Final Project - First Visualization

Programming for Business Analytics (11410ISS 406600)

Group 10

2025-11-03

Question statement:

What is the most popular payment method among customers in the United Kingdom (UK) and the United States (USA) based on recent e-commerce transaction data?

Library Setup

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   4.0.0     v tibble    3.3.0
## v lubridate 1.9.4     v tidyr     1.3.1
## v purrr     1.1.0
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(stringr)
library(dplyr)
library(ggplot2)
library(lubridate)
library(tidytext)
```

```
## Warning: package 'tidytext' was built under R version 4.5.2
```

Data Importing

```
ecommerce <- read.csv('ecommerce_dataset_10000.csv')

head(ecommerce)
```

```
##   customer_id  first_name last_name gender age_group signup_date country
## 1    CUST2353       Erica    Oliver Female Teenagers  2022-06-29  Canada
## 2    CUST4463 Christopher     White   Male    Adults  2023-08-24   China
## 3    CUST4512     Spencer    Foster   Male    Senior  2023-07-18 Germany
## 4    CUST5711     Jessica    Harris   Male Teenagers  2025-08-22  France
## 5    CUST1296         Amy   Johnson Female Teenagers  2021-03-23  Brazil
## 6    CUST2790      Shelby    Sutton  Other    Adults  2025-07-18  Canada
##   product_id         product_name       category quantity unit_price order_id
## 1    PROD108       Fitbit Versa 3    Electronics        3        229 ORD10000
## 2    PROD103         Levi's Jeans        Apparel        4         59 ORD10001
## 3    PROD111   Lego Star Wars Set           Toys        2         59 ORD10002
## 4    PROD107         Dyson Vacuum Home & Kitchen        4        399 ORD10003
## 5    PROD105 Adidas Running Shoes        Apparel        1        110 ORD10004
## 6    PROD108       Fitbit Versa 3    Electronics        5        229 ORD10005
##   order_date order_status   payment_method rating review_text review_id
## 1 2023-07-13      Pending      Credit Card      2        good  REV20000
## 2 2024-08-12      Pending           PayPal      2     average  REV20001
## 3 2024-08-04    Delivered Cash on Delivery      5        good  REV20002
## 4 2025-05-23    Delivered Cash on Delivery      2   very good  REV20003
## 5 2023-07-02     Returned Cash on Delivery      1   very good  REV20004
## 6 2023-04-13     Returned           PayPal      3   very good  REV20005
##   review_date
## 1  2025-06-06
## 2  2023-08-05
## 3  2023-01-03
## 4  2023-03-14
## 5  2023-10-18
## 6  2023-02-14
```

Data Cleaning

```
ecommerce <- ecommerce %>%
  mutate(
    order_year = year(ymd(order_date))
  )
summary(ecommerce$order_year)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2022    2023    2024    2024    2024    2025
```

```
ecommerce_clean <- ecommerce %>%
  filter(
    !is.na(payment_method),
    country %in% c("UK", "USA"),
    order_year %in% c(2022, 2024)
  )

head(ecommerce_clean)
```

```
##   customer_id first_name last_name gender age_group signup_date country
```

```
## 1    CUST2451    Barbara    Hansen Female    Adults  2024-11-10      UK
## 2    CUST1438   Michelle    Vargas   Male    Adults  2023-07-11      UK
## 3    CUST2997     Amanda  Martinez Female    Senior  2021-06-02     USA
## 4    CUST2895   Lawrence     Hines Female    Senior  2021-03-15     USA
## 5    CUST1182       John    Jacobs   Male    Senior  2023-03-09      UK
## 6    CUST4751      Tyler    Martin   Male    Adults  2020-11-07     USA
##   product_id         product_name    category quantity unit_price order_id
## 1    PROD103         Levi's Jeans     Apparel        2         59 ORD10007
## 2    PROD109    Kindle Paperwhite       Books        1        129 ORD10012
## 3    PROD105 Adidas Running Shoes     Apparel        3        110 ORD10025
## 4    PROD102      Sony Headphones Electronics        5        199 ORD10029
## 5    PROD113 Wilson Tennis Racket      Sports        3        149 ORD10035
## 6    PROD112    Barbie Dreamhouse        Toys        3        199 ORD10047
##   order_date order_status   payment_method rating review_text review_id
## 1 2024-01-29      Pending      Credit Card      1   very good  REV20007
## 2 2024-05-15      Shipped      Credit Card      1    very bad  REV20012
## 3 2024-05-21      Pending Cash on Delivery      2     average  REV20025
## 4 2024-12-31    Cancelled      Credit Card      5   very good  REV20029
## 5 2022-12-11    Cancelled           PayPal      5     average  REV20035
## 6 2024-12-28    Cancelled      Credit Card      1     average  REV20047
##   review_date order_year
## 1  2025-06-02       2024
## 2  2024-12-28       2024
## 3  2023-06-05       2024
## 4  2024-12-04       2024
## 5  2024-02-20       2022
## 6  2024-12-07       2024
```

Calculate Most Popular Payment Method by Country

UK Most Popular Payment Method

```
payment_summary_uk <- ecommerce_clean %>%
  filter(country == "UK", order_year %in% c(2022, 2024)) %>%
  group_by(order_year, payment_method) %>%
  summarise(total_transactions = n(), .groups = "drop")

payment_summary_uk
```

```
## # A tibble: 6 x 3
##   order_year payment_method   total_transactions
##        <dbl> <chr>                         <int>
## 1       2022 Cash on Delivery                 30
## 2       2022 Credit Card                      39
## 3       2022 PayPal                           38
## 4       2024 Cash on Delivery                101
## 5       2024 Credit Card                     103
## 6       2024 PayPal                          102
```

```r
top_methods_uk <- payment_summary_uk %>%
  group_by(payment_method) %>%
  summarise(overall = sum(total_transactions)) %>%
  slice_max(overall, n = 3) %>%
  pull(payment_method)

top_methods_uk
```

```
## [1] "Credit Card"      "PayPal"           "Cash on Delivery"
```

USA Most Popular Payment Method

```r
payment_summary_usa <- ecommerce_clean %>%
  filter(country == "USA", order_year %in% c(2022, 2024)) %>%
  group_by(order_year, payment_method) %>%
  summarise(total_transactions = n(), .groups = "drop")

payment_summary_usa
```

```
## # A tibble: 6 x 3
##   order_year payment_method   total_transactions
##        <dbl> <chr>                         <int>
## 1       2022 Cash on Delivery                 42
## 2       2022 Credit Card                      49
## 3       2022 PayPal                           33
## 4       2024 Cash on Delivery                126
## 5       2024 Credit Card                     117
## 6       2024 PayPal                           98
```

```r
top_methods_usa <- payment_summary_usa %>%
  group_by(payment_method) %>%
  summarise(overall = sum(total_transactions)) %>%
  slice_max(overall, n = 3) %>%
  pull(payment_method)

top_methods_usa
```

```
## [1] "Cash on Delivery" "Credit Card"      "PayPal"
```

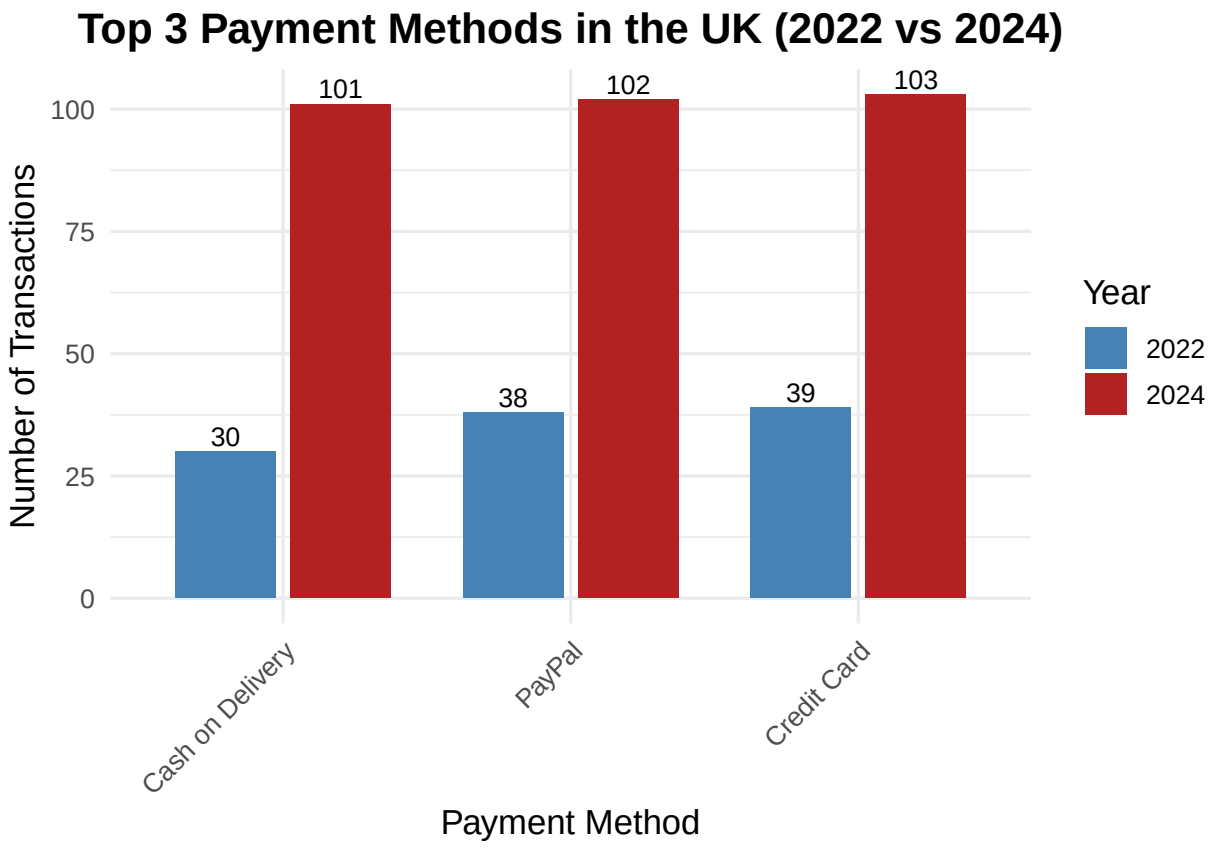
Visualization Section

UK Visualization

```r
payment_summary_uk <- payment_summary_uk %>%
  filter(payment_method %in% top_methods_uk)

ggplot(payment_summary_uk,
```

```
      aes(x = reorder(payment_method, total_transactions, FUN = sum),
          y = total_transactions,
          fill = as.factor(order_year),
          label = total_transactions)) +
geom_col(position = position_dodge(width = 0.8), width = 0.7) +
geom_text(position = position_dodge(width = 0.8),
           vjust = -0.3, size = 3.5) +
scale_fill_manual(
  values = c("2022" = "steelblue", "2024" = "firebrick"),
  name = "Year"
) +
labs(
  title = "Top 3 Payment Methods in the UK (2022 vs 2024)",
  x = "Payment Method",
  y = "Number of Transactions"
) +
theme_minimal(base_size = 13) +
theme(
  plot.title = element_text(hjust = 0.5, face = "bold"),
  axis.text.x = element_text(angle = 45, hjust = 1)
)
```



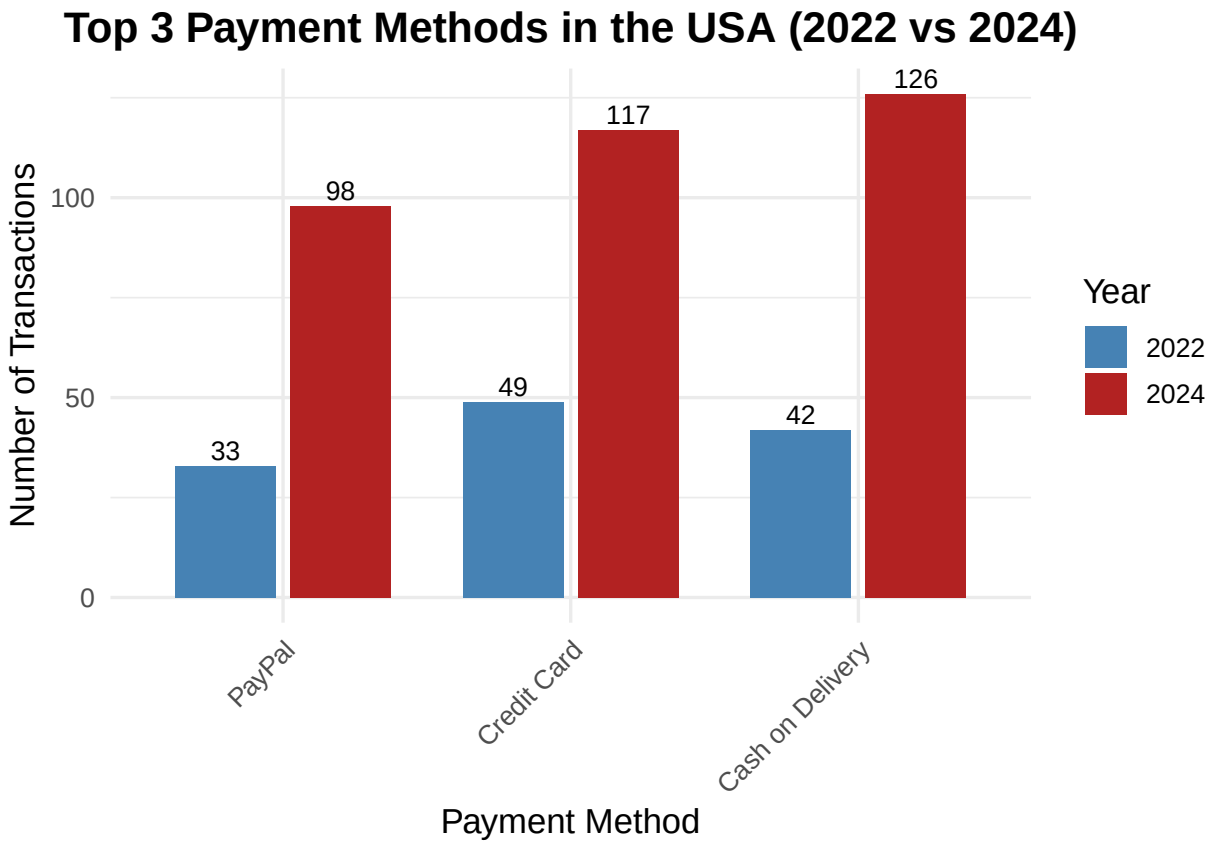
The bar chart illustrates the top three payment methods used by UK customers in 2022 and 2024. Across all methods, transaction volumes increased substantially between the two years, approximately a threefold growth, suggesting expanding e-commerce activity and customer adoption.

Among the payment options, Credit Card emerged as the most frequently used method, maintaining a clear lead in both years. PayPal ranked second, followed by Cash on Delivery as the least common option. This trend suggests that UK consumers continue to prefer digital and card-based payments, reflecting high trust in secure, cashless transactions and widespread access to credit systems.

USA Visualization

```
payment_summary_usa <- payment_summary_usa %>%
  filter(payment_method %in% top_methods_usa)

ggplot(payment_summary_usa,
       aes(x = reorder(payment_method, total_transactions, FUN = sum),
           y = total_transactions,
           fill = as.factor(order_year),
           label = total_transactions)) +
  geom_col(position = position_dodge(width = 0.8), width = 0.7) +
  geom_text(position = position_dodge(width = 0.8),
            vjust = -0.3, size = 3.5) +
  scale_fill_manual(
    values = c("2022" = "steelblue", "2024" = "firebrick"),
    name = "Year"
  ) +
  labs(
    title = "Top 3 Payment Methods in the USA (2022 vs 2024)",
    x = "Payment Method",
    y = "Number of Transactions"
  ) +
  theme_minimal(base_size = 13) +
  theme(
    plot.title = element_text(hjust = 0.5, face = "bold"),
    axis.text.x = element_text(angle = 45, hjust = 1)
  )
```



The chart displays the top three payment methods among U.S. customers in 2022 and 2024. While Credit Card was the dominant method in 2022, by 2024 Cash on Delivery had overtaken it, showing a notable shift in consumer behavior.

Meanwhile, PayPal consistently remained the least used method, though it also experienced growth between the two years. Overall, U.S. consumers appear to balance convenience and control with card payments remaining strong but Cash on Delivery gaining traction as a trusted alternative.