Business Case

Netflix - Data Exploration and Visualisation

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Introduction

Netflix is one of the most popular media and video streaming platforms. They have over 10000 movies or tv shows available on their platform, as of mid-2021, they have over 222M Subscribers globally. This tabular dataset consists of listings of all the movies and tv shows available on Netflix, along with details such as - cast, directors, ratings, release year, duration, etc.

Business Problem

Analyze the data and generate insights that could help Netflix ijn deciding which type of shows/movies to produce and how they can grow the business in different countries

Dataset

Link: Dataset_link

The dataset provided to you consists of a list of all the TV shows/movies available on Netflix:

`Show_id` : Unique ID for every Movie / Tv Show

`Type` : Identifier - A Movie or TV Show

`Title` : Title of the Movie / Tv Show

`Director` : Director of the Movie

`Cast` : Actors involved in the movie/show

`Country` : Country where the movie/show was produced

`Date_added` : Date it was added on Netflix

`Release_year` : Actual Release year of the movie/show

`Rating` : TV Rating of the movie/show

`Duration` : Total Duration - in minutes or number of seasons

`Listed_in` : Genre

`Description` : The summary description

Summary

- Netflix added more movies as compare to TV shows, as the data shows almost 70% of the content are of type Movies
- Content for United States on Netflix is maximum followed by India and UK, as compare to other countries.
- Netflix content is mostly available for Mature Audience [Only for Adults]
- Very less no. of TV shows which are meant for Children
- Most popular genres in recent years are International movies, Dramas, Comedies, and International TV Shows
- In 2020, there is significant amount of drop in content added due to COVID pandemic

For **`Movies`**

- In United States , India and United kingdom movies are more popular as comapre to other countires
- Almost same no. of movies are added on netflix every month.
- Most the movies are around the duration of 1h 30mins

For **`TV Shows`**

- Most of the TV shows have 1 season or 2 seasons.
- For Japan and South Korea, Netflix should focus more on TV shows as compare to movies

Recommendation

For **`Movies`**

- Preferred movies duration should be less than 2hrs or so.
- Netflix should add more movies for United States and India falling in category of International movies and comedies
- Netflix should add more movies for United States and India having rating of TV-MA & TV-14.
- Top three countries where movies added are United States, India & United Kingdom.
- Netflix should add Movies/TV Show on Friday than any other weekday.

For **`TV Shows`**

- Preferd movies duration is 1-2 seeasons.
- Netflix should focus on countries like Japan, South Korea and France in TV shows , as they prefer TV shows over movies.
- Netflix shoud add TV Show on Friday than other weekday
- More content for children should be added

Detailed Analysis

Importing all the `libs`

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Loading the `data`

In [2]:
```
# data_set = 'https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/original/netflix.csv'
data_set = 'netflix.csv'
```

In [3]:
```
df = pd.read_csv(data_set)
```

In [4]:
```
df.shape
```

Out[4]:
```
(8807, 12)
```

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   show_id       8807 non-null   object
 1   type          8807 non-null   object
 2   title         8807 non-null   object
 3   director      6173 non-null   object
 4   cast          7982 non-null   object
 5   country       7976 non-null   object
 6   date_added    8797 non-null   object
 7   release_year  8807 non-null   int64 
 8   rating        8803 non-null   object
 9   duration      8804 non-null   object
 10  listed_in     8807 non-null   object
 11  description   8807 non-null   object
dtypes: int64(1), object(11)
memory usage: 825.8+ KB
```

In [6]:
```
df.sample(5)
```

Out[6]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
4844	s4845	TV Show	Unbreakable Kimmy Schmidt	NaN	Ellie Kemper, Jane Krakowski, Tituss Burgess, ...	United States	May 30, 2018	2019	TV-14	4 Seasons	TV Comedies	When a woman is rescued from a doomsday cult a...
2662	s2663	TV Show	The Midnight Gospel	NaN	Duncan Trussell, Phil Hendrie, Drew Pinsky, Jo...	United States	April 20, 2020	2020	TV-MA	1 Season	TV Comedies	Traversing trippy worlds inside his universe s...
8159	s8160	Movie	Teenage Mutant Ninja Turtles II: The Secret of...	Michael Pressman	Paige Turco, David Warner, Mark Caso, Michelan...	United States, Hong Kong	January 1, 2020	1991	PG	88 min	Children & Family Movies, Comedies	The evil Shredder decides that ooze is what gi...
521	s522	TV Show	Kim's Convenience	NaN	Paul Sun-Hyung Lee, Jean Yoon, Andrea Bang, Si...	Canada	July 6, 2021	2021	TV-MA	5 Seasons	International TV Shows, TV Comedies	While running a convenience store in Toronto, ...
3994	s3995	Movie	Vince and Kath and James	Theodore Boborol	Julia Barretto, Joshua Garcia, Ronnie Alonte, ...	Philippines	March 21, 2019	2016	TV-PG	115 min	International Movies, Romantic Movies	Love can be complicated, especially when Vince...

Observation

In this data set we can see the follow which we need to take care before we do anything

> The following column contains the data seperated by comma (,) so we need to separate it out: `cast` , `director` , `country` , `listed_in`
>
> We have many `NaN` (missing value) in many fields, like `director` , `cast` , `country`
>
> The column `date_added` is a string, we may like to change it to date format
>
> The column `duration` is mixed, like in mins for Movie and no. of seasons for TV Show

Exploring the data

In [7]:
```
df.describe()
```

Out[7]:

	release_year
count	8807.000000
mean	2014.180198
std	8.819312
min	1925.000000
25%	2013.000000
50%	2017.000000
75%	2019.000000
max	2021.000000

In [8]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   show_id       8807 non-null   object
 1   type          8807 non-null   object
 2   title         8807 non-null   object
 3   director      6173 non-null   object
 4   cast          7982 non-null   object
 5   country       7976 non-null   object
 6   date_added    8797 non-null   object
 7   release_year  8807 non-null   int64 
 8   rating        8803 non-null   object
 9   duration      8804 non-null   object
 10  listed_in     8807 non-null   object
 11  description   8807 non-null   object
dtypes: int64(1), object(11)
memory usage: 825.8+ KB
```

In [9]:
```
df.describe(include='object').T
```

Out[9]:

	count	unique	top	freq
show_id	8807	8807	s1	1
type	8807	2	Movie	6131
title	8807	8807	Dick Johnson Is Dead	1
director	6173	4528	Rajiv Chilaka	19
cast	7982	7692	David Attenborough	19
country	7976	748	United States	2818
date_added	8797	1767	January 1, 2020	109
rating	8803	17	TV-MA	3207
duration	8804	220	1 Season	1793
listed_in	8807	514	Dramas, International Movies	362
description	8807	8775	Paranormal activity at a lush, abandoned prope...	4

In [10]:
```
df.isnull().sum()
```

Out[10]:
```
show_id         0
type            0
title           0
director     2634
cast          825
country       831
date_added     10
release_year    0
rating          4
duration        3
listed_in       0
description     0
dtype: int64
```

In [11]:
```
# Percentage of null value in each columns
(df.isnull().sum() / df.shape[0]) * 100
```

Out[11]:
```
show_id         0.000000
type            0.000000
title           0.000000
director       29.908028
cast            9.367549
country         9.435676
date_added      0.113546
release_year    0.000000
rating          0.045418
duration        0.034064
listed_in       0.000000
description     0.000000
dtype: float64
```

In [12]:
```
df.columns
```

Out[12]:
```
Index(['show_id', 'type', 'title', 'director', 'cast', 'country', 'date_added',
       'release_year', 'rating', 'duration', 'listed_in', 'description'],
      dtype='object')
```

In [13]:
```
df.nunique()
```

Out[13]:
```
show_id         8807
type               2
title           8807
director        4528
cast            7692
country          748
date_added      1767
release_year      74
rating            17
duration         220
listed_in        514
description     8775
dtype: int64
```

In [14]:
```
df.shape
```

Out[14]:
```
(8807, 12)
```

Unnesting the data for few of the cols (`cast`, `director`, `country`, `listed_in`)

In [15]:
```
df.head(4)
```

Out[15]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	90 min	Documentaries	As her father nears the end of his life, filmm...
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, TV Dramas, TV Mysteries	After crossing paths at a party, a Cape Town t...
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021	TV-MA	1 Season	Crime TV Shows, International TV Shows, TV Act...	To protect his family from a powerful drug lor...
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseries, Reality TV	Feuds, flirtations and toilet talk go down amo...

I. Unnesting `Cast`

In [16]:
```
df_1 = df.loc[:,'cast'].apply(lambda x: str(x).split(', ')).tolist()
df_1 = pd.DataFrame(df_1, index=df.title).stack().reset_index()
df_1 = df_1.loc[:, ['title', 0]]
df_1 = df_1.rename(columns={0: "cast"})
```

In [17]:
```
df_1
```

Out[17]:

	title	cast
0	Dick Johnson Is Dead	nan
1	Blood & Water	Ama Qamata
2	Blood & Water	Khosi Ngema
3	Blood & Water	Gail Mabalane
4	Blood & Water	Thabang Molaba
...	...	...
64946	Zubaan	Manish Chaudhary
64947	Zubaan	Meghna Malik
64948	Zubaan	Malkeet Rauni
64949	Zubaan	Anita Shabdish
64950	Zubaan	Chittaranjan Tripathy

64951 rows × 2 columns

II. Unnesting `Directors`

In [18]:
```
df_2 = df.loc[:,'director'].apply(lambda x: str(x).split(', ')).tolist()
df_2 = pd.DataFrame(df_2, index=df.title).stack().reset_index()
df_2 = df_2.loc[:, ['title', 0]]
df_2 = df_2.rename(columns={0: "director"})
```

In [19]:
```
df_2
```

Out[19]:

	title	director
0	Dick Johnson Is Dead	Kirsten Johnson
1	Blood & Water	nan
2	Ganglands	Julien Leclercq
3	Jailbirds New Orleans	nan
4	Kota Factory	nan
...	...	...
9607	Zodiac	David Fincher
9608	Zombie Dumb	nan
9609	Zombieland	Ruben Fleischer
9610	Zoom	Peter Hewitt
9611	Zubaan	Mozez Singh

9612 rows × 2 columns

III. Unnesting `listed_in`

In [20]:
```
df_3 = df.loc[:,'listed_in'].apply(lambda x: str(x).split(', ')).tolist()
df_3 = pd.DataFrame(df_3, index=df.title).stack().reset_index()
df_3 = df_3.loc[:, ['title', 0]]
df_3 = df_3.rename(columns={0: "listed_in"})
```

In [21]:
```
df_3
```

Out[21]:

	title	listed_in
0	Dick Johnson Is Dead	Documentaries
1	Blood & Water	International TV Shows
2	Blood & Water	TV Dramas
3	Blood & Water	TV Mysteries
4	Ganglands	Crime TV Shows
...	...	...
19318	Zoom	Children & Family Movies
19319	Zoom	Comedies
19320	Zubaan	Dramas
19321	Zubaan	International Movies
19322	Zubaan	Music & Musicals

19323 rows × 2 columns

IV. Unnesting `country`

In [22]:
```
df_4 = df.loc[:,'country'].apply(lambda x: str(x).split(', ')).tolist()
df_4 = pd.DataFrame(df_4, index=df.title).stack().reset_index()
df_4 = df_4.loc[:, ['title', 0]]
df_4 = df_4.rename(columns={0: "country"})
```

In [23]:
```
df_4
```

Out[23]:

	title	country
0	Dick Johnson Is Dead	United States
1	Blood & Water	South Africa
2	Ganglands	nan
3	Jailbirds New Orleans	nan
4	Kota Factory	India
...	...	...
10840	Zodiac	United States
10841	Zombie Dumb	nan
10842	Zombieland	United States
10843	Zoom	United States
10844	Zubaan	India

10845 rows × 2 columns

Merging all the data after unnesting

In [24]:
```
# Merting the 4 dataframes, df_1 to df_4
df_5 = pd.merge(df_1, df_2, on='title', how='inner')
df_6 = pd.merge(df_5, df_3, on='title', how='inner')
df_7 = pd.merge(df_6, df_4, on='title', how='inner')

# Renaming the cols
df_7.rename(
            columns={
                "cast": "Actors",
                "director" : "Director",
                "listed_in" : "Genre",
                "country" : "Country"
            }, inplace=True
)

# Replacing the NaN
df_7['Actors'].replace('nan', 'Unknown Actor', inplace=True)
df_7['Director'].replace('nan', 'Unknown Director', inplace=True)
df_7['Country'].replace('nan', np.NaN, inplace=True)
```

In [25]:
```
df_7
```

Out[25]:

	title	Actors	Director	Genre	Country
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa
...	...	...	...	...	...
201986	Zubaan	Anita Shabdish	Mozez Singh	International Movies	India
201987	Zubaan	Anita Shabdish	Mozez Singh	Music & Musicals	India
201988	Zubaan	Chittaranjan Tripathy	Mozez Singh	Dramas	India
201989	Zubaan	Chittaranjan Tripathy	Mozez Singh	International Movies	India
201990	Zubaan	Chittaranjan Tripathy	Mozez Singh	Music & Musicals	India

201991 rows × 5 columns

In [26]:
```
df_7.nunique()
```

Out[26]:
```
title        8807
Actors      36440
Director     4994
Genre          42
Country       127
dtype: int64
```

Merging this new dataframe (df_7) with the original df so that we can get the other columns

In [27]:
```
# dropping those 4 columns from the original df

df_8 = df.drop(['director', 'cast', 'country', 'listed_in'], axis=1)
```

In [28]:
```
df_8
```

Out[28]:

	show_id	type	title	date_added	release_year	rating	duration	description
0	s1	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 min	As her father nears the end of his life, filmm...
1	s2	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
2	s3	TV Show	Ganglands	September 24, 2021	2021	TV-MA	1 Season	To protect his family from a powerful drug lor...
3	s4	TV Show	Jailbirds New Orleans	September 24, 2021	2021	TV-MA	1 Season	Feuds, flirtations and toilet talk go down amo...
4	s5	TV Show	Kota Factory	September 24, 2021	2021	TV-MA	2 Seasons	In a city of coaching centers known to train I...
...	...	...	...	...	...	...	...	...
8802	s8803	Movie	Zodiac	November 20, 2019	2007	R	158 min	A political cartoonist, a crime reporter and a...
8803	s8804	TV Show	Zombie Dumb	July 1, 2019	2018	TV-Y7	2 Seasons	While living alone in a spooky town, a young g...
8804	s8805	Movie	Zombieland	November 1, 2019	2009	R	88 min	Looking to survive in a world taken over by zo...
8805	s8806	Movie	Zoom	January 11, 2020	2006	PG	88 min	Dragged from civilian life, a former superhero...
8806	s8807	Movie	Zubaan	March 2, 2019	2015	TV-14	111 min	A scrappy but poor boy worms his way into a ty...

8807 rows × 8 columns

In [29]:
```
df_7.head()
```

Out[29]:

	title	Actors	Director	Genre	Country
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa

In [30]:
```
# Merging df_7 and df_8 to get the final new dataframe (df_new)
df_new = pd.merge(df_7, df_8, on='title', how='left')
df_new.head(5)
```

Out[30]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	September 25, 2021	2020	PG-13	90 min	As her father nears the end of his life, filmm...
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa	s2	TV Show	September 24, 2021	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...

In [31]:
```
df_new.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201991 entries, 0 to 201990
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   title         201991 non-null  object
 1   Actors        201991 non-null  object
 2   Director      201991 non-null  object
 3   Genre         201991 non-null  object
 4   Country       190094 non-null  object
 5   show_id       201991 non-null  object
 6   type          201991 non-null  object
 7   date_added    201833 non-null  object
 8   release_year  201991 non-null  int64 
 9   rating        201924 non-null  object
 10  duration      201988 non-null  object
 11  description   201991 non-null  object
dtypes: int64(1), object(11)
memory usage: 20.0+ MB
```

In [32]:
```
# We see many country as Null as we replaced missing data for country with NaN
df_new.isnull().sum()
```

Out[32]:
```
title              0
Actors             0
Director           0
Genre              0
Country        11897
show_id            0
type               0
date_added       158
release_year       0
rating            67
duration           3
description        0
dtype: int64
```

In [33]:
```
df_new.nunique()
```

Out[33]:
```
title           8807
Actors         36440
Director        4994
Genre             42
Country          127
show_id         8807
type               2
date_added      1767
release_year      74
rating            17
duration         220
description     8775
dtype: int64
```

In [34]:
```
df_new.shape
```

Out[34]:
```
(201991, 12)
```

Fixing the `duration` column for better analysis

In [35]:
```
df_new['duration'].isnull().sum()
```

Out[35]:
```
3
```

In [36]:
```
df_new[df_new['duration'].isnull()]
```

Out[36]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
126537	Louis C.K. 2017	Louis C.K.	Louis C.K.	Movies	United States	s5542	Movie	April 4, 2017	2017	74 min	NaN	Louis C.K. muses on religion, eternal love, gi...
131603	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	Movies	United States	s5795	Movie	September 16, 2016	2010	84 min	NaN	Emmy-winning comedy writer Louis C.K. brings h...
131737	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	Movies	United States	s5814	Movie	August 15, 2016	2015	66 min	NaN	The comic puts his trademark hilarious/thought...

In [37]:
```
df_new.loc[df_new['duration'].isnull(), 'duration']
```

Out[37]:
```
126537    NaN
131603    NaN
131737    NaN
Name: duration, dtype: object
```

In [38]:
```
df_new.loc[df_new['duration'].isnull(), 'rating']
```

Out[38]:
```
126537    74 min
131603    84 min
131737    66 min
Name: rating, dtype: object
```

In [39]:
```
# We can see that these 3 missing duration is placed in the rating column. So lets fix that

# Fixing the duration column
```

```
df_new.loc[df_new['duration'].isnull(), 'duration'] = df_new.loc[df_new['duration'].isnull(), 'rating']

# Fixing the rating column
df_new.loc[df_new['rating'].str.contains('min', na=False), 'rating'] = np.nan
```

In [40]:
```
df_new['duration'].isnull().sum()
```

Out[40]:
```
0
```

In [41]:
```
df_new.loc[df_new['rating'].str.contains('min', na=False), 'rating']
```

Out[41]:
```
Series([], Name: rating, dtype: object)
```

In [42]:
```
df_new.sample(5)
```

Out[42]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description
164357	King's Ransom	Regina Hall	Jeffrey W. Byrd	Action & Adventure	Canada	s7209	Movie	November 1, 2019	2005	PG-13	98 min	A wealthy, despicable businessman comes to the...
88083	Record of Grancrest War	Ai Kayano	Unknown Director	International TV Shows	Japan	s3697	TV Show	July 1, 2019	2018	TV-MA	1 Season	Lone mage Siluca wanders the land of Atlatan, ...
160704	Indiana Jones and the Raiders of the Lost Ark	Vic Tablian	Steven Spielberg	Classic Movies	United States	s7073	Movie	January 1, 2019	1981	PG	116 min	When Indiana Jones is hired by the government ...
157738	Hell and Back	Nick Swardson	Tom Gianas	Independent Movies	United States	s6955	Movie	September 6, 2018	2015	R	86 min	When best friends break a blood oath, one of t...
115689	Borderliner	Eivind Sander	Unknown Director	International TV Shows	Norway	s4998	TV Show	March 6, 2018	2017	TV-MA	1 Season	To protect his family, a police detective cove...

In [43]:
```
# Removing the mins from the duration column (this will be used for Movies)
df_new['duration_movies'] = df_new['duration'].str.replace('min', '')

# Removing the Seasons from the duration column (this will be used for TV Shows)
df_new['duration_tv_shows'] = df_new['duration'].str.replace('Seasons', '')
df_new['duration_tv_shows'] = df_new['duration_tv_shows'].str.replace('Season', '')
```

In [44]:
```
df_new.sample(4)
```

Out[44]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows
9986	Sky Rojo	Miguel Ángel Silvestre	Unknown Director	International TV Shows	Spain	s402	TV Show	July 23, 2021	2021	TV-MA	2 Seasons	A fatal turn of events at a brothel sends thre...	2 Seasons	2
93468	Ultraman	Eiji Hanawa	Unknown Director	Anime Series	United States	s3959	TV Show	April 1, 2019	2019	TV-14	1 Season	Decades ago, a hero from the stars left this w...	1 Season	1
176888	Power Rangers Lightspeed Rescue	Alison MacInnis	Unknown Director	Kids' TV	Japan	s7767	TV Show	January 1, 2016	2000	TV-Y7	1 Season	As demons rumble from their graves beneath Mar...	1 Season	1
74886	Sincerely Yours, Dhaka	Shamol Mawla	Abdullah Al Noor	Comedies	Bangladesh	s3125	Movie	December 16, 2019	2018	TV-MA	136 min	Eleven emerging Bangladeshi filmmakers present...	136	136 min

In [45]:
```
def filter_tv_shows(d):
    if (type(d) is not float) and ('min' in d):
        return 0
    else:
        return d

def filter_movie(d):
    if (type(d) is not float) and ('Season' in d):
        return 0
    else:
        return d

df_new['duration_tv_shows'] = df_new['duration_tv_shows'].apply(filter_tv_shows)
df_new['duration_movies'] = df_new['duration_movies'].apply(filter_movie)
```

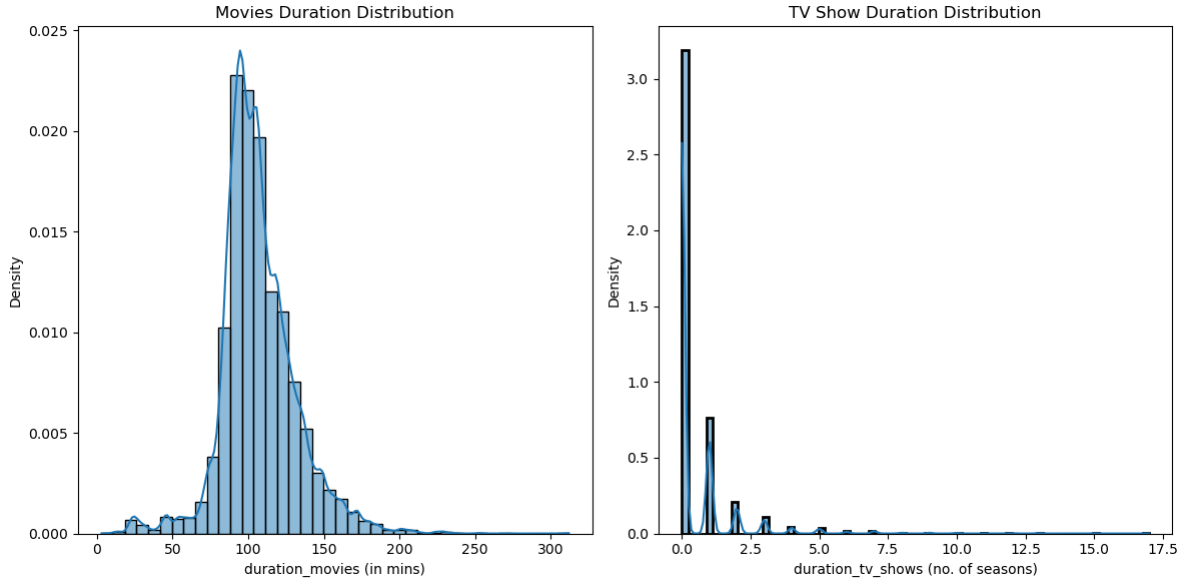
In [46]:
```
df_new.sample(5)
```

Out[46]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows
194347	The Prison	Kyeong-yeong Lee	Na Hyeon	Dramas	South Korea	s8468	Movie	November 18, 2017	2017	TV-MA	125 min	A cop-turned-convict discovers a crime syndica...	125	0
168210	Magnetic	Wille Lindberg	Thierry Donard	International Movies	France	s7379	Movie	June 12, 2020	2018	TV-14	110 min	Attracted to thrills across the globe, intrepi...	110	0
45749	I'm Leaving Now	Unknown Actor	Lindsey Cordero	Documentaries	United States	s1914	Movie	October 1, 2020	2019	TV-MA	75 min	In this evocative documentary, an undocumented...	75	0
55661	Lost Bullet	Arthur Aspaturian	Guillaume Pierret	International Movies	France	s2359	Movie	June 19, 2020	2020	TV-MA	93 min	Facing a murder charge, a genius mechanic with...	93	0
179681	Room on the Broom	Martin Clunes	Max Lang	Independent Movies	United Kingdom	s7892	Movie	July 1, 2019	2012	TV-Y7	26 min	A gentle witch with a ginger braid offers ride...	26	0

In [47]:
```
df_new['duration_tv_shows'] = df_new['duration_tv_shows'].astype('int')
df_new['duration_movies'] = df_new['duration_movies'].astype('int')
```

In [48]:
```
# Create a figure and subplots
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 6))

# Plotting the Movies duration distribution
movie_duration = df_new.loc[df_new['duration_movies'] > 0, 'duration_movies']
sns.histplot(movie_duration, kde=True, bins=40,
             edgecolor='black', linewidth=1, stat='density', ax=ax1)
ax1.set_title('Movies Duration Distribution')
ax1.set_xlabel('duration_movies (in mins)')

# Plotting the TV Shows duration distribution
tv_dutation = df_new['duration_tv_shows']
sns.histplot(tv_dutation, kde=True, bins=75,
             edgecolor='black', linewidth=2, stat='density', ax=ax2)
ax2.set_title('TV Show Duration Distribution')
ax2.set_xlabel('duration_tv_shows (no. of seasons)')

# Adjust spacing between subplots
fig.tight_layout()

# Display the plot
plt.show()
```



Observation

> As we can see most of the TV shows have 1 season.
>
> Most the movies are around the duration of 1h 30mins

Changing the datatypes for the `date_added` column

In [49]:
```
df_new.dtypes
```

Out[49]:
```
title                object
Actors               object
Director             object
Genre                object
Country              object
show_id              object
type                 object
date_added           object
release_year          int64
rating               object
duration             object
description          object
duration_movies       int64
duration_tv_shows     int64
dtype: object
```

In [50]:
```
df_new['date_added'].isnull().sum()
```

Out[50]:
```
158
```

In [51]:
```
df['date_added']
```

Out[51]:
```
0       September 25, 2021
1       September 24, 2021
2       September 24, 2021
3       September 24, 2021
4       September 24, 2021
               ...
8802     November 20, 2019
8803          July 1, 2019
8804      November 1, 2019
8805      January 11, 2020
8806         March 2, 2019
Name: date_added, Length: 8807, dtype: object
```

In [52]:
```
def convert_datetime(d):
    if type(d) is not float:
        d = str(d).strip()
    return d
```

In [53]:
```
df_new['date_added'] = df_new['date_added'].map(convert_datetime)
```

In [54]:
```
df_new['date_added'].isna().sum()
```

Out[54]:
```
158
```

In [55]:
```
df_new['date_added'] = pd.to_datetime(df_new['date_added'])
```

In [56]:
```
df_new['date_added'].isna().sum()
```

Out[56]:
```
158
```

In [57]:
```
df_new['date_added_month'] = df_new['date_added'].dt.month
df_new['date_added_year'] = df_new['date_added'].dt.year
df_new['date_added_day'] = df_new['date_added'].dt.day
df_new['date_added_day_name'] = df_new['date_added'].dt.day_name()
df_new['date_added_month_name'] = df_new['date_added'].dt.month_name()
```

In [58]:
```
df_new.sample(10)
```

Out[58]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_
58325	The Stolen	Alice Eve	Niall Johnson	Dramas	United Arab Emirates	s2456	Movie	2020-06-01	2016	TV-14	98 min	A well-to-do British woman must venture into N...	98	0	6.0	20
49670	True: Friendship Day	Michela Luci	Todd Kauffman	Children & Family Movies	Canada	s2082	Movie	2020-09-01	2020	TV-Y	24 min	When a giant Grippity-Grab snags Grizelda's fr...	24	0	9.0	20
20735	The Platform	Mahira Abdelaziz	Unknown Director	International TV Shows	United Arab Emirates	s821	TV Show	2021-06-02	2021	TV-14	3 Seasons	A programming genius builds a fact-finding, tr...	0	3	6.0	2
82515	Creeped Out	Julian Richings	Unknown Director	TV Thrillers	Canada	s3450	TV Show	2019-10-04	2019	TV-PG	2 Seasons	A masked figure known as "The Curious" collect...	0	2	10.0	2
100782	Mowgli: Legend of the Jungle	Freida Pinto	Andy Serkis	Children & Family Movies	United States	s4320	Movie	2018-12-07	2018	PG-13	105 min	An orphaned boy raised by animals in the jungl...	105	0	12.0	2
99391	Life Ki Toh Lag Gayi	Asrani	Rakesh Mehta	Action & Adventure	India	s4256	Movie	2018-12-28	2012	TV-MA	109 min	A vengeful son, a cop on a mission, a wannabe ...	109	0	12.0	2
192791	The Longshots	Glenn Plummer	Fred Durst	Comedies	United States	s8403	Movie	2019-01-30	2008	PG	95 min	When an 11-year-old girl becomes Pop Warner fo...	95	0	1.0	2
25564	Four Sisters Before the Wedding	Bea Alonzo	Mae Czarina Cruz	Children & Family Movies	Philippines	s1031	Movie	2021-04-16	2020	TV-MA	116 min	When their parents' marriage threatens to crum...	116	0	4.0	2
3938	My Boss's Daughter	David Koechner	David Zucker	Romantic Movies	United States	s164	Movie	2021-09-01	2003	R	86 min	A young man house-sits for his mean boss, hopi...	86	0	9.0	2
134003	The Short Game	Jack Nicklaus	Josh Greenbaum	Sports Movies	United States	s5938	Movie	2013-12-12	2013	PG	100 min	They are fiercely competitive athletes, determ...	100	0	12.0	2

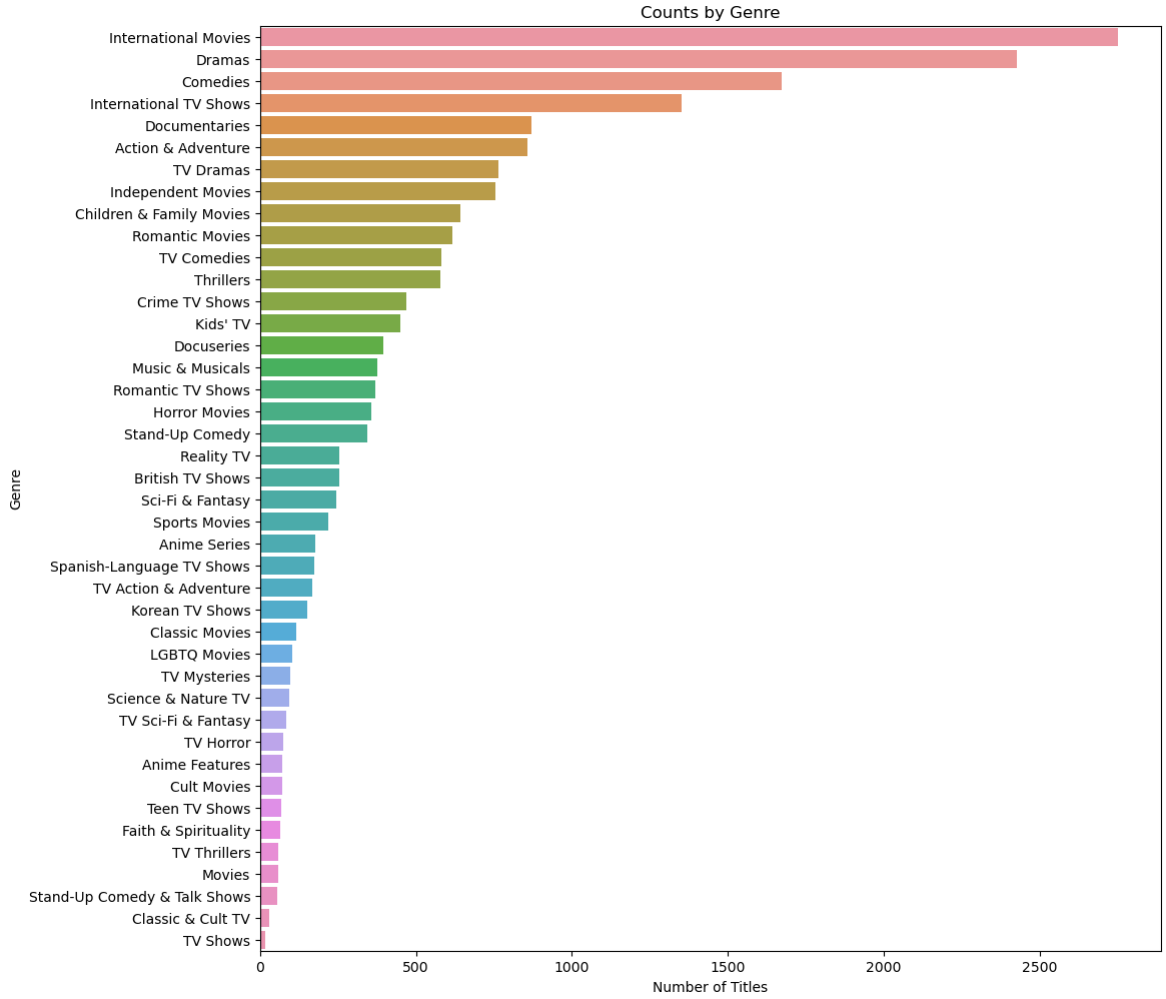
Analysis of the `Genre` column

In [59]:
```
df_new['Genre'].value_counts()
```

Out[59]:
```
Dramas                          29775
International Movies            28211
Comedies                        20829
International TV Shows          12845
Action & Adventure              12216
Independent Movies               9834
Children & Family Movies         9771
TV Dramas                        8942
Thrillers                        7107
Romantic Movies                  6412
TV Comedies                      4963
Crime TV Shows                   4733
Horror Movies                    4571
Kids' TV                         4568
Sci-Fi & Fantasy                 4037
Music & Musicals                 3077
Romantic TV Shows                3049
Documentaries                    2407
Anime Series                     2313
TV Action & Adventure            2288
Spanish-Language TV Shows        2126
British TV Shows                 1808
Sports Movies                    1531
Classic Movies                   1434
TV Mysteries                     1281
Korean TV Shows                  1122
Cult Movies                      1077
TV Sci-Fi & Fantasy              1045
Anime Features                   1045
TV Horror                         941
Docuseries                        845
LGBTQ Movies                      838
TV Thrillers                      768
Teen TV Shows                     742
Reality TV                        735
Faith & Spirituality              719
Stand-Up Comedy                   540
Movies                            412
TV Shows                          337
Classic & Cult TV                 272
Stand-Up Comedy & Talk Shows      268
Science & Nature TV               157
Name: Genre, dtype: int64
```

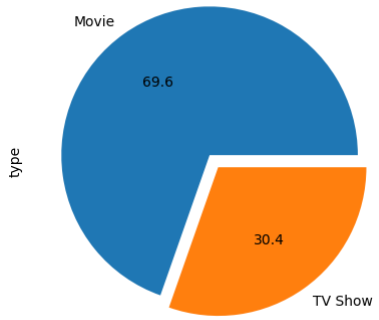
In [60]:
```
genre_title_count = df_new.groupby('Genre').agg({"title":"nunique"}).sort_values(by=['title'],
                                                 ascending=False).reset_index()
genre_title_count.columns = ['Genre', 'Title']
```

In [61]:
```
# Plotting a horizontal bar chart
plt.figure(figsize=(30, 12))
sns.barplot(x='Title', y='Genre', data=genre_title_count)

# Set plot title and axis labels
plt.title('Counts by Genre')
plt.xlabel('Number of Titles')
plt.ylabel('Genre')

plt.subplots_adjust(left=0.6)
```



Analysis based on `type` column (TV show vs Movies)

In [62]:
```
# Check the distribution of TV Show and Movie
df['type'].value_counts(normalize=True).plot(kind='pie', autopct='%.1f', explode=(0.05,0.05));
```



Observation

> As we can see almost 70% of the content are Movie and 30% are TV shows

In [63]:
```
df_new
```

Out[63]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_ye
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	2021-09-25	2020	PG-13	90 min	As her father nears the end of his life, filmm...	90	0	9.0	202
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	202
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	202
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	202
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	202
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
201986	Zubaan	Anita Shabdish	Mozez Singh	International Movies	India	s8807	Movie	2019-03-02	2015	TV-14	111 min	A scrappy but poor boy worms his way into a ty...	111	0	3.0	201
201987	Zubaan	Anita Shabdish	Mozez Singh	Music & Musicals	India	s8807	Movie	2019-03-02	2015	TV-14	111 min	A scrappy but poor boy worms his way into a ty...	111	0	3.0	201
201988	Zubaan	Chittaranjan Tripathy	Mozez Singh	Dramas	India	s8807	Movie	2019-03-02	2015	TV-14	111 min	A scrappy but poor boy worms his way into a ty...	111	0	3.0	201
201989	Zubaan	Chittaranjan Tripathy	Mozez Singh	International Movies	India	s8807	Movie	2019-03-02	2015	TV-14	111 min	A scrappy but poor boy worms his way into a ty...	111	0	3.0	201
201990	Zubaan	Chittaranjan Tripathy	Mozez Singh	Music & Musicals	India	s8807	Movie	2019-03-02	2015	TV-14	111 min	A scrappy but poor boy worms his way into a ty...	111	0	3.0	201

201991 rows × 19 columns

Analysis based on `country` column

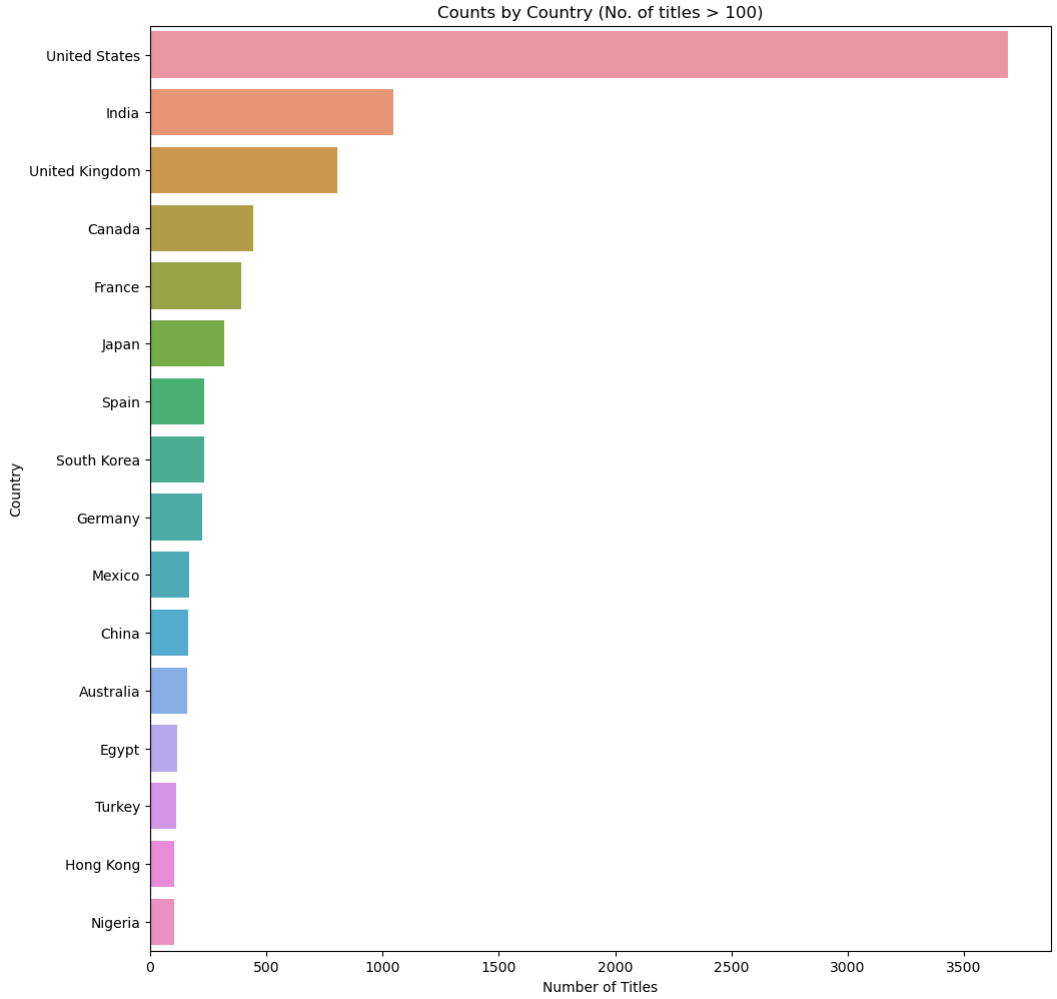
In [64]:
```
#number of distinct titles on the basis of country
country_title_count = df_new.groupby('Country').agg({"title":"nunique"}).sort_values(by=['title'],
                                                    ascending=False).reset_index()
country_title_count.columns = ['Country', 'Title']
```

In [65]:
```
country_title_count[country_title_count.Title > 100]
```

Out[65]:

	Country	Title
0	United States	3689
1	India	1046
2	United Kingdom	804
3	Canada	445
4	France	393
5	Japan	318
6	Spain	232
7	South Korea	231
8	Germany	226
9	Mexico	169
10	China	162
11	Australia	160
12	Egypt	117
13	Turkey	113
14	Hong Kong	105
15	Nigeria	103

In [66]:
```
# Plotting a horizontal bar chart
plt.figure(figsize=(30, 12))
sns.barplot(x='Title', y='Country', data=country_title_count[country_title_count.Title > 100])

# Set plot title and axis labels
plt.title('Counts by Country (No. of titles > 100)')
plt.xlabel('Number of Titles')
plt.ylabel('Country')

plt.subplots_adjust(left=0.6)
```



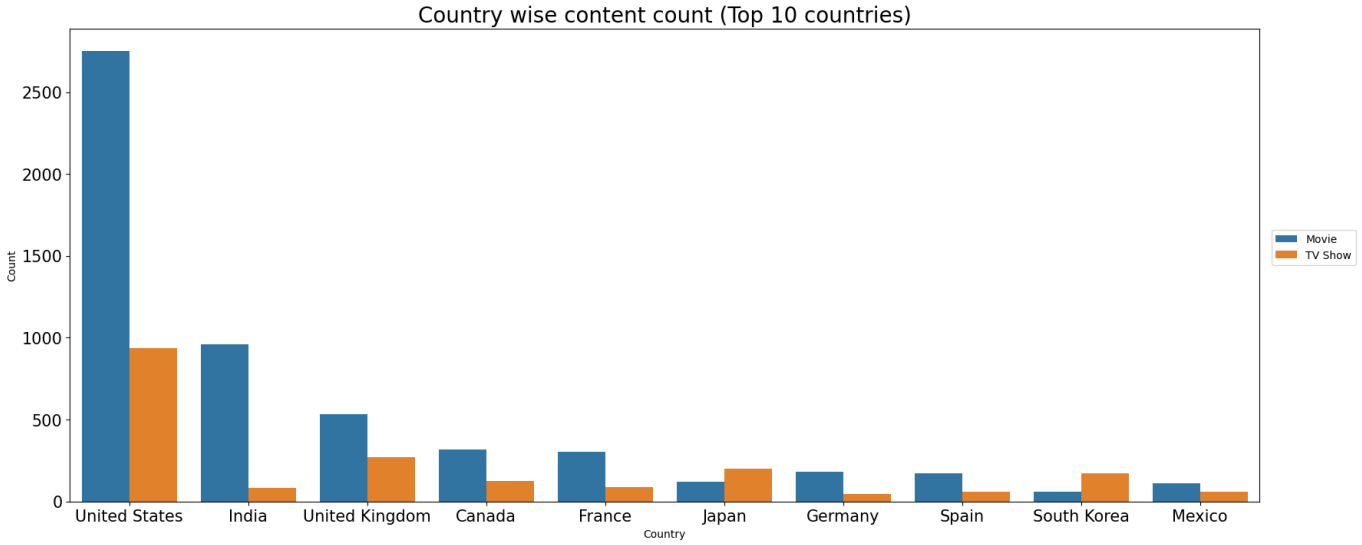
Observation

> US,India,UK,Canada and France are leading countries in Content Creation on Netflix

In [67]:
```
#number of distinct titles on the basis of country
country_title_count = df_new.groupby(['Country', 'type']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                ascending=False).reset_index()
country_title_count.columns = ['Country', 'Type', 'Count']
```

In [68]:
```
top_10_countries = country_title_count.groupby(['Country']).agg({"Count":"sum"}).sort_values(by=['Count'],
                                                ascending=False).reset_index()[:10]['Country'].tolist()

top_10 = country_title_count[country_title_count['Country'].isin(top_10_countries)]
```

In [69]:
```
plt.figure(figsize=(20,8))
sns.barplot(x= "Country", y= "Count", data = top_10, hue="Type")
plt.xlabel('Country')
plt.ylabel('Count')

colors = ["#FF7F0F", "#1F77B5"]  # Custom colors for movies and TV shows bars
sns.set_palette(sns.color_palette(colors))

plt.title("Country wise content count (Top 10 countries)",  fontsize=20)
plt.xticks(fontsize=15)
plt.yticks(fontsize=15)

plt.legend(loc=(1.01,0.5))
plt.show()
```



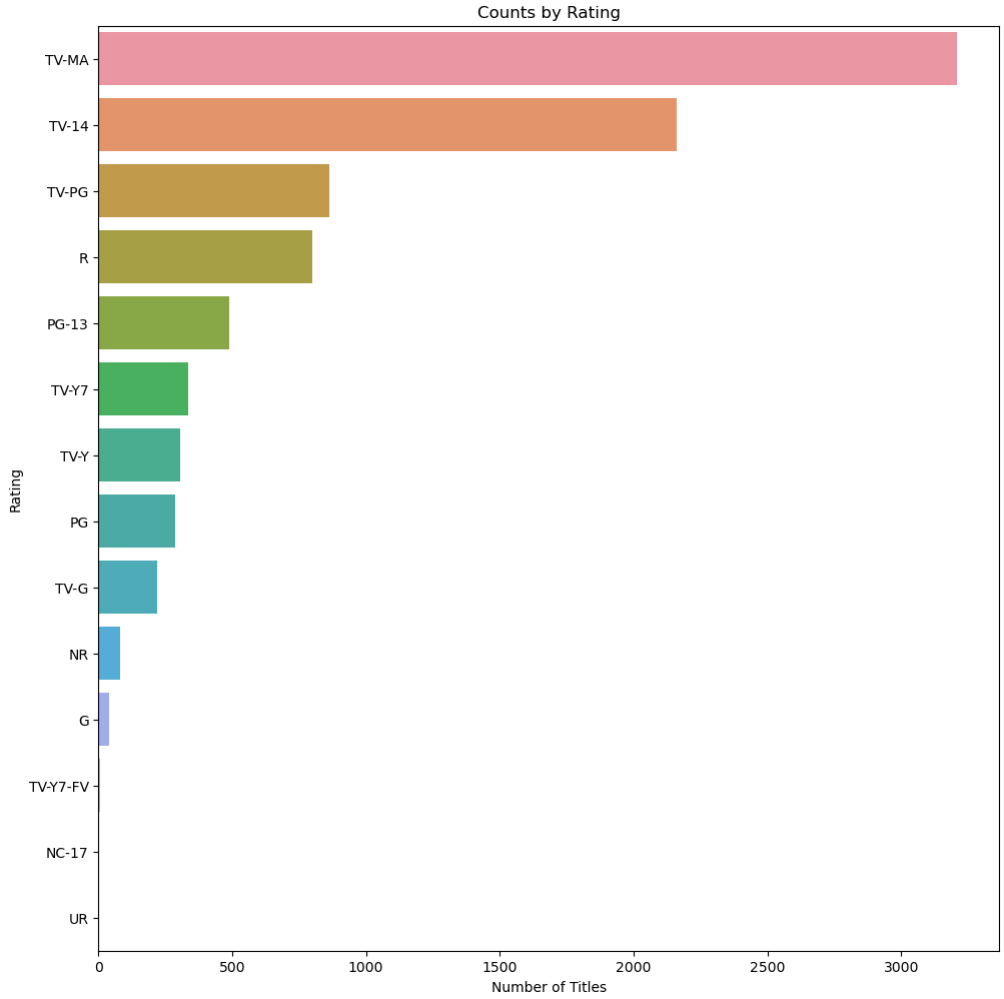
Observation

> For Japan and South Korea, Netflix should focus more on TV shows as compare to movies For India and US, most of the content are in the form of Movies

Analysis based on `rating`

In [70]:
```
#number of distinct titles on the basis of rating
rating_title_count = df_new.groupby('rating').agg({"title":"nunique"}).sort_values(by=['title'],
                                                  ascending=False).reset_index()
rating_title_count.columns = ['rating', 'Title']
```

In [71]:
```
# Plotting a horizontal bar chart
plt.figure(figsize=(30, 12))
sns.barplot(x='Title', y='rating', data=rating_title_count)

# Set plot title and axis labels
plt.title('Counts by Rating')
plt.xlabel('Number of Titles')
plt.ylabel('Rating')

plt.subplots_adjust(left=0.6)
```



Observation

> As per the above chart, most of the highly rated content on Netflix is intended for Mature Audiences, R Rated, content not intended for audience under 14 and those which require Parental Guidance

Analysis based on `duration`

I. For `Movies`

In [72]:
```
#number of distinct titles on the basis of duration
df_new.groupby(['duration_movies']).agg({"title":"nunique"}).reset_index()

duration_title_count = df_new.groupby(['duration_movies']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                ascending=False).reset_index()
duration_title_count.columns = ['Duration (in mins)', 'Title']
duration_title_count.drop(0, inplace=True)
```

In [73]:
```
duration_title_count
```

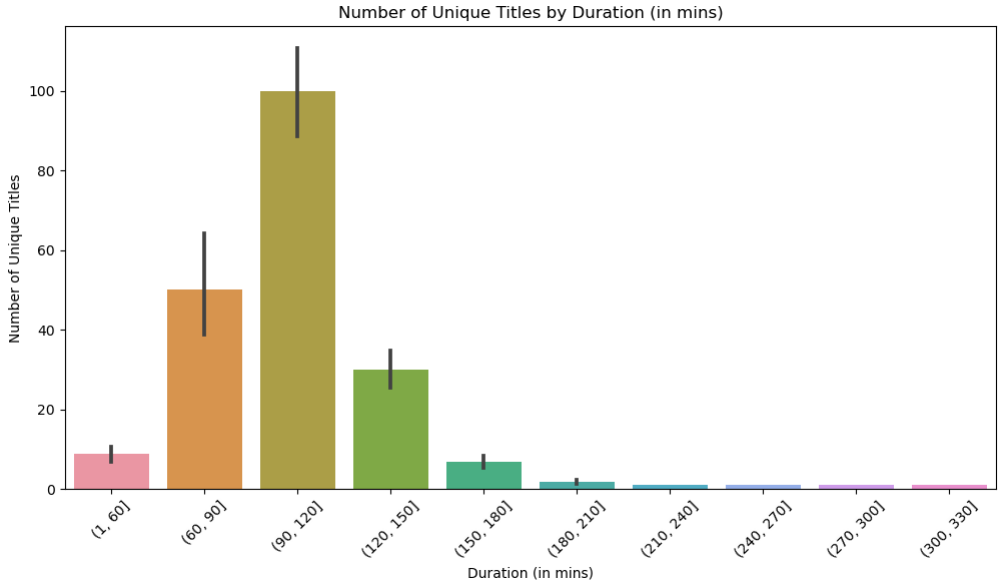
Out[73]:

	Duration (in mins)	Title
1	90	152
2	97	146
3	93	146
4	94	146
5	91	144
...	...	...
201	18	1
202	43	1
203	178	1
204	5	1
205	312	1

205 rows × 2 columns

In [74]:
```
# Set bin ranges
bins = [1] + list(range(60, duration_title_count['Duration (in mins)'].max() + 30, 30))

# Plotting the bar chart with bin size of 30 starting from 1
plt.figure(figsize=(12, 6))
sns.barplot(x=pd.cut(duration_title_count['Duration (in mins)'], bins=bins), y='Title', data=duration_title_count)

# Set plot title and axis labels
plt.title('Number of Unique Titles by Duration (in mins)')
```

```
plt.xlabel('Duration (in mins)')
plt.ylabel('Number of Unique Titles')

# Rotate x-axis labels for better readability (if needed)
plt.xticks(rotation=45)

# Display the plot
plt.show()
```



Observation

> As per the above chart, the most watched movie has a duration from 90mins to 120mins

II. For TV Shows

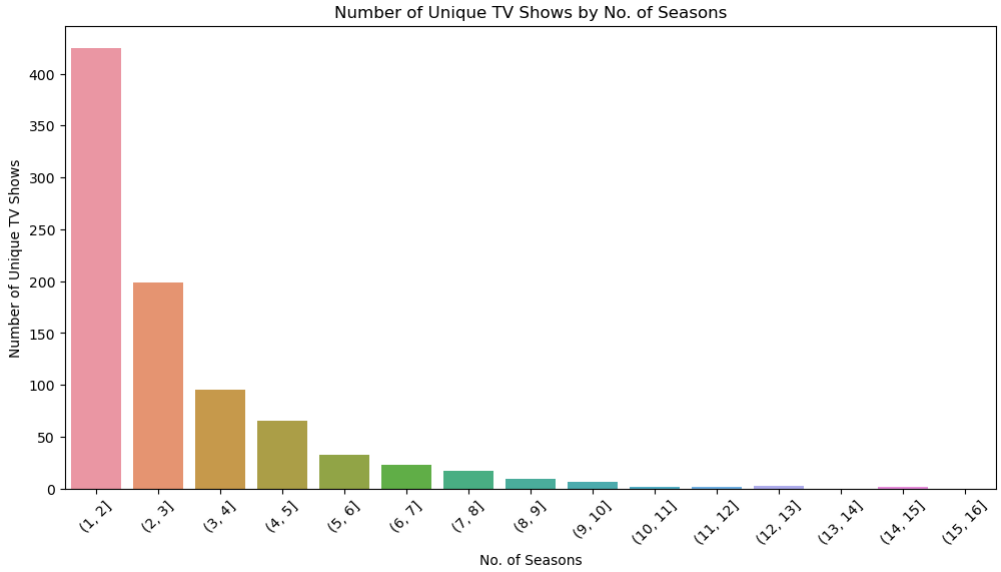
In [75]:
```
#number of distinct titles on the basis of duration
df_new.groupby(['duration_tv_shows']).agg({"title":"nunique"}).reset_index()

seasons_title_count = df_new.groupby(['duration_tv_shows']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                ascending=False).reset_index()
seasons_title_count.columns = ['No. of Seasons', 'Title']
seasons_title_count.drop(0, inplace=True)
```

In [76]:
```
seasons_title_count
```

Out[76]:

	No. of Seasons	Title
1	1	1793
2	2	425
3	3	199
4	4	95
5	5	65
6	6	33
7	7	23
8	8	17
9	9	9
10	10	7
11	13	3
12	11	2
13	12	2
14	15	2
15	17	1

In [77]:
```
# Set bin ranges
bins = list(range(1, seasons_title_count['No. of Seasons'].max()))

# Plotting the bar chart with bin size of 30 starting from 1
plt.figure(figsize=(12, 6))
sns.barplot(x=pd.cut(seasons_title_count['No. of Seasons'], bins=bins), y='Title', data=seasons_title_count)

# Set plot title and axis labels
plt.title('Number of Unique TV Shows by No. of Seasons')
plt.xlabel('No. of Seasons')
plt.ylabel('Number of Unique TV Shows')

# Rotate x-axis labels for better readability (if needed)
plt.xticks(rotation=45)

# Display the plot
plt.show()
```



In [78]:
```
bins
```

Out[78]:
```
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16]
```

Observation

> As per the above chart, the most watched TV Show has a 1 or 2 seasons

Analysis based on `Actor`

In [79]:
```
#number of distinct titles on the basis of duration
df_new.groupby(['Actors']).agg({"title":"nunique"}).reset_index()

actor_title_count = df_new.groupby(['Actors']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                    ascending=False).reset_index()
actor_title_count.columns = ['Actors', 'Title']
```

In [80]:
```
actor_title_count
```

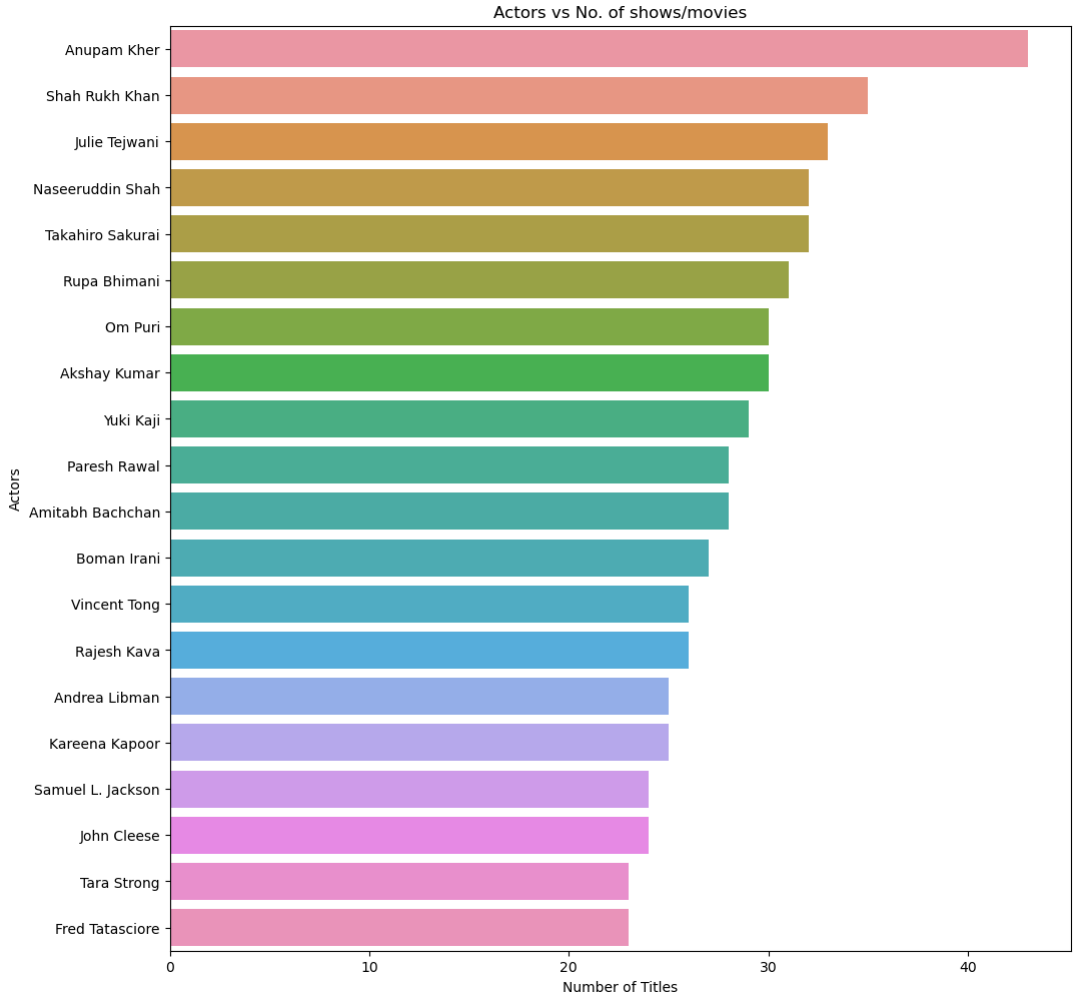
Out[80]:

	Actors	Title
0	Unknown Actor	825
1	Anupam Kher	43
2	Shah Rukh Khan	35
3	Julie Tejwani	33
4	Naseeruddin Shah	32
...	...	...
36435	Jamie Lee	1
36436	Jamie Kenna	1
36437	Jamie Kaler	1
36438	Jamie Johnston	1
36439	Ṣọpẹ́ Dìrísù	1

36440 rows × 2 columns

In [81]:
```
top_20_actors = actor_title_count[actor_title_count['Actors'] != 'Unknown Actor'].head(20)
```

In [82]:
```
# Plotting a horizontal bar chart
plt.figure(figsize=(30, 12))
sns.barplot(x='Title', y='Actors', data=top_20_actors)

# Set plot title and axis labels
plt.title('Actors vs No. of shows/movies')
plt.xlabel('Number of Titles')
plt.ylabel('Actors')

plt.subplots_adjust(left=0.6)
```



Observation

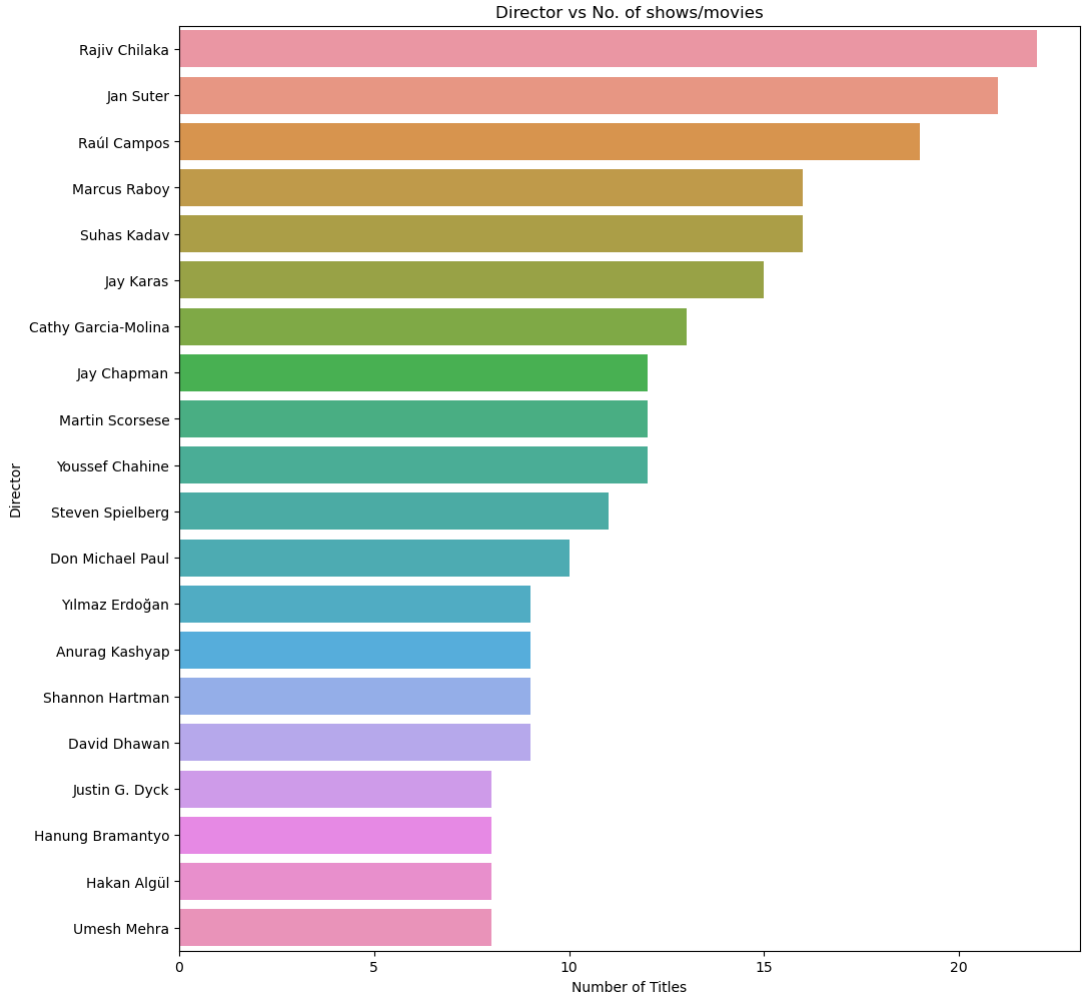
> As per the above chart, Anupam Kher,Shah Rukh Khan, Julie Tejwani, Naseeruddin Shah and Takahiro Sakurai occupy the top stop in Most Watched content.

Analysis based on `Directors`

In [83]:
```
#number of distinct titles on the basis of duration
df_new.groupby(['Director']).agg({"title":"nunique"}).reset_index()

directors_title_count = df_new.groupby(['Director']).agg({"title":"nunique"}).sort_values(by=['title'],
                                        ascending=False).reset_index()
directors_title_count.columns = ['Director', 'Title']
```

In [84]:
```
top_20_director = directors_title_count[directors_title_count['Director'] != 'Unknown Director'].head(20)
```

In [85]:
```
# Plotting a horizontal bar chart
plt.figure(figsize=(30, 12))
sns.barplot(x='Title', y='Director', data=top_20_director)

# Set plot title and axis labels
plt.title('Director vs No. of shows/movies')
plt.xlabel('Number of Titles')
plt.ylabel('Director')

plt.subplots_adjust(left=0.6)
```



Observation

> As per the above chart, Rajiv Chilaka, Jan Suter and Raul Campos are the most popular directors across Netflix.

Analysis based on number of TV Show/Movie `realeased over years`

In [86]:
```
df_new.head(2)
```

Out[86]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_year	date
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	2021-09-25	2020	PG-13	90 min	As her father nears the end of his life, filmm...	90	0	9.0	2021.0	
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	

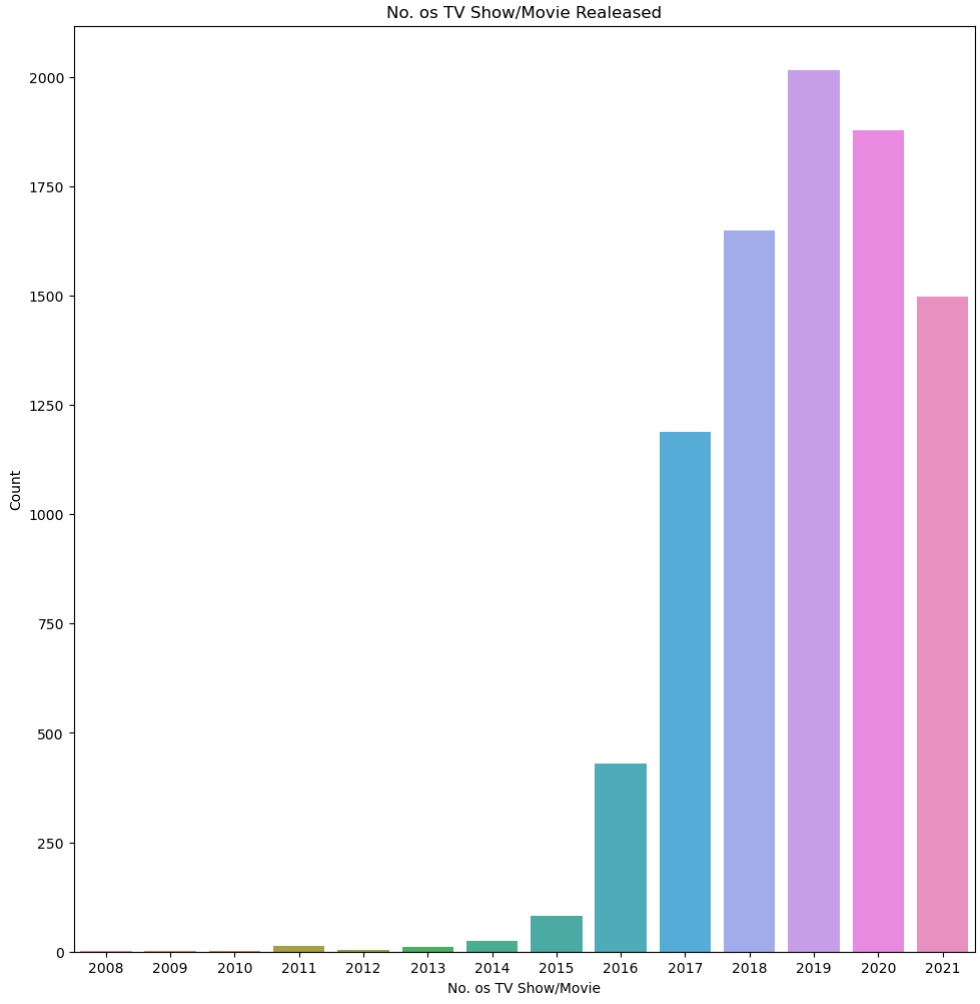
In [87]:
```
release_count_by_year = df_new.groupby(['date_added_year']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                    ascending=False).reset_index()

release_count_by_year.columns = ['Year', 'Count']
release_count_by_year.Year = release_count_by_year.Year.astype('int')
```

In [88]:
```
release_count_by_year
```

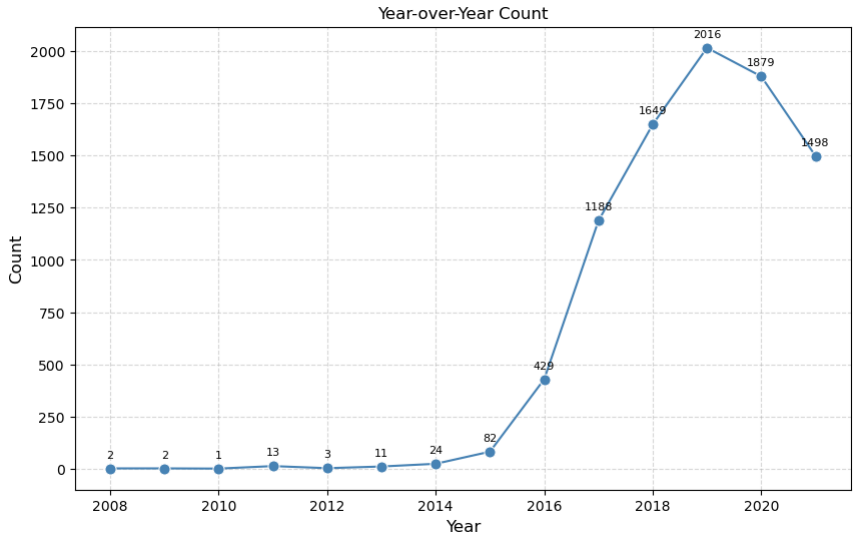
Out[88]:

	Year	Count
0	2019	2016
1	2020	1879
2	2018	1649
3	2021	1498
4	2017	1188
5	2016	429
6	2015	82
7	2014	24
8	2011	13
9	2013	11
10	2012	3
11	2008	2
12	2009	2
13	2010	1

In [89]:
```
# Plotting a horizontal bar chart
plt.figure(figsize=(30, 12))
sns.barplot(x='Year', y='Count', data=release_count_by_year)

# Set plot title and axis labels
plt.title('No. os TV Show/Movie Realeased')
plt.xlabel('No. os TV Show/Movie')
plt.ylabel('Count')

plt.subplots_adjust(left=0.6)
```



In [90]:
```
# Plotting the year-over-year count
plt.figure(figsize=(10, 6))
sns.lineplot(x='Year', y='Count', data=release_count_by_year, marker='o', markersize=8, color='steelblue')

# Set plot title and axis labels
plt.title('Year-over-Year Count')
plt.xlabel('Year', fontsize=12)
plt.ylabel('Count', fontsize=12)

# Customize tick labels and gridlines
plt.xticks(fontsize=10)
plt.yticks(fontsize=10)
plt.grid(True, linestyle='--', alpha=0.5)

# Add data labels to each point
for i, count in enumerate(release_count_by_year['Count']):
    plt.text(release_count_by_year['Year'][i], count + 50, str(count), ha='center', fontsize=8, color='black')

# Display the plot
plt.show()
```



Observation

> The Amount of Content across Netflix has increased from 2008 continuously till 2019. Then started decreasing from here(that might be due to COVID)

Analysis of TV Shows and Movies over `time`

In [91]:
```
df_new.head()
```

Out[91]:

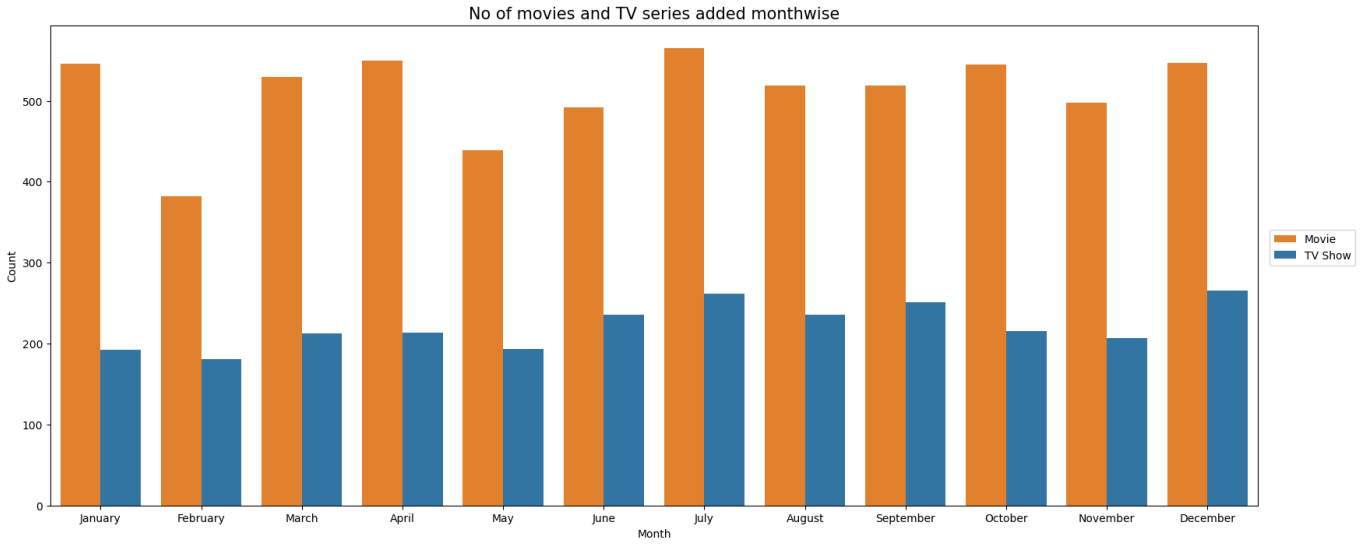
	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_year	date
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	2021-09-25	2020	PG-13	90 min	As her father nears the end of his life, filmm...	90	0	9.0	2021.0	
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	

In [92]:
```
df_datetime_month = df_new.groupby(['type', 'date_added_month', 'date_added_month_name']).agg({"title":"nunique"}).reset_index()
df_datetime_month
```

Out[92]:

	type	date_added_month	date_added_month_name	title
0	Movie	1.0	January	546
1	Movie	2.0	February	382
2	Movie	3.0	March	529
3	Movie	4.0	April	550
4	Movie	5.0	May	439
5	Movie	6.0	June	492
6	Movie	7.0	July	565
7	Movie	8.0	August	519
8	Movie	9.0	September	519
9	Movie	10.0	October	545
10	Movie	11.0	November	498
11	Movie	12.0	December	547
12	TV Show	1.0	January	192
13	TV Show	2.0	February	181
14	TV Show	3.0	March	213
15	TV Show	4.0	April	214
16	TV Show	5.0	May	193
17	TV Show	6.0	June	236
18	TV Show	7.0	July	262
19	TV Show	8.0	August	236
20	TV Show	9.0	September	251
21	TV Show	10.0	October	215
22	TV Show	11.0	November	207
23	TV Show	12.0	December	266

In [93]:
```
plt.figure(figsize=(20,8))
sns.barplot(x= "date_added_month_name", y= "title", data = df_datetime_month, hue="type")
plt.xlabel('Month')
plt.ylabel('Count')

colors = ["#FF7F0F", "#1F77B5"]  # Custom colors for movies and TV shows bars
sns.set_palette(sns.color_palette(colors))

plt.title("No of movies and TV series added monthwise",  fontsize=15)
plt.legend(loc=(1.01,0.5))
plt.show()
```



Observation

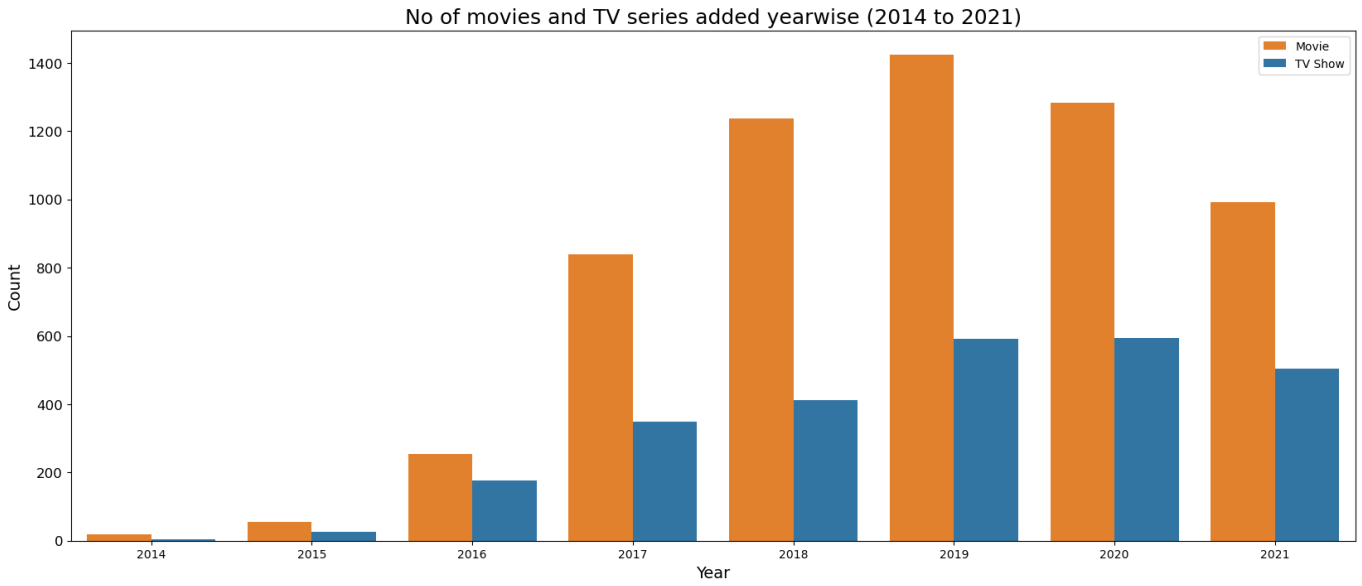
> July and December are the months when most content both for Movies and TV Shows, thats mostly beacuse of Vacation Time (schools/colleges), or may be beacuse of Summer/Winter break
>
> No of movies added per month is greater then no of TV shows added per month.

In [94]:
```
df_datetime_year = df_new.groupby(['type', 'date_added_year']).agg({"title":"nunique"}).reset_index()
df_datetime_year['date_added_year'] = df_datetime_year['date_added_year'].astype('int')
df_datetime_year_last_7years = df_datetime_year[df_datetime_year['date_added_year'] > 2013]
df_datetime_year_last_7years
```

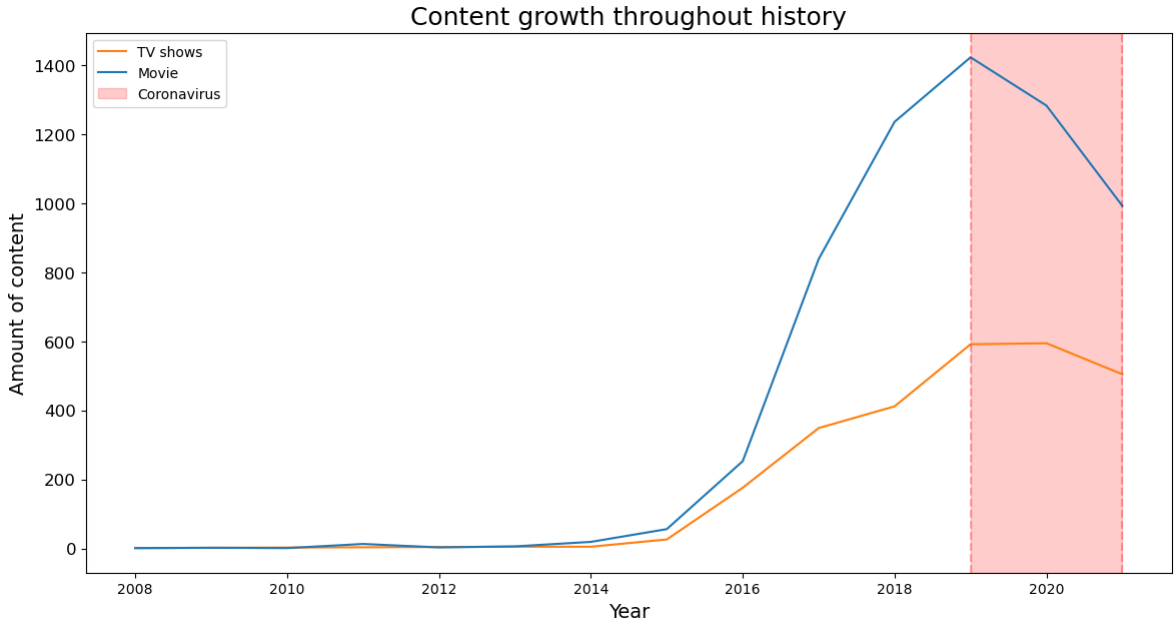
Out[94]:

	type	date_added_year	title
6	Movie	2014	19
7	Movie	2015	56
8	Movie	2016	253
9	Movie	2017	839
10	Movie	2018	1237
11	Movie	2019	1424
12	Movie	2020	1284
13	Movie	2021	993
16	TV Show	2014	5
17	TV Show	2015	26
18	TV Show	2016	176
19	TV Show	2017	349
20	TV Show	2018	412
21	TV Show	2019	592
22	TV Show	2020	595
23	TV Show	2021	505

In [95]:
```
plt.figure(figsize=(20,8))
sns.barplot(x= "date_added_year", y= "title", data = df_datetime_year_last_7years, hue="type")
plt.xlabel('Year', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.yticks(fontsize=12)

colors = ["#FF7F0F", "#1F77B5"]  # Custom colors for movies and TV shows bars
sns.set_palette(sns.color_palette(colors))

plt.title("No of movies and TV series added yearwise (2014 to 2021)",  fontsize=18)

plt.legend()
plt.show()
```



In [96]:
```
TVshows = df_datetime_year[df_datetime_year['type'] == 'TV Show']
Movie = df_datetime_year[df_datetime_year['type'] == 'Movie']

TVshows_progress = TVshows['date_added_year']
Movie_progress = Movie['date_added_year']

plt.figure(figsize=(14, 7))

plt.plot(TVshows_progress, TVshows.title, label='TV shows')
plt.plot(Movie_progress, Movie.title, label='Movie')


plt.axvline(2019, alpha=0.3, linestyle='--', color='r')
plt.axvline(2021, alpha=0.3, linestyle='--', color='r')
plt.axvspan(2019, 2021, alpha=0.2, color='r', label='Coronavirus')

# plt.xticks(list(range(1925, 2026, 5)), fontsize=12)
plt.title('Content growth throughout history', fontsize=18)
plt.xlabel('Year', fontsize=14)
plt.ylabel('Amount of content', fontsize=14)
plt.yticks(fontsize=12)
plt.legend()
plt.show()
```



Observation

> The no. of content on Netflix increased drastically from 2015 obwards
>
> 2019 is the year when Netflix added the maximum no. of TV shows and movies
>
> We can also see that after 2019, the no. of contents decreased, mostly due to COVID pandemic.

In [97]:
```
df_new.head(5)
```

Out[97]:

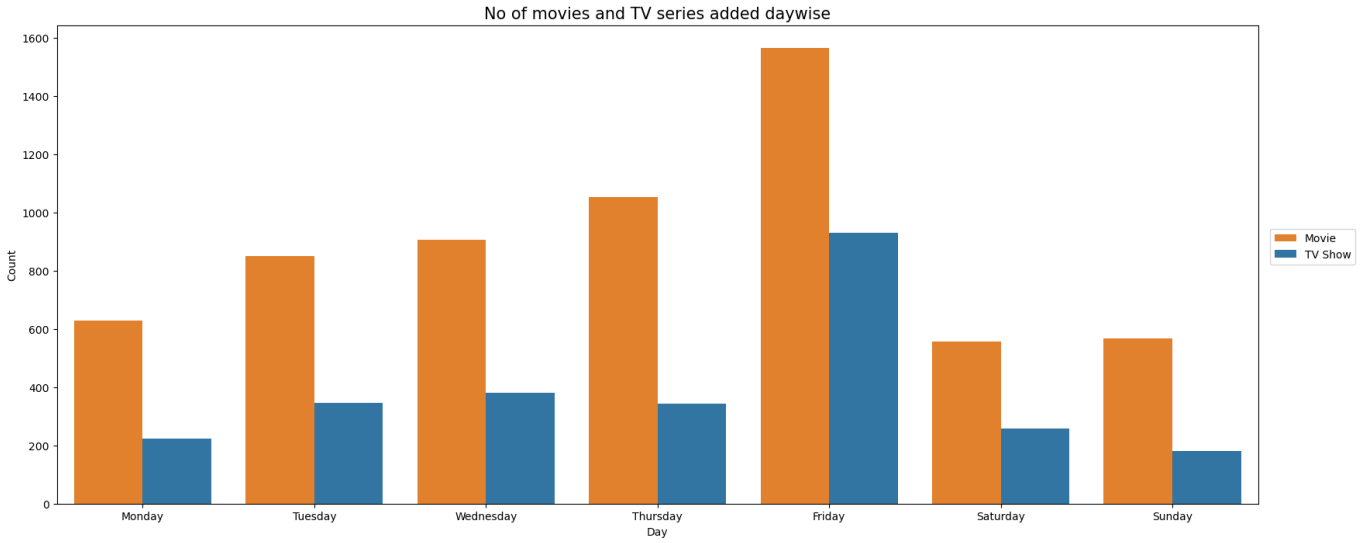
	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_year	date
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	2021-09-25	2020	PG-13	90 min	As her father nears the end of his life, filmm...	90	0	9.0	2021.0	
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	

In [98]:
```
df_datetime_day = df_new.groupby(['type', 'date_added_day_name']).agg({"title":"nunique"}).reset_index()

order = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday"]
df_datetime_day['date_added_day_name'] = pd.Categorical(df_datetime_day['date_added_day_name'], categories=order, ordered=True)
df_datetime_day = df_datetime_day.sort_values(['type', 'date_added_day_name'])

df_datetime_day
```

Out[98]:

	type	date_added_day_name	title
1	Movie	Monday	628
5	Movie	Tuesday	852
6	Movie	Wednesday	906
4	Movie	Thursday	1053
0	Movie	Friday	1566
2	Movie	Saturday	557
3	Movie	Sunday	569
8	TV Show	Monday	223
12	TV Show	Tuesday	345
13	TV Show	Wednesday	382
11	TV Show	Thursday	343
7	TV Show	Friday	932
9	TV Show	Saturday	259
10	TV Show	Sunday	182

In [99]:
```
plt.figure(figsize=(20,8))
sns.barplot(x= "date_added_day_name", y= "title", data = df_datetime_day, hue="type")
plt.xlabel('Day')
plt.ylabel('Count')

colors = ["#FF7F0F", "#1F77B5"]  # Custom colors for movies and TV shows bars
sns.set_palette(sns.color_palette(colors))

plt.title("No of movies and TV series added daywise",  fontsize=15)
plt.legend(loc=(1.01,0.5))
plt.show()
```



Observation

> Number of content added on Netflix on "Friday" is the max. followed by Thursday as weekend appraches after these days. New content on Monday, Tuesday are lower mostly beacuse its the start of the week, and we expect people would be more engrossed with work/school/college

Analysis of TV Shows and Movies over `Genre`

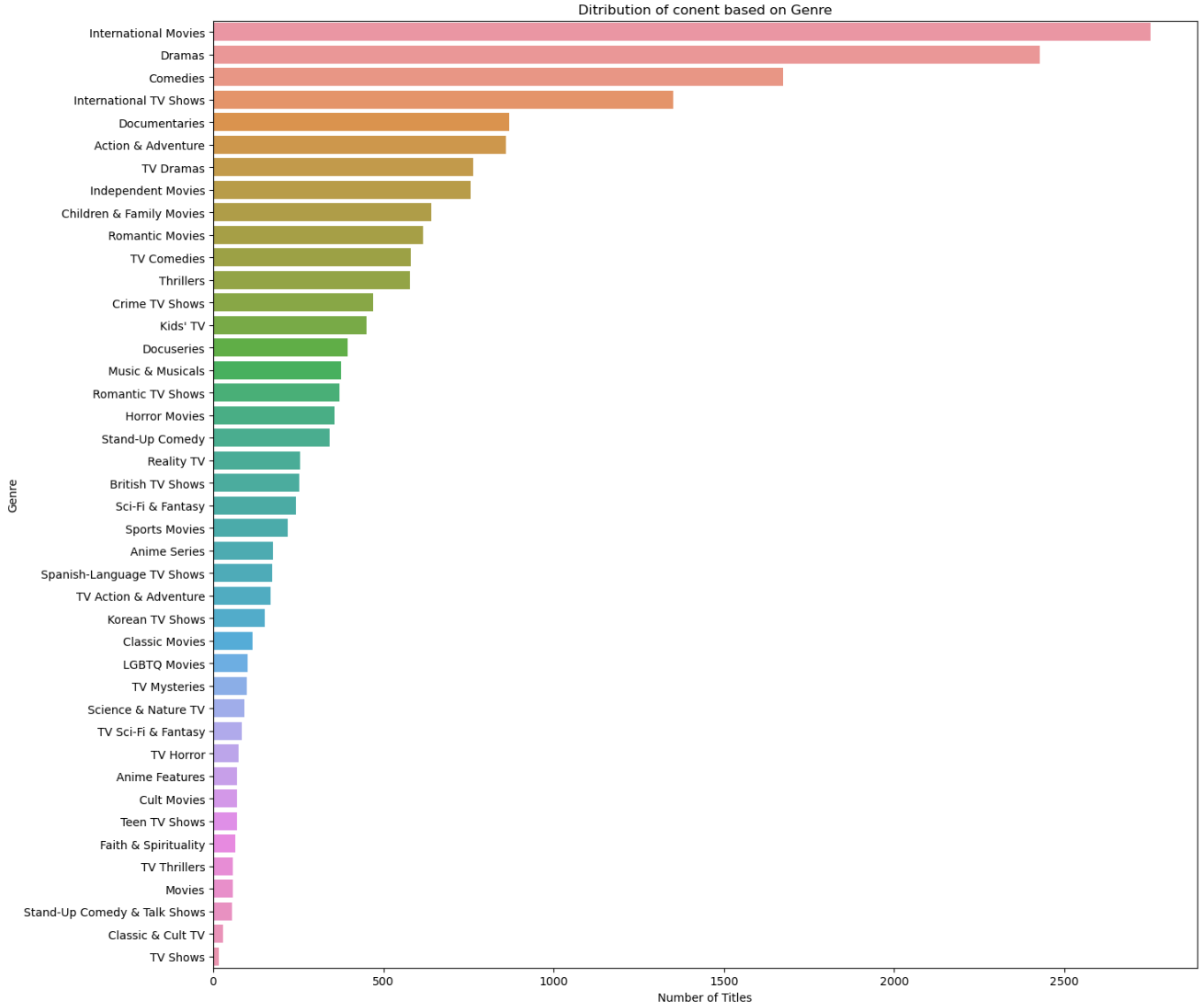
In [100…
```
df_new.head()
```

Out[100]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_year	dat
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	2021-09-25	2020	PG-13	90 min	As her father nears the end of his life, filmm...	90	0	9.0	2021.0	
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	

In [101…
```
#number of distinct titles on the basis of duration
genre_title_count = df_new.groupby(['Genre']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                  ascending=False).reset_index()
genre_title_count.columns = ['Genre', 'Title']
```

In [102…
```
# Plotting a horizontal bar chart
plt.figure(figsize=(40, 15))
sns.barplot(x='Title', y='Genre', data=genre_title_count)

# Set plot title and axis labels
plt.title('Ditribution of conent based on Genre')
plt.xlabel('Number of Titles')
plt.ylabel('Genre')

plt.subplots_adjust(left=0.6)
```



Observation

> Most appearing category in netflix movies and TV shows are:
>
> - International Movies
> - Dramas
> - Comedies
> - International TV show
> - Documentaries

Non-Graphical Analysis (Top Actors/Directors in different countries)

In [103…

```
df_new.head()
```

Out[103]:

	title	Actors	Director	Genre	Country	show_id	type	date_added	release_year	rating	duration	description	duration_movies	duration_tv_shows	date_added_month	date_added_year	dat
0	Dick Johnson Is Dead	Unknown Actor	Kirsten Johnson	Documentaries	United States	s1	Movie	2021-09-25	2020	PG-13	90 min	As her father nears the end of his life, filmm...	90	0	9.0	2021.0	
1	Blood & Water	Ama Qamata	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
2	Blood & Water	Ama Qamata	Unknown Director	TV Dramas	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
3	Blood & Water	Ama Qamata	Unknown Director	TV Mysteries	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	
4	Blood & Water	Khosi Ngema	Unknown Director	International TV Shows	South Africa	s2	TV Show	2021-09-24	2021	TV-MA	2 Seasons	After crossing paths at a party, a Cape Town t...	0	2	9.0	2021.0	

In [104…
```
dir_country = df_new[df_new['Director'] != 'Unknown Director']
dir_country_title_count = dir_country.groupby(['Country', 'Director']).agg({"title":"nunique"}).sort_values(by=['title', 'Country'],
                                          ascending=False).reset_index()
```

In [105…
```
# all_countries = dir_country_title_count['Country'].unique()

# for country in all_countries:
#     print("*******************************************************")
#     print(f"Top Directors from the country : {country}")
#     print("*******************************************************")
#     top_dir = dir_country_title_count[dir_country_title_count['Country'] == country]

#     print(top_dir.iloc[0:2, [1,2]].to_string(index=False))
#     print()
```

In [106…
```
countries = ['India', 'United States', 'United Kingdom', 'France']

for country in countries:
    print("*******************************************************")
    print(f"Top Directors from the country : {country}")
    print("*******************************************************")
    top_dir = dir_country_title_count[dir_country_title_count['Country'] == country]

    print(top_dir.iloc[0:2, [1,2]].to_string(index=False))
    print()
```

```
*******************************************************
Top Directors from the country : India
*******************************************************
      Director  title
Anurag Kashyap      9
  David Dhawan      9

*******************************************************
Top Directors from the country : United States
*******************************************************
    Director  title
   Jay Karas     15
Marcus Raboy     15

*******************************************************
Top Directors from the country : United Kingdom
*******************************************************
           Director  title
Alastair Fothergill      4
   Edward Cotterill      4

*******************************************************
Top Directors from the country : France
*******************************************************
       Director  title
 Thierry Donard      5
Youssef Chahine      4
```

Observation

> Anurag Kashyap and David Dhawan are the most famous directors for Inida.
>
> Jay Karas and Marcus Raboyare are the most famous directors in United States.
>
> Alastair Fothergill and Edward Cotterill are the most famous directors in UK.

In [107…
```
actor_country = df_new[df_new['Actors'] != 'Unknown Actor']
actor_country_title_count = actor_country.groupby(['Country', 'Actors']).agg({"title":"nunique"}).sort_values(by=['title', 'Country'],
                                          ascending=False).reset_index()
```

In [108…
```
actor_country_title_count
```

Out[108]:

	Country	Actors	title
0	India	Anupam Kher	40
1	India	Shah Rukh Khan	34
2	India	Naseeruddin Shah	31
3	Japan	Takahiro Sakurai	29
4	India	Akshay Kumar	29
...	...	...	...
50884		Nisreen Faour	1
50885		Son Suk-ku	1
50886		Souad Massi	1
50887		Suhail Haddad	1
50888		Walid Abdul Salam	1

50889 rows × 3 columns

In [109…
```
# all_countries = actor_country_title_count['Country'].unique()

# for country in all_countries:
#     print("*******************************************************")
#     print(f"Top Actors from the country : {country}")
#     print("*******************************************************")
#     top_dir = actor_country_title_count[actor_country_title_count['Country'] == country]

#     print(top_dir.iloc[0:2, [1,2]].to_string(index=False))
#     print()
```

In [110…
```
countries = ['India', 'United States', 'United Kingdom', 'France']

for country in countries:
    print("*******************************************************")
    print(f"Top Actors from the country : {country}")
    print("*******************************************************")
    top_dir = actor_country_title_count[actor_country_title_count['Country'] == country]

    print(top_dir.iloc[0:2, [1,2]].to_string(index=False))
    print()
```

```
*******************************************************
Top Actors from the country : India
*******************************************************
       Actors  title
   Anupam Kher     40
Shah Rukh Khan     34

*******************************************************
Top Actors from the country : United States
*******************************************************
          Actors  title
Samuel L. Jackson     22
      Tara Strong     22

*******************************************************
Top Actors from the country : United Kingdom
*******************************************************
           Actors  title
David Attenborough     17
       John Cleese     16

*******************************************************
Top Actors from the country : France
*******************************************************
        Actors  title
Benoît Magimel      5
Wille Lindberg      5
```

Observation

> Anupam Kher and Shah Rukh Khan are the most famous actors for Inida.
>
> Samuel L. Jackson and Tara Strong are the most famous actors for USA.
>
> David Attenboroug and John Cleese are the most famous actors for UK.

In [111…
```
top_20_actors = actor_country_title_count.sort_values('title', ascending=False)[:20]

print("***********************************************")
print("        Top 20 actors across the globe")
print("***********************************************")

print(top_20_actors)
print("***********************************************")
```

```
**********************************************
       Top 20 actors across the globe
**********************************************
          Country             Actors  title
0           India        Anupam Kher     40
1           India     Shah Rukh Khan     34
2           India   Naseeruddin Shah     31
3           Japan   Takahiro Sakurai     29
4           India       Akshay Kumar     29
5           India            Om Puri     29
6           Japan          Yuki Kaji     28
7           India   Amitabh Bachchan     28
8           India       Paresh Rawal     28
9           India        Boman Irani     27
10          India     Kareena Kapoor     25
11  United States  Samuel L. Jackson     22
12  United States        Tara Strong     22
13          Japan        Daisuke Ono     22
14  United States    Fred Tatasciore     21
15          India         Ajay Devgn     21
17          India        Salman Khan     20
16  United States       Adam Sandler     20
18  United States       James Franco     19
19  United States       Nicolas Cage     19
**********************************************
```

Heatmaps (`Country` v/s `Ratings`)

In [112…
```
#number of distinct titles on the basis of rating
rating_country_title_count = df_new.groupby(['Country', 'rating']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                ascending=False).reset_index()
rating_country_title_count.columns = ['Country', 'Rating', 'Count']
```

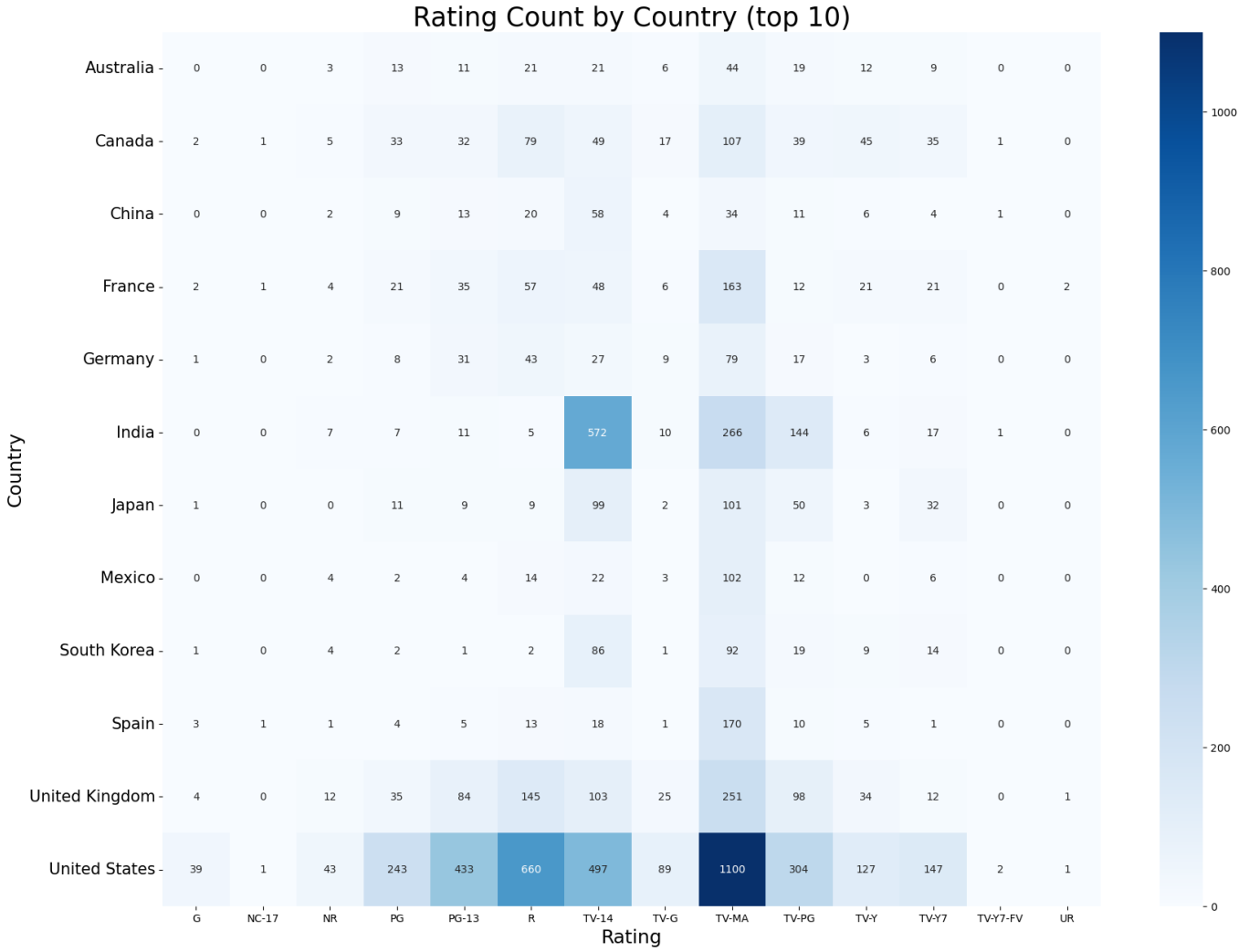
In [113…
```
rating_country_title_count
```

Out[113]:

	Country	Rating	Count
0	United States	TV-MA	1100
1	United States	R	660
2	India	TV-14	572
3	United States	TV-14	497
4	United States	PG-13	433
...	...	...	...
511	Malawi	TV-PG	1
512	Malaysia	TV-Y	1
513	Malta	PG-13	1
514	Malta	R	1
515	Zimbabwe	TV-MA	1

516 rows × 3 columns

In [114…
```
to_10_countries_names = rating_country_title_count.groupby('Country').agg({'Count': 'sum'}).sort_values(by=['Count'],
                                                ascending=False).reset_index().loc[:11, 'Country']
to_10_countries = rating_country_title_count[rating_country_title_count['Country'].isin(to_10_countries_names)]
heatmap_data = to_10_countries.pivot(index='Country', columns='Rating', values='Count')
heatmap_data = heatmap_data.fillna(0).astype('int')
plt.figure(figsize=(20, 15))

sns.heatmap(heatmap_data, annot=True, cmap="Blues", fmt = "d")
plt.title('Rating Count by Country (top 10)', fontsize=25)
plt.xlabel('Rating', fontsize=18)
plt.ylabel('Country', fontsize=18)
plt.yticks(fontsize=15)


plt.show()
```



Observation

> Top 10 countries are having most content that belongs to TV-MA catagory
>
> India and United States are having large content in TV-14 category
>
> United Kingdom and United States are having large content in R category
>
> Very less no. of TV shows which are meant for Children (TV-Y and TV-Y7)

Heatmaps (`Country` v/s `Genre`)

In [115…
```
#number of distinct titles on the basis of rating
genre_country_title_count = df_new.groupby(['Country', 'Genre']).agg({"title":"nunique"}).sort_values(by=['title'],
                                                    ascending=False).reset_index()
genre_country_title_count.columns = ['Country', 'Genre', 'Count']
```

In [116…
```
genre_country_title_count
```

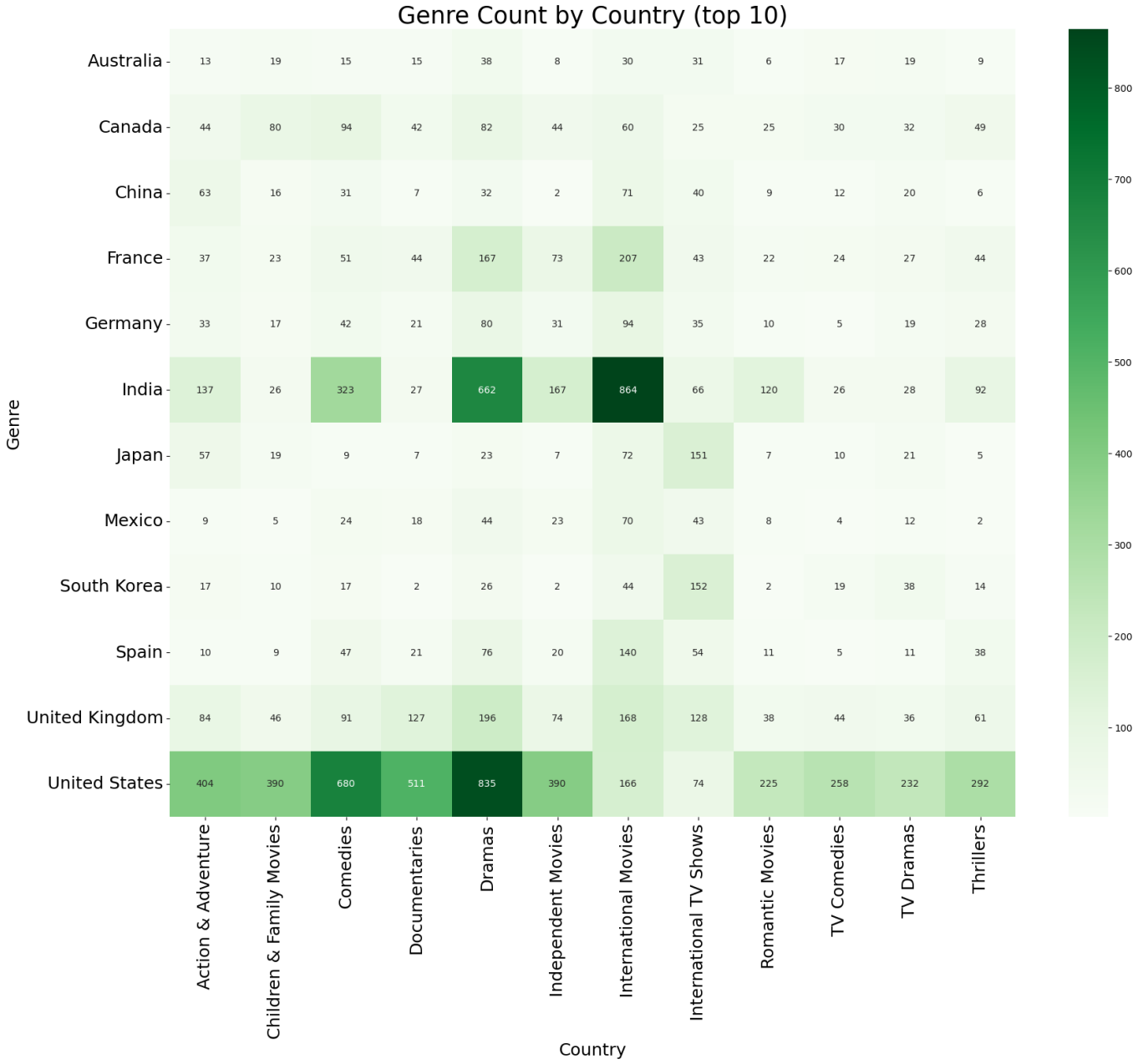
Out[116]:

	Country	Genre	Count
0	India	International Movies	864
1	United States	Dramas	835
2	United States	Comedies	680
3	India	Dramas	662
4	United States	Documentaries	511
...	...	...	...
1417	Mauritius	International TV Shows	1
1418	Mauritius	TV Dramas	1
1419	Mexico	Classic Movies	1
1420	Mexico	Faith & Spirituality	1
1421	Zimbabwe	Romantic Movies	1

1422 rows × 3 columns

In [117…
```
top_10_countries_names = genre_country_title_count.groupby('Country').agg({'Count': 'sum'}).sort_values(by=['Count'],
                                                    ascending=False).reset_index().loc[:11, 'Country']

top_10_genre_names = genre_country_title_count.groupby('Genre').agg({'Count': 'sum'}).sort_values(by=['Count'],
                                                    ascending=False).reset_index().loc[:11, 'Genre']


top_10_genre = genre_country_title_count[genre_country_title_count['Genre'].isin(top_10_genre_names)]
```

```
top_10_countries = top_10_genre[top_10_genre['Country'].isin(top_10_countries_names)]

heatmap_data = top_10_countries.pivot(index='Country', columns='Genre', values='Count')
heatmap_data = heatmap_data.fillna(0).astype('int')
plt.figure(figsize=(20, 15))

sns.heatmap(heatmap_data, annot=True, cmap="Greens", fmt = "d")
plt.title('Genre Count by Country (top 10)', fontsize=25)
plt.xlabel('Country', fontsize=18)
plt.ylabel('Genre', fontsize=18)
plt.yticks(fontsize=18)
plt.xticks(fontsize=18)


plt.show()
```



Observation

> For United States , Netflix should add more content of genre Dramas and Comedy.
>
> For India, Netflix should add more content of genre International movies , Dramas and Comedies.

End of Analysis