Business task
Analyze user interaction data from the Fitbit app to identify trends and suggest marketing strategies to enhance user engagement and drive Bellabeat's growth.

1. Ask
    a. What are the problems that are trying to be solved?
    b. Who are the main stakeholder and what are their expectations?

2. Prepare

Four main files were used for this project: daily_activity, sleep, heart rate, and weight.

3. Process

3.1 Data cleaning and manipulation

Data screening with Microsoft Excel:

1. Standardized date format: Data was in date/hour format. The Split function was applied to get data and time separately.
2. Primary key standardization: The concat function was used to join ID+date to generate a unique primary key. This will help later on to match data from the other tables.
3. Basic data cleaning: It was checked for consistency in data type, validity of ranges, blank cells, and duplicate data.

Checking data integrity with SQL;

1. Create a database and import the CVS file into new tables.
2. Data cleaning using SQL functions DISTINCT, LENGT, and TRIM.
3. JOIN daily activity record, daily sleep record, and heart rate record using the LEFT JOIN function.
4. Save cleaned and unified data to be analyzed

Data analysis and visualizations with R programming:

1. Install packages: tidiverse, skimr, janitor, ggplot2,
2. Load and read CVS with read.cvs function.
3. Data structure preview with head and str.
4. Change data type = as.Date function to standarize to YYYY-MM-DD (daily_activity$ActivityDate = as.Date(daily_activity$ActivityDate, "%m/%d/%Y")
5. Summarize each table with the summary() function.

```
daily_activity %>%
  select(TotalSteps,
         TotalDistance,
         VeryActiveMinutes,
         FairlyActiveMinutes,
         LightlyActiveMinutes,
         SedentaryMinutes,
         Calories) %>%
```

```
summary()
```

6. Analyze outputs
    a. An average user walks 5.490 km or 7638 steps a day. The CDC recommend that most adults aim for 10,000 steps per day. For most people, this is the equivalent of about 8 kilometers, or 5 miles.
    b. An average user spends 991.2 minutes or 16.52 hours in 24-hour movement sedentarily. A little physical movement while awake, up to 10 hours a day without movement, can increase the risk of chronic diseases, including high cholesterol, blood pressure. Adults are advised to limit sedentary time to 8 hours or less.
    c. The average calories burned daily are 2304 kCal. The appropriate number of calories burned per day varies depending on factors such as age, gender, weight, height, and activity level.
    d. The average of highly active minutes spent is 21.16 minutes, which is less then at least 30 minutes per day exercising intentionally.
7. Conclusions
    a. Responders are sedentary throughout the day in general
    b. Responders spend their time mostly inactive rather than very active or active.
    c. Responders spend a small amount of time doing exercises.
    Sleep
    d. The average number total sleep time is 419 minutes, or around 7 hours.
    e. The average time spent in bed is 458 minutes or 7 hours 30 min.
    f. Users record sleep at least once a daily in average
    g. Responders in average spent 30 minutes in bed awake
    h. Participants get enough sleep on average
    i. Most of the participants sleep once per day
    Weight
    j. The average BMI is 25.19, which is significantly higher than normal BMI range (18 – 24.9).
    k. The average weight is 72 kg, or 158.8 pounds.
    l. There are only 8 responders shared their weight data. There is no data on users' age, height, or body fat percentage to draw conclusions about health.
    m. None of the participants are underweight
    n. The average height of responders is 169 cm
    o. According to the CDC, a person with a BMI between 25 and 29.9 is considered overweight.
8. Share outputs

Frequency of usage (popular day)

    a. According to the bar chart, people are more active on Tuesday, Wednesday, and Thursday. Tuesday is the most popular day of the week to work out. In the middle of the week, people have the highest motivation for activity. On Monday an average person goes through the day's activities lacking motivation and productivity that’s why the percentage is the lowest - 12.8 %.

Relationship between sleep and sedentary time.

b. The scatter plot above shows that between 0- 1500 sedentary minutes total time asleep decreases with increasing sedentary time.

calculate the correlation index between sedentary time and time asleep

c. Value of -0.6 indicating a negative correlation (one variable increases as the other decreases) between total time asleep and sedatives minutes.

calculate the percentage of active minutes for each level of activity

d. create a pie chart showing the percentage of active minutes for each level of activity
e. the pie chart indicates that sedentary minutes account for a high percentage of all minutes (81.3%), what might be related to Desk jobs (office jobs), screen time (spending more time in front of screens, whether it's for work or leisure), lifestyle habits (reading or watching movies), using cars and other transportations a lot. This can lead to a sedentary lifestyle and can be a major contributor to the high percentage of sedentary minutes

Create a visual showing the total number of minutes asleep for each day of the week

f. The bar chart shows that Wednesday is the day with the highest total minutes of sleep. This information can be useful in understanding sleep patterns and identifying factors that may affect sleep quality on different days of the week.

9. Act

What are some of the trends in smart device usage?

a. Based on the analysis and calculation of unique users, responders most often use the FitBit to track their daily activity levels and calories burned, fewer people for sleep control and very few report information about weight.
b. User in average spends approximately 16.5 hours in 24-hour movement sedentarily.
c. Responders spend their time mostly inactive rather than very active or active and spend small amount of time doing exercises.
d. An average user walks 5.5 kilometers a day, this could be considered a moderately active lifestyle. The CDC recommend that most adults aim for 10,000 steps per day. For most people, this is the equivalent of about 8 kilometers, or 5 miles.
e. The average number of total time asleep is approximately 7 hours. This would fall within the range of recommended sleep duration for adults, which is typically 7-9 hours per night.
f. There is a strong negative correlation (-0.6) between total time asleep and sedentary minutes. The longer the sedentary time, the stronger the association with poor sleep quality and duration.
g. Lack of physical activity during the day can lead to increased levels of stress and anxiety, which can make it more difficult to fall asleep at night. Additionally, a sedentary lifestyle can lead to a decrease in overall energy expenditure, which can contribute to feelings of fatigue and daytime sleepiness.

h. An average BMI of 25.19 falls within the overweight range according to the World Health Organization (WHO) classification.
i. Tuesday is the most popular day for work outs.
j. There is a strong correlation between total steps taken and calories burned.
k. Saturday is the day users get the most sleep in a week.

How could trends apply to Bellabeat customers? How could these trends help influence Bellabeat marketing strategy?

a. Promote active lifestyle: Given that users spend a significant amount of time sedentary and are not very active, Bellabeat could focus on promoting the benefits of an active lifestyle.
b. Incorporating some of the features that can be a great way to encourage more physical activity and walking:
    i. goal setting (target to encourage users to aim for 10,000 steps per day or more), receiving reminders throughout the day to reach those goals
    ii. gamification elements, such as challenges or rewards, reminders, or alerts throughout the day to encourage them to take breaks from sedentary activities.
    iii. coaching and feedback features that can provide users with personalized recommendations for how to improve their activity levels.
c. For improving the weight control experience successful marketing strategy should focus on promoting weight management features, such as calorie tracking and meal planning to help users achieve a healthy weight:
    i. integration of a food diary: Bellabeat could partner with popular food tracking apps or create its own in-app diary to track and monitor food intake in addition to their physical activity for a comprehensive picture of overall calorie balance.
d. utilize personalized recommendations for healthy eating and exercise habits (suggest specific meal plans based on the user's dietary preferences or suggest targeted exercises to help meet specific weight loss goals).
e. Integrate community support: social features to allow users to connect with each other and offer support and motivation. This may include virtual challenges or competitions that encourage users to work towards a common goal or simply a platform for users to share their progress.
f.
g. offer additional resources such as nutrition and fitness guides or access to certified dietitians or personal trainers. This can provide users with additional support and guidance to help them achieve their weight loss goals.
h.
i. gamify the experience by creating challenges or goals that reward users for achieving specific milestones.
j.
k. Emphasize sleep tracking. Developing sleep tracking features and providing guidance on improving sleep quality, given the correlation observed between sedentary time and poor sleep quality.
l.

m. Bellabeat can encourage people to go to sleep earlier to get adequate amount and good quality of sleep by providing reminders and notifications:
n.
o. set a bedtime reminder: Fitness trackers can be set to remind users to go to bed at a certain time each night. This can help establish a regular sleep schedule and promote healthier sleep habits.
p.
q. monitor sleep patterns: Fitness trackers can track sleep patterns and provide insights into the quality and duration of sleep.
r.
s. personalized recommendations for improving sleep habits. This might include suggestions for adjusting bedtime routines, reducing caffeine consumption, or increasing physical activity during the day.
t.
u. Knowing that Tuesday is a popular workout day, Bellabeat could provide personalized workout recommendations for users based on their fitness goals, offer Tuesday-specific workouts to encourage users to stick to their routine, create challenges or competitions specifically for Tuesdays to encourage users to work out and stay motivated.
v.
w. Since Saturday is the day users get the most sleep in a week, Bellabeat could offer tips and guidance to help users maintain good sleep habits throughout the week and improve sleep quality.
x.
y. Promote weight management: Given that very few users report weight-related information, Bellabeat could focus on promoting the benefits of weight management and highlight how its products can help users monitor and track their weight goals.