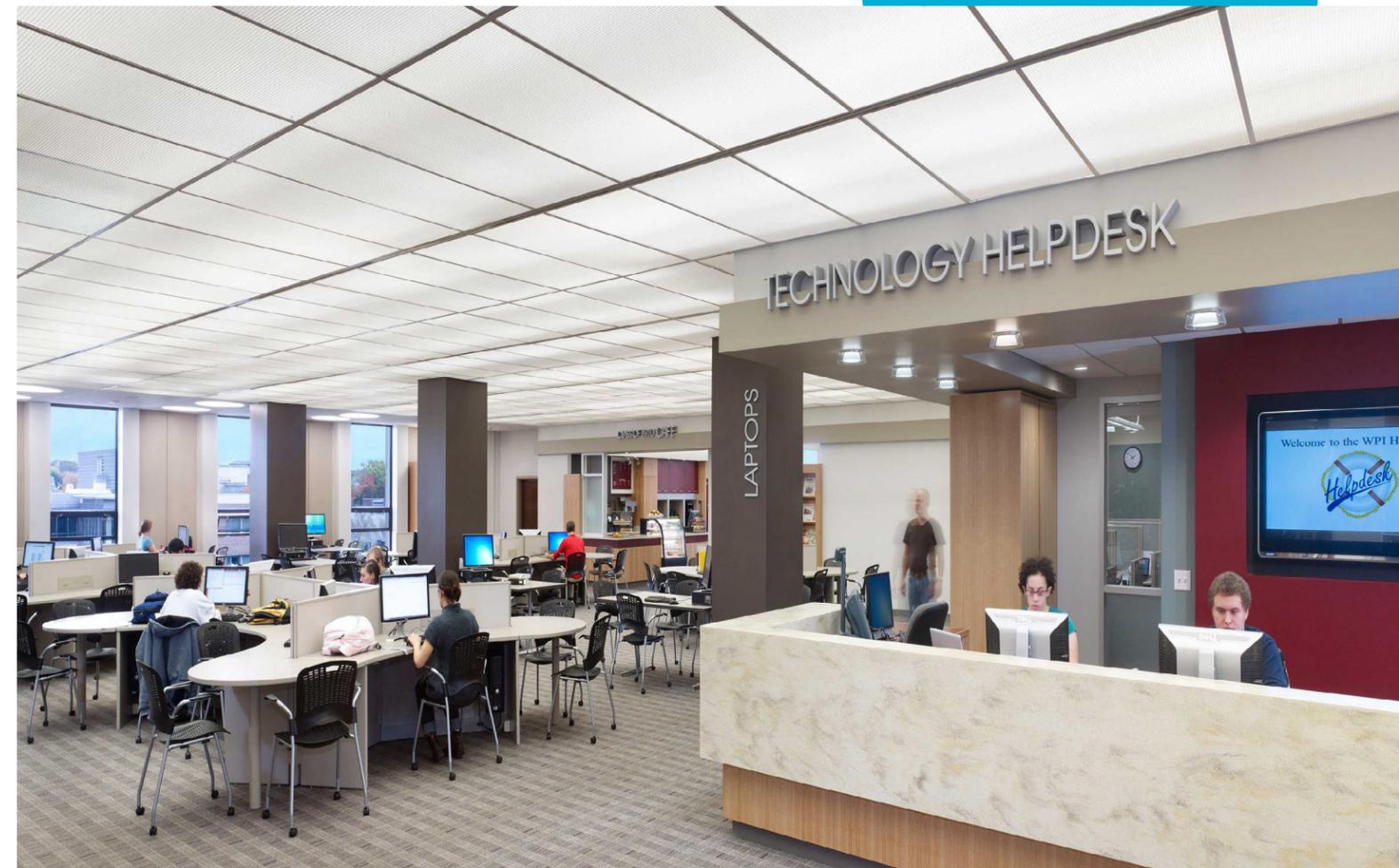
Ethical Consideration:

We worked with confidential information about Habitat for Humanity MW/GW homeowners, and were required to sign an NDA. Our project was approved by the IRB, and we used an informed consent procedure for all interviews and observations. The informed consent script can be found in appendices A, B, C, D, and E.

Chapter 4:
Findings, Results and Conclusion

4.1. Findings Introduction

Through the timeline of our project, we made key discoveries that helped influence its direction. In this chapter, we will go over the ways other Habitat affiliates organize data, the pitfalls of creating a standardized data entry structure with over 50 unique homeowner cases, and how, through the iterative process with our database, tutorials, and manual, we were able to create a stronger end product.

4.2. There is a Variation in How Other Branches Track Data

From our correspondence with other Habitat for Humanity affiliates in Massachusetts, we found there is not a standard method for tracking data and each affiliate is responsible for establishing their own system. Compared to Habitat for Humanity MW/GW, other branches had similar categories in which they structured their information but utilized different software to store their data. Regarding the responses from the Cape Cod and Springfield branches, neither of these offices used Microsoft Access as their data management system. Moreover, these systems were very different in comparison to each other and to what we designed.

The Springfield branch had three programs used for tracking different sections of mortgages: Calyx, a subscription service that they used to store mortgage origination; and More Than Data, which is used as their general database and mortgage servicing software. The last program they use is a cloud based service called Little Green Light CRM, which helps all their computers have access to the data needed to be found in the other two softwares.

Alternatively, Cape Cod's system, though done through multiple Excel spreadsheets rather than a unified database, used a software called DATTO to protect and store homeowner infor-

mation. With our project, we unified all categories of information in a single Access database, eliminating the need to use multiple softwares or spreadsheets, as shown in Figure 12 below.

Figure 12. Chart comparing what each database system tracks

Figure 13 shows the strengths and weaknesses of Excel and Access. Our sponsor valued the relational models and storage capacity Access was capable of, which is one of the reasons why it was chosen over Excel. While neither Springfield nor Cape Cod use Access, their responses gave insight on what data to keep an eye out for during data entry. This was useful in defining what tables to build in our database and how information relates to each other.

Basis	Microsoft Excel	Microsoft Access
Meaning	Microsoft Excel is an application that uses spreadsheets to create charts, graphs, and tabular models.	Microsoft Access is also an application that acts as a database program. It helps in collecting and sorting the data.
Objective	Excel's objective is to help build building **financial models in excel**, and statistical models and help track the inputs provided.	Access aims to help collect, sort, and manipulate the databases.
Storage capacity	Compared to Access, the storage capacity is less since Excel is not built to store data.	Compared to Excel, the storage capacity is more since Access is mainly created for storing, sorting, and manipulating databases.
Adaptability	Microsoft Excel is more adaptable. The user can change it at their discretion.	Microsoft Access is less flexible. It is rigid and not easy to change.
Applicable for	Microsoft Excel applies to financial analysts and statistical analysts.	Microsoft Access applies to small business owners.
Ease of learning	Microsoft Excel is easy to understand.	Microsoft Access is hard to understand.
Building systems	They are simple and easy on Excel.	They are difficult to Access.
Relational or flat	Microsoft Excel is flat and non-relational.	Microsoft Access is capable of building multiple relational models.
Programming knowledge	To learn and apply Excel, you do not need programming knowledge.	Programming knowledge is required to learn and use Access (for most features).

Figure 13. Comparison of what Access can do Vs. Excel
Source: Wall Street Mojo Excel Vs. Access

Overall, these responses helped us find a good place to start in the database development process. These categories helped us learn about all the types of information that Habitat for Humanity has to keep track of and led to a more informed discussion with our sponsor about what they wanted to include in the database. Similar to other Habitat for Humanity branches, Habitat for Humanity MW/GW also uses software like Excel and Quickshare to keep track of some homeowner information, specifically some financial information and home build data. Our sponsor didn't need us to document this information as specifically as other information, but still wanted it to be included to build a complete homeowner profile and make sure that all associated information is known about, even if it resides in another software.

4.3. Iterative Design Improved Final Database

Implementing an iterative design process allowed the database to be continually improved throughout the term. We had the first version of the database done within the second week of the term, based on the information that we had gathered during our first meetings. With each weekly meeting with the staff, we discussed new fields to include in the database. Following these meetings, we restructured the database to account for new data and new relationships.

Due to our unfamiliarity with legal terms relating to mortgages and deeds, we conducted research and asked our sponsor for more detail. From this process, we learned how to interpret mortgage and deed documents and where this information would fit in the database. As previously explained, the database relationships are based on real life relationships between documents, so understanding these legal terms was crucial to the database structure. To include this new information, we revisited homeowner files we had already entered, adding time to the data entry process. It sometimes took reading through multiple different documents to find specific pieces of information due to the variability in how all of the homeowner data could be structured.

4.4. Homeowner Documents Were Not Standardized

During data entry, we found the homeowner files to be much less standard than anticipated. This was likely due to these files spanning many decades and Habitat for Humanity MW/GW changing what information they kept track of as the organization grew. For example, we were only able to find verified income reports for a few individuals. Additionally, some of the homeowner applications had sections that were not filled out by the applicant. Because of this, we were unable to completely enter the information for certain homeowners who had missing data.

4.5. Front End Functionality Was A Requested Feature

From our weekly meetings with Habitat for Humanity MW/GW staff, we realized front end functionality would greatly improve the useability of the database. This required us to learn how to create forms and use macros. During our preparatory term, we studied database design, the components of data storage, and how to use Access strictly as a database system, not as both a front and back end system. As we spoke to more people throughout the project term, we realized the importance of a way to access, filter, sort, and look through all of the information stored in the database. We decided it would be necessary to include this functionality, with only a few weeks remaining in the term.

To add these features, we had to change our workflow. We almost entirely stopped data entry to focus on the design of the system, which we decided was more crucial to the success of our project. We decided to use Forms, which was a built-in functionality in Microsoft Access meant to be the point of user interaction. We were able to create the generic forms that would allow Habitat to have basic interaction with the database without having to work directly with the tables. However, to add more advanced functionality, we learned to use macros and Microsoft Visual Basic to add more fluidity to the final product. The members of our team with programming experience opted to create these macros, while other members created more basic forms.

The people who were designated to create the front end forms used many different ways to learn about how forms are created and made functional. The main way that we learned was by examining the sample databases that Microsoft provides with Access. This showed us the basic format of macros and how they could be structured and employed within different types of forms.

When we became stuck and could not progress, we also employed the use of Microsoft Forums, where more experienced users were happy to assist us with our problems.

In the end, we were able to create a number of basic forms with filtering features. We prioritized the basic functionality requested by the database users at Habitat for Humanity MW/GW. Once we had implemented the anticipated uses of the database in the forms and created filters to aid in their workflow, we shifted our focus to ensuring that the employees at Habitat for Humanity MW/GW would be able to use and understand the systems that we had created, as well as providing the resources needed to add new functionality to the forms as they became more familiar with the system.

4.6. Iteration Improved the Clarity of Documentation

To improve the quality of our documentation, we held a testing session with a volunteer worker and staff. The users utilized the manual and video tutorials during the database testing process, and we supervised this session for feedback. We learned that the users would switch back and forth to refer to the manual while testing the database. This was tiring and distracting, because it caused them to lose focus, slowed down their workflow, and made it difficult to keep track of the steps in the manual. To solve this problem, we recommended either using a secondary monitor, or printing a physical copy of the manual. This strategy would make it easier to reference the manual while working in the database.

We made revisions to highlight key words in the manual to emphasize what was most important. During testing, we found users wanted to know the essential information without reading every word. To address this, we decided to highlight the most important words in the manual. For instance, these are the words that describe commands in the database and could be easily found if you are somewhat familiar with Microsoft Access. We used bold text to make these words stand out, so the staff could focus their attention on the most crucial steps while skimming through the document.

We made improvements to the details of certain parts of the manual. For example, initially we did not include the last steps that would save the changes made to the database, thinking that it was not necessary, but we realized we needed it when the staff would close the tabs and forms without saving the changes and lose their progress. We had to ensure the manual was detailed enough to account for people with no experience with Access databases.

In the video tutorials, we improved the editing and conciseness of the instructions. We noticed that the staff would lose focus during the long pauses in the video tutorials, which led them to miss important information. To solve this issue, we edited the old video tutorials to omit the pauses and changed the tone of our voice to engage them more in what was being said. In conclusion, we increased user engagement by editing videos to reduce significant gaps, resulting in better performance and skilled employees.

During the testing session, we found there were certain topics the staff were interested in that were not covered by the guides. We created new videos and edited the written manual to include these topics. These topics would allow the staff to broaden their database knowledge and add more features to the database if needed. For example, we made new video tutorials on the creation of forms; the creation of macros (filters); SQL programming; and the editing of the design of forms, queries, and reports. We made these instructions easy to follow without requiring previous knowledge. We also included these sections in our written manual. The final version of our manual can be found in Appendix F. For ease of access and organizational purposes, we created a dedicated folder on the office drive consisting of the manual and tutorials.

Recommendations

We have a number of recommendations for how the database can be improved and expanded. These suggestions stem from our interviews with staff, insights from the design process, and review of homeowner files. Due to the limited time of our project, we did not implement features that were outside of our scope.

1. We recommend tracking home repair information in the database. This could be achieved with the addition of a few fields and tables to track home repair information. The existing properties table can hold home repair properties, with a field to indicate if it was a repair project. A duplication of the properties table could be used to manage repaired homes and keep the repaired homes separate from the Habitat-built homes if that better suits their needs. An additional table could be added to include repair information, such as the type of repair, recipient information, or cost of the project.

2. We recommend standardizing the homeowner application to include veteran status, disability status, AMI information, a copy of the applicant's W2 and other income verifications, and making all the application fields required to ensure the application is properly filled. Disability and veteran status information is stored in the database, but was not present in every homeowner file. Including these fields within the homeowner application would provide a standardized way to collect this information so it can be easily entered in the database. The Greater Springfield branch mentioned they track W2 forms and other income sources, which may contain additional information for verifying income.

3. We recommend establishing a process to ensure data integrity. This can be accomplished by having the data double checked by a different person during the data entry process. The autocorrect within Access automatically corrects "misspelled" words without asking the user first, and leaves behind no indication that an edit was made. Even then, disabling autocorrect in one cell does not have an effect on the other cells. We also found that the book and page numbers of official documents could be confusing, and that double checking on the deed registry website was helpful.

4. We recommend exploring further means of expediting data entry through automation and the additional capabilities of Access. Another feature that Habitat for Humanity MW/GW would like to have is automation for inputting data and filling out external forms with information from the database. We initially hoped to achieve this in our project but determined it was outside our scope due to time constraints. The use of forms is a good way to break down the data entry into a digestible form, but it requires that many different forms are used to enter all of the information associated with homeowners. A sort of "one-stop shop" form would allow new users to enter all required data instead of navigating through the different forms with the possibility of forgetting some. The autofill of database information into external forms was also discussed but realized to be unachievable during our project term.

5.   We recommend shifting the database to cloud-based hosting instead of being stored on the Habitat for Humanity MW/GW network drive. This would offer additional security, storage, and other benefits like automatic backups. The maximum amount of data that can be stored in an Access database is two gigabytes. Our final version of the database was less than .01 gigabytes, so it is unlikely that file size will be an issue soon. However, if the database is expanded to contain scanned versions of documents like deeds, mortgages, or homeowner applications, size would likely be an issue. We did some preliminary research into the use of Microsoft Azure cloud hosting and the use of Microsoft Dataverse, but not enough to come to a conclusion about what would be best suited to Habitat for Humanity MW/GW's needs if they decided to move the database.
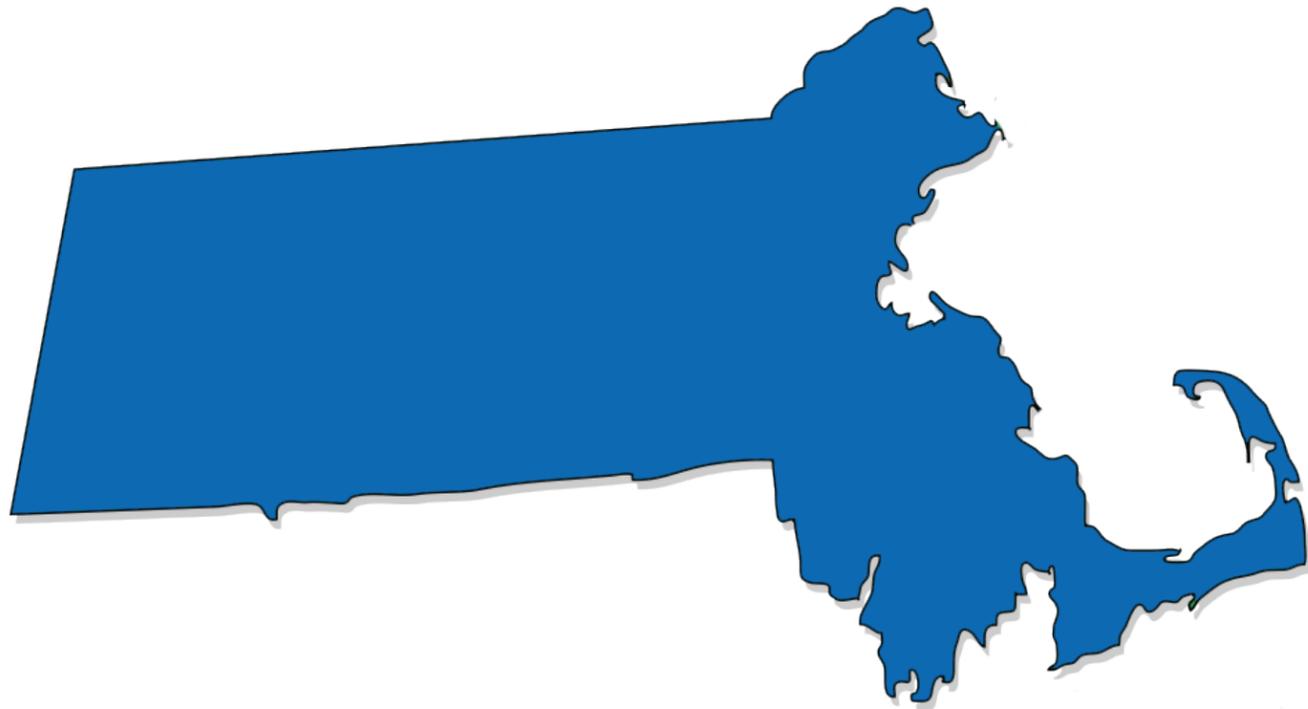
Conclusion

     We believe this database will have a lasting effect on Habitat for Humanity MW/GW and we hope it will be used and improved upon for many years. From our time spent at the Habitat for Humanity MW/GW office, we have seen the impacts that affordable housing has made on people within our community and are happy to have helped Habitat for Humanity MW/GW work towards their goal of providing affordable housing. The staff at Habitat for Humanity MW/GW were very friendly and helpful in our design process, and we would like to thank them all for their assistance.

     We learned a lot during our project term. Specifically, we learned about Microsoft Access databases and other technical skills, such as documentation or using video tutorial software like Camtasia. Additionally, we learned a lot about the legal and financial aspects of owning a home, which will assist us in the future. We also learned the importance of non-profit organizations for the communities they serve, and how important volunteers are for keeping them running. Therefore, we hope to see more collaborations between non-profit organizations and WPI.

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Appendix A. Interview with Habitat of Humanity MetroWest/Worcester Sponsors

Informed Consent Script: We are a group of students from Worcester Polytechnic Institute. We are conducting this interview and request to audibly record it to obtain information about the current data management system at Habitat for Humanity MetroWest / Greater Worcester (MW/GW). We believe this interview will be valuable to accomplish our goal of creating an Access database for the homeowners' information Habitat for Humanity MW/GW has helped over the years. Your answers will remain anonymous. This survey is completely voluntary and you may withdraw at any time. If interested, a copy of the audio recording or the transcript of this interview may be provided at the conclusion of the interview.

1. How did you get started with working at Habitat for Humanity MW/GW? / What made you pursue this job?
2. What are your expectations for our team and this project?
3. What is the number of staff that are working for Habitat for Humanity MW/GW? How many do you think are employed on the homeowner and ReStore side? How many will use the database?
4. What are the current systems being used for data management? Where are all of the different items that you want to be in the centralized database currently stored?
5. What would you say is the limiting factor of your current data organization system?
6. Why did you choose Microsoft Access to have your database in?
7. How does this current system impact your workflow and affect Habitat for Humanity MW/GW?
8. Who will be using this database?
9. What information needs to be stored in this database?
10. Do you recommend anyone else we can speak with for our project?
11. Can you recommend any resources that you think might help our research?
12. Can we contact you in the future if we have questions?

Appendix B. Investigating the Current System

 Informed Consent Script: We are a group of students from Worcester Polytechnic Institute. We are conducting this interview and request to audibly record it to obtain information about the current data management system at Habitat for Humanity MetroWest / Greater Worcester (MW/GW). We believe this interview will be valuable to accomplish our goal of creating an Access database for the homeowners' information Habitat for Humanity MW/GW has helped over the years. Your answers will remain anonymous. This survey is completely voluntary and you may withdraw at any time. If interested, a copy of the audio recording or the transcript of this interview may be provided at the conclusion of the interview.

1.   How does the current system impact your workflow?

2.   What information do you find the need to search for the most frequently?

3.   Could you show us how you obtain a piece of information you need?

    a.   Observe how long this takes. Note where the documents are physically located.

Appendix C. Interview with Other Massachusetts Habitat for Humanity Offices

Informed Consent Script: We are a group of students from Worcester Polytechnic Institute. We are conducting this interview and request to audibly record it to obtain information about the current data management system at Habitat for Humanity MetroWest / Greater Worcester (MW/GW). We believe this interview will be valuable to accomplish our goal of creating an Access database for the homeowners' information Habitat for Humanity MW/GW has helped over the years. Your answers will remain anonymous. This survey is completely voluntary and you may withdraw at any time. If interested, a copy of the audio recording or the transcript of this interview may be provided at the conclusion of the interview.

1.   What are the current systems being used for data management?

    a.   What information are you storing?

2.   Do you have difficulty finding information you need?

3.   What is the size of your organization? How many Homeowners do you have?

4.   How did you get this system up and running? How would you summarize the process?

5.   Were there any major roadblocks you had to get past? What type of methods made the system easier to build?

Appendix D. Questions Throughout the Project Term

Informed Consent Script: We are a group of students from Worcester Polytechnic Institute. We are conducting this interview and request to audibly record it to obtain information about the current data management system at Habitat for Humanity MetroWest / Greater Worcester (MW/GW). We believe this interview will be valuable to accomplish our goal of creating an Access database for the homeowners' information Habitat for Humanity MW/GW has helped over the years. Your answers will remain anonymous. This survey is completely voluntary and you may withdraw at any time. If interested, a copy of the audio recording or the transcript of this interview may be provided at the conclusion of the interview.

- Does it make sense to continue using the master spreadsheet rather than entering data directly - into the database?
- Do you like the database so far and what are some additional fields you would like us to include in it?
- How should we start moving forward to have other Habitat staff who are mostly using the database test it? Since it's still missing information in it should we still start testing?
- Where do we make a checkbox for "Equity Reimbursement Amount"? Is it necessary? Do you want it as a separate tab?
- Do all homeowners have:

      Resale Price Multiplier?

      AMI?

- Should we keep track of homeowners' unverified income and financial information? Separately, household income, or both?
- Should we keep track of the Occupation, Employer or both?
- Should we keep track of the same information for the cosigner?
- Do you want us to write a blurb about the homeowner story? Should we only create the field in the database for that?
- Should we create a field for the Employer at Time of Application or Industry?
- For the date of house sale, do we consider it to be the date of the mortgage?

- Do you want a field for Repurchase Agreements?
- What are the top 5(ish) specific use cases you have in mind for the database?
- Should our provided tutorials include filter and/or macro design or is that too technically complex?
- Do you want tutorials on basics of how to use MS Access?

      If so, made by us or sourced by us?

- What kinds of things does habitat want to be able to do with the database once we are done/gone?
- Show how to add fields to forms?
- What details to take for forbearance agreements and deed restrictions?
- Anything to change for the current state of promissory notes & terms?

Appendix E. Questions on our Database System

Informed Consent Script: We are a group of students from Worcester Polytechnic Institute. We are conducting this interview and request to audibly record it to obtain information about the current data management system at Habitat for Humanity MetroWest / Greater Worcester (MW/GW). We believe this interview will be valuable to accomplish our goal of creating an Access database for the homeowners' information Habitat for Humanity MW/GW has helped over the years. Your answers will remain anonymous. This survey is completely voluntary and you may withdraw at any time. If interested, a copy of the audio recording or the transcript of this interview may be provided at the conclusion of the interview.

1. What have been the main points of confusion in migrating to this new system?

    a. What do you think new users will struggle with?

3. Is there anything about the old way of doing things that you prefer over this?

4. Are there any features you would like to be added?

5. Can you show us how you obtain information using the database?

6. Overall, how would you consider this an improvement over the old system?

Appendix F. Updated Version of the Manual

Habitat for Humanity MW/GW Access Database Manual

Contents

How to open the Access database

1. Open **File Explorer** in one of the office computers or using remote access to one of the office computers.
2. Go to **This PC** > **Office Data** > **Database Project**.
3. Double-click **'Habitat MWGW Database'** to open the database.
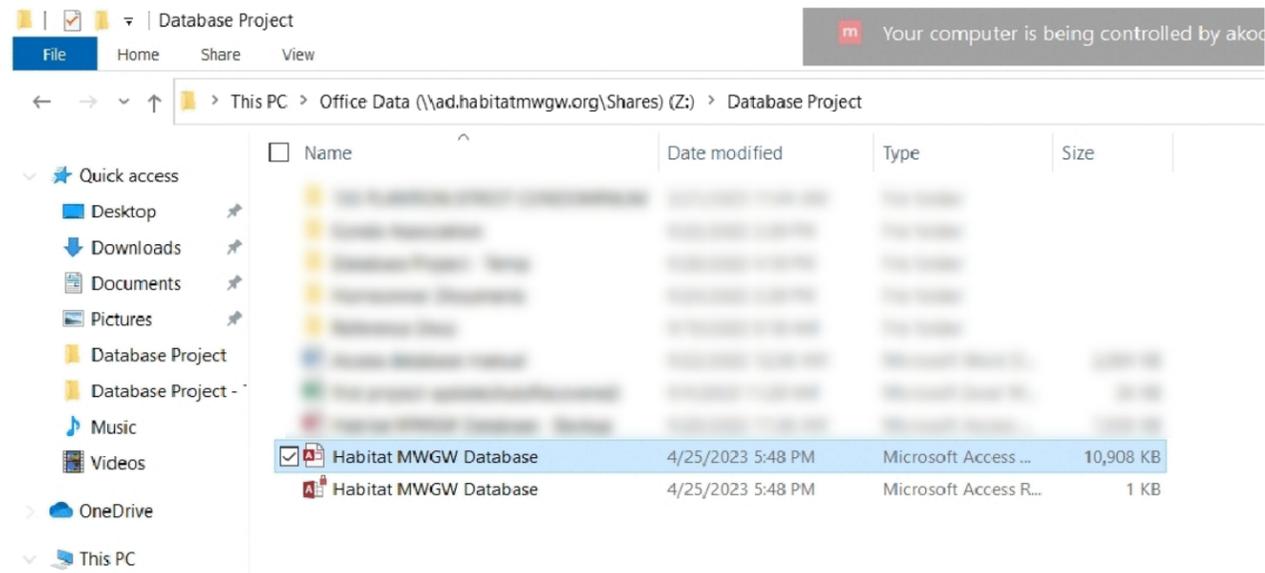
It should look like this:
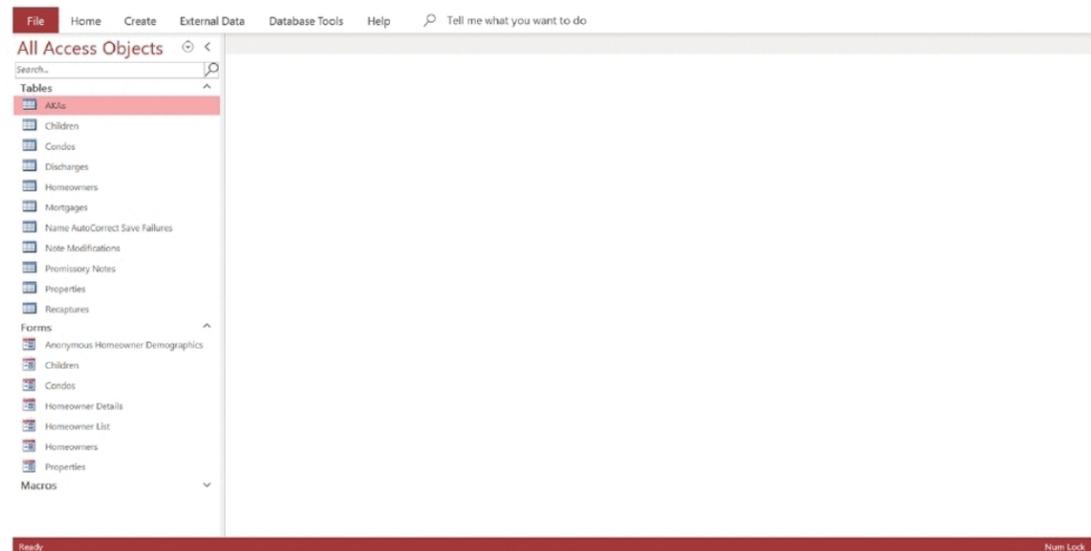
The first time that you open the database, you may encounter an error across the top of the screen as seen below.
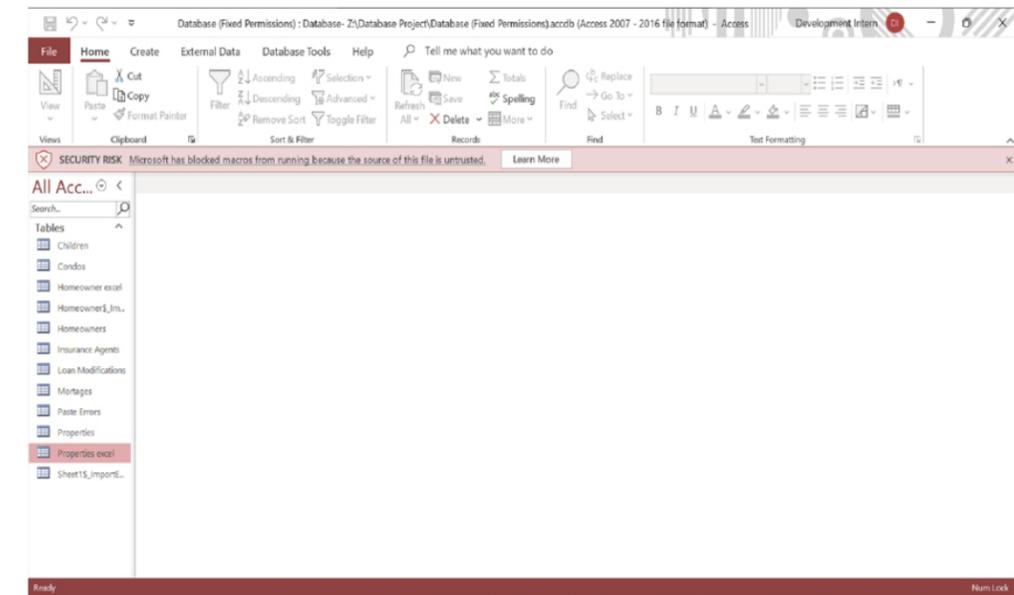
This is very easy to fix. First, click the red "**File**" button in the top left corner of the Access window. Then, click the "**Options**" tab from the bottom of the menu that runs down the lefthand side of the window.
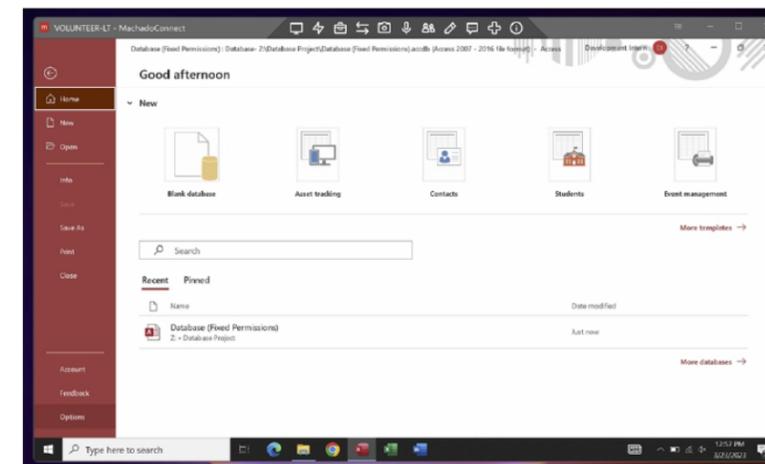
In the window that pops up, click on the "**Trust Center**" option on the bottom of the menu on the left.
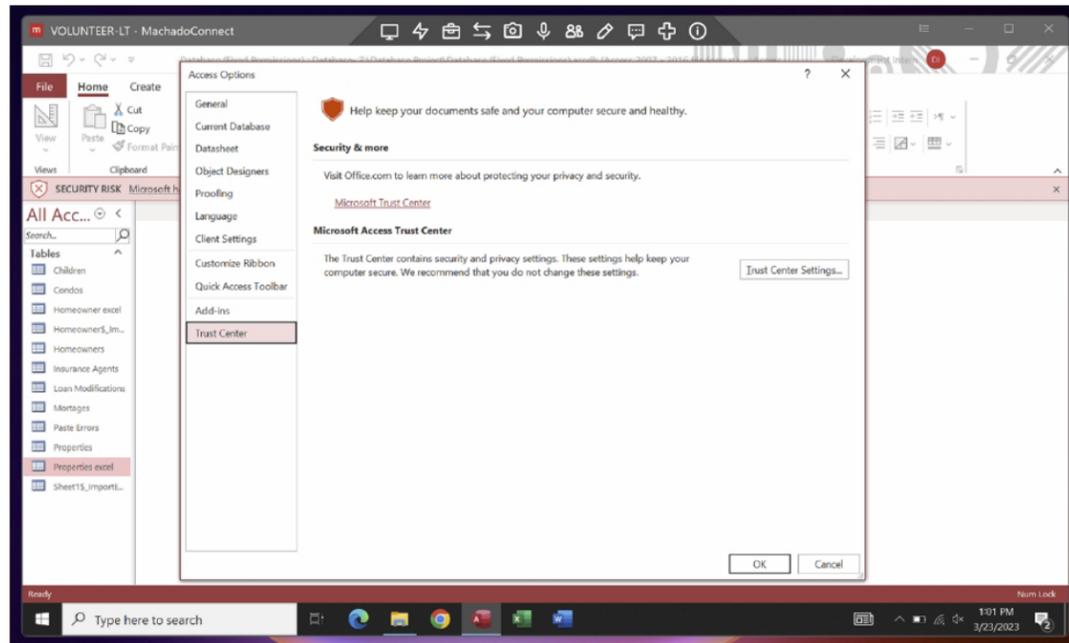
Once in the Trust Center, you will need to click the box that says "**Allow Trusted Locations on my network (not recommended)**". The reason this is not recommended is because it is much easier to penetrate a network than a computer's local storage. However, this Z drive is provided by Habitat MWGW to organize all of their files and it is okay to trust.
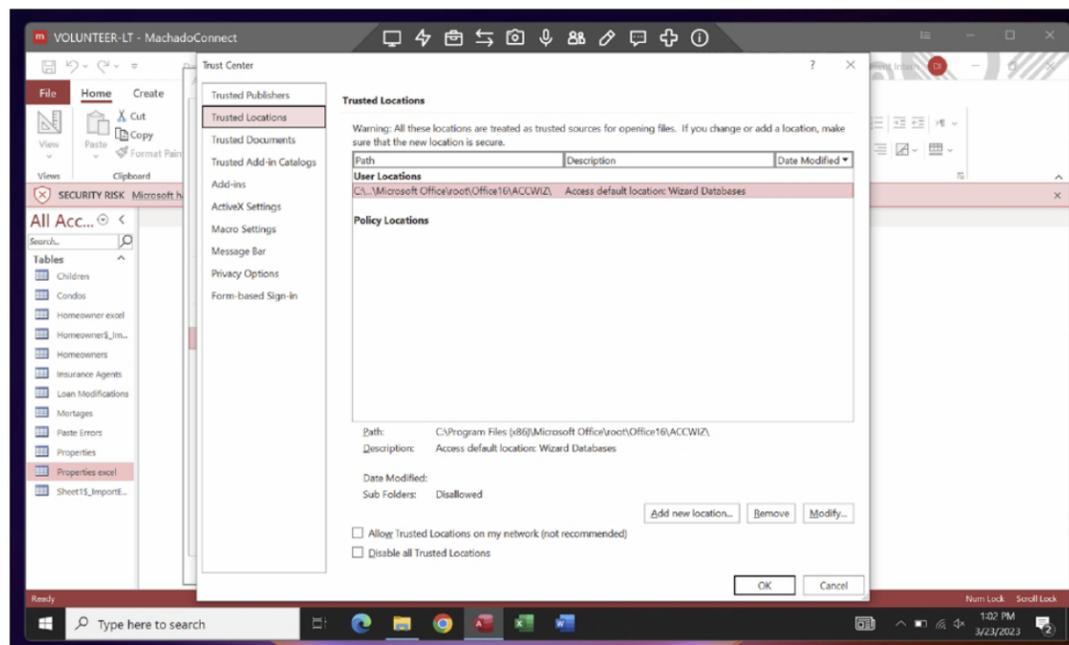
Click on the button towards the bottom right that says add new location. It is easiest to browse the File Explorer to locate the database. To minimize the risk brought on by trusting network devices, select the fullest pathway you can that allows access to the Database. For example, if the database is stored at the pathway **Z-Drive/DatabaseProjectFiles/Database.accdb**, select the folder **Z-Drive/DatabaseProjectFiles/** as the new trusted location. Adding Z-Drive/ as the new Trusted Location will work, but is less secure.

Once that is done, all windows can be closed by hitting the "**Okay**" button on each window to apply changes. If done properly, the error will not be displayed when reopening that database. Please note that if the database has not been closed, the error message will still be there because it has not refreshed. Closing and reopening the database will fix this.

How to view data in the database

Method 1

1. Follow the steps of **"How to open the database"**.
2. After opening the database, you will see Tables, Forms, Macros, etc. on the left of your screen.
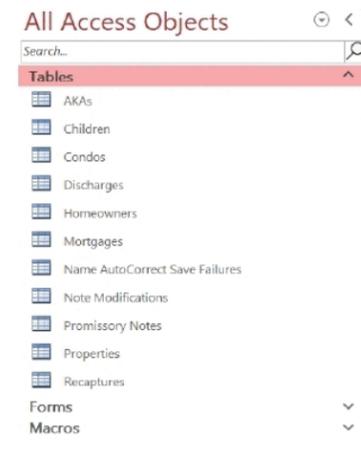
3. Double click on the **table you want to view**.

For purposes of demonstration, let's double-click the table 'Homeowners'. The screen capture below shows what comes up.
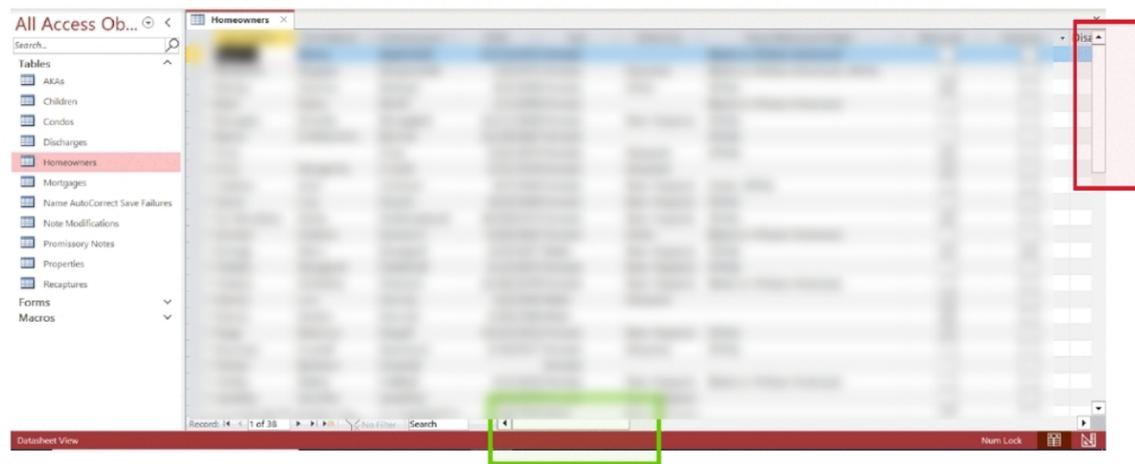
Note: If you want to scroll up or down, use the scroll bar located on the right of the page, which is displayed inside the red rectangle.

If you want to scroll right or left, use the scroll bar located on the bottom of the page, which is displayed inside the green rectangle.

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Method 2 – Locked Records

1. Follow the steps of **"How to open the database"**.
2. Click once the table or query you want information from.
3. In the search bar **"Tell me what to do"** located on the top of the screen inside the red rectangle shown in the screen capture below, type '**form**'.

4. In the menu that comes up (shown in the figure below), click '**Form**'.

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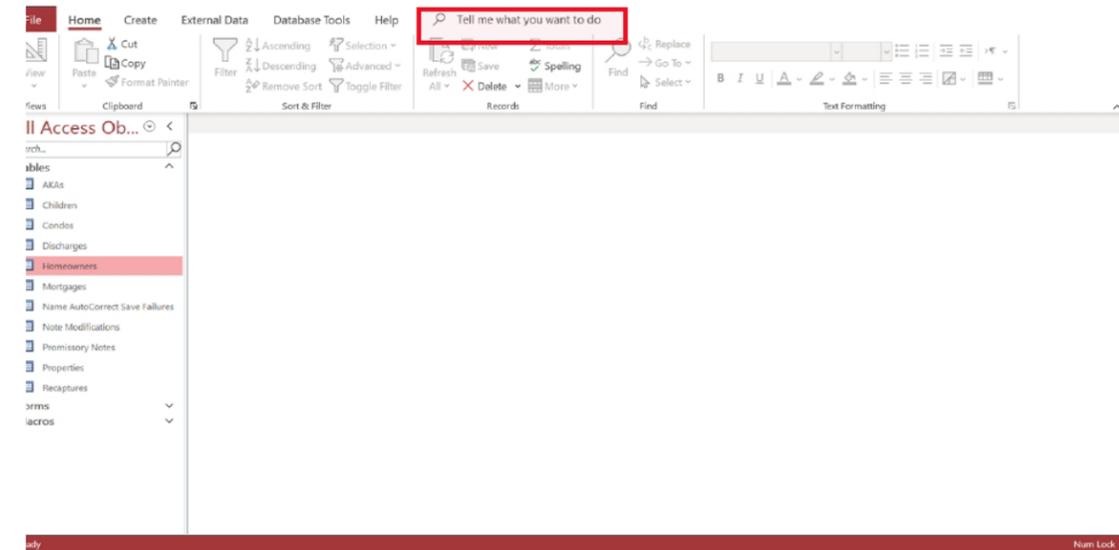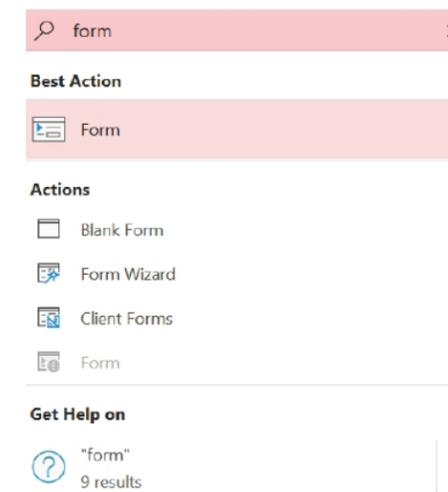
Your screen should look like this:
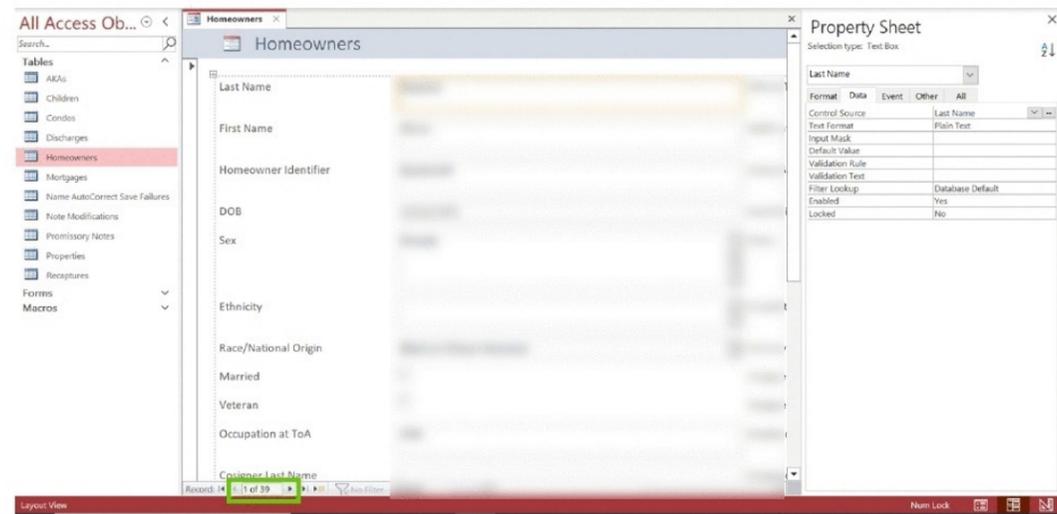
5. Using the small left and right arrows in the bottom left corner of the form located inside the green rectangle, you can view the data for each homeowner in alphabetical order.

6. To view the first record of your database, click the left arrow located in the bottom left corner of this Form, as highlighted in the red box below. To view the last record of your database, click the right arrow located in the bottom left corner of this Form, as highlighted in the blue box below.
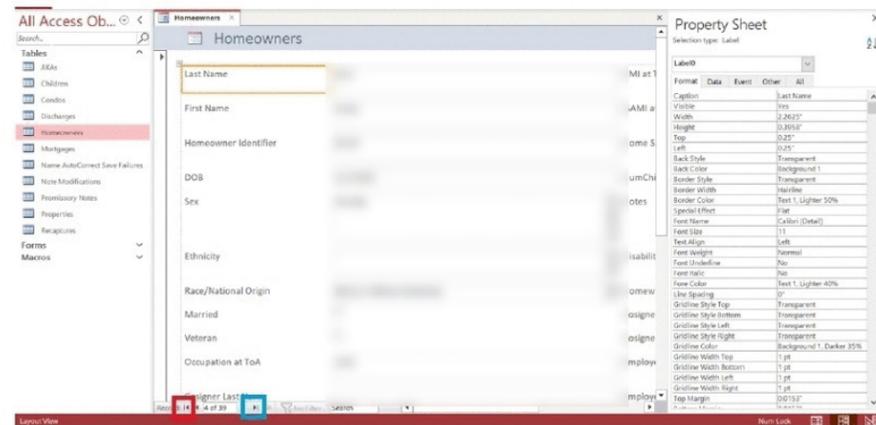
How to enter data in the database

Method 1

1. Follow the steps of "**How to open the database**".
2. Follow the steps of "**How to view data in the database**" **Method 1**.
3. Find the cell you want to enter data into, click on it with your mouse, and type the data.
4. When you are done, press either Tab or the right arrow from your keyboard to insert data in the following box; or put the cursor of your mouse in one of the other cells you want to enter data into.

Method 2 – using forms

1. Follow the steps of "**How to open the database**".
2. Follow the steps of "**How to view data in the database**" **Method 2**.
3. Select the small box in the bottom right corner of the screen to make sure you are in detail view to enter data.

4. To enter new data in the database, click the right arrow in the bottom left corner of the form located inside the blue box, shown in the figures below.
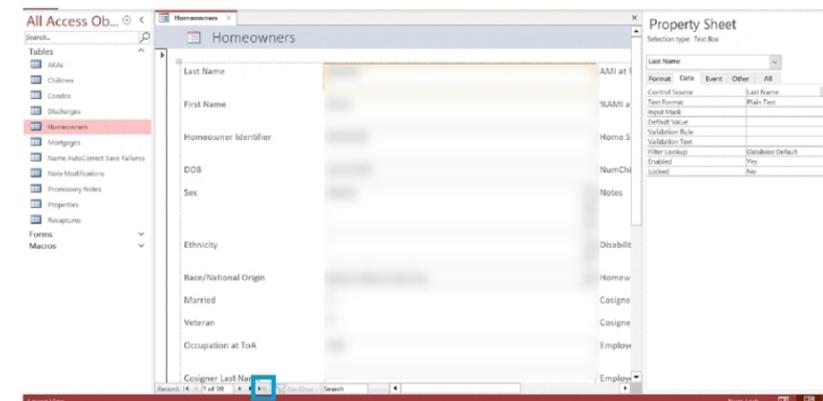
Your screen should look like this:
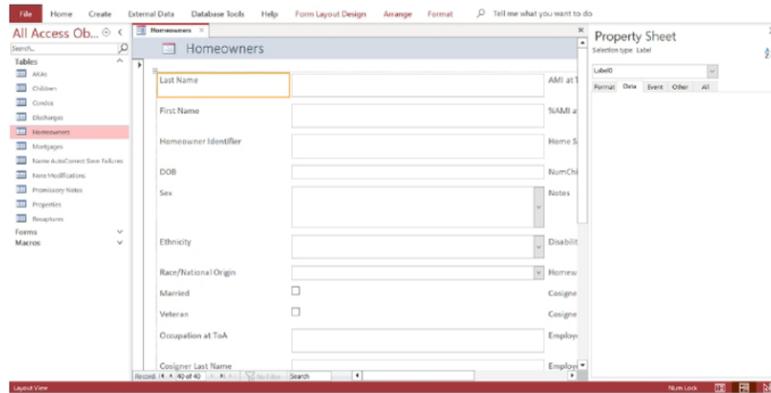
5. Select the box you want to put data into and start typing.
6. To go to the next box, either press Tab from the keyboard, or select the box you want to fill using your mouse and start typing.

Regardless of which method is used, the order in which objects are added is important due to the entity relationships within the database. The following order can be used:

1. Homeowner
2. Children
3. Condo (If applicable)
4. Property
5. Mortgage
6. Promissory Note
7. Loan Modifications
8. Discharges

First add the homeowner. You will be able to fill out every field except for the children. The children are added next. Because the parent was added first, they can be selected from the dropdown when creating the children. Once all children are added, the homeowner profile can be completed by adding the children to the parent. Adding a condo association is only necessary if the property of the new homeowner is a condo and it is part of a condo association that has not been used by any other Habitat MW/GW properties. An Insurance Agent needs to be added only if the Insurance Agent for the property has not been used for any other Habitat MW/GW Properties in the past. If those two fields are not required, the property itself can be added.

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How to edit existing data of the database

1. Follow the steps of "**How to open the database**".
2. Follow the steps of "**How to view data in the database**" Method 1.
3. Click on the cell, whose data you want to edit, put the cursor where you want to edit, and edit accordingly.
4. Click the **save icon or 'Ctrl + S'** to save your changes.

How to edit field headings

1. **Select the field** you want to edit.

Note: To do so go to the heading of the field and hover your mouse until a downward black arrow appears and then click the field.

2. **Double-click on the heading** of the field and change accordingly.
3. Click the **save icon or 'Ctrl + S'** to save your changes.

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How to access the Entity Relationship Diagram

1. Follow the steps of "**How to open the database**".

2. Click once the table or query you want information from.

3. In the search bar "**Tell me what to do**" located on the top of the screen inside the red rectangle shown in the screen capture below, type '**relationships**.
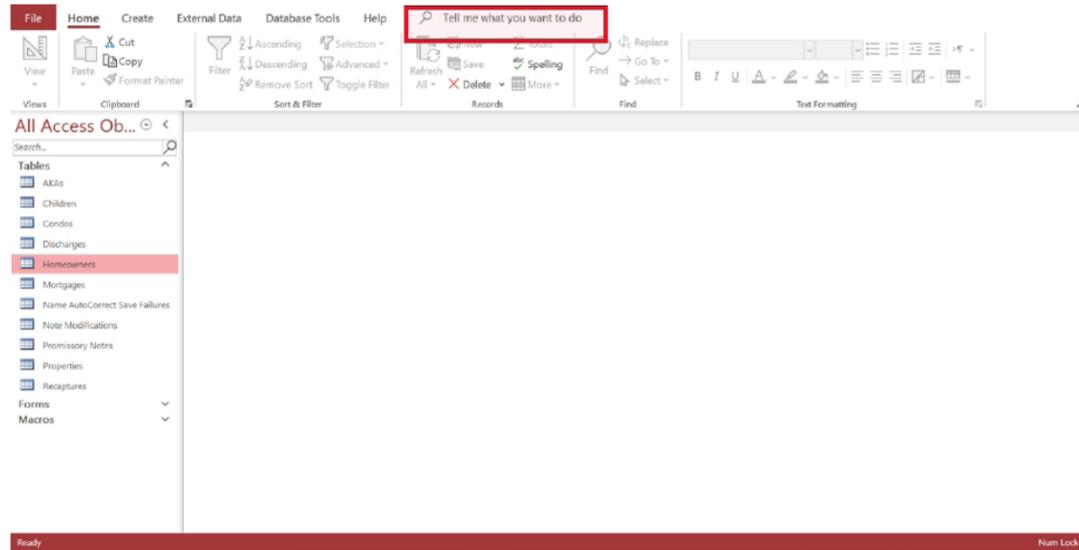
4. In the menu that comes up (shown in the figure below), click '**Relationships**.
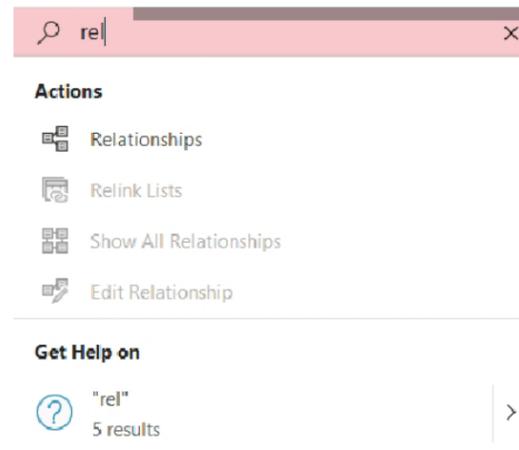

Your screen should display the ERD and look like this:
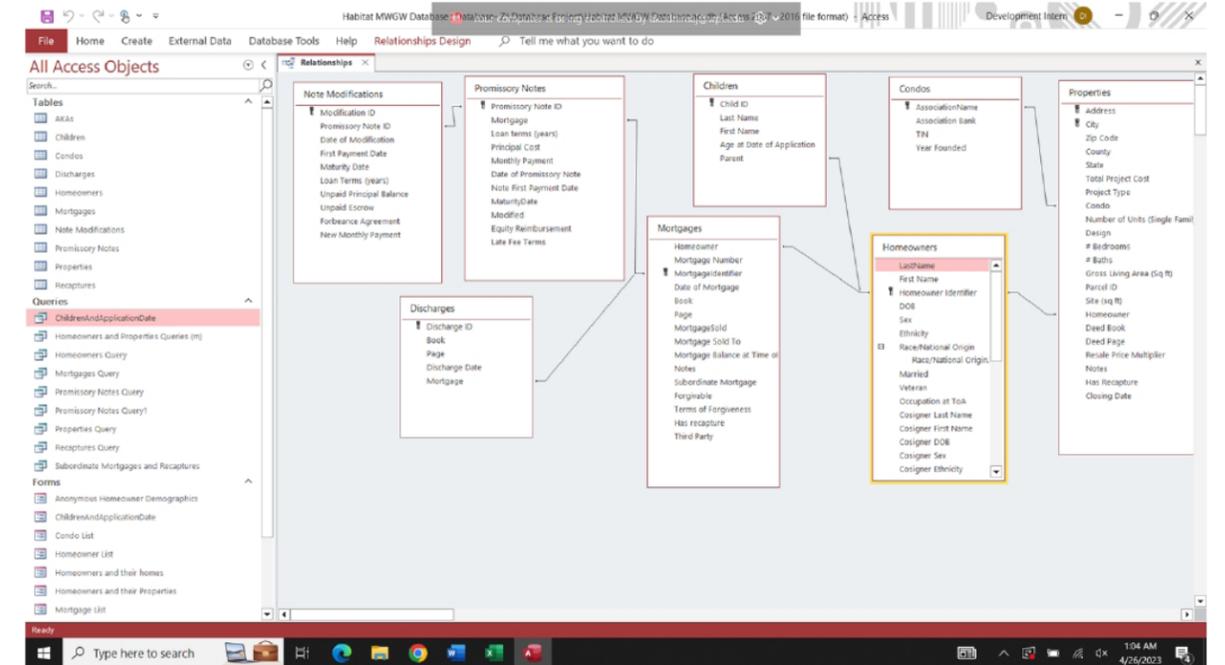
This diagram gives an overview of all the tables and fields within them. The lines connecting each table shows how the primary keys are used to relate the tables to each other.

How to navigate forms

1. Follow the steps of "**How to open the database**".
2. On the left of the screen, you can find the list of current forms. From the list, double-click the one you would like to open.
3. To filter the information you need, **follow the instructions in each form**.

Example

In the form '**Anonymous Homeowner Demographics**', which looks like in the picture below, you can filter the information using the small white boxes shown inside the red rectangle.
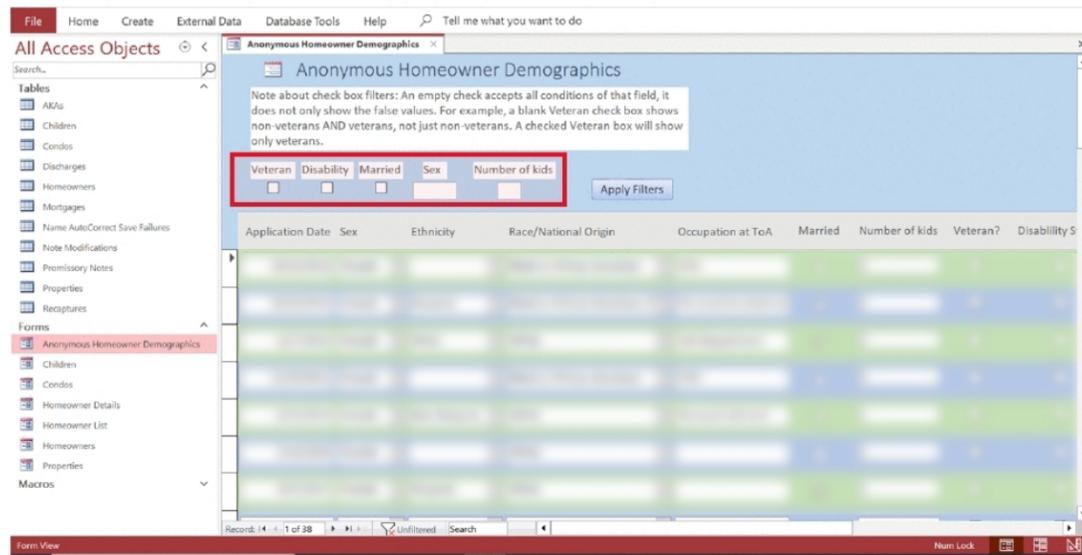
To find out how many of the homeowners are veterans, you would select the checkbox under '**Veteran**' and click '**Apply Filters**'. Your screen should look like this:
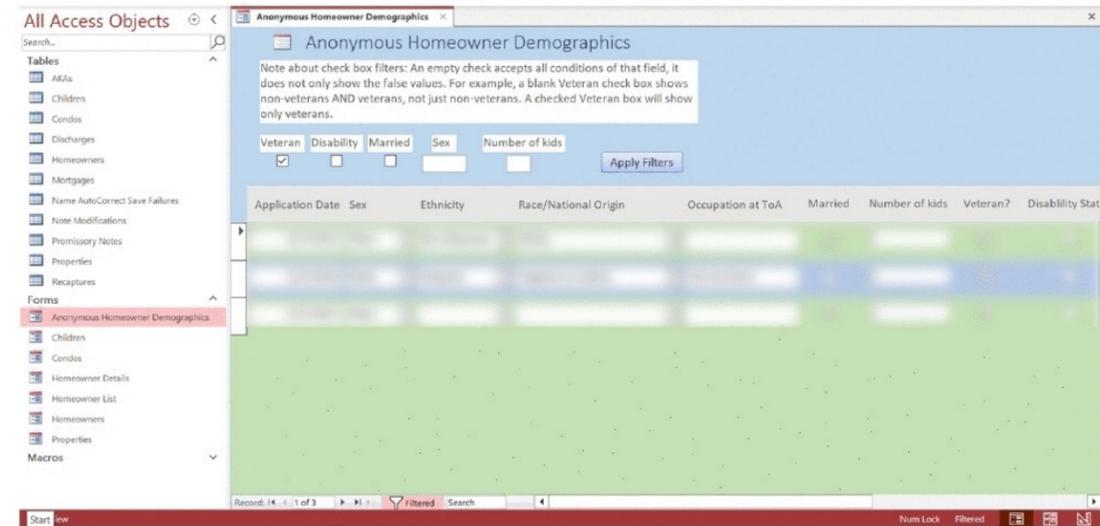
To find out how many of the homeowners are married and female, you would deselect the checkbox located under '**Veteran**', select the checkbox under '**Married**', type '**Female**' in the box located under '**Sex**', and click '**Apply Filters**'. Your screen should look like this:
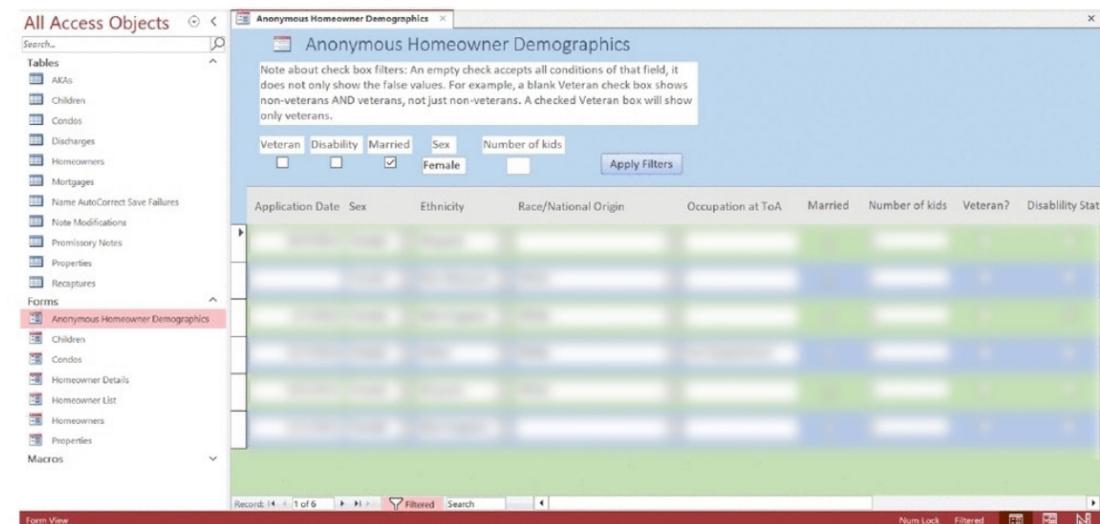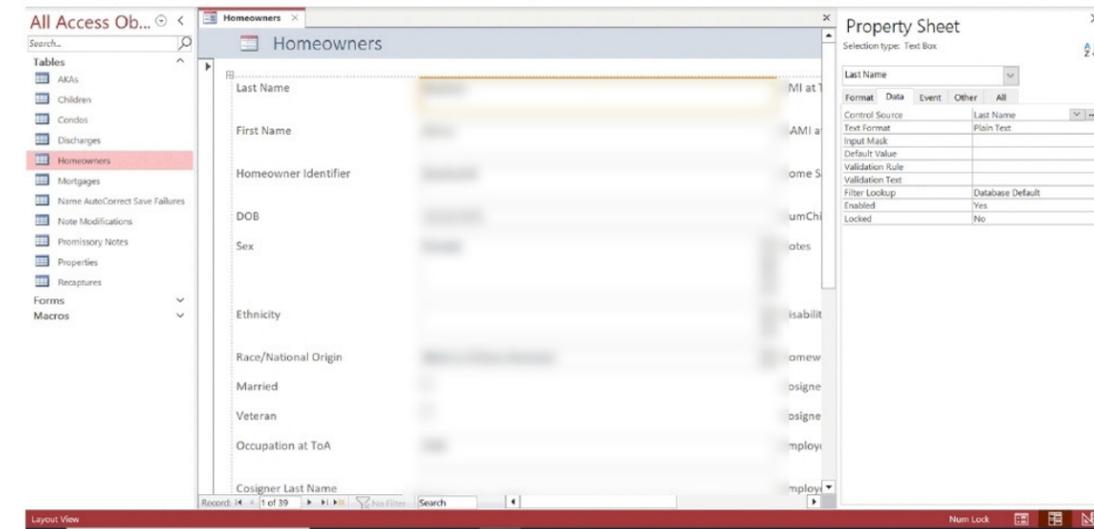
How to create forms

1. Click once the table or query you want information from.

2. In the search bar "**Tell me what to do**" located on the top of the screen inside the red rectangle shown in the screen capture below, type '**form**'.
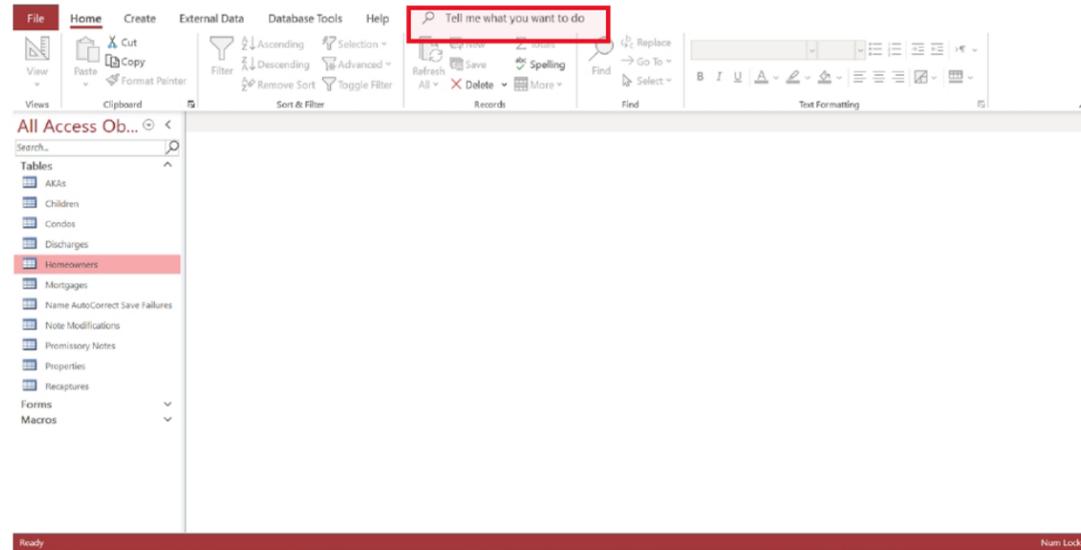
3. In the menu that comes up (shown in the figure below), click '**Form**'.
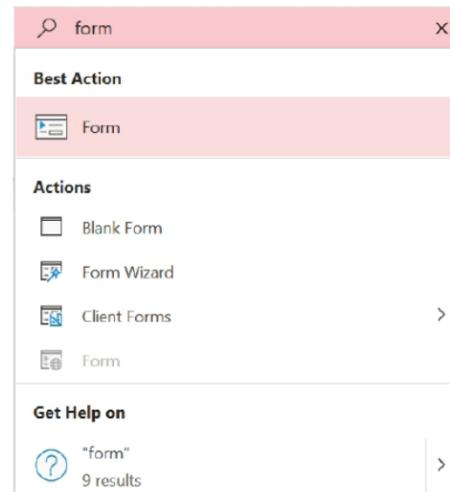

Your screen should look like this:

How to create a query

1. Follow the steps of "**How to open the database**".
2. **Follow the steps of "How to view data in the database" Method 1.**
3. Click the '**Create**' tab and in the Queries group, click '**Query Wizard**'.

4. **In the 'New Query'** dialog box, Select '**Simple Query Wizard**' and then '**OK**'.
5. Select the table that contains the field, add the '**Available Fields**' you want to '**Selected Fields**'. For each field, perform these two steps:
   a. Under '**Tables/Queries**', click the table or query that contains the field.
   b. Under '**Available Fields**', double-click the field to add it to the '**Selected Fields**' list. If you want to add all fields to your query, click the button with the double right arrows **(>>).**
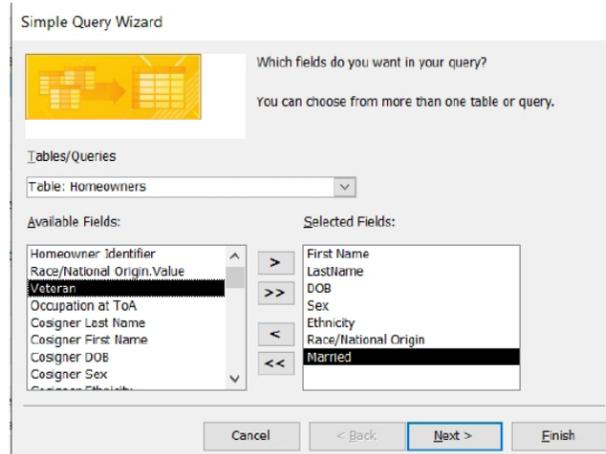

6. When you have added all the fields that you want, click '**Next**'.
7. On the last page of the wizard, give the query a title, choose whether you want to open the query in Datasheet view or modify the query in Design view, and then select '**Finish**'.

Note: If you choose to open the query, the query displays the selected data in Datasheet view. If you choose to modify the query, the query opens in Design view. A Design view provides access to create or modify tables, forms, or any other database objects. Whereas in Datasheet view all these functions cannot be seen easily. Datasheet view allows data entry and editing, only data can be edited. The format of the data however cannot be changed.
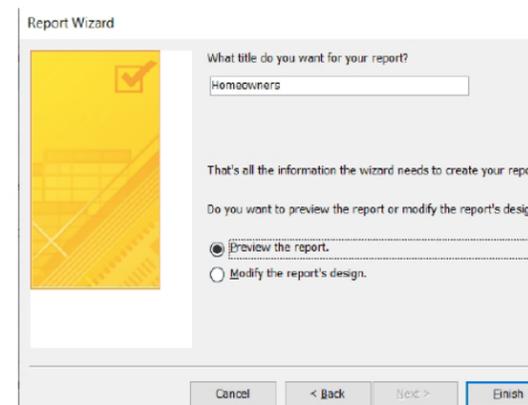
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How to create a report

1. Follow the steps of "**How to open the database**".
2. **Follow the steps of "How to view data in the database" Method 1.**
3. Click the '**Create**' tab and in the Reports group, click '**Report Wizard**'.
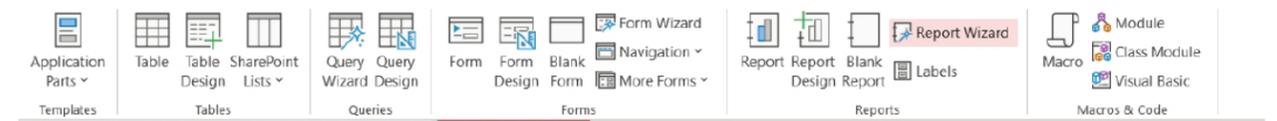
4. Select a table or query, double-click each field in '**Available Fields**' you want to add to the report, and select '**Next**'.
5. **Double-click the field** you want to group by and select '**Next**'.
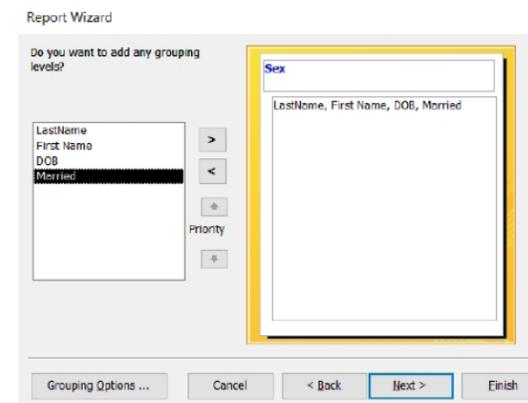
6. Complete the rest of the wizard screens and select '**Next**'.
7. On the last page of the wizard, give the report a title, choose whether you want to '**Preview the report**' **or 'Modify the report's design'** and then select '**Finish**'.
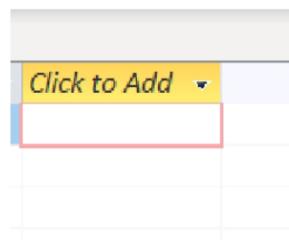

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How to add a new table, field, and set relationships

1. Follow the steps of **"How to open the database"**.
2. Follow the steps of **"How to view data in the database" Method 1**.
3. Go to **'Create'** and in the group 'Tables' click **'Table'**.
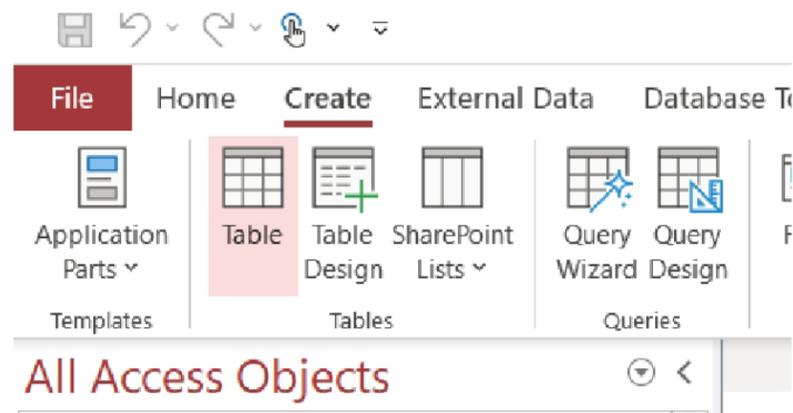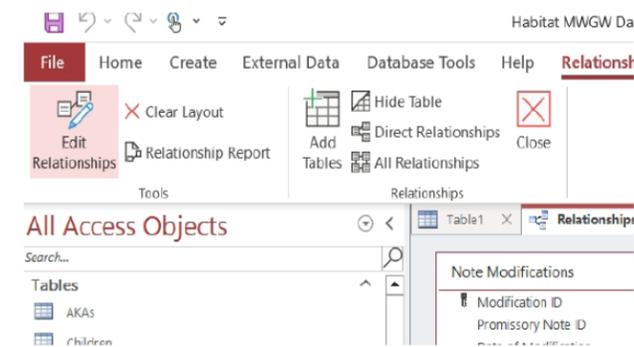

To add new fields:

4. Click **'Click to Add'**.

5. Select the type of field you want.
6. Type a field title.

To add relationships:

7. go to **'Relationships'**.
8. Click **'Edit Relationships'** in the Tools group.

9. Click the first field, drag the cursor to the second field and release.
10. In the window that pops up, confirm your selection and click **'Create'**.