Team 7 : BDI 513 Final Project : The Evolution of Streaming Services Before, During and After COVID-19 (2018-2024)

Team Members:

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Data Question: How did the COVID-19 pandemic affect the financial performance and user engagement of streaming companies listed on NASDAq?

Business Objective:

This project aims to evaluate the impact of the COVID-19 pandemic on the financial performance and user engagement of NASDAQ-listed streaming companies (Netflix, Disney, Comcast, Spotify, and Fox) from 2018 to 2024. The objective is to provide insights into market trends, subscriber behavior, and financial outcomes during pre-COVID, during COVID, and post-COVID periods. By leveraging these insights, the project seeks to identify growth opportunities, competitive advantages, and strategic recommendations to enhance market positioning and profitability for the streaming industry.

Assess

Examine the current state of streaming platforms, their financial performance, and market positioning.

```
(*Company names and their market capitalizations
 by fetching financial data for each stock ticker*)
```

In[ ]:=
```
tickerSelect = {"NFLX", "DIS", "CMCSA", "SPOT", "FOXA"}

logoSelect = {     ,     ,     ,     ,     };

nameSelect = {"Netflix", "Disney", "Comcast", "Spotify", "Fox"}
```

Out[ ]=
```
{NFLX, DIS, CMCSA, SPOT, FOXA}
```

Out[ ]=
```
{Netflix, Disney, Comcast, Spotify, Fox}
```

```
(*Market Capitalization*)
```

In[ ]:=
```
tickerAndMktCap = Table[FinancialData[i, {"Name", "MarketCap"}], {i, tickerSelect}]
```

Out[ ]=

$\left\{\left\{\text{Netflix}, \$3.80587\times10^{11}\right\}, \left\{\text{Disney}, \$2.18259\times10^{11}\right\},\right.$

$\left\{\text{Comcast}, \$1.67645\times10^{11}\right\}, \left\{\text{Spotify Technology}, \$9.57775\times10^{10}\right\},$

$\left.\left\{\text{Fox Corporation Class A Common Stock}, \$2.17369\times10^{10}\right\}\right\}$

```
(*Sorted Bar Chart for market capitalization (in trillions of USD)*)
```

```
In[ ]:= assoLogoMktcap = ReverseSort[AssociationThread[logoSelect →
            Round[QuantityMagnitude[tickerAndMktCap[All, 2] / 10 ^ 12], 0.01]]];
     BarChart[
       assoLogoMktcap,
       ScalingFunctions → None,
       LabelingFunction → Top,
       ChartLabels → Callout[Keys[assoLogoMktcap], Above],
       AxesLabel →
         {Style["Company", 15], Style["MarketCap \n(Units: Trillion USD)", 15]},
       PlotLabel → Style["Streaming Companies, Nov 25, 2024", Bold, 15],
       BarSpacing → Large,
       BarOrigin → Bottom,
       ImageSize → 500,
       AspectRatio → 1 / GoldenRatio,
       Background → White,
       ChartStyle → 47
     ]
```

Out[ ]=
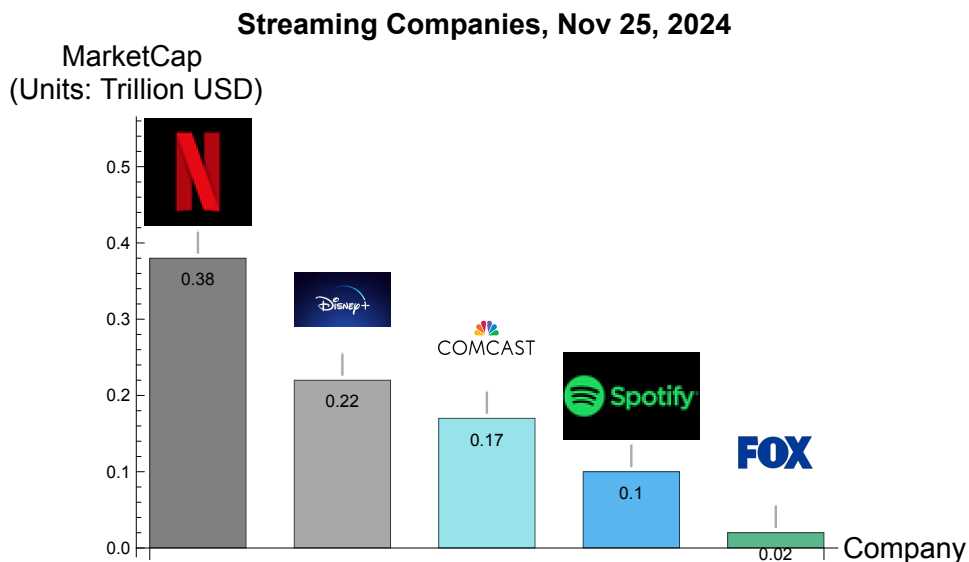
How do these streaming service companies perform financially?

■ Get stock return information for the most recent trading day.

```
In[ ]:= tickerAndRet = Table[FinancialData[i, {"Symbol", "Return"}], {i, tickerSelect}]
```

Out[ ]=

{{NASDAQ:NFLX, 1.0794%}, {NYSE:DIS, -0.110542%},
 {NASDAQ:CMCSA, 1.48026%}, {NYSE:SPOT, 0.361923%}, {NASDAQ:FOXA, 0.877756%}}

```
(*Table for Stock Returns of the streaming platforms*)
```

In[ ]:= `colorList[data_] :=`

`Table[…] + ;`

`Grid[tickerAndRet, Background → {None, colorList[tickerAndRet]}, Frame → All]`

Out[ ]=

NASDAQ:NFLX	1.0794%
NYSE:DIS	−0.110542%
NASDAQ:CMCSA	1.48026%
NYSE:SPOT	0.361923%
NASDAQ:FOXA	0.877756%

Insights: This analysis looks at the stock market performance of the five streaming platforms, focusing on market capitalization and stock returns. It provides an overview of each company's current strategy and identifies opportunities for maximizing profitability and strategies for risk management.

Benchmark

Comparing the performance of streaming platforms against NASDAQ stocks, establishing industry benchmarks, and identifying trends and best practices.

`(*Select and Import Stock data *)`

```
tickerSelect;
stockSelect = Interpreter["Financial"][tickerSelect];
benchmark = Interpreter["Financial"]["^COMP"];

(*Combine selected stocks and benchmark for analysis *)
stocksAndBenchmark = Append[stockSelect, benchmark]

(*Set the date range for the data*)
startDate = DateObject[{2017, 1, 1}];
endDate = DateObject[{2024, 11, 25}];

(*Retrieve cumulative fractional change for
 each stock and benchmark within the date range*)
stockTS = Table[FinancialData[i, "CumulativeFractionalChange",
     {startDate, endDate}], {i, stocksAndBenchmark}];
(*Plot the cumulative fractional changes*)
DateListPlot[stockTS, Joined → True, Filling → Bottom,
 PlotLegends → Placed[LineLegend[stocksAndBenchmark], Right],
 ImageSize → 300, PlotRange → All]
```
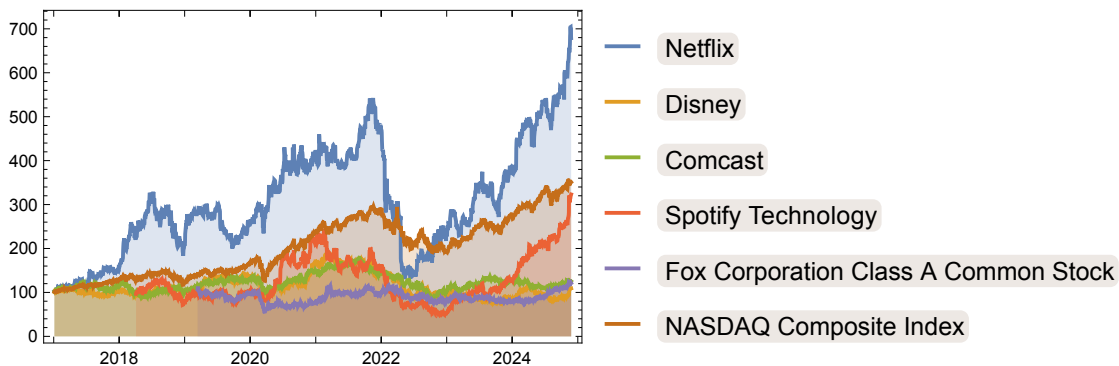
Out[◦]=

{ Netflix , Disney , Comcast , Spotify Technology ,

Fox Corporation Class A Common Stock , NASDAQ Composite Index }

Out[◦]=


```
(*Create a multi-
 column grid of cumulative return plots for each stock vs benchmark*)
```
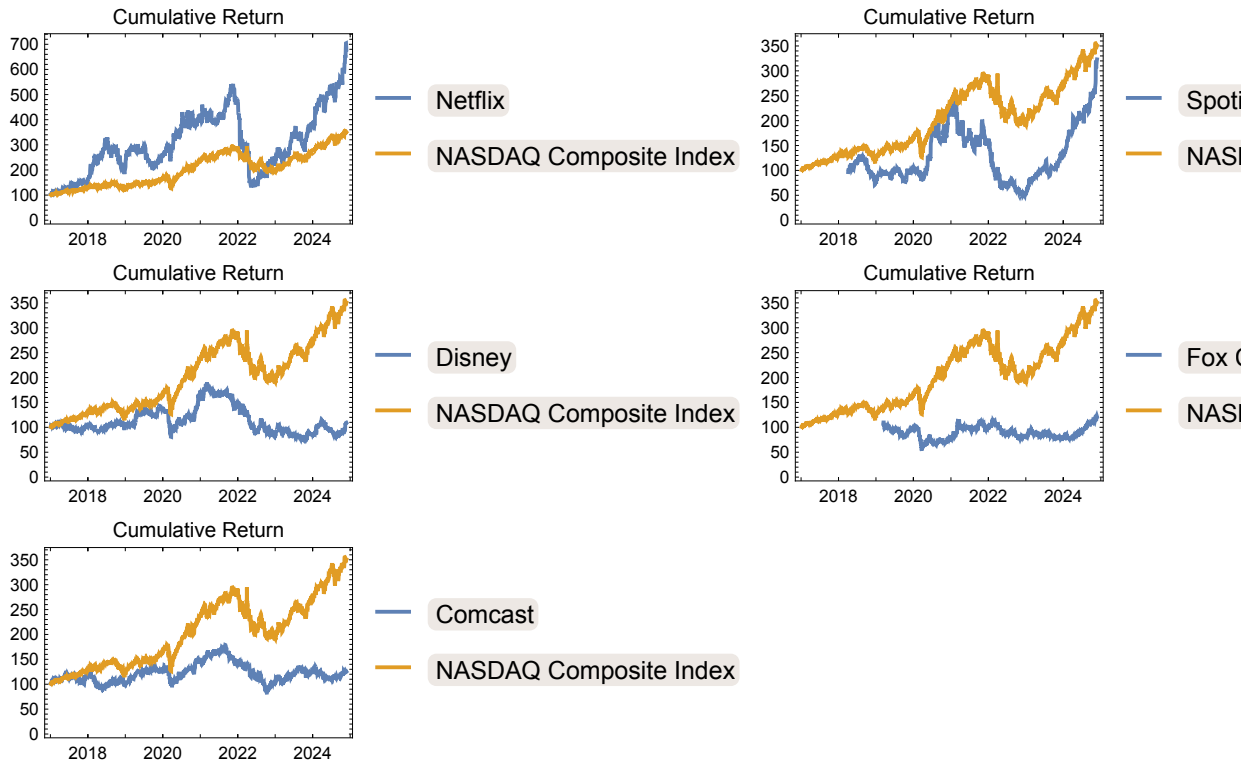
```
In[ ]:= StreamStockInfographic = Multicolumn[
         Table[DateListPlot[{stockTS〚i〛, stockTS〚6〛}, PlotLabel → "Cumulative Return",
           PlotRange → Full, PlotLegends → Placed[{stockSelect〚i〛, benchmark}, Right]],
          {i, Range@Length@tickerSelect}],
         2]
```

Out[ ]=

Insights: By analyzing the current state of these five major streaming companies in the stock market, we can assess their historical performance visually, particularly during key events . This helps identify potential future strategies and understand how past trends could influence their market positioning.

```
(*Select the company*)
```

```
companySelect = Interpreter["Company"][nameSelect]
companyTS = EntityValue[companySelect,
    Dated[{"TotalRevenue", "GrossProfit", "OperatingExpense", "NetIncome"},
     Interval[{startDate, endDate}]], "EntityAssociation"];

(*Date List Plot for Total Revenue*)
DateListPlot[companyTS〚All, 1〛, Joined → True, Filling → Bottom,
 PlotLegends → Placed[LineLegend[companySelect], Right],
 ImageSize → 300, PlotRange → All]
```
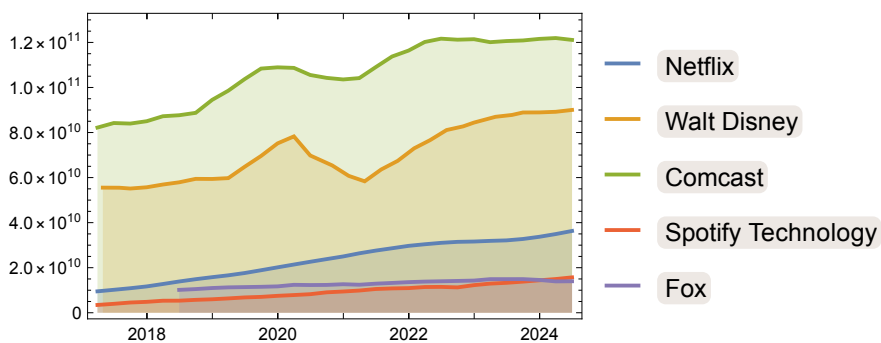
Out[•]=

{ Netflix , Walt Disney , Comcast , Spotify Technology , Fox }
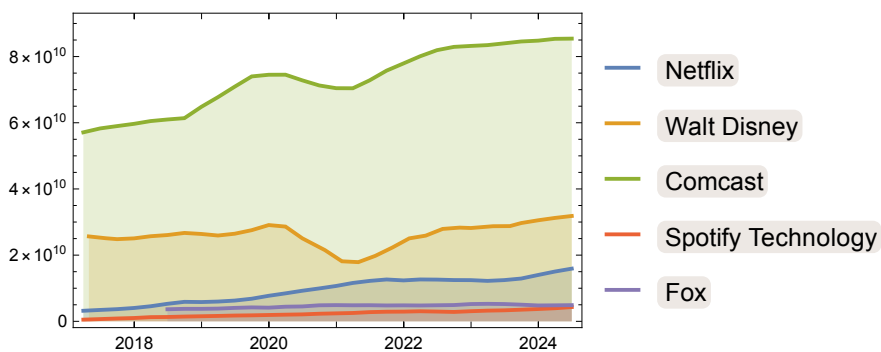
Out[•]=


```
(*Date List Plot for Gross Profit*)
DateListPlot[companyTS〚All, 2〛, Joined → True, Filling → Bottom,
 PlotLegends → Placed[LineLegend[companySelect], Right],
 ImageSize → 300, PlotRange → All]
```
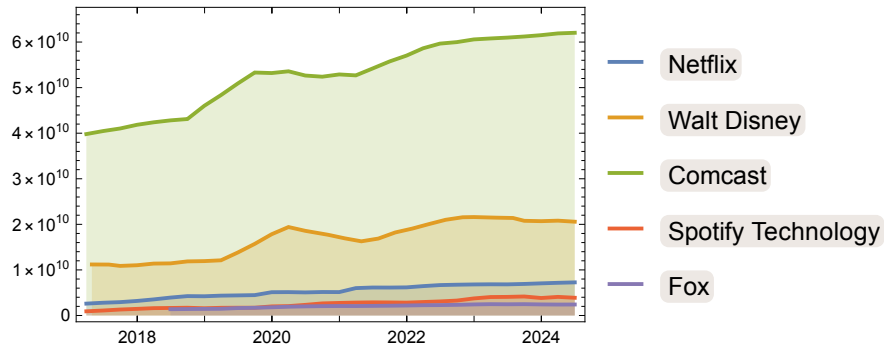
Out[•]=

```
(*Date List Plot for Operating Expense*)
DateListPlot[companyTS〚All, 3〛, Joined → True, Filling → Bottom,
 PlotLegends → Placed[LineLegend[companySelect], Right],
 ImageSize → 300, PlotRange → All]
```

Out[◦]=


```
(*Date List Plot for Net Income*)
DateListPlot[companyTS〚All, 4〛, Joined → True, Filling → Bottom,
 PlotLegends → Placed[LineLegend[companySelect], Right],
 ImageSize → 300, PlotRange → All]
```
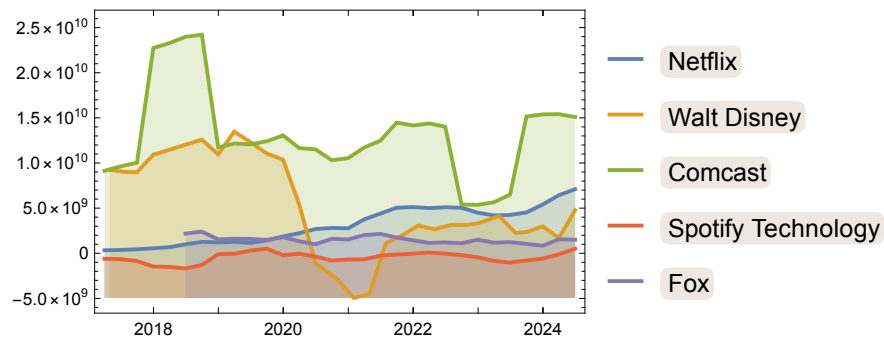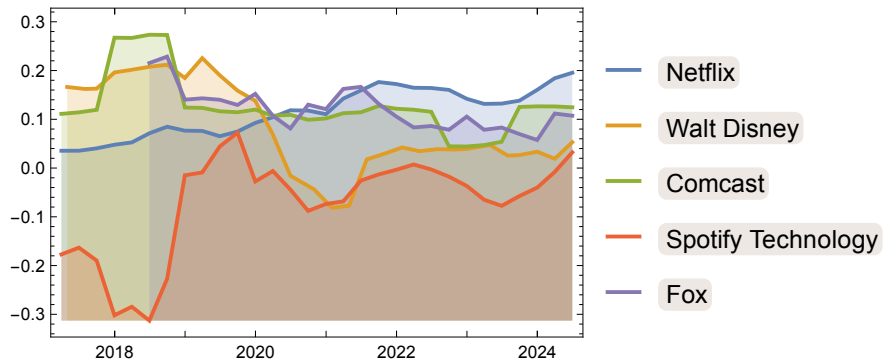
Out[◦]=


```
(* Time series plot showing the ratio of Net Income to Total Revenue =
 Net margin for a selected company*)
```

In[ ]:= `DateListPlot[companyTS[All, 4] / companyTS[All, 1], Joined → True,`
`    Filling → Bottom, PlotLegends → Placed[LineLegend[companySelect], Right],`
`    ImageSize → 300, PlotRange → All]`

Out[ ]=

(*Infographic with multiple time series plots showing financial
  margins (Net Margin, Gross Margin, Operating Margin) for each company*)

```
In[ ]:= StreamStockInfographic = Multicolumn[
        Table[
          DateListPlot[{companyTS〚i, 2〛 / companyTS〚i, 1〛,
            (companyTS〚i, 2〛 - companyTS〚i, 3〛) / companyTS〚i, 1〛,
            companyTS〚i, 4〛 / companyTS〚i, 1〛}, PlotRange → {Full, {0, 0.8}},
          Filling → Bottom, PlotLabel → Keys[companyTS]〚i〛,
          PlotLegends → {"Gross Margin", "Operating Margin", "Net Margin"}],
         {i, 1, Length[companyTS]}],
        2]
```

Out[ ]=
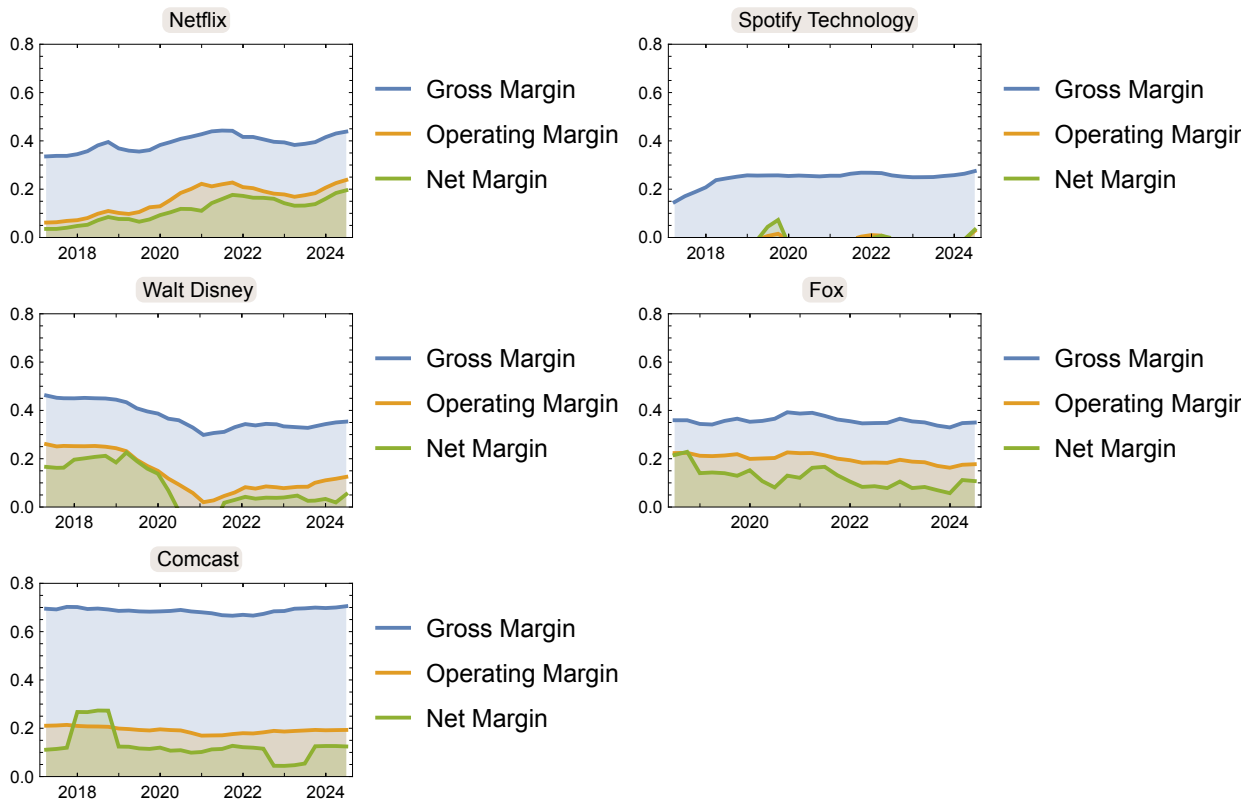
Insights: This section provides an overview of each company's financial performance, focusing on total revenue, as well as key metrics like net margin, operating margin, and gross margin. It also looks at gross profit, operating expenses, and net income. These figures help to assess the financial health of each company and can provide clues about their future strategies, such as how they might focus on managing costs, improving profitability, or driving growth.

Classify

Grouping streaming platforms into categories based on specific characteristics or performance indicators and use these classifications to analyze trends.

```
(*Table for annual global subscriptions*)
```

In[ ]:= `data = {{"Year", "Netflix", "Disney+", "Comcast", "Spotify", "FOX"},`
`    {2018, 124.3, 0, 27.2, 341, 6}, {2019, 151.5, 10, 28.6, 445, 6},`
`    {2020, 192.9, 26.5, 28.4, 567, 6}, {2021, 219.7, 118, 29.6, 675, 8},`
`    {2022, 230.7, 164, 32, 205, 10}, {2023, 260.28, 150, 32, 770, 10},`
`    {2024, 282.72, 122.7, 32.2, 892, 12}};`

In[ ]:= `Grid[data, Frame → All, Alignment → Center, Spacings → {2, 1}]`

Out[ ]=

Year	Netflix	Disney+	Comcast	Spotify	FOX
2018	124.3	0	27.2	341	6
2019	151.5	10	28.6	445	6
2020	192.9	26.5	28.4	567	6
2021	219.7	118	29.6	675	8
2022	230.7	164	32	205	10
2023	260.28	150	32	770	10
2024	282.72	122.7	32.2	892	12

```
(*Define time frames categorizing data into Pre-COVID,
During-COVID,and Post-COVID periods, with respective data slices*)
```

In[ ]:= `timeFrames = {{"Pre-COVID", {data[[2, 2 ;; 6]], data[[3, 2 ;; 6]]}},`
`    {"During-COVID", {data[[4, 2 ;; 6]], data[[5, 2 ;; 6]]}},`
`    {"Post-COVID", {data[[6, 2 ;; 6]], data[[7, 2 ;; 6]]}}};`

```
(*Calculate the average values for each company in each time frame*)
```

In[ ]:= `averages = Map[{#[[1]], Mean /@ Transpose[#[[2]]]} &, timeFrames];`

```
(*Extract the company names from the first
 row of the dataset and assign colors for each company*)
```

In[ ]:= `companies = Rest[data[[1]]];`
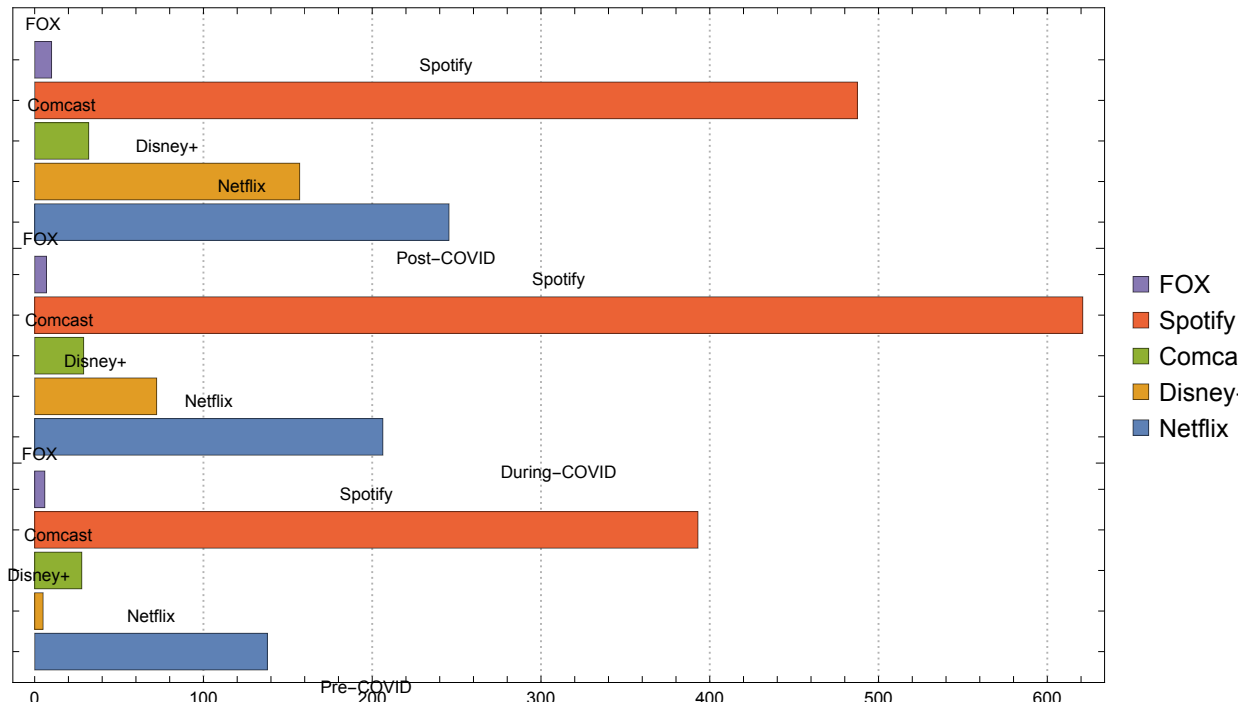`colors = ColorData[97, "ColorList"];`

```
(*Stacked Bar Chart for global subscriptions*)
```

```
In[ ]:= BarChart[averages〚All, 2〛,
        ChartLabels → {Placed[averages〚All, 1〛, Below], Placed[companies, Above]},
        ChartStyle → colors, BarOrigin → Left, ChartLegends → companies,
        PlotTheme → "Detailed", ImageSize → Large,
        AxesLabel → {"Time Frame", "Average Revenue (Billions $)"}]
```

Out[ ]=

Insights: To understand trends in user engagement, we categorize streaming platforms into three distinct periods: pre-COVID, during COVID, and post-COVID. By examining the annual subscription data in these categories, we can identify shifts in user behavior over time. The stacked bar chart allows us to compare subscription growth and decline across these periods, providing a clearer picture of how the pandemic influenced consumer habits. For example, we see a spike in subscriptions during COVID because more people were at home.

```
(*Heatmaps for annual global subscriptions (in millions)*)

(*Netflix*)
```

```
netflixData = {Entity["Country", "UnitedStates"] → 74.8,
    Entity["Country", "Canada"] → 74.8, Entity["Country", "Mexico"] → 74.8,
    Entity["Country", "UnitedKingdom"] → 47.1, Entity["Country", "Germany"] → 47.1,
    Entity["Country", "France"] → 47.1, Entity["Country", "Italy"] → 47.1,
    Entity["Country", "Spain"] → 47.1, Entity["Country", "Sweden"] → 47.1,
    Entity["Country", "Netherlands"] → 47.1, Entity["Country", "China"] → 32.9,
    Entity["Country", "India"] → 32.9, Entity["Country", "Japan"] → 32.9,
    Entity["Country", "Australia"] → 32.9, Entity["Country", "SouthKorea"] → 32.9,
    Entity["Country", "Indonesia"] → 32.9, Entity["Country", "Brazil"] → 41.6,
    Entity["Country", "Argentina"] → 41.6, Entity["Country", "Chile"] → 41.6,
    Entity["Country", "Colombia"] → 41.6, Entity["Country", "SouthAfrica"] → 9.8,
    Entity["Country", "Nigeria"] → 9.8, Entity["Country", "Egypt"] → 9.8,
    Entity["Country", "Kenya"] → 9.8, Entity["Country", "Turkey"] → 9.8};
```

In[ ]:=
```
GeoRegionValuePlot[netflixData, ColorFunction → "Rainbow",
  PlotRange → All, PlotLabel → "Netflix Subscribers by Country (Q4 2023)",
  Frame → True, GeoProjection → "Mercator", GeoBackground → "NaturalEarth"]
```
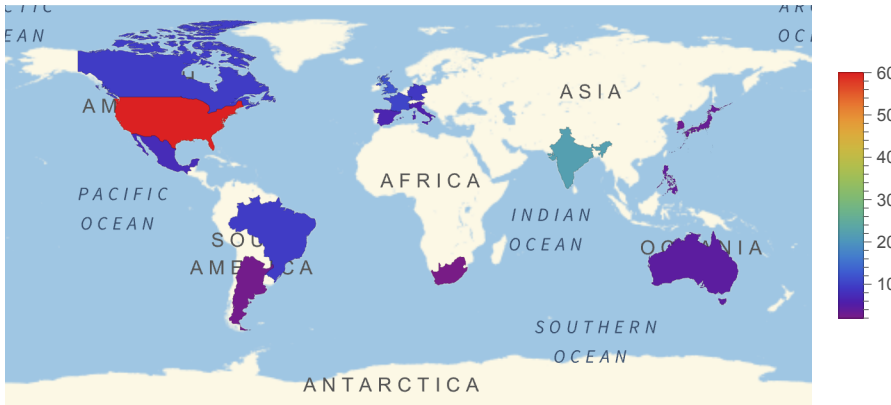
Out[ ]=
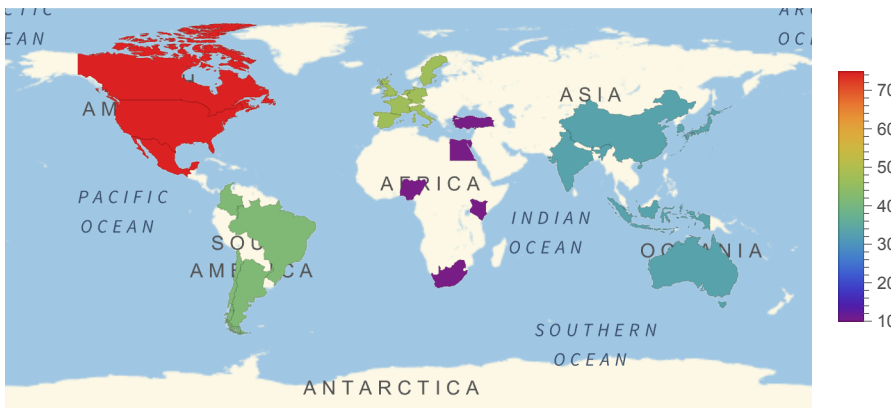

```
(*Disney*)
```

In[ ]:=
```
disneyData =
    {Entity["Country", "UnitedStates"] → 60.0, Entity["Country", "Canada"] → 9.5,
     Entity["Country", "Mexico"] → 7.5, Entity["Country", "UnitedKingdom"] → 12.0,
     Entity["Country", "France"] → 10.5, Entity["Country", "Germany"] → 9.0,
     Entity["Country", "Italy"] → 6.0, Entity["Country", "Spain"] → 6.5,
     Entity["Country", "India"] → 22.0, Entity["Country", "Japan"] → 3.5,
     Entity["Country", "Australia"] → 4.5, Entity["Country", "SouthKorea"] → 3.0,
     Entity["Country", "Brazil"] → 9.5, Entity["Country", "Argentina"] → 2.5,
     Entity["Country", "SouthAfrica"] → 2.0, Entity["Country", "Philippines"] → 4.0};
```

In[ ]:= `GeoRegionValuePlot[disneyData, ColorFunction → "Rainbow",`
`    PlotRange → All, PlotLabel → "Disney+ Subscribers by Country (Q4 2023)",`
`    Frame → True, GeoProjection → "Mercator", GeoBackground → "NaturalEarth"]`
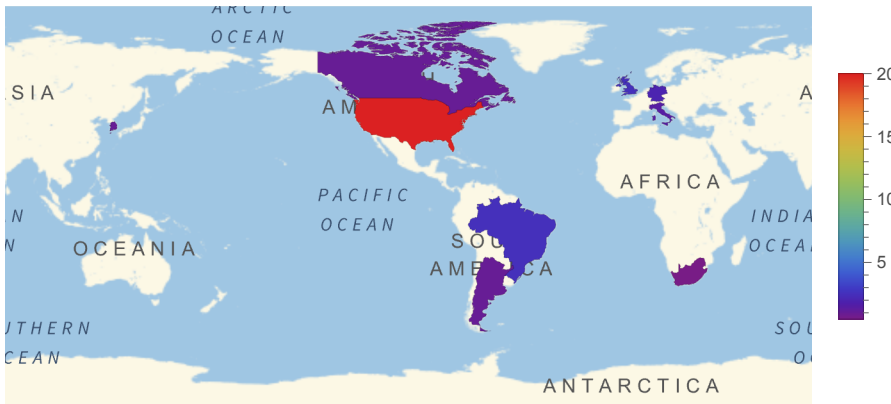
Out[ ]=

`(*Comcast*)`

In[ ]:= `comcastData = {Entity["Country", "UnitedStates"] → 20.0,`
`        Entity["Country", "Canada"] → 1.0, Entity["Country", "UnitedKingdom"] → 2.5,`
`        Entity["Country", "Germany"] → 2.0, Entity["Country", "Italy"] → 1.5,`
`        Entity["Country", "SouthKorea"] → 1.0, Entity["Country", "Brazil"] → 2.5,`
`        Entity["Country", "Argentina"] → 1.0, Entity["Country", "SouthAfrica"] → 0.5};`

In[ ]:= `GeoRegionValuePlot[comcastData, ColorFunction → "Rainbow", PlotRange → All,`
`    PlotLabel → "Comcast (Peacock) Subscribers by Country (Q4 2023)",`
`    Frame → True, GeoProjection → "Mercator", GeoBackground → "NaturalEarth"]`
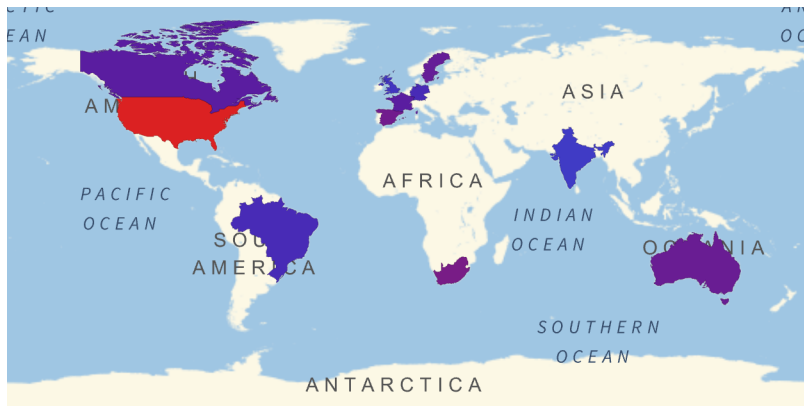
Out[ ]=

`(*Spotify*)`

```
In[ ]:= spotifyData = {Entity["Country", "UnitedStates"] → 90.0,
        Entity["Country", "Canada"] → 8.0, Entity["Country", "UnitedKingdom"] → 14.0,
        Entity["Country", "Germany"] → 12.0, Entity["Country", "France"] → 8.0,
        Entity["Country", "Sweden"] → 6.5, Entity["Country", "Spain"] → 5.0,
        Entity["Country", "Brazil"] → 12.0, Entity["Country", "India"] → 15.0,
        Entity["Country", "Australia"] → 6.0, Entity["Country", "SouthAfrica"] → 4.0};
```

```
In[ ]:= GeoRegionValuePlot[spotifyData, ColorFunction → "Rainbow",
        PlotRange → All, PlotLabel → "Spotify Subscribers by Country (Q4 2023)",
        Frame → True, GeoProjection → "Mercator", GeoBackground → "NaturalEarth"]
```
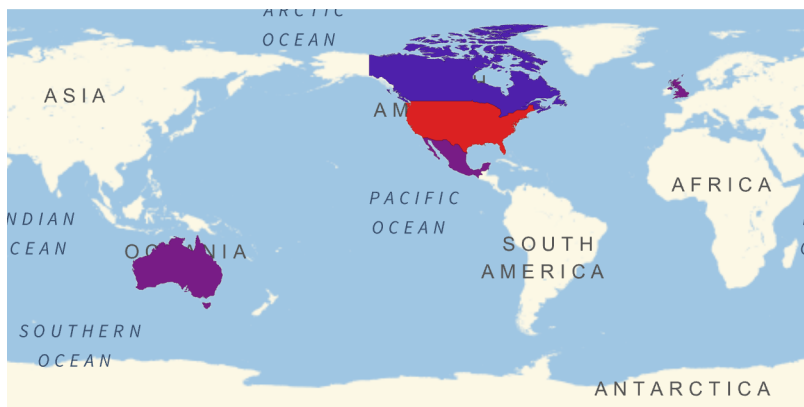
Out[ ]=


```
(*Fox*)
```

```
In[ ]:= foxData = {Entity["Country", "UnitedStates"] → 8.0,
        Entity["Country", "Canada"] → 1.0, Entity["Country", "UnitedKingdom"] → 0.5,
        Entity["Country", "Australia"] → 0.5, Entity["Country", "Mexico"] → 0.5};
```

```
In[ ]:= GeoRegionValuePlot[foxData, ColorFunction → "Rainbow", PlotRange → All,
        PlotLabel → "Fox Streaming Subscribers by Country (Q4 2023)",
        Frame → True, GeoProjection → "Mercator", GeoBackground → "NaturalEarth"]
```

Out[ ]=

Insights: The heat map provides a broader, general view of user engagement and annual subscription

trends across different countries. By color-coding regions based on subscription levels, we can easily identify which countries have the highest engagement and where platforms may be seeing slower growth. This allows us to spot regional differences and assess how various markets are responding to streaming services. For instance, some countries show consistently high subscription rates, while others reflect more seasonal or fluctuating engagement, giving insight into how platforms can tailor their strategies for specific regions.

Develop

Conclusion and Recommendation:

The pandemic reshaped the streaming industry, with industry leaders like Netflix and Disney+ benefiting from their large content libraries and versatile models. Netflix, with a valuation of $380.59 billion, maintained strong growth thanks to its efficient operations and a 30% profit margin. Disney+, meanwhile, grew rapidly from 26.5 million to 115 million subscribers, with its main driver being strong family and franchise content.

In contrast, platforms like Fox and Comcast struggled, lacking the same global appeal and content choices. Spotify, on the other hand, has a huge expansion in its subscriber base from 81 million to 225 million, and this was mainly due to its freemium model and global accessibility.

While the U.S. remains a key market, regions like India and Brazil present significant growth opportunities, especially if platforms can tailor their content to local tastes. To continue growing, streaming services will need to invest in localized, diverse content and explore hybrid monetization models that mix subscriptions with ads or pay-per-view options. This approach will be key to staying competitive and profitable in an increasingly changing market.

References

1   https://recreationrush.com/netflix-subscribers-statistics/
2   https://tridenstechnology.com/netflix-subscribers-statistics/
3   https://evoca.tv/netflix-user-statistics/
4   https://www.businessofapps.com/data/netflix-statistics/
5   https://backlinko.com/netflix-users