In [2]:
```
import pandas as pd
import numpy as np
from numpy import nan, NaN,NAN
from matplotlib import pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

In [3]:
```
netflix_df=pd.read_csv("netflix.csv")
netflix_df
df=netflix_df.copy()
df
```

Out[3]:

	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...
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, Romantic TV Shows, TV ...	In a city of coaching centers known to train l...
...	...	...	...	...	...	...	...	...	...	...	...	...
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	November 20, 2019	2007	R	158 min	Cult Movies, Dramas, Thrillers	A political cartoonist, a crime reporter and a...

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	July 1, 2019	2018	TV-Y7	2 Seasons	Kids' TV, Korean TV Shows, TV Comedies	While living alone in a spooky town, a young g...
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	November 1, 2019	2009	R	88 min	Comedies, Horror Movies	Looking to survive in a world taken over by zo...
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	January 11, 2020	2006	PG	88 min	Children & Family Movies, Comedies	Dragged from civilian life, a former superhero...
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	March 2, 2019	2015	TV-14	111 min	Dramas, International Movies, Music & Musicals	A scrappy but poor boy worms his way into a ty...

8807 rows × 12 columns

Missing Value Detection

In [4]:
```
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 [33]:
```
missing_data=df.isna().sum().to_frame()
missing_data.rename(columns={0:"Null_Value_Cnt"},inplace=True)
missing_data["Null_Value_Percentage"]=round(missing_data["Null_Value_Cnt"]*100/len(df),2)
```

In [34]:
```
missing_data
```

Out[34]:

	Null_Value_Cnt	Null_Value_Percentage
show_id	0	0.00
type	0	0.00
title	0	0.00
director	2634	29.91
cast	825	9.37
country	831	9.44
date_added	10	0.11
release_year	0	0.00
rating	4	0.05
duration	3	0.03
listed_in	0	0.00
description	0	0.00

Observation : There is almost 30% data missing from director column .Followed By the country and cast with over 9% of its data missing

In [35]:
```
df.describe()
```

Out[35]:

	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 [9]:
```
df.describe(include="object")
```

Out[9]:

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

Missing values Treatment and transformation of some of the Basic metric columns

In [36]:
```
df["Date"]=pd.to_datetime(df["date_added"])
df["Month"]=df["Date"].dt.month_name()
df["Mon"]=df["Date"].dt.month
df["Mon"].replace(to_replace=NaN,value=0,inplace=True)
df["Year"]=df["Date"].dt.year
df["Year"].replace(to_replace=NaN,value=0,inplace=True)
```

```
df["director"].replace(to_replace=NaN,value="X",inplace=True)
df["cast"].replace(to_replace=NaN,value="X",inplace=True)
df["Year"]=df["Year"].astype("int")
df["Mon"]=df["Mon"].astype("int")
```

In [37]:

```
df
```

Out[37]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description	Date	Mo
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	X	United States	September 25, 2021	2020	PG-13	90 min	Documentaries	As her father nears the end of his life, filmm...	2021-09-25	Septem
1	s2	TV Show	Blood & Water	X	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...	2021-09-24	Septem
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...	2021-09-24	Septem
3	s4	TV Show	Jailbirds New Orleans	X	X	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseries, Reality TV	Feuds, flirtations and toilet talk go down amo...	2021-09-24	Septem
4	s5	TV Show	Kota Factory	X	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, Romantic TV Shows, TV ...	In a city of coaching centers known to train l...	2021-09-24	Septem
...	...	...	...	...	...	...	...	...	...	...	...	...	...	

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description	Date	Mo
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	November 20, 2019	2007	R	158 min	Cult Movies, Dramas, Thrillers	A political cartoonist, a crime reporter and a...	2019-11-20	Novem
8803	s8804	TV Show	Zombie Dumb	X	X	NaN	July 1, 2019	2018	TV-Y7	2 Seasons	Kids' TV, Korean TV Shows, TV Comedies	While living alone in a spooky town, a young g...	2019-07-01	
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	November 1, 2019	2009	R	88 min	Comedies, Horror Movies	Looking to survive in a world taken over by zo...	2019-11-01	Novem
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	January 11, 2020	2006	PG	88 min	Children & Family Movies, Comedies	Dragged from civilian life, a former superhero...	2020-01-11	Janu
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	March 2, 2019	2015	TV-14	111 min	Dramas, International Movies, Music & Musicals	A scrappy but poor boy worms his way into a ty...	2019-03-02	Ma

8807 rows × 16 columns

Analyse the amount of content added in the platform Yearly and Monthly

In [38]:
```
df.groupby(["Year","type"])["type"].count()
```

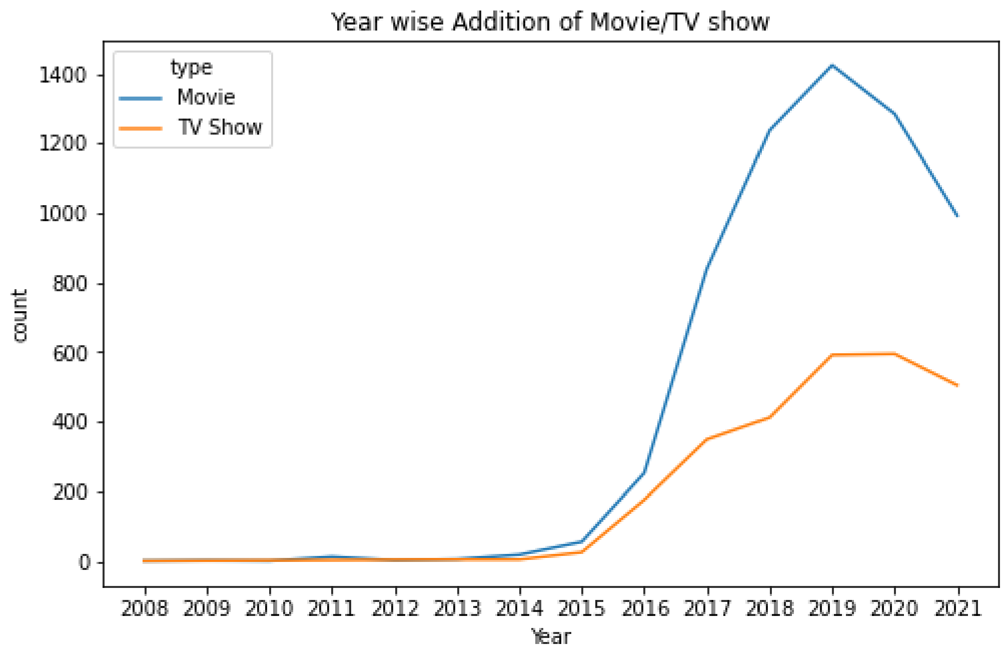
Out[38]:
```
Year  type   
0     TV Show      10
2008  Movie         1
      TV Show       1
2009  Movie         2
2010  Movie         1
2011  Movie        13
2012  Movie         3
2013  Movie         6
      TV Show       5
2014  Movie        19
      TV Show       5
2015  Movie        56
      TV Show      26
2016  Movie       253
      TV Show     176
2017  Movie       839
      TV Show     349
2018  Movie      1237
      TV Show     412
2019  Movie      1424
      TV Show     592
2020  Movie      1284
      TV Show     595
2021  Movie       993
      TV Show     505
Name: type, dtype: int64
```

In [39]:
```
trend_year=df.groupby(["Year","type"])["type"].count().to_frame()
trend_year.rename(columns={"type":"count"},inplace=True)
trend_year.reset_index(inplace=True)
trend_year.loc[trend_year["Year"]==0]
trend_year.drop(0,axis=0,inplace=True)
trend_year
```

Out[39]:

	Year	type	count
1	2008	Movie	1
2	2008	TV Show	1
3	2009	Movie	2
4	2010	Movie	1
5	2011	Movie	13
6	2012	Movie	3
7	2013	Movie	6
8	2013	TV Show	5
9	2014	Movie	19
10	2014	TV Show	5
11	2015	Movie	56
12	2015	TV Show	26
13	2016	Movie	253
14	2016	TV Show	176
15	2017	Movie	839
16	2017	TV Show	349
17	2018	Movie	1237
18	2018	TV Show	412
19	2019	Movie	1424
20	2019	TV Show	592
21	2020	Movie	1284
22	2020	TV Show	595
23	2021	Movie	993
24	2021	TV Show	505

In [41]:
```
plt.rcParams["figure.figsize"] = (8,5)
plt.xticks(np.arange(2008,2022,1))
plt.title("Year wise Addition of Movie/TV show")
sns.lineplot(x="Year",y="count",data=trend_year,hue="type")
plt.show()
```



Observation :There is an Exponential increase in the number of Movies/TV shows added from 2015-2019.But past two years this has dropped.Most possible reason is Covid.

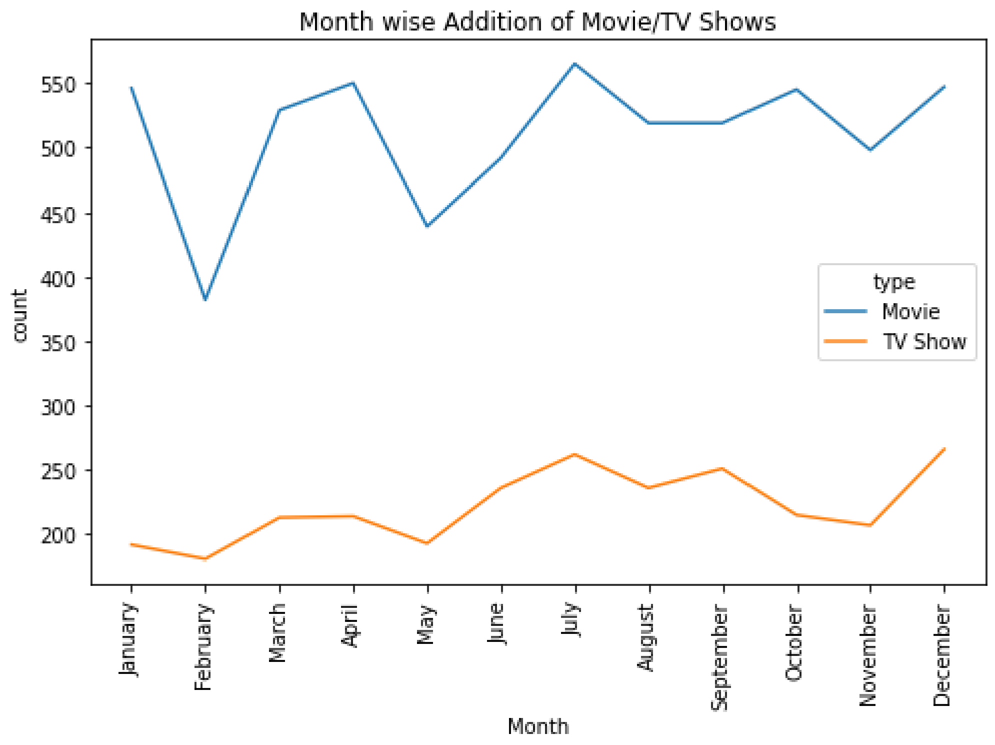
In [42]:
```
trend_mon=df.groupby(["Mon","Month","type"])["type"].count().to_frame()
trend_mon.rename(columns={"type":"count"},inplace=True)
trend_mon.reset_index(inplace=True)
trend_mon
```

Out[42]:

	Mon	Month	type	count
0	1	January	Movie	546
1	1	January	TV Show	192
2	2	February	Movie	382
3	2	February	TV Show	181
4	3	March	Movie	529
5	3	March	TV Show	213
6	4	April	Movie	550
7	4	April	TV Show	214
8	5	May	Movie	439
9	5	May	TV Show	193
10	6	June	Movie	492
11	6	June	TV Show	236
12	7	July	Movie	565
13	7	July	TV Show	262
14	8	August	Movie	519
15	8	August	TV Show	236
16	9	September	Movie	519
17	9	September	TV Show	251
18	10	October	Movie	545
19	10	October	TV Show	215
20	11	November	Movie	498
21	11	November	TV Show	207
22	12	December	Movie	547
23	12	December	TV Show	266

In [500…

```
plt.rcParams["figure.figsize"] = (8,5)
plt.xticks(rotation=90)
plt.title("Month wise Addition of Movie/TV Shows")
sns.lineplot(x="Month",y="count",data=trend_mon,hue="type")
plt.show()
```



Observation :Both movie and TV show follows almost a similar trend where July has most number of movie/TV shows added to Netflix and February the least

Nested Column Unpacking(Director,Country,Listed In)

In [209…

```
director_lst=df["director"].apply(lambda x:str(x).split(", ")).to_list()
```

In [44]:
```
director_df=pd.DataFrame(director_lst,index=df["show_id"])
director_df=director_df.stack()

director_df=pd.DataFrame(director_df)
director_df.reset_index(inplace=True)
director_df=director_df[["show_id",0]]
director_df.columns=["show_id","director"]
director_df=director_df.merge(df[["show_id","title","type"]])
director_df.describe(include="object")
```

Out[44]:

	show_id	director	title	type
count	9612	9612	9612	9612
unique	8807	4994	8807	2
top	s5888	X	Walt Disney Animation Studios Short Films Coll...	Movie
freq	13	2634	13	6854

In [65]:
```
dir_con
```

Out[65]:

	show_id	director	title	type	country
0	s1	Kirsten Johnson	Dick Johnson Is Dead	Movie	United States
1	s8	Haile Gerima	Sankofa	Movie	United States
2	s8	Haile Gerima	Sankofa	Movie	Ghana
3	s8	Haile Gerima	Sankofa	Movie	Burkina Faso
4	s8	Haile Gerima	Sankofa	Movie	United Kingdom
...	...	...	...	...	...
8465	s8802	Majid Al Ansari	Zinzana	Movie	Jordan
8466	s8803	David Fincher	Zodiac	Movie	United States
8467	s8805	Ruben Fleischer	Zombieland	Movie	United States
8468	s8806	Peter Hewitt	Zoom	Movie	United States
8469	s8807	Mozez Singh	Zubaan	Movie	India

8470 rows × 5 columns

In [210…
```
country_lst=df["country"].apply(lambda x:str(x).split(", ")).to_list()
```

In [208…
```
country_df=pd.DataFrame(country_lst,index=df["show_id"])
country_df=country_df.stack()

country_df=pd.DataFrame(country_df)
country_df.reset_index(inplace=True)
country_df=country_df[["show_id",0]]
country_df.columns=["show_id","country"]
country_df=country_df.merge(df[["show_id","title","type"]])
```

In [67]:
```
country_df["country"].describe(include="object")
country_df["country"].value_counts(dropna=False).sort_values(ascending=False).head(10)
```

Out[67]:
```
United States     3689
India             1046
United Kingdom     804
Canada             445
France             393
Japan              318
Spain              232
South Korea        231
Germany            226
Mexico             169
Name: country, dtype: int64
```

Observation- 127 Unique Countries(Missing Excluded) .The top 10 countries are lised above based on the amount of content

In [211…
```
listed_lst=df["listed_in"].apply(lambda x:str(x).split(", ")).to_list()
```

In [52]:
```
listed_df=pd.DataFrame(listed_lst,index=df["show_id"])
listed_df=listed_df.stack()

listed_df=pd.DataFrame(listed_df)
listed_df.reset_index(inplace=True)
listed_df=listed_df[["show_id",0]]
listed_df.columns=["show_id","listed"]
listed_df=listed_df.merge(df[["show_id","title","type"]])
x=listed_df.groupby(["type","listed"])["listed"].count().to_frame()
x.rename(columns={"listed":"count"},inplace=True)
x.reset_index("listed",inplace=True)
x_movie=x.loc["Movie"]
x_tv=x.loc["TV Show"]
```

Analyse content added in the platform based on their Genre

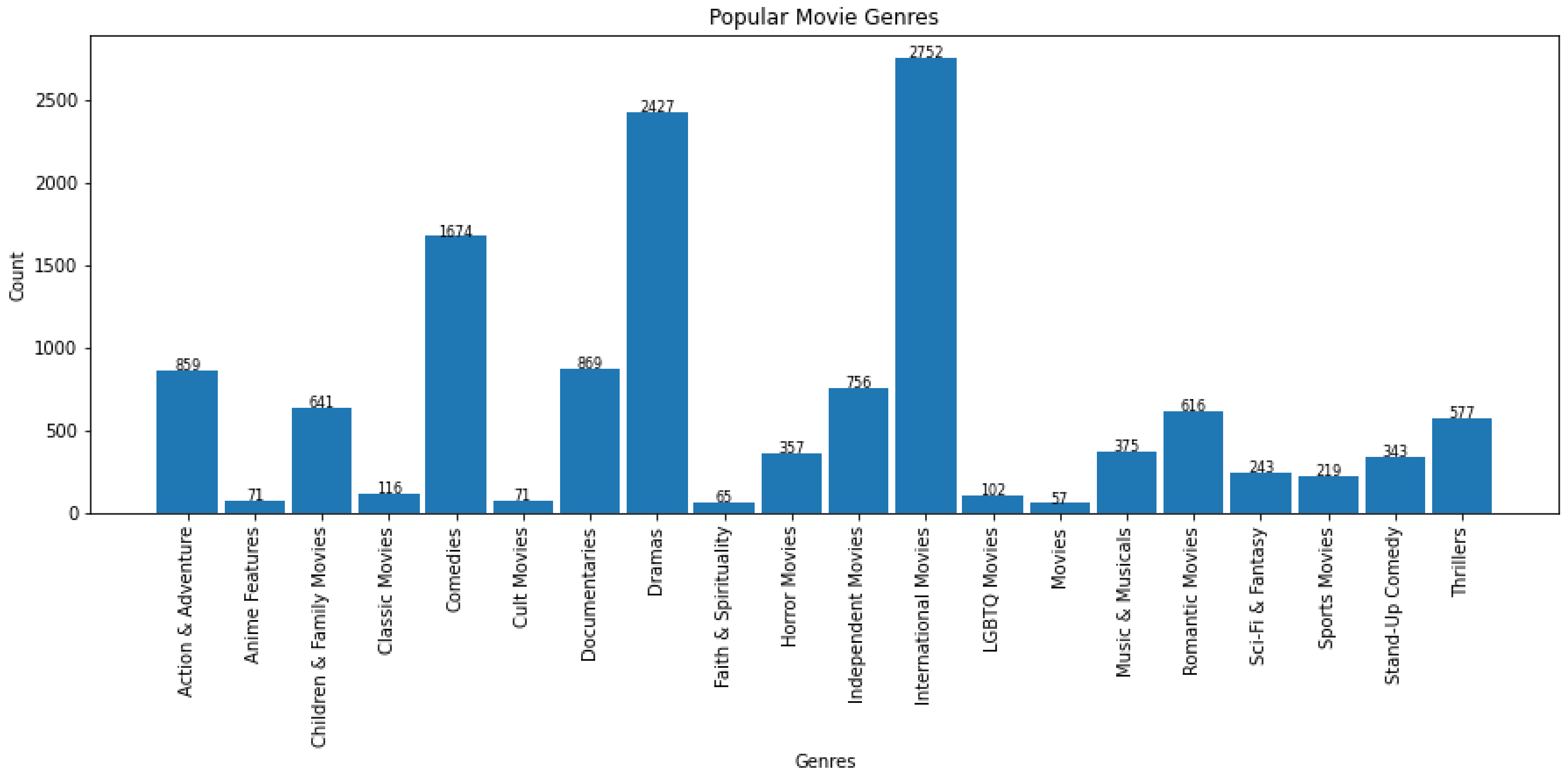
In [144…
```
x_movie
x_tv
```

Out[144]:

	listed	count
type		
TV Show	Anime Series	176
TV Show	British TV Shows	253
TV Show	Classic & Cult TV	28
TV Show	Crime TV Shows	470
TV Show	Docuseries	395
TV Show	International TV Shows	1351
TV Show	Kids' TV	451
TV Show	Korean TV Shows	151
TV Show	Reality TV	255
TV Show	Romantic TV Shows	370
TV Show	Science & Nature TV	92
TV Show	Spanish-Language TV Shows	174
TV Show	Stand-Up Comedy & Talk Shows	56
TV Show	TV Action & Adventure	168
TV Show	TV Comedies	581
TV Show	TV Dramas	763
TV Show	TV Horror	75
TV Show	TV Mysteries	98
TV Show	TV Sci-Fi & Fantasy	84
TV Show	TV Shows	16
TV Show	TV Thrillers	57
TV Show	Teen TV Shows	69

In [150…
```
x_movie_val1=x_movie["listed"].to_list()
x_movie_val2=x_movie["count"].to_list()
```

In [201…
```
plt.rcParams["figure.figsize"] = (15,5)
plt.bar(x_movie_val1,x_movie_val2,width=.9)
plt.xticks(x_movie_val1,rotation=90)
plt.title("Popular Movie Genres")
plt.xlabel("Genres")
plt.ylabel("Count")
for idx,val in enumerate(x_movie_val2):
    plt.text(idx,val+.2,str(val),fontsize=8,ha="center")
plt.show()
```

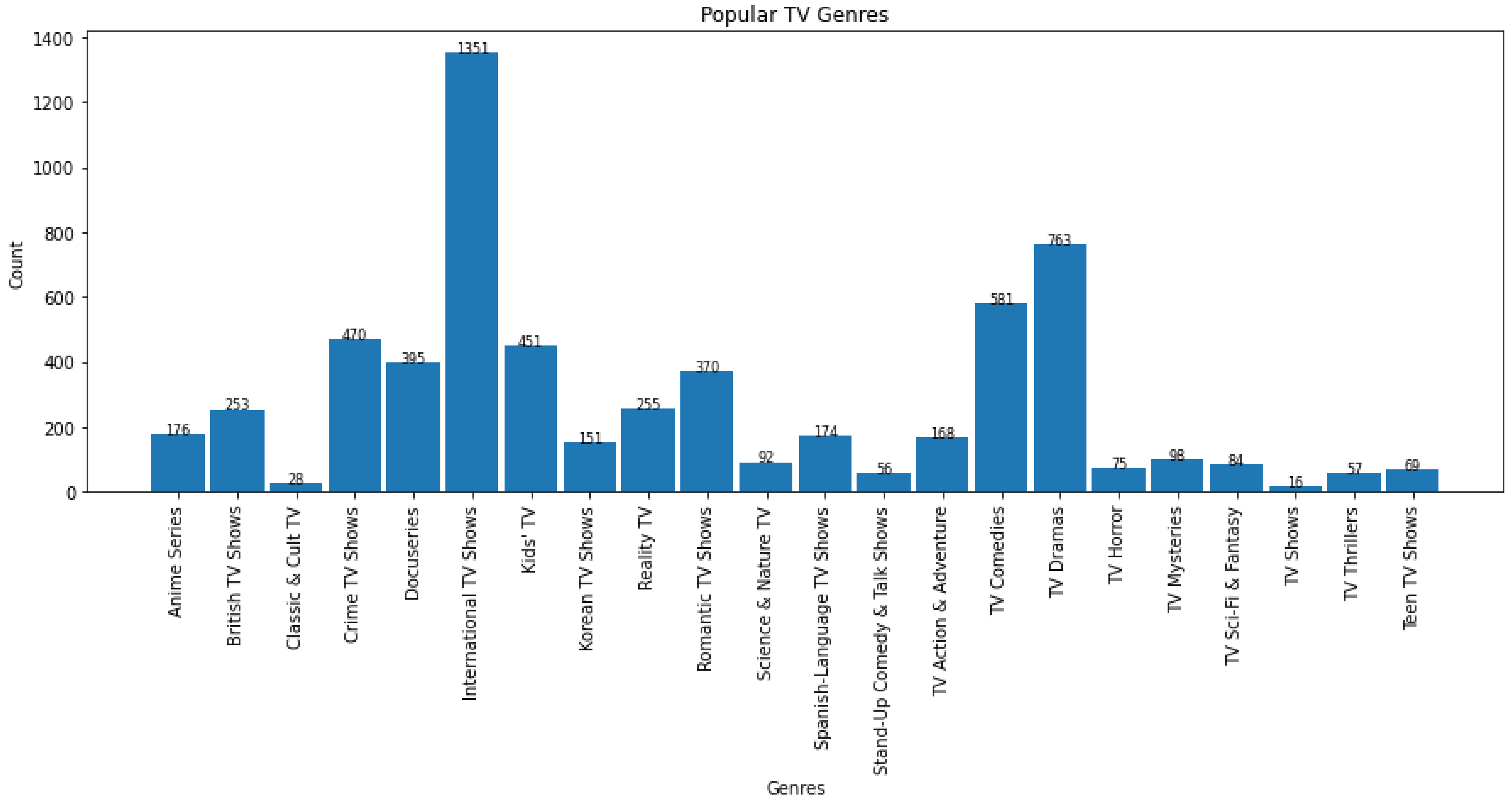


Observation :Popular Movie Genres-

International,Drama,Comedy,Documentries,Action and Adventure.

```
In [202…  x_tv_val1=x_tv["listed"].to_list()
          x_tv_val2=x_tv["count"].to_list()
```

```
In [342…  plt.rcParams["figure.figsize"] = (15,5)
          plt.bar(x_tv_val1,x_tv_val2,width=.9)
          plt.xticks(x_tv_val1,rotation=90)
          plt.title("Popular TV Genres")
          plt.xlabel("Genres")
          plt.ylabel("Count")
          for idx,val in enumerate(x_tv_val2):
              plt.text(idx,val+.2,str(val),fontsize=8,ha="center")
          plt.show()
```



Observation: Popular TV Genres-Drama,International,Comedy,Crime,Kids TV

In [64]:
```
lis_con=listed_df.merge(country_df[["country","show_id"]])
lis_con=lis_con.groupby(["country","listed"])["listed"].count().to_frame()
lis_con.rename(columns={"listed":"count"},inplace=True)
lis_con.reset_index(inplace=True)
to_del=lis_con.loc[lis_con["country"]==''].index
lis_con.drop(to_del,axis=0,inplace=True)
lis_con.reset_index(drop=True,inplace=True)
lis_con.sort_values("count",ascending=False,inplace=True)
```

```
lis_con_fil=lis_con.loc[lis_con["count"]>50]
lis_con_fil.reset_index(drop=True,inplace=False).head(20)
```

Out[64]:

	country	listed	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
5	United States	Action & Adventure	404
6	United States	Children & Family Movies	390
7	United States	Independent Movies	390
8	India	Comedies	323
9	United States	Thrillers	292
10	United States	TV Comedies	258
11	United States	TV Dramas	232
12	United Kingdom	British TV Shows	225
13	United States	Romantic Movies	225
14	United States	Stand-Up Comedy	216
15	United States	Kids' TV	214
16	France	International Movies	207
17	United States	Horror Movies	201
18	United Kingdom	Dramas	196
19	United States	Docuseries	192

Observation - Above frame shows some of the top genres preffered in

countries

Analyse data wrt Country and Director

In [53]:
```
idx=country_df.loc[country_df["country"]=="nan"].index
country_df.drop(idx,axis=0,inplace=True)
```

In [54]:
```
ixd=director_df.loc[director_df["director"]=="X"].index
director_df.drop(ixd,axis=0,inplace=True)
```

In [55]:
```
director_df.reset_index(drop=True,inplace=True)
director_df
```

Out[55]:

	show_id	director	title	type
0	s1	Kirsten Johnson	Dick Johnson Is Dead	Movie
1	s3	Julien Leclercq	Ganglands	TV Show
2	s6	Mike Flanagan	Midnight Mass	TV Show
3	s7	Robert Cullen	My Little Pony: A New Generation	Movie
4	s7	José Luis Ucha	My Little Pony: A New Generation	Movie
...	...	...	...	...
6973	s8802	Majid Al Ansari	Zinzana	Movie
6974	s8803	David Fincher	Zodiac	Movie
6975	s8805	Ruben Fleischer	Zombieland	Movie
6976	s8806	Peter Hewitt	Zoom	Movie
6977	s8807	Mozez Singh	Zubaan	Movie

6978 rows × 4 columns

In [190…
```
director_df.value_counts("director").head(20)
```

```
Out[190]: director
Rajiv Chilaka          22
Jan Suter              21
Raúl Campos            19
Suhas Kadav            16
Marcus Raboy           16
Jay Karas              15
Cathy Garcia-Molina    13
Jay Chapman            12
Youssef Chahine        12
Martin Scorsese        12
Steven Spielberg       11
Don Michael Paul       10
Shannon Hartman         9
Anurag Kashyap          9
David Dhawan            9
Yılmaz Erdoğan          9
Quentin Tarantino       8
Fernando Ayllón         8
Troy Miller             8
Hakan Algül             8
dtype: int64
```

Observation-Top 20 Directors are listed above along with the number of Movie/TV shows directed by them

```
In [56]: country_df.reset_index(drop=True,inplace=True)
         country_df
```

```
Out[56]:
         show_id        country                 title      type
     0        s1  United States  Dick Johnson Is Dead     Movie
     1        s2   South Africa         Blood & Water   TV Show
     2        s5          India          Kota Factory   TV Show
     3        s8  United States               Sankofa     Movie
     4        s8          Ghana               Sankofa     Movie
   ...       ...            ...                   ...       ...
 10009     s8802         Jordan               Zinzana     Movie
 10010     s8803  United States                Zodiac     Movie
 10011     s8805  United States            Zombieland     Movie
 10012     s8806  United States                  Zoom     Movie
 10013     s8807          India                Zubaan     Movie

10014 rows × 4 columns
```

```
In [206…
dir_cnt=dir_con.groupby(["country","director"])["director"].count().to_frame()
dir_cnt.rename(columns={"director":"count"},inplace=True)
dir_cnt.reset_index(["director","country"],inplace=True)

dir_cnt_fil=dir_cnt.loc[(dir_cnt["country"].str.contains('|'.join(['Canada', 'France', 'Spain', 'India', 'South Korea', 'Japan',
      'Mexico', 'United Sta',"United K"])))]
dir_cnt_fil=dir_cnt_fil.sort_values(["country","count"],ascending=[True,False])
dir_cnt_fil=dir_cnt_fil.groupby("country").head(3)
dir_cnt_fil.reset_index(drop=True,inplace=True)

dir_cnt_fil
```

Out[206]:

	country	director	count
0	Canada	Justin G. Dyck	8
1	Canada	John Paul Tremblay	5
2	Canada	Mike Clattenburg	5
3	France	Thierry Donard	5
4	France	Youssef Chahine	4
5	France	Florent Bodin	3
6	India	Anurag Kashyap	9
7	India	David Dhawan	9
8	India	Umesh Mehra	8
9	Japan	Toshiya Shinohara	7
10	Japan	Masahiko Murata	5
11	Japan	Hiroyuki Seshita	4
12	Mexico	Jan Suter	12
13	Mexico	Raúl Campos	10
14	Mexico	Alex Díaz	3
15	South Korea	Bong Joon Ho	2
16	South Korea	Jung-ah Im	2
17	South Korea	Mark A.Z. Dippé	2
18	Spain	Fernando González Molina	4
19	Spain	Hernán Zin	4
20	Spain	Alexis Morante	3
21	United Kingdom	Alastair Fothergill	4
22	United Kingdom	Edward Cotterill	4
23	United Kingdom	Blair Simmons	3

	country	director	count
24	United Kingdom,	Farah Nabulsi	1
25	United Kingdom,	Orlando von Einsiedel	1
26	United States	Jay Karas	15
27	United States	Marcus Raboy	15
28	United States	Jay Chapman	12
29	United States,	Madeleine Gavin	1

Recommendation-Top 3 directors country wise are shown above for eg:India-Anurag Kashyap,David Dhawan,Priyadarshan etc US-Jay Karas,Marcus Raboy and so on.Hence adding more of their work can fetch more viewers in the respective countries

In [68]:
```
country_df_movie=country_df.loc[country_df["type"]=="Movie"]
country_df_tv=country_df.loc[country_df["type"]=="TV Show"]
```

In [70]:
```
country_df_movie
country_list_mv=country_df_movie["country"].to_list()
```

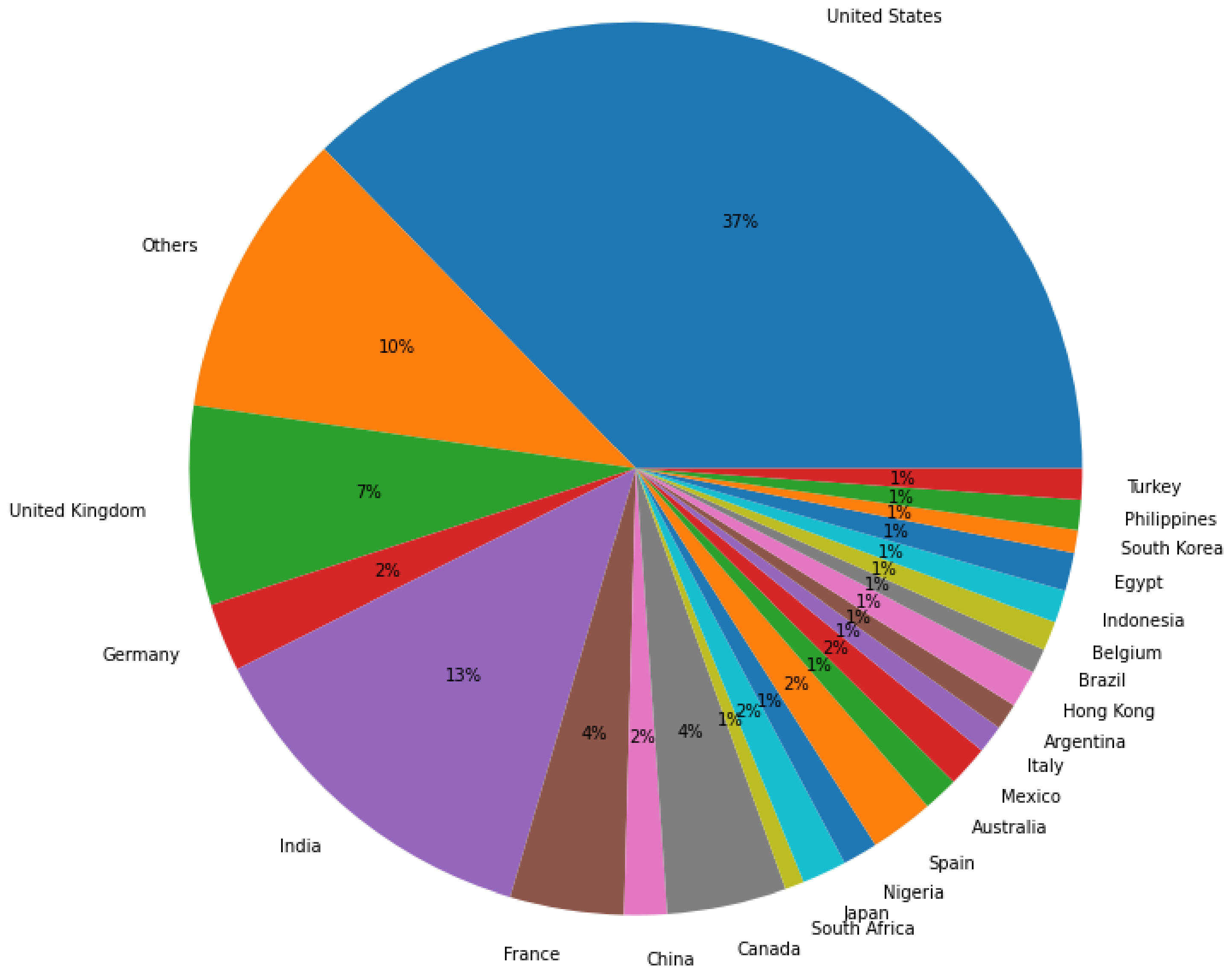
In [444…
```
from collections import Counter
count_dict=Counter(country_list_mv)
dict_toplot=Counter()
for key in count_dict.keys():
    if count_dict[key]<50:
        dict_toplot['Others']+=count_dict[key]

    else:
        dict_toplot[key]=count_dict[key]

print(dict_toplot)

list_country=list(dict_toplot.keys())
list_country_count=list(dict_toplot.values())
```

```
Counter({'United States': 2751, 'India': 962, 'Others': 769, 'United Kingdom': 532, 'Canada': 319, 'France': 303, 'Germany': 18
2, 'Spain': 171, 'Japan': 119, 'China': 114, 'Mexico': 111, 'Egypt': 102, 'Hong Kong': 100, 'Nigeria': 94, 'Australia': 94, 'Ind
onesia': 86, 'Turkey': 83, 'Philippines': 80, 'Belgium': 78, 'Italy': 75, 'Argentina': 71, 'Brazil': 66, 'South Korea': 61, 'Sou
th Africa': 51})
```

In [859…

```
plt.rcParams["figure.figsize"] = (15,12)
data=list_country_count
labels=list_country
plt.pie(data,labels=labels,autopct='%.0f%%')
plt.title("Percentage of Movies from Different Countries")
plt.show()
```

Percentage of Movies from Different Countries



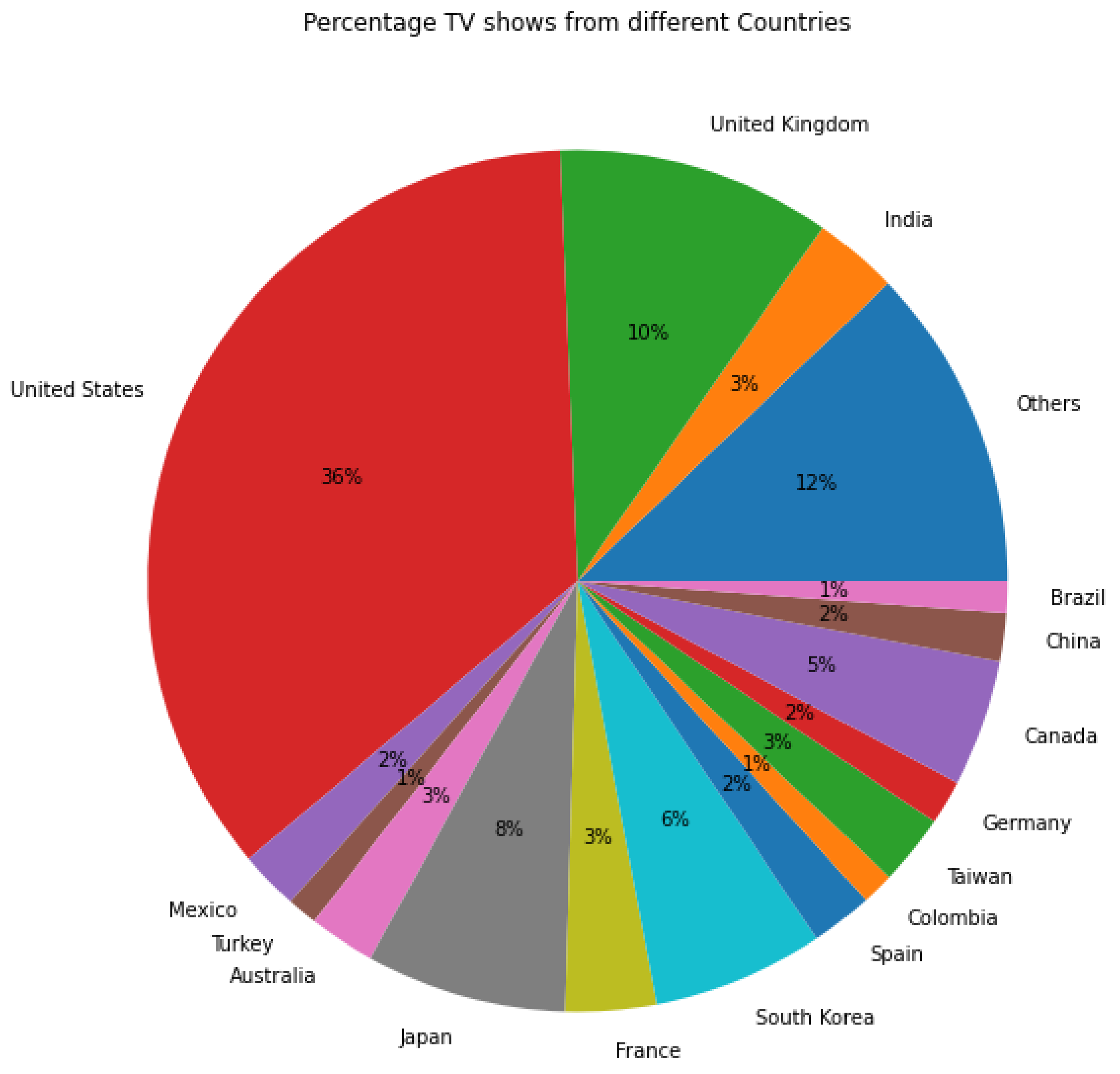
Observation-Most number of movies in Netflix comes from countries like US ,India,UK .

In [78]:
```python
country_df_tv
country_list_tv=country_df_tv["country"].to_list()
```

In [79]:
```python
from collections import Counter
count_dict_tv=Counter(country_list_tv)
dict_toplot_tv=Counter()
for key in count_dict_tv.keys():
    if count_dict_tv[key]<30:
        dict_toplot_tv['Others']+=count_dict_tv[key]

    else:
        dict_toplot_tv[key]=count_dict_tv[key]

print(dict_toplot_tv)

list_country_tv=list(dict_toplot_tv.keys())
list_country_count_tv=list(dict_toplot_tv.values())
```

```
Counter({'United States': 938, 'Others': 321, 'United Kingdom': 272, 'Japan': 199, 'South Korea': 170, 'Canada': 126, 'France':
90, 'India': 84, 'Taiwan': 70, 'Australia': 66, 'Spain': 61, 'Mexico': 58, 'China': 48, 'Germany': 44, 'Colombia': 32, 'Brazil':
31, 'Turkey': 30})
```

In [80]:
```python
plt.rcParams["figure.figsize"] = (15,10)
data=list_country_count_tv
labels=list_country_tv
plt.pie(data,labels=labels,autopct='%.0f%%')
plt.title("Percentage TV shows from different Countries")
plt.show()
```



Most number of TV shows in Netflix comes from countries like US ,UK,Japan,South Korea,Canada .

Analyse data wrt Country and Cast

In [212…

```
cast_lst=df["cast"].apply(lambda x:str(x).split(", ")).to_list()
```

In [82]:

```
cast_df=pd.DataFrame(cast_lst,index=df["show_id"])
cast_df=cast_df.stack()

cast_df=pd.DataFrame(cast_df)
cast_df.reset_index(inplace=True)
cast_df=cast_df[["show_id",0]]
cast_df.columns=["show_id","cast"]
cast_df=cast_df.merge(df[["show_id","title","type"]])
ind=cast_df.loc[cast_df["cast"]=='X'].index
cast_df.drop(ind,axis=0,inplace=True)
cast_df.describe(include="object")
```

Out[82]:

	show_id	cast	title	type
count	64126	64126	64126	64126
unique	7982	36439	7982	2
top	s3775	Anupam Kher	Black Mirror	Movie
freq	50	43	50	44475

In [83]:

```
cast_df
```

Out[83]:

	show_id	cast	title	type
1	s2	Ama Qamata	Blood & Water	TV Show
2	s2	Khosi Ngema	Blood & Water	TV Show
3	s2	Gail Mabalane	Blood & Water	TV Show
4	s2	Thabang Molaba	Blood & Water	TV Show
5	s2	Dillon Windvogel	Blood & Water	TV Show
...	...	...	...	...
64946	s8807	Manish Chaudhary	Zubaan	Movie
64947	s8807	Meghna Malik	Zubaan	Movie
64948	s8807	Malkeet Rauni	Zubaan	Movie
64949	s8807	Anita Shabdish	Zubaan	Movie
64950	s8807	Chittaranjan Tripathy	Zubaan	Movie

64126 rows × 4 columns

In [93]:
```
country_df
```

Out[93]:

	show_id	country	title	type
0	s1	United States	Dick Johnson Is Dead	Movie
1	s2	South Africa	Blood & Water	TV Show
2	s5	India	Kota Factory	TV Show
3	s8	United States	Sankofa	Movie
4	s8	Ghana	Sankofa	Movie
...	...	...	...	...
10009	s8802	Jordan	Zinzana	Movie
10010	s8803	United States	Zodiac	Movie
10011	s8805	United States	Zombieland	Movie
10012	s8806	United States	Zoom	Movie
10013	s8807	India	Zubaan	Movie

10014 rows × 4 columns

In [94]:
```
cast_con=cast_df.merge(country_df[["country","show_id"]])
cast_con
```

Out[94]:

	show_id	cast	title	type	country
0	s2	Ama Qamata	Blood & Water	TV Show	South Africa
1	s2	Khosi Ngema	Blood & Water	TV Show	South Africa
2	s2	Gail Mabalane	Blood & Water	TV Show	South Africa
3	s2	Thabang Molaba	Blood & Water	TV Show	South Africa
4	s2	Dillon Windvogel	Blood & Water	TV Show	South Africa
...	...	...	...	...	...
75800	s8807	Manish Chaudhary	Zubaan	Movie	India
75801	s8807	Meghna Malik	Zubaan	Movie	India
75802	s8807	Malkeet Rauni	Zubaan	Movie	India
75803	s8807	Anita Shabdish	Zubaan	Movie	India
75804	s8807	Chittaranjan Tripathy	Zubaan	Movie	India

75805 rows × 5 columns

In [104…

```
cast_cnt=cast_cnt.sort_values(["count","country"],ascending=[False,True])
top_20=cast_cnt.head(20)
top_20.reset_index(drop=True,inplace=True)
top_20
```

Out[104]:

	country	cast	count
0	India	Anupam Kher	40
1	India	Shah Rukh Khan	34
2	India	Naseeruddin Shah	31
3	India	Akshay Kumar	29
4	India	Om Puri	29
5	Japan	Takahiro Sakurai	29
6	India	Amitabh Bachchan	28
7	India	Paresh Rawal	28
8	Japan	Yuki Kaji	28
9	India	Boman Irani	27
10	India	Kareena Kapoor	25
11	Japan	Daisuke Ono	22
12	United States	Samuel L. Jackson	22
13	United States	Tara Strong	22
14	India	Ajay Devgn	21
15	United States	Fred Tatasciore	21
16	India	Salman Khan	20
17	United States	Adam Sandler	20
18	India	Kay Kay Menon	19
19	India	Nawazuddin Siddiqui	19

Observation -The above shows the top 20 Popular actors in the platform

In [97]:
```
cast_cnt=cast_con.groupby(["country","cast"])["cast"].count().to_frame()
cast_cnt.rename(columns={"cast":"count"},inplace=True)
cast_cnt.reset_index(["cast","country"],inplace=True)
to_del=cast_cnt.loc[cast_cnt["country"]==''].index
cast_cnt.drop(to_del,axis=0,inplace=True)

cast_cnt.reset_index(drop=True,inplace=True)
cast_cnt=cast_cnt.sort_values(["count","country"],ascending=[False,True])
cast_cnt=cast_cnt.loc[cast_cnt["count"]>10]

top_cast=(cast_cnt.groupby("country").head(3)).sort_values("country")
top_cast.reset_index(drop=True,inplace=True)
top_cast
```

Out[97]:

	country	cast	count
0	Canada	Ashleigh Ball	12
1	Canada	John Paul Tremblay	14
2	Canada	Robb Wells	14
3	Egypt	Hassan Hosny	13
4	Egypt	Ahmed Helmy	13
5	India	Anupam Kher	40
6	India	Shah Rukh Khan	34
7	India	Naseeruddin Shah	31
8	Japan	Takahiro Sakurai	29
9	Japan	Yuki Kaji	28
10	Japan	Daisuke Ono	22
11	Nigeria	Richard Mofe-Damijo	11
12	Nigeria	Blossom Chukwujekwu	12
13	Nigeria	Tina Mba	11
14	Philippines	Kathryn Bernardo	11
15	Turkey	Demet Akbağ	13
16	United Kingdom	David Attenborough	17
17	United Kingdom	Michael Palin	14
18	United Kingdom	John Cleese	16
19	United States	Fred Tatasciore	21
20	United States	Tara Strong	22
21	United States	Samuel L. Jackson	22

Recommendation-Top 3 Popular Actors in Netflix in each of the Countries

where the total count of their movie/TV show is greater than 10.Hence adding more content of these actors will fetch more viewers from their respective countries

Analyse data wrt Rating

Source https://help.netflix.com/en/node/2064/us

In [105…
```
df.insert(9,"target_aud",'')
```

In [668…
```
rate_idx=df.loc[df["rating"].isin(["PG","G",'TV-Y','TV-Y7','TV-G','TV-PG'])].index
rate_idx
```

Out[668]:
```
Int64Index([   6,   13,   22,   23,   26,   34,   37,   39,   40,   41,
            ...
            8786, 8787, 8789, 8793, 8795, 8796, 8797, 8800, 8803, 8805],
           dtype='int64', length=2052)
```

In [669…
```
df.loc[rate_idx,["target_aud"]]='Kids'
```

In [670…
```
rate_idx=df.loc[df["rating"].isin(["PG-13","TV-14"])].index
rate_idx
```

Out[670]:
```
Int64Index([   0,    8,    9,   18,   20,   21,   24,   25,   27,   28,
            ...
            8766, 8767, 8770, 8771, 8772, 8774, 8782, 8794, 8799, 8806],
           dtype='int64', length=2650)
```

In [671…
```
df.loc[rate_idx,["target_aud"]]='Teens'
df
```

Out[671]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	target_aud	target_aug	duration	listed_in	d
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	X	United States	September 25, 2021	2020	PG-13	Teens		90 min	Documentaries	fa
1	s2	TV Show	Blood & Water	X	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA			2 Seasons	International TV Shows, TV Dramas, TV Mysteries	(
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...	
3	s4	TV Show	Jailbirds New Orleans	X	X	NaN	September 24, 2021	2021	TV-MA			1 Season	Docuseries, Reality TV	
4	s5	TV Show	Kota Factory	X	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA			2 Seasons	International TV Shows, Romantic TV Shows, TV ...	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	

	show_id	type	title	director	cast	country	date_added	release_year	rating	target_aud	target_aug	duration	listed_in	d
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	November 20, 2019	2007	R			158 min	Cult Movies, Dramas, Thrillers	
8803	s8804	TV Show	Zombie Dumb	X	X	NaN	July 1, 2019	2018	TV-Y7	Kids		2 Seasons	Kids' TV, Korean TV Shows, TV Comedies	W
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	November 1, 2019	2009	R			88 min	Comedies, Horror Movies	I s w o
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	January 11, 2020	2006	PG	Kids		88 min	Children & Family Movies, Comedies	c su
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	March 2, 2019	2015	TV-14	Teens		111 min	Dramas, International Movies, Music & Musicals	b hi

8807 rows × 18 columns

In [672...

```
rate_idx=df.loc[df["rating"].isin(["R","TV-MA","NC-17"])].index
rate_idx
```

```
Out[672]: Int64Index([   1,    2,    3,    4,    5,    7,   10,   11,   12,   14,
                       ...
                       8762, 8765, 8768, 8769, 8788, 8791, 8798, 8801, 8802, 8804],
                      dtype='int64', length=4009)
```

```
In [673…  df.loc[rate_idx,["target_aud"]]='Adults'
```

```
In [679…  df.loc[~df["target_aud"].isin(["Kids","Adults","Teens"])]["rating"].unique()
```

```
Out[679]: array(['74 min', '84 min', '66 min', 'NR', nan, 'TV-Y7-FV', 'UR'],
                dtype=object)
```

```
In [681…  rate_idx=df.loc[df["rating"].isin(["NR","UR"])].index
          rate_idx
```

```
Out[681]: 83
```

```
In [682…  df.loc[rate_idx,["target_aud"]]='Adults'
```

```
In [685…  rate_idx=df.loc[df["rating"].isin(['TV-Y7-FV'])].index
          rate_idx
          df.loc[rate_idx,["target_aud"]]='Teens'
```

```
In [686…  rate_idx=df.loc[df["rating"].isin(['74 min', '84 min', '66 min', np.nan])].index
          rate_idx
          df.loc[rate_idx,["target_aud"]]='Not Available'
```

```
In [690…  rating_df=country_df.merge(df[["target_aud","show_id"]])
```

```
In [691…  rating_df
```

Out[691]:

	show_id	country	title	type	target_aud
0	s1	United States	Dick Johnson Is Dead	Movie	Teens
1	s2	South Africa	Blood & Water	TV Show	Adults
2	s5	India	Kota Factory	TV Show	Adults
3	s8	United States	Sankofa	Movie	Adults
4	s8	Ghana	Sankofa	Movie	Adults
...	...	...	...	...	...
10009	s8802	Jordan	Zinzana	Movie	Adults
10010	s8803	United States	Zodiac	Movie	Adults
10011	s8805	United States	Zombieland	Movie	Adults
10012	s8806	United States	Zoom	Movie	Kids
10013	s8807	India	Zubaan	Movie	Teens

10014 rows × 5 columns

In [709…

```
rating_cnt=rating_df.groupby(["country","target_aud"])["target_aud"].count().to_frame()
rating_cnt.rename(columns={"target_aud":"count"},inplace=True)
rating_cnt.reset_index(inplace=True)
to_del=rating_cnt.loc[rating_cnt["country"]==''].index
rating_cnt.drop(to_del,axis=0,inplace=True)
rating_cnt.reset_index(drop=True,inplace=True)
rating_cnt
```

Out[709]:

	country	target_aud	count
0	Afghanistan	Adults	1
1	Albania	Adults	1
2	Algeria	Adults	2
3	Algeria	Teens	1
4	Angola	Adults	1
...	...	...	...
266	West Germany	Adults	3
267	West Germany	Kids	1
268	West Germany	Teens	1
269	Zimbabwe	Adults	2
270	Zimbabwe	Kids	1

271 rows × 3 columns

In [836…

```
top_country=rating_cnt.groupby("country")["count"].sum().sort_values(ascending=False).head(20)
top_country=top_country.reset_index()["country"].to_list()
top_country
top_country_df=rating_cnt.loc[rating_cnt["country"].isin(top_country)]
top_country_df.reset_index(drop=False,inplace=True)
top_country_df.drop("index",axis=1,inplace=True)
to_del=top_country_df.loc[top_country_df["target_aud"]=='Not Available'].index
top_country_df.drop(to_del,axis=0,inplace=True)
top_country_df
```

```
Out[836]:
```

	country	target_aud	count
0	Argentina	Adults	71
1	Argentina	Kids	10
2	Argentina	Teens	10
3	Australia	Adults	68
4	Australia	Kids	59
6	Australia	Teens	32
7	Brazil	Adults	64
8	Brazil	Kids	20
9	Brazil	Teens	13
10	Canada	Adults	192
11	Canada	Kids	171
12	Canada	Teens	82
13	China	Adults	56
14	China	Kids	34
15	China	Teens	72
16	Egypt	Adults	33
17	Egypt	Kids	7
18	Egypt	Teens	77
19	France	Adults	227
20	France	Kids	83
21	France	Teens	83
22	Germany	Adults	124
23	Germany	Kids	44
24	Germany	Teens	58

	country	target_aud	count
25	Hong Kong	Adults	54
26	Hong Kong	Kids	7
27	Hong Kong	Teens	44
28	India	Adults	278
29	India	Kids	184
30	India	Teens	584
31	Indonesia	Adults	21
32	Indonesia	Kids	30
33	Indonesia	Teens	39
34	Italy	Adults	57
35	Italy	Kids	18
37	Italy	Teens	24
38	Japan	Adults	110
39	Japan	Kids	99
41	Japan	Teens	108
42	Mexico	Adults	120
43	Mexico	Kids	23
44	Mexico	Teens	26
45	Nigeria	Adults	45
46	Nigeria	Kids	11
47	Nigeria	Teens	47
48	South Korea	Adults	98
49	South Korea	Kids	46
50	South Korea	Teens	87

	country	target_aud	count
51	Spain	Adults	185
52	Spain	Kids	24
53	Spain	Teens	23
54	Turkey	Adults	71
55	Turkey	Kids	10
56	Turkey	Teens	32
57	United Kingdom	Adults	409
58	United Kingdom	Kids	208
59	United Kingdom	Teens	187
60	United States	Adults	1805
61	United States	Kids	949
63	United States	Teens	932

In [837…
```
def cal_percent(x):
    ans=x*100/x.sum()
    return round(ans,2)
```

In [838…
```
top_country_df["percent"]=top_country_df.groupby("country")["count"].transform(cal_percent)
```

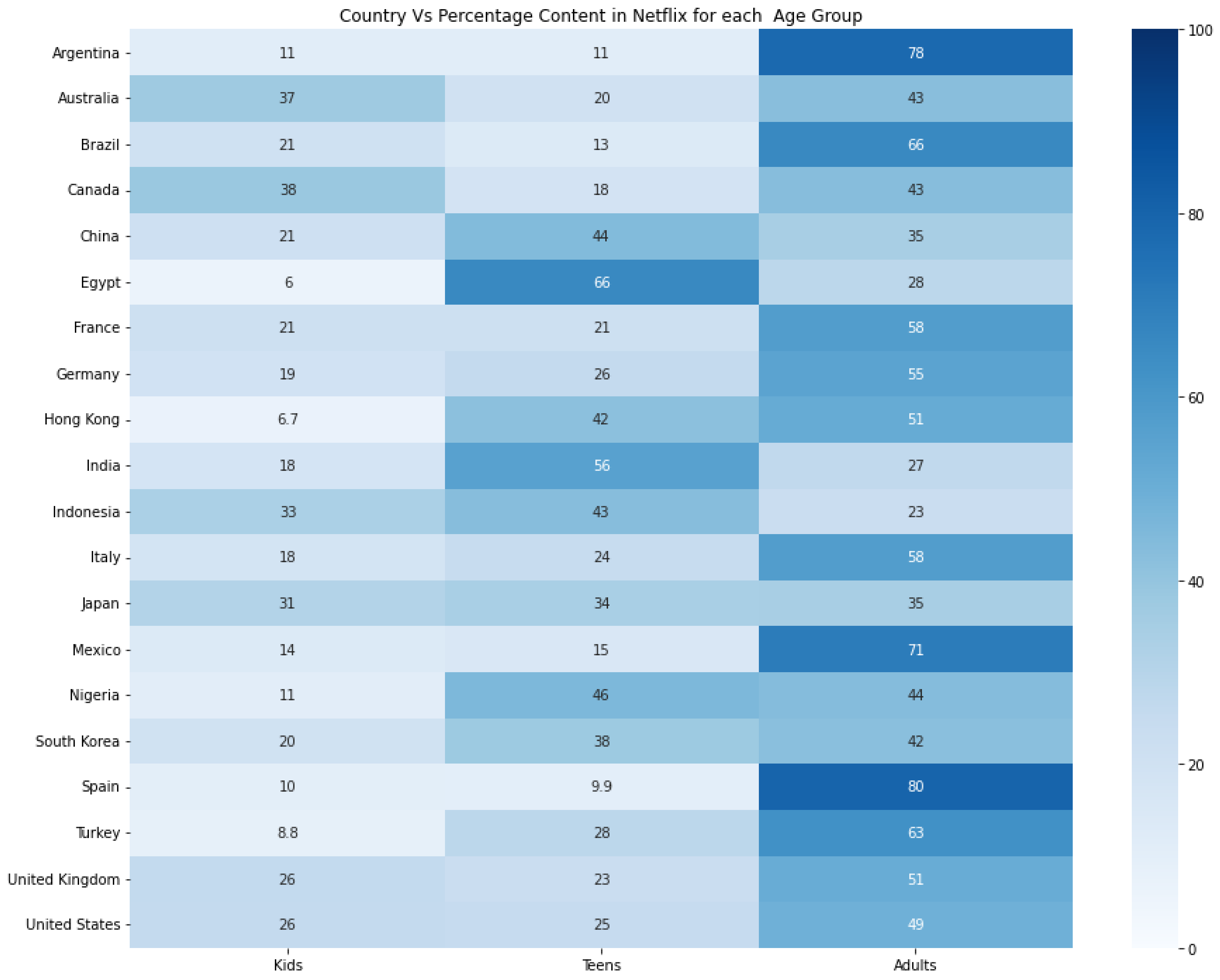
In [840…
```
heatmap_df=top_country_df.pivot_table(index=["country"],columns="target_aud",values="percent")
heatmap_df=heatmap_df[["Kids","Teens","Adults"]]
heatmap_df
```

Out[840]:

target_aud country	Kids	Teens	Adults
Argentina	10.99	10.99	78.02
Australia	37.11	20.13	42.77
Brazil	20.62	13.40	65.98
Canada	38.43	18.43	43.15
China	20.99	44.44	34.57
Egypt	5.98	65.81	28.21
France	21.12	21.12	57.76
Germany	19.47	25.66	54.87
Hong Kong	6.67	41.90	51.43
India	17.59	55.83	26.58
Indonesia	33.33	43.33	23.33
Italy	18.18	24.24	57.58
Japan	31.23	34.07	34.70
Mexico	13.61	15.38	71.01
Nigeria	10.68	45.63	43.69
South Korea	19.91	37.66	42.42
Spain	10.34	9.91	79.74
Turkey	8.85	28.32	62.83
United Kingdom	25.87	23.26	50.87
United States	25.75	25.28	48.97

In [851…

```
sns.heatmap(heatmap_df,annot=True,cmap="Blues",vmin=0,vmax=100)
plt.xlabel('')
plt.ylabel('')
plt.title("Country Vs Percentage Content in Netflix for each  Age Group")
plt.show()
```



	Kids	Teens	Adults
Argentina	11	11	78
Australia	37	20	43
Brazil	21	13	66
Canada	38	18	43
China	21	44	35
Egypt	6	66	28
France	21	21	58
Germany	19	26	55
Hong Kong	6.7	42	51
India	18	56	27
Indonesia	33	43	23
Italy	18	24	58
Japan	31	34	35
Mexico	14	15	71
Nigeria	11	46	44
South Korea	20	38	42
Spain	10	9.9	80
Turkey	8.8	28	63
United Kingdom	26	23	51
United States	26	25	49

Recommendation-Most of the Asian countries like India,Indonesia,Hongkong,China targets on Teen Audiences ,while most of the Western and European countries targets Adult audiences.So adding content belonging to those categories for respective countries can fetch more audience

Recommendation -It is also observed that countries like Spain,Mexico,Argentina have very less content added for the Teen audiences compared to other age groups.Hence adding more content for them can improve the business for Netflix in those countries.

Recommendation-Countries like Turkey,Hongkong,Egypt have less content added for Kids compared to other age groups.Hence adding more content in for them as well can improve the business in those countries.For instance country like Egypt has a higher density of population in 5-14 Age group (Source:https://www.populationpyramid.net/egypt/2020/)

In [144…

```
con_show=country_df.groupby("title")["title"].count().to_frame()
con_show.rename(columns={"title":"No:of country"},inplace=True)
con_show.reset_index(inplace=True)
to_show=con_show.sort_values(["No:of country"],ascending=False).head(20)
to_show.reset_index(drop=True,inplace=True)

to_show
```

Out[144]:

	title	No:of country
0	Barbecue	12
1	The Look of Silence	10
2	The Professor and the Madman	8
3	Shaun the Sheep	8
4	Domino	7
5	The Take	7
6	The Congress	7
7	Arctic Dogs	7
8	The Breadwinner	7
9	Nymphomaniac: Volume II	6
10	The Command	6
11	Sankofa	6
12	Stop at Nothing: The Lance Armstrong Story	6
13	Another Forever	6
14	Ultimate Beastmaster	6
15	The Danish Girl	6
16	A Sort of Family	6
17	Wadjda	6
18	Frozen Planet: The Epic Journey	6
19	Beyond Skyline	6

Recommnebdation-The above shows the movies and the number of their producing countries.Adding content which was produced by multiple countries can improve business

Analyse wrt to time gap

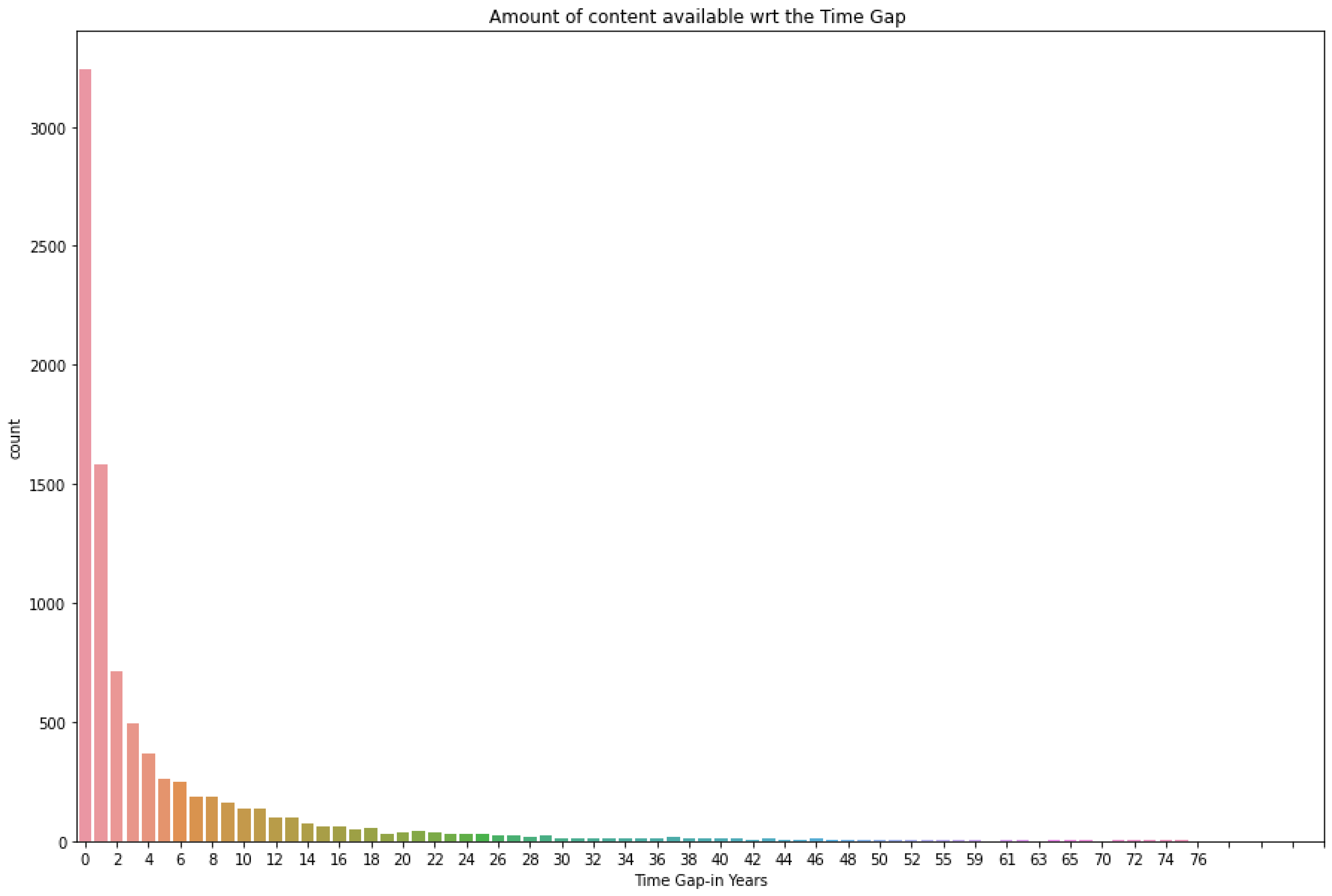
Time gap :difference between the release year and year the content was added in the platform

In [213…

```
df["gap"]=df["Year"]-df["release_year"]
```

In [175…

```
gap=df.loc[df["gap"]>=0]
sns.countplot(x="gap",data=gap)
plt.xticks(np.arange(0,80,2))
plt.xlabel("Time Gap-in Years")
plt.title("Amount of content available wrt the Time Gap ")
#plt.yticks(np.arange(1920,2030,10))
plt.show()
```



Recommendation-Adding newer content in the platform favours more audience.The above plot proves the same.