Project Title

Decoding the Millennial Mindset

Names of students who worked on the project

1. Avash Adhikari
2. Chandramita Dutta
3. Gopika Kini

Links to demos, documents, or whatever is needed to show the visualization.

Webpage: https://avashadhikari.github.io/i247-s23-g3-final-project/
Figma: Illustrations and Designs

Project goals, including what kinds of tasks the interface containing the visualization is targeted towards.

We have created a website with a few visualizations, some with interactive elements, to present information on millennial trends and statistics.
Goals and tasks:

- A general overview of the different generations, and the demographics, highlighting why to focus on strategy for millennials.
- A comprehensive exploration of the factors that have shaped millennials' social traits and ideologies, to inform marketing methods geared to this crucial demographic.
- A timeline to analyze the historical setting in which millennials grew up and how it shaped their attitudes. It aims to uncover the underlying reasons for millennials' distinct outlook on life by highlighting major events such as the rise of the internet, economic recessions, and cultural shifts, and their effects on millennials
- Interactive visualizations that are easy to understand and interact with, along with instructions and cues on key points we want to highlight
- Look into how millennials view marriage:
  - How have landmark events like same-sex marriage changed the current matrimonial situation?
  - Has alternatives to marriage like a registered partnership or just couples living together changed over time?

- ○ Is the state of parenthood constant over time? Is there a change? If yes, how do we make this evident to marketing firms?
- Looking into how millennials view housing:
  - ○ Has their perspective on homeownership changed? If yes, how drastic is it? How do they differ from other generations?
  - ○ With the housing crisis and an inflated market, how do they perceive living with their parents?
- Looking into how millennials spend their money:
  - ○ How has inflation affected their economic situation? What are their debts like?
  - ○ What are their consumer habits? What factors appeal to them more?
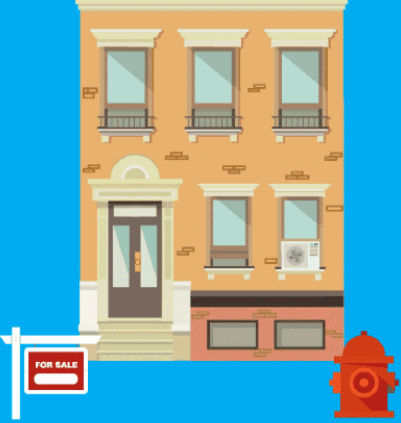 - ○ What do they value or spend their money on?

Discussion of related work.

For our background study, we looked into several related works ranging from Census visualizations to infographics created by corporate companies. The breadth and diversity of the topic also inspired us to narrow our focus to Marketing executives exclusively.

1. Goldman Sachs Millennial Infographic

(The page is archived now, hence adding screenshots that we found on the internet and some which we had captured before)

Goldman Sachs created an infographic about millennials, highlighting several key characteristics of this generation. This infographic was our primary source of inspiration for our visualization. It contained effective visualizations to show millennials' housing, their growing influence in the economy, their unique attitudes towards work and career, and their preferences for digital technology and social media. One notable finding from the infographic is that millennials are delaying major life events, such as marriage and home ownership, in favor of experiences and travel. Some of the sources of data used in the infographic were old and it inspired us to recreate a similar visualization with newer data.

2. [Mckinsey Insights](#) (Cracking the code on millennial consumers)

   Mckinsey has an insights article on how to best optimize marketing and catering to millennial consumers.

   This article focuses on understanding millennials' tastes, behaviors, and purchasing habits, offering insight on the factors that influence their decision-making process. It also investigates significant trends and patterns among this generation, allowing potential/current clients to create personalized marketing tactics that are appealing to millennials. We particularly liked this work because the content helped us internalize what sectors of data points we wanted to focus on when we started on our own project, and also gave us some good insights to build on.

Millennials spend more than older generations on experiences, and they don't curb spending on material goods to do so.

Mean reported monthly spending on experiences, by category, $

- ● Millennials
- ● Gen Xers
- ● Baby boomers

164
134
101
79 74
114
74 63
45
40
25
15

Entertainment (eg, restaurant, movie, sporting event)
Cable TV, subscription streaming service
Personal care (eg, haircut, manicure)
Gym membership, training, fitness class
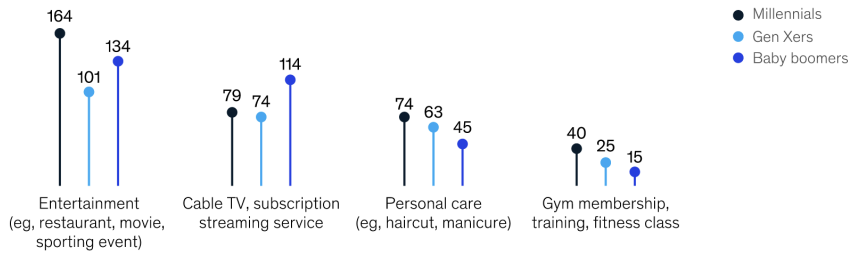
Mean reported annual spending on material goods, by category, $

- ● Millennials
- ● Gen Xers
- ● Baby boomers

524
439
355
322
385
187
264
185
134
103 116
56
87
134
81

Apparel
Athletic apparel
Footwear
Cosmetics
Skin care
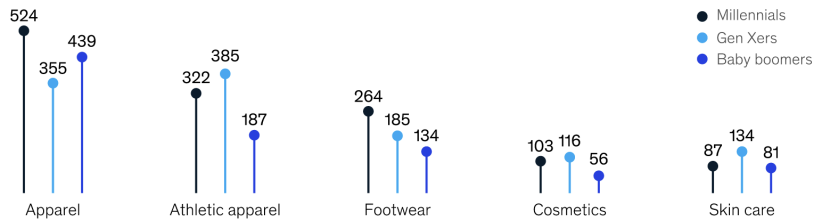
Source: McKinsey Millennial Survey, May 2016

3. How Americans of different generations spend their money

The Tableau visualization in the link above presents a good Sankey chart that breaks down spending categories, such as housing, transportation, food, healthcare, and entertainment, among others, for various generations.

This has the potential to clearly show what spending habits are of higher priority to millennials and what are not, and also how these spending habits contrast from generation to generation. This helped inform how we would plan to incorporate data about millennial spending habits in our project

4. Millennials switch from renter majority to owner majority

This webpage is an article consisting of multiple visualizations focusing on how millennials now are switching from renter majority to owner majority, implying they prefer to buy homes rather than rent, even despite the sharp increase in inflation. The website does a really good job at depicting a couple things — (1) How millennial home ownership increased over the years (2) How each generations home ownership and rental situation has changed in the 50 largest US cities over the last 5 years, which also helped us pull data and make our own visualizations by cleaning and aggregating the data on a US map in our project.

5. Understanding The Research On Millennial Shopping Behaviors

Our primary audience for the visualization is marketers. The particular visualization helped us tie together all different sections to present it specifically to marketers. The article highlights key insights from various studies on millennial shopping behavior, including their preference for digital channels, reliance on social media for product discovery and recommendations, and a desire for personalized experiences. It also shows that millennials are more likely to value experiences over material possessions and are willing to pay for higher quality products that align with their values.

6. [Millennials Are Running Out of Time to Build Wealth](#)

The Bloomberg article highlights how the COVID-19 pandemic has further exacerbated the existing financial struggles of millennials, making it more challenging for them to achieve financial stability and milestones such as homeownership and retirement. The article discusses various factors contributing to the economic difficulties faced by millennials, including student debt, stagnant wages, rising cost of living, and a lack of social safety nets. The piece concludes by suggesting that policy changes and societal shifts are needed to address these issues and support the financial well-being of millennials.

Along with some wonderful insights, the article also served as a datapoint for a few of our visualizations.

7. [Americans Name the 10 Most Significant Historic Events of Their Lifetimes](#)

The article presents the results of a survey conducted by Pew Research Center in 2016 in which Americans were asked to name the 10 most significant historic events of their lifetimes. The survey found that the 9/11 attacks were the most commonly cited event, followed by the election of Barack Obama as the first Black president of the United States and the Vietnam War. This was our inspiration to design the timeline in our project. The timeline is inspired by all the major events that happened during the millennial era which serves as a reference to the other visualizations.

8. [As Millennials Near 40, They're Approaching Family Life Differently Than Previous Generations](#)

The article discusses how millennials are approaching family life differently than previous generations, as they are getting married later, having fewer children, and are more likely to cohabit before marriage. It also examines the various factors

that have influenced their family formation decisions, such as financial concerns, changing gender roles, and personal fulfillment. Additionally, the article explores how these changes in family dynamics may have broader societal implications, including the potential for new policies and cultural norms. The data presented and some of the simpler visualizations became a reference point for our millennial family and relationship section.

9. [Millennial Homeowners Finally Outnumber Millennial Renters - The New York Times](#)

   According to an article in The New York Times, for the first time in over a decade, the number of millennials who own homes now surpasses the number of millennials who rent. This shift in housing tenure among millennials is attributed to a combination of factors, including the aging of the millennial generation, a strong labor market, and historically low mortgage rates. The article also notes that while this shift may signal a change in the preferences and priorities of this generation, it is still unclear whether this trend will continue in the future. We used this as a reference for our visualization of house owners of different generations.

10. [Timeline: Key Events in U.S. History that Defined Generations](#)

    We took inspiration from this visualization's basic structure and concept for our timeline design, and utilized Figma to redesign it.

A description of the visualization, with adequate screenshots and/or illustrations.

Visualization Description
Our project is presented as a single-page website with animated and interactive graphs, illustrations, and visualizations along with explanatory text. Our main aim was to build a story and provide users with effective graphs and illustrations to draw insights.

NOTE: For each topic, the screenshots are right after the description

1. Population distribution by generation

   - This visualization sets the context for why we are looking specifically at millennials for marketing strategy in the first place.

- We used census data to see each age group and then banded them together based on age ranges of what age group falls into what band/generation
- Hovering over each band highlights the exact value for each age range, and this visualization clearly shows that millennials are the biggest population currently.

Distribution of population by generation in the United States as of 2023. **Millennials** are currently the generation with most population.
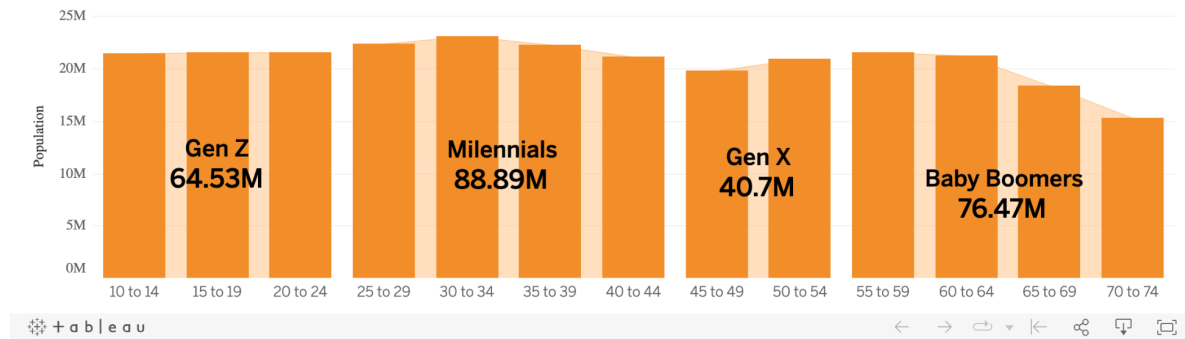
(Viz 1 - US Population by generations, Source : US Census)

2. Timeline

- This visualization provides a timeline for major events that happened as millennials grew up.
- The legend at the top-right describes what the intensity/hue of the color means. The intensity is lighter as the cohort approaches adulthood, heavy/higher intensity when they are in the workforce, and goes lighter again as they approach retirement age
- The aim is to signify how millennials were affected throughout these major generation-defining events almost all their life, while other adjacent generations were affected at one end or the other, or at a lesser intensity

Cohort reaches adulthood | Entire cohort is in the workforce | Cohort approaches retirement age

Facebook was founded in 2004

In 2008, Obama becomes the first black President of the US. 66% of the voters were millennials.

Gay marriage was legalized

COVID-19 is declared a global pandemic

iphone was launched

9/11 Attacks

Iran-Afghan war ended

The Great Recession (Dec 2007 - June 2009)

Oldest millennial are 21 years old

The youngest millennial was 20 years old

Oldest millennials are now 43

2001   2004   2007   2010   2013   2016   2018   2021

Gen X (Born between 1965-1979)

Millennials (Born between 1980-1996)

Gen Z (Born between 1997 - 2012)

(Viz 2 - Millennial Era Timeline, Source: generational-power-index-2021)
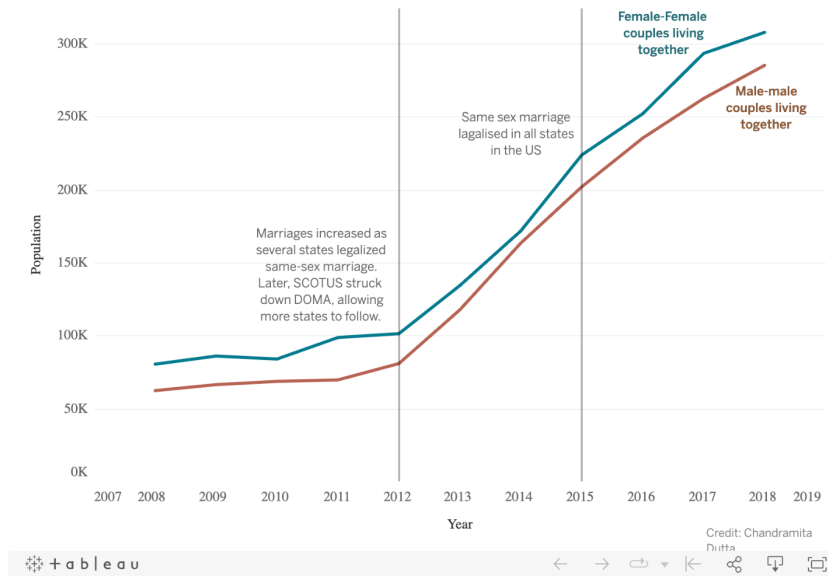
3. Changing landscape of same-sex households

- This visualization provides insight into the current statistics of same-sex couples, particularly focusing on millennials since they are the generation that's getting married more often than other generations
- In this visualization, we plotted two line charts along a graph that depict the change in the number of same-sex marriages over multiple years
- We have two vertical segments that immediately draw focus, along with text that describes the exact events that happened in those years
  - The first line depicts the event where the Supreme Court struck down the Defense of Marriage Act, thereby allowing more states to follow into states that legalized same-sex marriage
  - The second line depicts a historic landmark event where same-sex marriage was legalized in all 50 US states

The Millennial Lifestyle

Understanding the complex interplay between lifestyle choices and consumer behavior is crucial for businesses to cater to the diverse needs and preferences of millennials. We delve deeper into this topic by exploring millennials' family and relationship choices, their housing preferences, and how these factors impact their consumer behavior.

Love Takes Over: A look at the Changing Landscape of Same-sex Households

Milennials witnessed a rapid change in the living conditions of same-sex couples due to landmark events like the legalization of marriage.

(Viz 3 - Changing Landscape of Same Sex Households, Source: US Census)

4. Putting off marriage for later

- This is a simple illustration with some text that describes how the median age for first marriage has increased for both men and women in the span of three decades, partly because of the prioritization of individual goals

Forever Can Wait: The Saga of Later Marriages and Individual Escapades

The median age for first marriages has increased from 26 for men and 24 for women in 1990 to **30.5** for men and **28** for women in 2020, showing a trend towards later marriages and prioritization of individual goals.
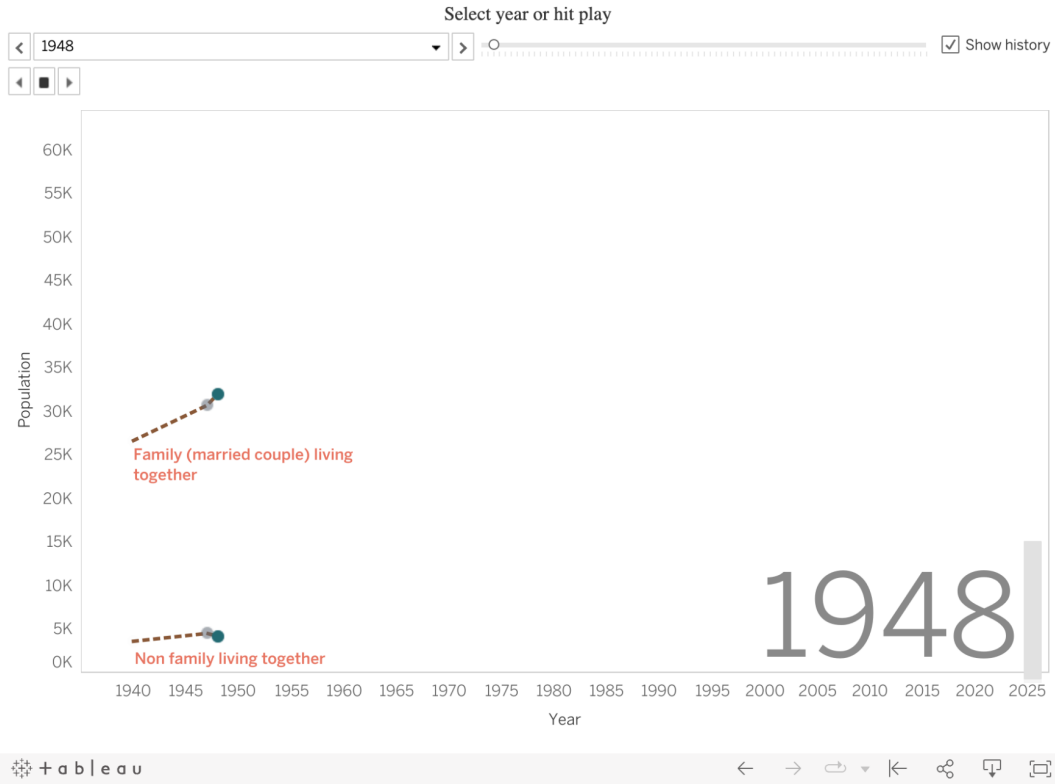
(Viz 4 - Forever can wait, Source: US Census)

5. Knot or Not: Untangling the declining divide in modern unions

- This visualization describes how modern unions (non-married couples living together) have increased exponentially over time.
- This viz has an animation component to it. We ask the user to either choose a year by moving the slider along the x-axis or using the dropdown or use the Play button to start the animation. We've added three different stages of screenshots below that depict different points in the animation.
- The visualization by the end of the animation shows how the gap between married couple households and non-married couples has bridged over time, signifying that millennials, in general, swaying away from marriage while still being in love with and living with their partner in what's deemed to be "non-traditional" situations.

Knot or Not: Untangling the Declining Divide in Modern Unions

As **Millennials** matured, the gap between family and non-family households narrowed.
Click on the **Play** button or use the **Slider** to see how the gap has bridged over time.

Select year or hit play

| ‹ | 1948 | ▾ | › |

○ ————————————————————————— ☑ Show history

◀ ■ ▶

Population

60K
55K
50K
45K
40K
35K
30K
25K
20K
15K
10K
5K
0K

Family (married couple) living together

Non family living together

1948

1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025

Year

+ a b l e a u

Knot or Not: Untangling the Declining Divide in Modern Unions

As **Millennials** matured, the gap between family and non-family households narrowed.
Click on the **Play** button or use the **Slider** to see how the gap has bridged over time.

Select year or hit play

| 1987 | ▼ | > |

☑ Show history

(Viz 5 - Knot or Not, Source: US Census)

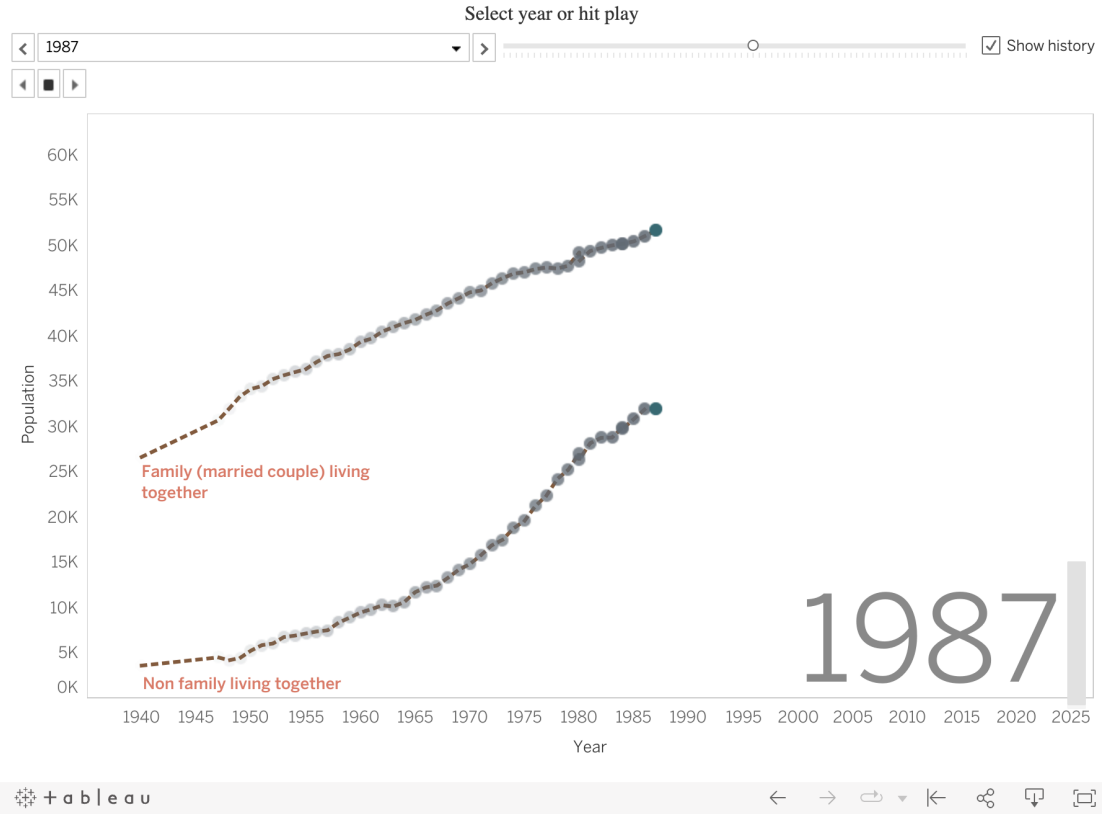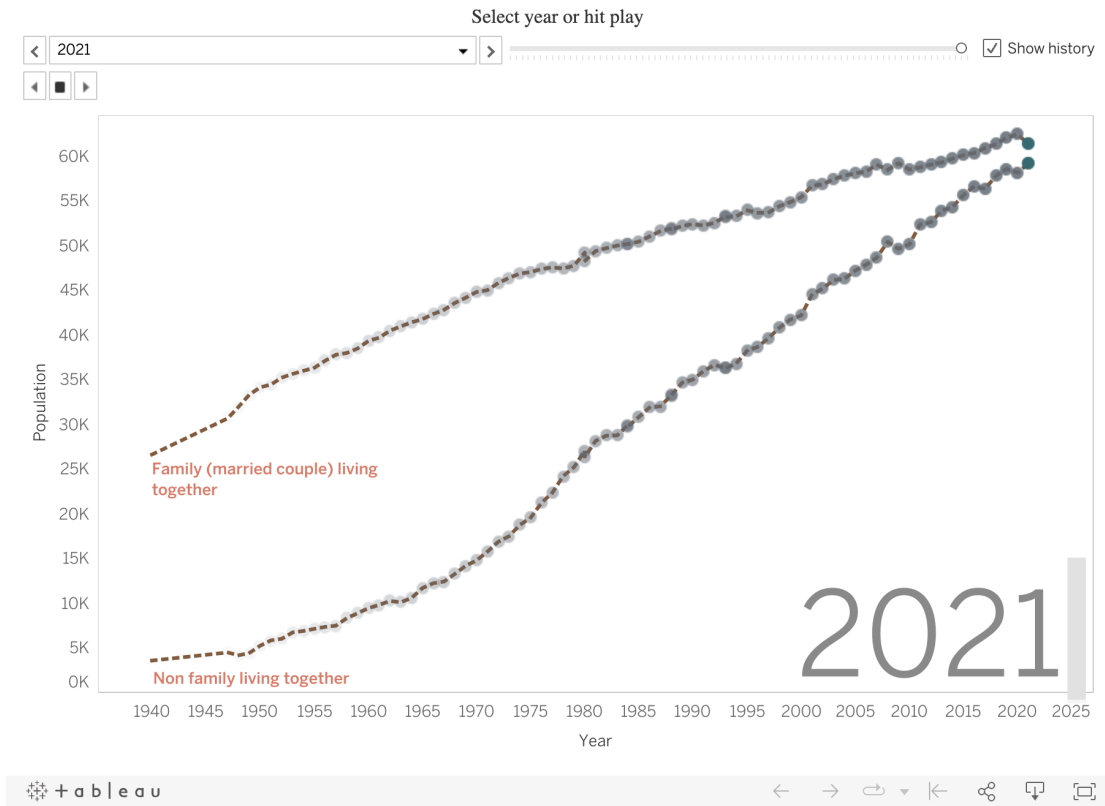**Knot or Not: Untangling the Declining Divide in Modern Unions**

As **Millennials** matured, the gap between family and non-family households narrowed.
Click on the **Play** button or use the **Slider** to see how the gap has bridged over time.

(Viz 5 - Knot or Not, Source: US Census)

6. Baby, Maybe? The Shift in Millennial Attitudes Towards Parenthood

- This visualization describes how people's attitudes have changed towards parenthood over time.
- This viz has an animation component to it. We ask the user to either choose a year, move the slider along the x-axis, or use the Play button to start the animation. We've added two different stages of screenshots below that depict different points in the animation
- The visualization by the end of the animation shows how the peak parenthood age has shifted towards an older age over decades.

Milennials have been waiting **longer** to have children. Click on the play button to see the peak move through the past **decades** towards an older age.

Select decade or hit play

| 1970 | ▾ | > |
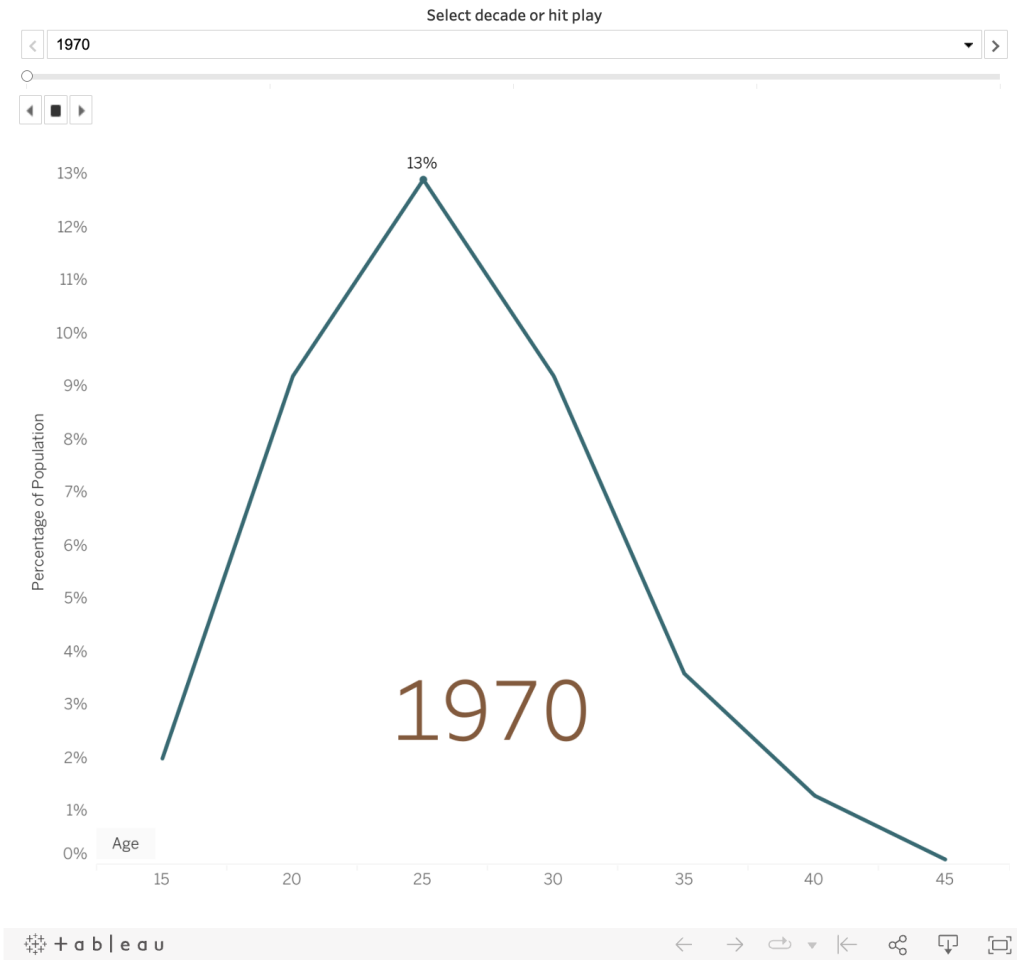
(Viz 6 - Baby, Maybe, Source: US Census and Goldman Sachs Survey Results)

Milennials have been waiting **longer** to have children. Click on the play button to see the peak move through the past **decades** towards an older age.

Select decade or hit play

| ‹ | 2010 | ▾ | › |

◂ ■ ▸

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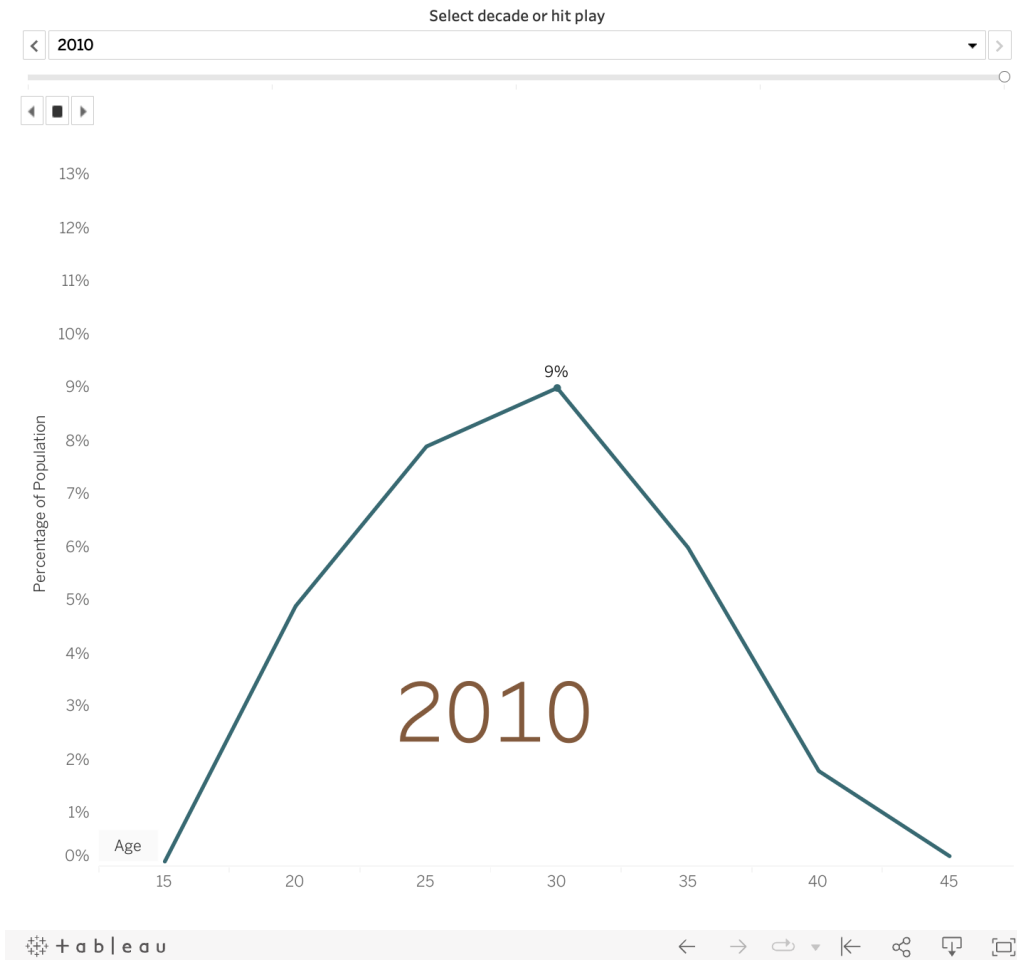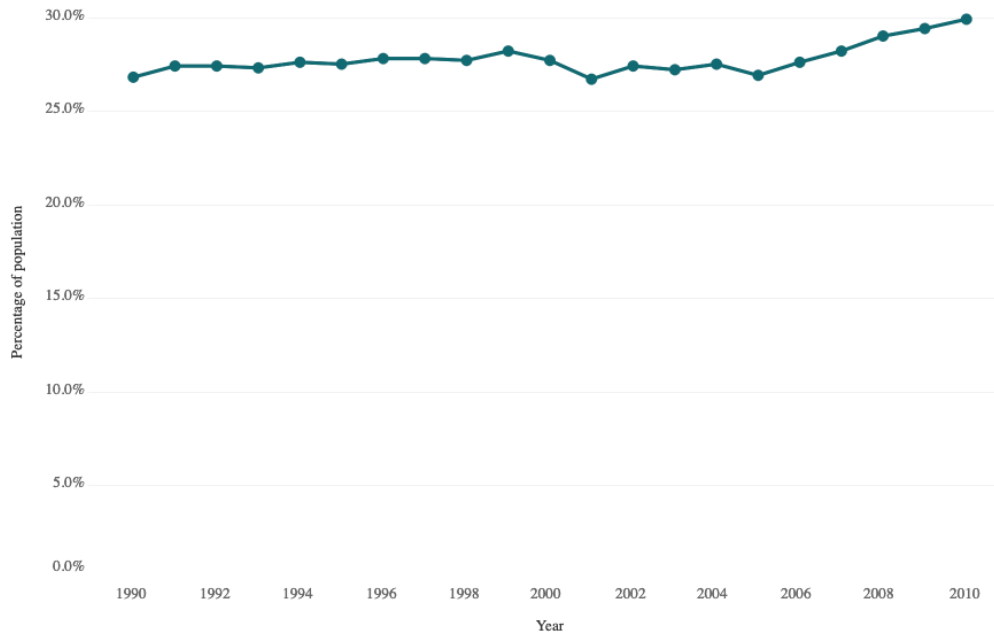
7. Living with parents

- The line chart shows the change in the percentage of the population living with their parents over the years.
- The line steadily rises over the years, indicating an increase in the number of young adults living with their parents.
- The graph also has an interactive component letting users choose a zoomed-in view of the temporal change for a better understanding.

In recent years, a rising number of **Millennials** between the ages of **18 and 34** have decided to live with their parents.

Zoom in

No ▾

(Viz 8 - Living with parents, Source : IPUMS-CPS, IPUMS-USA and Goldman Sachs Global Investment Research)

8. Radar/Spider chart for Millennial Debt
   - This visualization depicts how millennials have more student debt than any other debt, indicating how the cost of education has skyrocketed over time, and attainment of education comes at a hefty cost
   - This viz is an interactive spider chart, which upon hovering highlights the current debt situation of millennials in pink. A longer "tail" towards a type of debt indicates a higher debt in that type, and vice versa.

Credit card Debt

Boomers
Gen X
Millennial

Vehicle Debt

Education Debt

Mortgage Debt
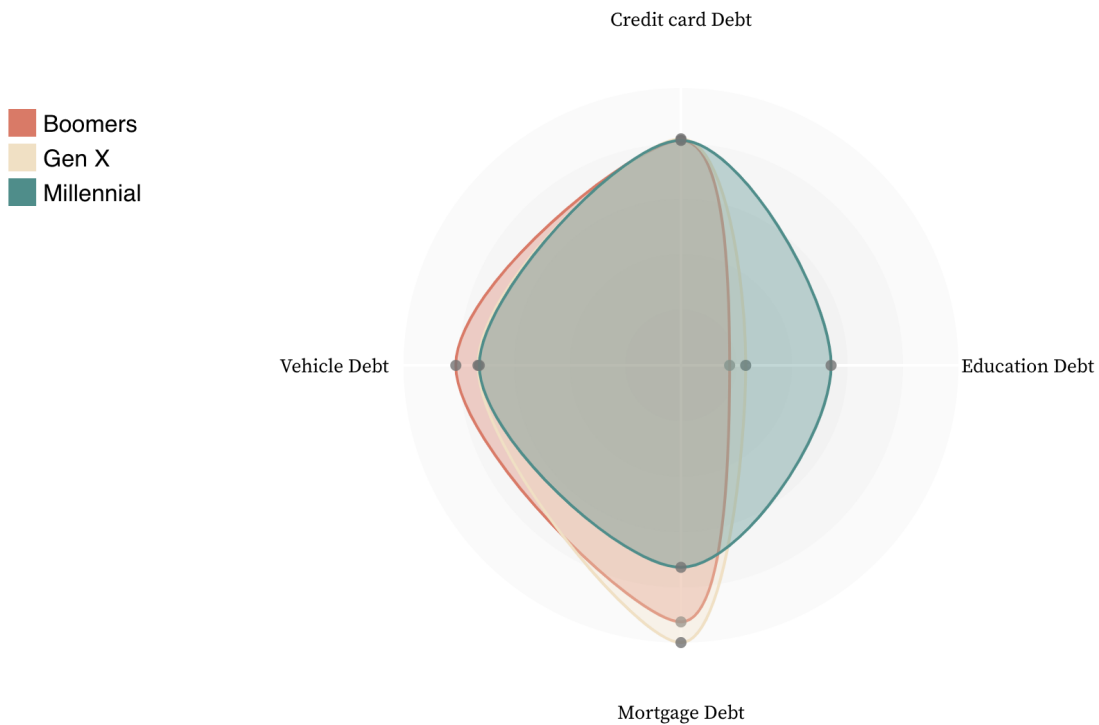
(Viz 9 - Millennial Debt, Source: Data and Statistics Page - FEDERAL RESERVE BANK of NEW YORK)

9. Show me the money: Visualizing Consumer Habits
   ● This is a simple illustration that aims to show the different consumer habits that millennials have.
   ● We can clearly see different segments, each with a different percentage of what millennials value more, with values and quality taking precedence over the image of the consumer products

Quality-driven consumers

These consumers aren't just buying products, they're buying a statement. These are willing to pay more for quality products that reflect their values and see brands as extensions of themselves

40%

38%

Image-driven consumers

They enjoy shopping, and likely to try new brands and products. They are likely to pay premium to be the first ones to try new products to set themselves apart

Value-driven consumers

They prioritize cost savings and are budget-conscious, brand agnostic. They recommendations and advice before making purchasing decisions.

22%

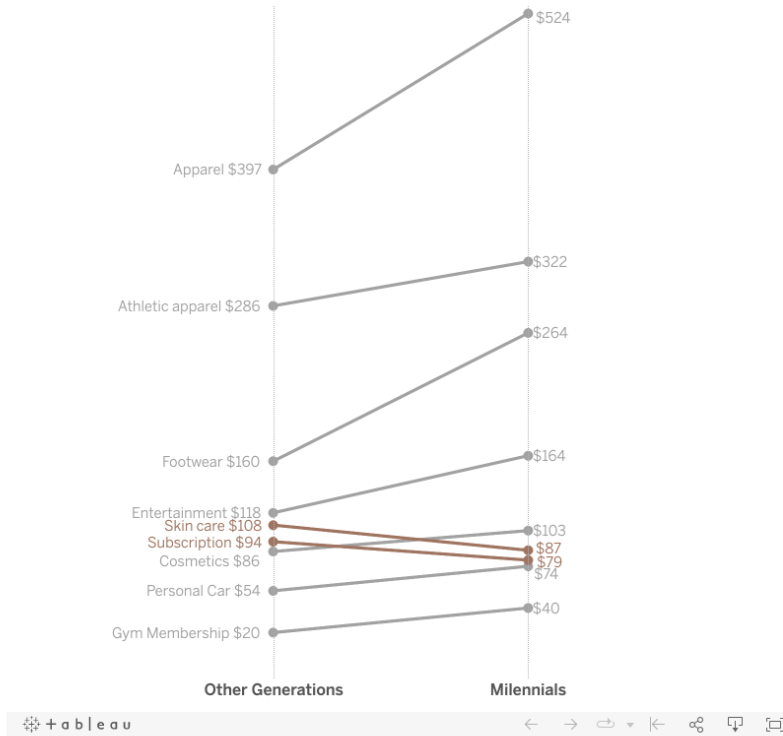(Viz 10 - Consumer habits, Source: McKinsey Millennial Survey 2016)

10. Spending Outside the Box

- The graph represents the differences in spending habits between millennials and other generations for different categories of goods.
- For each category, the spending by millennials is compared to the mean spending by other generations(GenX, Boomers).
- The slope indicates whether the spending has increased or decreased.

Spending Outside the Box: Thrifty Trends, Skincare and Subscription sidesteps

Milennials spend more on common goods and experiences compared to the mean spending of other generations, except for **skin care** and **subscriptions**

Apparel $397 → $524

Athletic apparel $286 → $322

$264

Footwear $160 → $164

Entertainment $118
Skin care $108 → $103
Subscription $94 → $87
Cosmetics $86 → $79
$74
Personal Car $54

Gym Membership $20 → $40

Other Generations   Milennials

(Viz 7 - Spending on goods and experiences, Source: McKinsey Millennial Survey 2016)

Illustrations and Visualising text

To show major insights such as the Millennial population and composition of the workforce - it made more sense to display the numbers directly than any kind of visualization. We used Figma for all our illustrations. All the human illustrations used in the website are from artify.

The illustration contains a computer model from 1980, representing the birth of the first millennial, alongside a modern desktop from 1996, which represents the last birth year for the generation. Through this comparison, the changing technology landscape during the millennial generation becomes apparent, and how it has impacted their lifestyle and habits.

As of 2023, Millennials make up **26%** of the US population.

40% of the US workforce are Millennials

Millennials spend **$900B** on goods annually

We used Figma to create typographical representations of single-number statistics such as population, spending, and composition of the workforce.

Usability Studies

For our mid-project Usability Studies, we had three participants, and each was provided with a version of our site which included our basic visualizations. We conducted interviews of 20 minutes with each of the participants. They were given three tasks to complete after exploring the visualization.

From our mid-project usability study, our main findings were as below -

- Participants liked the minimalist design of the website. They found that there was too much text outside of the visualization
- The graphs convey the information but more annotations and text could improve the visualizations
- The interactivity helped in conveying the information effectively, however, the look and feel of buttons and other artifacts on the website seemed outdated
- The interactivity and animations were highly helpful for participants to understand the functionality.
- The area chart used for "same-sex marriages over the years" was slightly confusing for participants from a non-technical, non-data background.

Based on the received feedback during our mid-project usability study, we made changes to some of our visualizations.

- We simplified an area chart into a line chart for the "same-sex marriages over the years" visualization
- We reduced the amount of text to deliver content concisely.
- Participants liked animations and interactivity but found too much animation to be distracting. This happened when the participant was presented with a visualization of changing numbers that indicated a shift in marriage age for men and women from 1990 to 2021. This was a very interesting insight that led us to use static visualizations to convey information effectively without distractions. This helped attract attention directly to the content rather than the transitions that bring them about.
- We modified the timeline which was interactive initially and changed it to static visualization to give a more comprehensive view of all the events in a single frame.

Below is the result of our final usability study

Our final usability study was a set of qualitative interviews with 2 participants - participant 1 from our mid-project usability study and one new participant. Both participants are Ischool students who have sufficient background in Data Visualization and UX Design. Thus, their feedback was very insightful to us.

NOTE: We referred to the previous year's project usability study (The Healthcare Industry's Ongoing Great Reshuffle) and followed the same structure.

Along with the interviews, we showed our designs to 4 participants and we asked them to rate certain aspects of the website.

1) Visual appeal: Participants rate the attractiveness and overall aesthetic of the website, on a scale of 1 (least attractive) to 5 (very attractive).
2) Navigation ease: Participants rate how easy or difficult it was to navigate the website, on a scale of 1 (very difficult) to 5 (very easy).
3) Information clarity: Participants rate how clear and understandable the information on the website was, on a scale of 1 (unclear) to 5 (very clear).
4) User engagement: Participants rate how engaging the website was, and how much it drew their attention and kept them interested (Learned about Millennials and Want to know more about Millennials), on a scale of 1 (least engaging) to 5 (very engaging).

Prompt	Participant response (Average of 6 particpants)
Visual Appeal	4.08
Navigation Ease	3.9
Information Clarity	4.5
User engagement/interest	4.5

From the above data and interview insights, we conclude -

● **All participants** found the topic of the website to be interesting and engaging. They expressed their interest in learning more about the topic at hand.
● The illustrations and interactive graphs were particularly effective in compellingly presenting the information.
● The look of the website is **clean and appealing**. However, some participants found the website to be too long and required too much scrolling (hence 3.9).
● Overall, the study showed that the website **effectively presented information** on millennial trends in a visually appealing and engaging way.

Data Sources

A few different data sources were used to accomplish our goals. They are described below:

- US Census data:
    - Link: https://data.census.gov/
- Pew Research Center
    - Link :: https://www.pewresearch.org/social-trends/datasets/

(Both census data and Pew Research Data were used to build our own datasets)

    - Viz used in:
        - US Population by generations
        - Infographics used for population percentages
        - Same-sex couples household
        - Knot or Not
        - Baby, Maybe
- Rentcafe.com
    - Link: https://datawrapper.dwcdn.net/Q9jNy/75/# via https://www.rentcafe.com/blog/rental-market/market-snapshots/millennials-switch-renter-to-owner-majority/
    - Viz used in:
        - Homeownership change in the last 5 years in top 50 US cities for each generation [hex plot representation of the US Map]
- Data collected by Goldman Sachs Millennial Infographic from various sources and IPUMS-CPS, IPUMS-USA
    - Link: https://www.goldmansachs.com/intelligence/archive/millennials/
    - Viz used in:
        - Living with Parents

- Visual Capitalist
    - Link: Generational Power Index Report
    - Viz used in:
        - Millennial Era Timeline

Tools

1. **Tableau**: for various interactive and/or animated visualizations
2. **Observable** + **D3**: for various interactive and/or animated visualizations
3. **React** + **Javascript** + **HTML** + **CSS**: To power the website
4. **Excel/ Google Sheets**: Data cleanup

5. **Figma**: For illustrations, designs, and typography

Table of Contributions

We rated our contributions on a scale of 1 to 5, with 1 being least contributed to a specific area and 5 being the most contributed.

Task	Avash Adhikari	Chandramita Dutta	Gopika Kni
Storyline	5	5	5
Web design	5	3	4
Web code	5	3	3
Visualizations (Graphs)	3	5	3
Visualizations (Illustrations)	3	3	5
Data gathering	4	5	4
Usability study design	3	5	5
Usability study	4	5	4
Usability study conclusions	5	5	5
Project write-up	5	5	5

References

1) [Goldman Sachs Millennial Infographic](#)
2) [Mckinsey Insights](#)
3) [How Americans of different generations spend their money](#)
4) [Millennials switch from renter majority to owner majority](#)
5) [Understanding The Research On Millennial Shopping Behaviors](#)
6) [Millennials Are Running Out of Time to Build Wealth](#)
7) [Americans Name the 10 Most Significant Historic Events of Their Lifetimes](#)
8) [As Millennials Near 40, They're Approaching Family Life Differently Than Previous Generations](#)
9) [Millennial Homeowners Finally Outnumber Millennial Renters - The New York Times](#)
10) [Timeline: Key Events in U.S. History that Defined Generations](#)
11) Illustration - https://www.artify.co/vector-illustrations/lines/black-line-woman-shopping-store