



INFO-102 Introduction to Information Systems

Term Project – Milestone #5 – FINAL REPORT

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- Students may discuss lecture materials, but they may not discuss homework assignments with their classmates.
- Unless otherwise stated, students may collaborate on assignments with others within the same group. For this course, all homework assignments are group efforts and only the project is a joint effort venture.

All submissions should be the original works. Any incidence of plagiarism (any exchange, reuse, or direct submission of other's work, e.g., documents, code, etc., as your own or as your teams) or other academic dishonesty will be discussed with the student. Students found guilty of plagiarism can expect a Drexel University Alleged Academic Misconduct Report to be filed to the University Judicial Office, where a permanent record is maintained and result in an F for this course.

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I certify that:

- Homework, project, exams, and/or all other assignments in this course will be entirely my own original work, produced in response to the specific course requirements.
- I will not quote the words of any other person from a printed source or a website without indicating what has been quoted and providing an appropriate citation.
- I will not submit my work in this course to satisfy the requirements of any other course nor will I use the same work from any other course to satisfy the requirements of this course.

Full Name	Username (abc123)	Date	Signature (initials)
Justin Daniel	jtd78	03/13/2022	JD
Yena Lee	yl3385	03/13/2022	YL
Thabo Tsotetsi	tt643	03/13/2022	TT
Ekin Lau	el698	03/13/2022	EL

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MILESTONE #1 - PROPOSAL – **To be Reviewed**

In this project, your group will discuss and propose an information system to **integrate publicly available data** currently spread on the Internet for a given topic. The topic (or domain of application) must be chosen from the perspective of an open-domain application of global interest.

1. CONTEXT

Context is about describing the application domain on which your project will be focused on. This should be any other domain rather than computer science or information systems.

Examples: Covid, Natural Disasters, Healthcare, etc.

Be specific about the domain topic you want to propose. You can also combine multiple domains (e.g., Healthcare + Finance)

Example: Collect and aggregate healthcare service-related indicators across all counties/states in the USA (or why not globally?) and compare them against Human Development Index (DHI) related indicators.

The domain on which our project will be focused is the Housing Market. The housing market consists of the buying and selling of properties, and the trends in prices and availability, which correlates with demand. We are going to be dealing with the collection and organization of property details from public records in every region across the United States. What is important to note is that the details for both residential and non-profit properties are listed in public records. These property details will consist of the selling date, selling price, square footage, notable amenities, and important maintenance information such as whether the property is up to code.

1. MOTIVATION

In this section, you must present facts that provide evidence that something within the context above is worth the effort of proposing an information system. You can also establish a connection with the next sections by providing examples of existing systems/tools.

Try to answer this question: Why an Information System is required in the proposed application domain?

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The aim is to change the overflow of information that the user would receive if they were looking to buy or sell properties. The internet is full of information and the average user looks for simple and easy ways to navigate when coming to the housing domain. Having said that, the Information System we look to provide is to make it simple to receive and get information on the latest trends or updates.

The emphasis is on simplicity. An example would be that we would have different categories which have different information from numbers and updates which would be a daily process and attempt to get the latest information on the housing market from reputable sources.

2. PROBLEM DESCRIPTION

This section needs to present evidence that an Information System is not a trivial solution in the domain application.

Try to answer this question: If an Information System is important and useful in the proposed application domain, why has it not been designed and created yet? What are the challenges?

When considering Information systems surrounding the idea of the housing market, there are many benefits that can arise from creating an information system. However, there are many challenges that make it difficult to create an information system for this domain. When talking about information systems for the housing market, it includes multiple variables because of how complex the domain can be. These variables can include the physical conditions of the house, such as the age of the house, the technology used, or the size of the house.

Along with the physical conditions, there are some geographical factors that are also important to keep note of. One important factor can be the area of the house, whether it is a safe neighborhood or a dangerous one. If the neighborhood is in a city or rural setting, these variables are all important for information systems. When making information systems for the housing market, there are many different variables that must be included. This can make it very difficult to make an information system for the housing market because of the vast amount of variables they need to be included.

Along with these variables, there is also the housing price that must be included if an information system is to be created. The housing price is one of if not the most important piece of data when making an information system because it is the information that most users would want to look at. While being the most important, it is also the most complex because all the previous variables mentioned play a role in the housing price tag. While it isn't hard to look up housing prices online, the prices can be very volatile, changing from

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day-to-day. Because of this, it is up to the consumer to decide if the price is accurate and fits the price of the seller.

It is also difficult to create an information system for the housing market because it is hard to keep the information up to date, especially if it contains thousands or millions of houses with each of their many variables. Unless vendors are constantly updating information about their products, it is hard to keep the information up to date and accurate, which can lead to problems, such as inconsistency and inefficiency.

3. EXPECTED OUTCOMES

Expected results are not necessarily required to be achieved. However, the IS will generally lead you to some expected results and outcomes (usually more than one).

Try to answer this question: If an Information System were available today, how would the proposed application domain be assisted from that IS? What would change (for the better)?

Even though most people are not professional in analyzing datasets of housing records, they are able to catch a trend of every sale that occurs in every region across the United States. Therefore, the Information System can lead to important information to all the potential buyers, sellers, intermediaries, financial institutions, and others that are related to the housing market area. With the application domain using IS, people would have opportunities to choose more suitable houses at reasonable prices and shrink the volume of high risk that can occur to them.

By indicating a change in property values by reflecting current trends, people can gain not only the deep insight of understanding recent housing market trends but also the ability to predict upcoming property circumstances which can help them make better decisions in the future. The housing market is a constantly morphing field and is holding a complicated process of determining property details but through the Information System, it is likely to evaluate real estate property values for specific regions accurately in less time.

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MILESTONE #2 – PART 1 – To be Reviewed

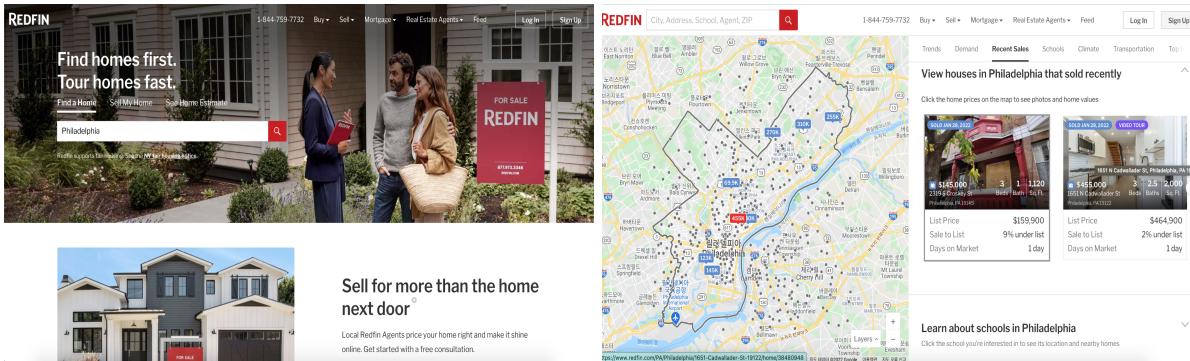
4. SOLUTIONS

In this section, you must find and describe at least 3 solutions available online that, at least, attempt to provide a solution for the problem you have described.

- Describe the overall solution and context.
- Identify and describe the main features available (you can add some screenshots, but make sure you provide the full URL link from where the images are being captured).
- Identify and describe some of the lacks and weaknesses that you believe you can propose improvements within your proposal.

As the main economically active population is the millennial generation who are accustomed to buying online, house marketing solutions have also changed into using online platforms with the improvement of technology. Not only using online brokerage but also all of the processes that are needed in house marketing such as repair, mortgage placement, insurance are all made up digitally.

1) Redfin (<https://www.redfin.com/>)



The screenshot shows the Redfin homepage. At the top, there's a navigation bar with links for 'Buy', 'Sell', 'Mortgage', 'Real Estate Agents', 'Feed', 'Login', and 'Sign Up'. Below the navigation is a search bar with 'Philadelphia' typed in. To the left of the search bar is a large image of a couple looking at a house with a 'FOR SALE REDFIN' sign. Below this image is another smaller image of a house with a 'FOR SALE' sign. To the right of the search bar is a map of the Philadelphia area with various neighborhoods and roads labeled. Below the map are two property listing cards. The first listing is for a house in Philadelphia with a price of \$185,000, 3 bedrooms, 1 bathroom, 1,120 square feet, listed 9% under list, and 1 day on market. The second listing is for a house in Philadelphia with a price of \$454,500, 3 bedrooms, 2.5 bathrooms, 2,000 square feet, listed 2% under list, and 1 day on market.

Redfin is a full-service real estate brokerage that was founded in 2004, Seattle. It provides lots of services like house marketing data, real estate agents based all over the United States and Canada. Due to the recent covid-19 crisis, the demand for house marketing online transactions has increased so that Redfin was able to prepare for new economic growth. Their main feature is online brokerage. Redfin generates sales with low fees as well as convenience through online platforms and improves performance by employing brokers directly or indirectly.

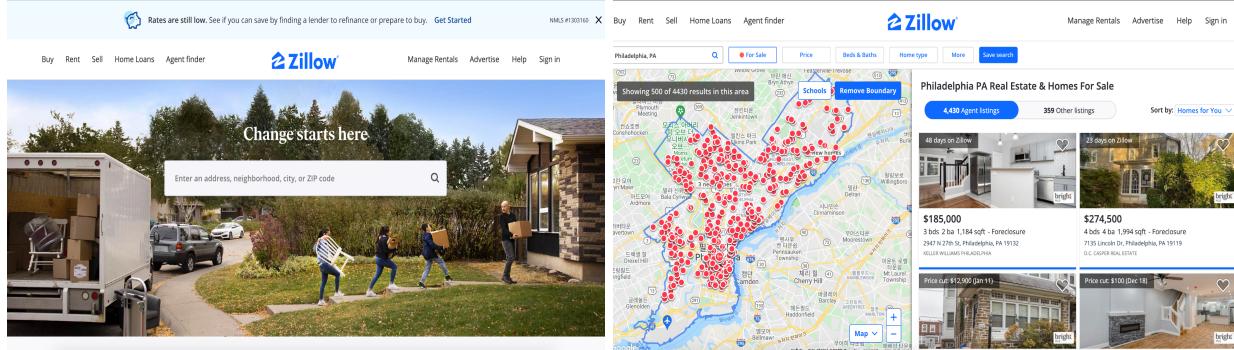
The weakness of Redfin that we can propose improvements for is there's no list for 'For Sale By Owner'. There are pros and cons about it, but with FSBO listing, we can save large

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commission payments, so it will be better to put the choice of FSBO listing for massive information.

2) Zillow (<https://www.zillow.com/>)



Zillow is known as the most visited real estate website in the United States founded in 2006, which offers buys and sells homes directly in dozens of markets across the country. Just by knowing the local zip code, we can access a wide range of real estate-related information.

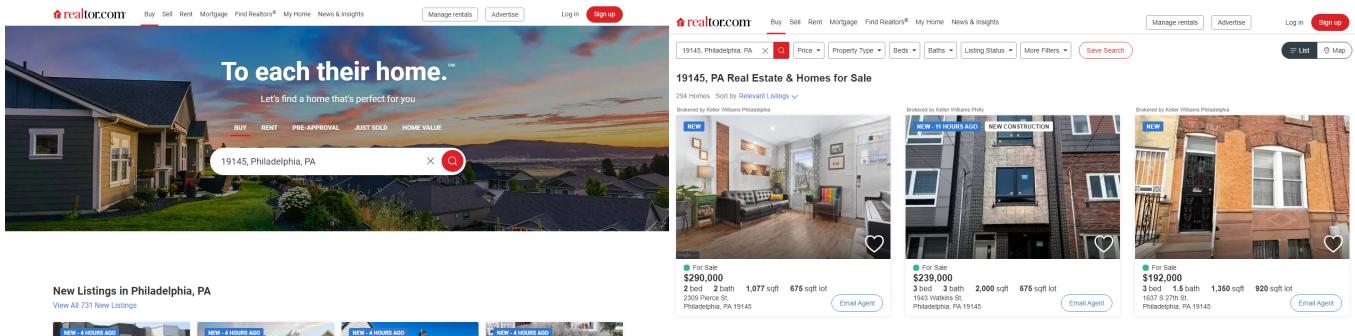
Zillow's main feature is specific house marketing information. Zillow receives information about property sales from the municipal office responsible for recording real estate transactions in our area. Zillow has data on over 100 million of US real estate.

The solution is reliable and overall good rated to users, but as they receive data indirectly from other real estate offices, there would be problems to keep updating the information about new houses. As the house marketing domains need quick and accurate information updating, this problem can lead to inconsistency and inefficiency.

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3) Realtor (<https://www.realtor.com/>)



The screenshot shows two views of the Realtor.com website. The left view is the homepage with a search bar for '19145, Philadelphia, PA'. The right view is a search results page for '19145, PA Real Estate & Homes for Sale' with four property listings:

- For Sale \$250,000**: 2 bed, 2 bath, 1,077 sqft, 676 sqft lot. Address: 2309 Pierce St, Philadelphia, PA 19145.
- For Sale \$239,000**: 3 bed, 3 bath, 2,000 sqft, 875 sqft lot. Address: 1943 Watkins St, Philadelphia, PA 19145.
- For Sale \$192,000**: 3 bed, 1.5 bath, 1,340 sqft, 920 sqft lot. Address: 1637 S 27th St, Philadelphia, PA 19145.

Realtor is an online option for clients to use to shop for housing. Clients can look up addresses, cities, zips, and neighborhoods to locate houses in specified locations to buy or rent housing. Realtor provides information on each house, regarding information about the estimated cost, the general area of the house, and the rooms of the house. With the housing markets rapidly changing daily, it becomes harder for clients to keep track of the prices without an online option. With Realtor, prices of houses are constantly being updated to the website and new houses are regularly being added to the site. This feature makes it easy for clients to shop for houses because they can easily search houses based on a location and select the available houses in the specified region.

While Realtor is a satisfactory option for clients to purchase housing, some weaknesses can be addressed. The first weakness is the lack of details regarding the conditions of the house. The website does allow realtors to post pictures, but this can often be deceiving as it is difficult to tell if the photos are recent or not. Another weakness is the lack of information regarding the location. The website provides the location of the house and the address, but nothing about the neighborhood. This could potentially lead buyers to purchase housing in a dangerous area.

+) Differences among our proposal from the solutions that we found (Realtor, Redfin, Zillow)

What our proposal is different from other domains is that the users can look up property information by using more specific and various searching filters. For example, in the Redfin platform, there is the weakness that there's no list for 'For sale by owner'. In the Housing market domain, a variety of participants that have different intentions are using this information, therefore it is necessary to fulfill all of the participants with what they want to obtain from this domain. In our domain, users can search house property reflecting current trends, different participants like owners, buyers, sellers, and sort in detailed lists.

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Moreover, what is important in the housing market domain is prompt information updating. By overcoming the weakness of Zillow that took time for new information updating, our domain reflects the latest real estate situation periodically so that users can comprehend the current context of the housing market, housing sales, and changing prices with accurate and prompt skills from our domain.

As the housing market domain has huge amounts of complex numbers, it is necessary to compose the domain with well-organized and visible lists. Our domain also takes UI/UX design seriously so that users can search and find needed property information in the domain conveniently by considering principles in good UI/UX design like visibility, affordance, consistency, and mapping.

To enhance competitiveness, our domain will perform recommendation algorithms using user-based collaborative filtering. By collecting the user's search history and activity data, our domain will figure out what area the user is interested in, and provide recent market changes and circumstances corresponding to the user's interested area automatically. In addition, our domain can also recommend nearby area information that is suitable for the user so that the user can consider better options for house marketing.

MILESTONE #2 – PART 2 – To be Reviewed

5. DATASETS

In this section, you must find and describe:

- Publicly available whether datasets exist

Finding the data website was not an easy challenge but we managed to find a website called

<https://realtyna.com/blog/what-are-best-public-sources-real-estate-data/>.

This website refers you to multiple sources for one to find information and it offers sites with different types of data sets or layouts. The sites are free and the information provided could be catered to the user's interest depending on what they are looking for.

- The format data is available

As stated the website you choose to go on will have different formats but they primarily have gradient maps and layouts that are in columns and they provide the relevant information a user would be looking for if they were buying a house.

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- Constraints to collect data (e.g., it requires the user to create login/password and validate credentials, it requires payment of data access fees, etc.)

The majority of the data sources listed on the website are free to use and do not require credentials, however, there are a few sites that require paid access. Some of the paid sites provide useful data related to market trends and mortgages, which can be useful in determining house prices.

Then if you manage to download a few examples of such datasets, you must analyze them and check whether they have some of the properties related to the quality of information (not all required):

- Accuracy and Precision
- Completeness and Consistency
- Timeliness
- Duplication

Monthly Price Change Estimates for U.S. and Census Divisions											
		Purchase-Only FHFA HPI® (Seasonally Adjusted, Nominal)									
		U.S.	Pacific	Mountain	West North	West South	East North Central	East South	New England	Middle Atlantic	South Atlantic
Oct 21 - Nov 21		1.1%	0.7%	1.0%	0.5%	1.2%	0.9%	1.7%	0.8%	0.7%	1.9%
Sep 21 - Oct 21		1.1%	1.7%	1.2%	0.7%	0.7%	0.7%	1.7%	0.0%	1.1%	1.4%
(Previous Estimate)		1.1%	1.6%	1.1%	0.6%	0.9%	0.7%	1.7%	-0.3%	1.3%	1.4%
Aug 21 - Sep 21		0.9%	0.4%	0.5%	0.7%	1.9%	1.0%	0.9%	1.5%	0.7%	0.7%
(Previous Estimate)		0.9%	0.4%	0.6%	0.6%	1.8%	1.0%	0.8%	1.7%	0.8%	0.7%
Jul 21 - Aug 21		1.0%	1.0%	1.6%	0.7%	0.9%	0.4%	1.6%	-0.1%	0.0%	1.8%
(Previous Estimate)		0.9%	1.0%	1.5%	0.7%	0.7%	0.4%	1.6%	-0.3%	0.0%	1.8%
Jun 21 - Jul 21		1.4%	1.3%	1.5%	0.8%	1.7%	0.9%	1.6%	1.3%	1.5%	1.8%
(Previous Estimate)		1.4%	1.3%	1.5%	0.8%	1.8%	0.9%	1.7%	1.4%	1.4%	1.9%
May 21 - Jun 21		1.7%	1.8%	3.0%	1.0%	1.8%	1.5%	1.7%	1.4%	1.0%	2.1%
(Previous Estimate)		1.7%	1.8%	3.0%	1.0%	1.8%	1.5%	1.8%	1.4%	1.0%	2.1%
12-Month Change:											
Nov 20 - Nov 21		17.5%	18.9%	22.8%	13.3%	18.1%	13.9%	19.8%	15.4%	14.0%	20.4%
Monthly Index Values for Latest 18 Months: U.S. and Census Divisions											
Purchase-Only FHFA HPI® (Seasonally Adjusted, Nominal, January 1991 = 100)											
		U.S.	Pacific	Mountain	West North	West South	East North Central	East South	New England	Middle Atlantic	South Atlantic
November-21		362.4	429.3	534.1	342.1	370.6	290.5	338.6	340.3	312.1	378.3
October-21		358.4	426.3	528.6	340.5	366.1	287.9	332.8	337.6	310.0	371.4
September-21		354.5	419.1	522.4	338.0	363.4	285.9	327.1	337.7	306.5	366.2
August-21		351.4	417.5	519.7	335.7	356.8	283.0	324.2	332.6	304.3	363.6
July-21		348.0	413.2	511.2	333.4	353.8	281.9	319.0	333.0	304.3	357.1
June-21		343.1	407.8	503.7	330.7	347.8	279.4	313.9	328.6	299.9	350.8
May-21		337.3	400.7	489.2	327.6	341.6	275.2	308.7	324.2	296.8	343.5
April-21		331.3	391.7	478.9	320.5	336.9	271.0	303.4	317.6	293.7	336.9
March-21		325.2	383.6	467.6	315.9	330.3	266.9	296.5	312.4	286.7	331.8
February-21		320.0	376.8	455.7	312.9	326.7	263.6	292.6	304.9	283.4	325.0
January-21		316.4	371.2	448.6	309.1	321.3	261.6	288.8	301.3	281.8	322.0
December-20		312.7	365.9	441.0	305.6	318.2	259.2	288.0	298.5	277.4	318.1
November-20		308.4	361.0	435.0	302.0	313.7	255.1	282.5	294.9	273.9	314.2
October-20		305.3	355.3	428.7	300.0	312.5	252.6	280.0	292.0	271.4	310.8
September-20		300.9	350.1	421.5	296.8	307.8	249.2	278.1	285.4	268.1	305.5
August-20		296.3	344.2	413.5	292.1	305.3	245.7	272.8	280.2	263.2	301.2
July-20		291.6	338.5	407.1	287.9	300.5	242.2	269.7	275.1	257.7	296.7
June-20		288.2	334.7	401.1	284.7	298.5	238.4	266.2	269.7	254.0	294.1

Source: FHFA

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This is a table from the Federal Housing Finance Agency (FHFA). Here is the link to access the latest FHFA Housing Price Index dataset by month (HPI):

<https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx>

It has a list of estimates for the monthly housing price changes for different areas of the United States and the total number for the country as a whole. The FHFA HPI is a rough measure of the price changes of single-family homes across the country. It is useful as an analytical tool for estimating changes in housing affordability in certain areas.

In terms of quality of information, the table is consistent with how the data is displayed. For the price change estimates, the values are displayed in percentage values to tenth place. The monthly index values are displayed in nominal values starting at 100, and it is given to the tenth place. In addition, the dataset is unique because it is based on calculated estimates from the FHFA and it is updated every month, which also speaks to the timeliness of the dataset in the sense that it is updated often.

Finally, analyze the structure of each dataset, and check how much similar or different they are – differences can impose a challenge when trying to integrate data into a central data repository. For example, some datasets can provide monthly basis data, whereas others only have data available aggregated by year.

There are multiple data sources listed on the website, but two of the ones that we decided to focus on were Data.gov and nahb.org, which is for the National Association of Homebuilders (NAHB). We were able to access the FHFA data using Data.gov, and we got the dataset for January 2022 that is referenced in the previous section. As for the NAHB website, we found this data table:

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New and Existing Homes Sold by Region

	NEW HOMES SOLD				NEW HOMES FOR SALE				EXISTING HOMES SOLD			
	NORTH-EAST (1)	MID-WEST (2)	SOUTH (3)	WEST (4)	NORTH-EAST (5)	MID-WEST (6)	SOUTH (7)	WEST (8)	NORTH-EAST (9)	MID-WEST (10)	SOUTH (11)	WEST (12)
2018	32	76	349	162	27	43	184	95	581	1,192	1,972	997
2019	30	70	399	182	28	40	171	88	581	1,183	2,016	985
2020	38	93	475	217	25	31	170	75	604	1,264	2,175	1,023
2021	36	87	446	194	32	42	239	95	633	1,313	2,357	1,108
2020 - Dec	41	112	553	237	25	31	170	75	750	1,450	2,500	1,220
2021 - Jan	47	124	575	247	26	30	169	75	730	1,440	2,590	1,150
Feb	40	104	465	214	26	30	172	75	640	1,220	2,460	1,220
Mar	47	109	550	167	26	31	169	79	620	1,190	2,370	1,120
Apr	41	98	476	181	26	31	174	83	610	1,200	2,240	1,080
May	40	92	412	189	25	30	186	85	600	1,210	2,230	1,030
Jun	28	96	391	168	26	31	205	88	620	1,250	2,230	1,040
Jul	27	70	415	192	28	32	215	90	630	1,310	2,270	1,080
Aug	31	59	409	169	29	32	226	93	610	1,290	2,210	1,080
Sep	31	66	435	193	29	34	227	92	640	1,360	2,430	1,160
Oct	29	66	391	163	29	36	230	95	630	1,430	2,450	1,150
Nov	32	55	397	241	30	40	236	95	630	1,430	2,540	1,170
Dec	27	86	456	242	32	42	239	95	630	1,410	2,370	1,110

[For greater detail and analysis of these and other data, go to HousingEconomics.com](#)

Last Updated: 01/26/2022

All data in thousands.

(1)-(4) & (9)-(12) Monthly data are seasonally adjusted at an annual rate

(5) thru (8) Monthly data are not seasonally adjusted.

Annual data is not seasonally adjusted.

Sources: (1) through (8) U.S. Bureau of the Census, Construction Reports, Series C-25. (9) through (12) Natl. Assn. of Realtors, Home Sales.

Prepared by Economics Department, NAHB. Available at www.HousingEconomics.com

<https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics/sales/regional-sales.pdf>

The table above lists the number of new and existing homes sold in the different regions of the United States. What is different about this dataset is that it lists data for multiple years while the dataset from the FHFA has a separate dataset for each month. That produces a slight inconvenience because now we have to reference multiple datasets from the FHFA to relate to just this dataset from the NAHB.

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MILESTONE #3 – PART 1 - To be Reviewed

1. PEOPLE

Suppose your system is at this point ready and available for deployment. You must analyze the different user profiles that would be using the system. Name each profile and list the available features in the system, identifying each profile that would have access to them. You can describe each user profile, and then create a user access matrix (each system feature in a row, each user profile in a column). In addition, identify whether each user profile has read-only access to each feature, or admin access (allowed to make changes in the core data).

In our system, there should be different types of user profiles. The first type of users should be for the everyday individual browsing through the system. This person might be in the market for buying a property so they want to use the system to research current and past property details for reference. They should be able to search the system using filters and view the list of properties and all of their features. Because they are merely viewers of the data, they should not have any editing privileges.

The second type of users is property owners. These individuals use the system with the intent of researching other properties similar to their own with the potential intent of selling. Because they are the owners, they should be able to edit certain details listed with their properties. However, they shouldn't be able to edit any listings for any properties besides what they currently own. In addition, the extent of what the property owner is allowed to edit has to be limited because we want to ensure that they do not interfere with the integrity of the listed data. For instance, we wouldn't want a property owner overestimating their square footage or other core details to drive up the value beyond what it truly is. A potential change they would be allowed to make would be updating details about maintenance information like when the roof was changed. They can also mark that their property is being listed for sale.

The third type of users include selling agents. These individuals use the system to manage the listings for their clients who are looking to sell their properties. They should have heightened privileges to make changes to properties that they are representing, as they are licensed individuals so there is a higher level of trust that they will be honest and accurate with the data they change.

The fourth type of user would be the administrators of the system. These individuals are concerned with making sure the data is updated and the system is functional. They have full admin access to the data, and are allowed to make changes.

Table:

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User Access Matrix	Buyer	Owner	Selling Agent	Administrator
Date	Read	Read	Read Write/Edit	Read Admin
Price	Read	Read	Read Write/Edit	Read Admin
Square footage	Read	Read	Read Write/Edit	Read Admin
Detail	Read	Read Write/Edit	Read Write/Edit	Read Admin

MILESTONE #3 – PART 2 - **To be Reviewed**

2. TECHNICAL FEASIBILITY

You must present a “Technical Feasibility Study” regarding the infrastructure resources required to support the deployment of the proposed system in a cloud-based environment:

- What sort of resources (databases, webservers, domains, etc.).
- Estimate the size or computing power of each one (for example, space required to store data in a database, and the number of user requests per minute in a website)

Include any additional information that you consider important to evaluate the feasibility of the system from a technical perspective.

For a technical feasibility study regarding the infrastructure resources required to support the deployment of the proposed system in a cloud-based system, it is important to consider the information the system is holding. For most information systems, cloud based systems are better compared to physical systems because of the many benefits that come from creating a cloud based system. The cloud provides better security from natural disasters, power outages or any other crisis. The cloud is flexible because the storage and functionality is changeable to fit the needs of the system. Considering the resources needed for the cloud-based environment, almost all cloud services require a database that is connected to the internet to store the information. The database should have a dedicated server as well to keep the database up and running. Without the database, it would be difficult to store the information anywhere else. Database is an essential part of any system because information systems without storage won't hold any information. With the database setup, the web server is also important for users because the website should be up at all times for accessibility. The web server holds all the programming aspects of a website.



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This includes how the website's design, the different functionality of the website, and even images of the product. The web servers should also have a dedicated server to keep the uptime of the website at maximum capabilities. Finally, the domain is necessary for access to the website. While the web server contains all the programming and code behind the website, the domain is how users will access the website. With this, a connection must be made between the database and website. Where the information from the database is available on the website, as well as information being entered through the website is being stored into the database.

For the size regarding the database, the database can be assumed to hold information regarding thousands or even millions of houses. Because of the massive amount of information, the size can be from a minimum of 1 terabytes to 10 terabytes should be more than enough. A size is also needed for the web server to hold the users and keep logs of their activity. For something regarding this information, a single server is usually enough to hold the records, with about a few GB of RAM. Regarding the computing power for the web server, 4 cores is a good start for a web server to be responsive with a 300MHz processor.

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MILESTONE #4

1. PROJECT PLAN

You must present a “Project Plan” regarding the analysis, design, development, and deployment of the proposed system that will support your business operations. Then, discuss different aspects and details that your plan must consider, especially unforeseen events that can potentially harm the established roadmap and deadlines.

Analysis:

- Requirements

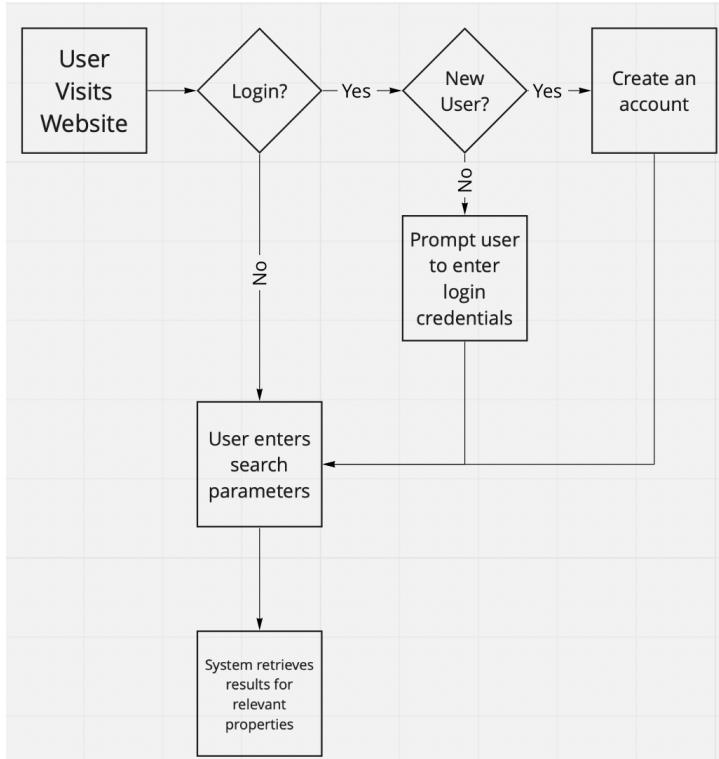
One of the main features that we need for our system is to search the database for addresses. This requires the capability for the system to handle a mix of numbers and letters. In addition, for the sake of convenience, the system should suggest relevant properties to the inputted address in the case of a typing error. However, there are instances where the user is not looking for a particular address but rather properties that fit a certain description. To address that scenario, the system should have search filters like a certain amount of square footage or amenities. In addition, users should be able to look at the map of properties to see the market values in a certain area. Another requirement is that the system is updated frequently to keep the data as accurate as possible.

When the user is accessing the system, they should have the option to create an account to save their searches and specific properties. Although it is not necessary for the system, a useful feature for users could be to edit their account details. However, what is important to note is that a user should still have access to the system even if they don’t have an account. One of the features of having the account could be editing listings. The level of editing privileges will vary with each type of user, as some users are licensed realtors, which give them special qualifications to change the data posted.

- Process Diagram

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Design:

When designing an information system, it is important to consider what the system is being created for. The main feature of the system is for users to access a website and should be able to enter an address and the system should produce something back corresponding to the user input. This implies there should be a working website where users can access with a domain name and a user interface a user can understand. A database where the information of the different addresses are stored and can be constantly updated because information regarding housing prices and condition need to be updated regularly. Also, a web server to keep the website running or users won't be able to access the website consistently. This is the minimum requirement for the main feature. When designing the project, the setup for the website, database, and web server must be included.

The website contains many features that are needed for the user to get the full experience of the website. When designing the website, it must contain an interactive search bar where users can input the address or area they are looking for. Along with the search bar, there should be options where the user can filter out certain aspects along with the area they

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search. This can include the price of the house, the structure of the interior of the house, the overall square footage, etc. The website can include an account feature where they can create an account and log in with certain credentials. The website should also include the domain that correlates to the information system. This website must also include a feature that is not for the average user but rather the administrator of the website. This is implemented to allow the administrator to update the website or database because bugs or errors are bound to happen. Along with possible bugs, administrators need to update the website with new and valid information. After the website is the web server, which is a computer that will store the website information, such as the HTML, images, CSS, and other files. With a server dedicated to the website, it ensures the website will stay running. It is also necessary to include a backup of the web server to ensure if the server were to be destroyed, the information can be quickly relocated to a different server.

Lastly, the database containing the different addresses and the information associated with each address must be included in an information system. The database is essentially a storage system containing vast amounts of information and organizing the information based on the way it is set up. For this information system, it should generally contain addresses or areas at the broadest level and as the user goes from state to city to neighborhoods to a certain house, it should be considered the most specific. The database should be connected to the website in a way that allows users to input an address and the database will output information that aligns with the input. Similar to the web server, it is important to set up a backup database, most likely the same database but a second one to ensure if the first database is destroyed or damaged, the second database can be quickly used to substitute the first one.

Development:

We should convert the system design prototyped in the Design phase into an operational information system and construct the system. The development phase is handled by developers and the estimated period for this phase can be about 3-6 months. Inside the development team, they are going to use version control software for tracking versions of the source code, viewing and sharing each programmers' updated activity.

We divide the Development phase into 4 sections (Web, Server, Database, Test). First, the Web section is the section that develops our Housing Market domain based on the design. Starting with the overall frame coding task, developers are working on the main page of our domain, and sub-screens like sell, buy, mortgage, agents, admin. Last, they are progressing code integration for each domain's connection. The second section is the Server

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task. In this section, developers handle developing GUI Server, Web application server, housing market database server, and perform server integration tasks. Third, for the Database section, collect the dataset that we prepared in the analysis phase, and integrate the database so that we can gather data in real-time. Then, work on a database table query task about housing market property. The final section is about testing. We can test our system in different aspects like unit test, system test, stress test, parallel test, and integration test while writing the result report for each test and checking if there's any bug or error.

Deployment:

For deployment, a potential thing that we could do is release the website. The site would show a graph that the user could scroll through of the previous years, months, and days showing housing prices and comparing them. Also, making the website similar to Zillow where you can contact real estate agents and find rentals or full-time property. Then, the customer/user can meet the agent in real life and explore the houses either near their current living area or further away. It ensures that there are 2 forms of exploration and housing. Relating back to the graph idea, if the prices go up a day, customers/users can choose to buy or not but also on the side it will show a prediction as well. As users begin to use the website, they can expose any potential issues that we can address. In addition, they can provide feedback as to features that we can add or change to improve the system.

Possible Obstacles:

Taking on the task of analyzing and building a housing information system there are a lot of obstacles which we could encounter. The first example would be the ability to create filters that could be able to match the customer's description of the ideal house if they are looking for something in particular. When thinking of a website the most important thing is that it works the way you want it to and one of the issues which could occur would be to have different features on the website work. Having the main page is key and making sure that all the information that is on the website is accurate, functioning, and well-formatted. This is the reason why there should be a need to make sure that all four sections are working Web, Server, Database, Test when building a website. One other encounter we could have is the ability to create a listing space where people can edit but we need to be able to ensure that those people are qualified for the task. This could be done through interviews and other things.

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Milestone #5 template is empty, but here are instructions regarding how to build your final report:

- Don't forget to include names of group member and sign (your initials) to agree with "**Plagiarism Policy**" and "**Academic Integrity Statement**"
- Don't forget the "**PROJECT TITLE**"
- Write an "Introduction" section briefly describing what your report is about and what is presented in each of the next sections
- Then, put all the content from Milestones #1 to #4 together, but review everything and check for completeness and conciseness
 - Organize the content of previous milestone in sections according to your own judgement regarding the best text flow
- (OPTIONAL) Write a "Discussion" section if you want to debate about different aspects of your proposal, for example, if not all members of your group agree in the same opinion
- Finally, write a "Conclusions" sections to wrap-up:
 - the most significant aspects of your project that must be remembered
 - challenges to be considered in future developments
 - any other important aspect covered in previous sections

PROJECT TITLE: Housing Market Today (HMT)

INTRODUCTION:

The housing market is a booming business which is constantly growing and the need for information is important. The only thing is due to the amount of information out there about housing and on the different websites, we took it upon ourselves to think of ways to make life easier for the average user who is interested in the housing market. One of the first things we did was to try and assess the different housing websites such as Relator, Zillow, and redfin. Our aim in doing so was to figure out ways in which we can look at already established websites and find their weaknesses. Once we have done that we look for solutions in which we can improve the way the information is displayed to the average user and from there add our unique way of doing things which will hopefully make life better for the users who are interested in purchasing housing.

In our report, we will go into our plan for how we want to implement our proposed system. This will include the analysis of the current solutions available and how we plan to improve on them in a unique product. We will go over the specific features that we wish to implement in our system which will vary with each type of user. Furthermore, we will talk about the resources we need to actually implement the system like databases, servers, or the amount of cloud space. Next, we will go over our project plan containing various sequential phases for implementing the system. This will include analysis, design, development, and deployment. Lastly, we will talk about potential challenges moving forward in addition to some important details that we would like to highlight about our system.

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CONTENT:

When we look at the context of the housing market, it is becoming increasingly competitive because there are so many sales being made and closing prices are fluctuating. In general, it is difficult to determine the current trends for property values or understand the vast amount of data in records. Therefore, we decide to choose an Information System that deals with the data from recent sales in the Housing Market. When it comes to property details from public records, those include the selling price, square footage, notable features, maintenance information, etc. In our domain, the aim is to change the overflow of information that the user would receive if they were looking to buy or sell properties. The IS we look to provide is to make the domain simple to receive and get information on the latest trends to updates. Even though most people are not professional in analyzing datasets of housing records, they can catch a trend of every sale that occurs in every region across the United States. With the application domain using IS, people with different intents like potential buyers, sellers, intermediaries, financial institutions would have opportunities to choose more suitable houses at reasonable prices and shrink the volume of high risk that can occur to them. By indicating a change in property values by reflecting current trends, people can gain not only the deep insight of understanding recent housing market trends but also the ability to predict upcoming property circumstances which can help them make better decisions in the future. The housing market is a constantly morphing field and is holding a complicated process of determining property details but through the Information System, it is likely to evaluate real estate property values for specific regions accurately in less time.

To plan specific functions of our domain, we thought it was important to analyze the current solutions available nowadays, and overcome their weaknesses. As the main economically active population is the millennial generation who are accustomed to buying online, house marketing solutions have also changed into using online platforms with the improvement of technology. Not only using online brokerage but also all the processes that are needed in the housing market such as repair, mortgage placement, insurance are all made up digitally. What we found for the solution was Redfin, Zillow, and Realtor. First, Redfin is a full-service real estate brokerage that generates sales with low fees, is convenient through online platforms, and improves performance by employing brokers directly or indirectly. Next, Zillow is known as the most visited real estate website in the US which owns specific housing market information. Third, Realtor is an online platform for clients to look up addresses, cities, zips, and neighborhoods to locate houses in specified locations to buy or rent housing. Compared to these solutions, our proposal has a plan to make our domain more specific and have various search filters. In the Housing market domain, a variety of participants that have different intentions are using this information, therefore, it is necessary to fulfill all of the participants with what they want to obtain this

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domain. In our domain, users can search house property reflecting current trends, different participants like owners, buyers, sellers, and sort in detailed lists. Also, when it comes to updating information, the field of the housing market is so sensitive with updating time as the selling price is constantly fluctuating. Our domain reflects the latest real estate situation periodically so that users can comprehend the current context of the housing market, housing sales, and changing prices with accurate and prompt skills.

What we decided to utilize for our datasets in the housing market was the National Association of Homebuilders(NAHB) using nahb.org and the Federal Housing Finance Agency(FHFA) data using Data.gov. The database can be assumed to hold information regarding thousands or even millions of houses. Because of the massive amount of information, the size can be from a minimum of 1 terabyte to 10 terabytes should be more than enough. For our domain system, we analyzed the different user profiles that would be using the system.

<User access matrix>

User Access Matrix	Buyer	Owner	Selling Agent	Administrator
Date	Read	Read	Read Write/Edit	Read Admin
Price	Read	Read	Read Write/Edit	Read Admin
Square footage	Read	Read	Read Write/Edit	Read Admin
Detail	Read	Read Write/Edit	Read Write/Edit	Read Admin

<Project Plan>

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Phase	Content
Analysis	<ul style="list-style-type: none"> - Search the addresses database - Create an account
Design	<ul style="list-style-type: none"> - Website Design - Setup for the website, database, web server
Development	<ul style="list-style-type: none"> - Web : Frame, Main page, Setting screen, Admin page, Integrated Code - Server : GUI Server, Web application Server, Database server, Server integration test - Database : Data Collection, Table query, Database Integration Test - Test : Unit test, System test, Stress test, Parallel test, Integration test, Acceptance test
Deployment	<ul style="list-style-type: none"> - Release the website - Website Updating, Management - Feedback & Improvement

CONCLUSIONS:

The housing market is constantly growing and the demand for information systems is becoming a necessity to keep the information organized. With the constant growth of the housing market, the information can overwhelm the average user. The information design is focused on simplicity and newly updated information. We also draw the design on our IS based on the weakness and strengths of currently available systems, such as Zillow, Redfin, and Realtor. The strengths we plan to implement are specific filters, keeping the information updated on an hourly basis, and providing information compared to recent trends.

While these are the current plans, the future provides many difficulties that can affect the overall design of the system. Currently, our design is based on currently available systems and not something suitable for future designs. This can cause problems when trying to develop new designs or designs that would be suitable for future devices. Another issue is keeping track of newly updated housing because it can be difficult to keep the information up to date. While updating the information with information shouldn't be difficult, updating the information on an hourly basis can become difficult. If the information isn't updated as well, the information can become inconsistent, causing problems for the buyer. One more issue that may heavily affect the information system is the volatile house market. Our information system tries to predict the pricing of newly updated items based on trends



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in the housing market. This can lead to problems because it becomes difficult to predict the prices according to the trends along with the other variables that relate to housing.

To wrap up this report, our information system is designed to help users who are overwhelmed with currently available systems understand the available information regarding the housing market. We will be acquiring information from the Federal Housing Finance Agency and the National Association of Homebuilders. In addition, we will be using the strengths and weaknesses of currently available information systems to layout the design of our information systems.