In [1]:
```
import os, datetime, time, sys
import pandas as pd
import numpy as np
from datetime import datetime

import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df = pd.read_csv("netflix.csv")
```

In [3]:
```
df.head(4)
```

Out[3]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13	90 min	Documentar
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internatio TV Shows, Dramas, Myster
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021	TV-MA	1 Season	Crime Sho Internatio TV Shows, Ac
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA	1 Season	Docuseri Reality

SHAPE of data set

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

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

Data types

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
```

Convert date added and realse year into date format

Check for null values

In [6]:
```
df.isnull().sum()
```

Out[6]:
```
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
```

Null values in:

> director
> cast
> country
> date_added
> rating
> listed_in

Understand null values if they can be treated or deleted or mainatained as is..

1. Null values in --> duration

In [7]:
```
df[df['duration'].isnull()]
```

Out[7]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	April 4, 2017	2017	74 min	NaN	Movies	Lo on r

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	September 16, 2016	2010	84 min	NaN	Movies	I Lo
5813	s5814	Movie	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	United States	August 15, 2016	2015	66 min	NaN	Movies	The hilar

In [8]:
```
df[df['director'] == 'Louis C.K.']
```

Out[8]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	
5541	s5542	Movie	Louis C.K. 2017	Louis C.K.	Louis C.K.	United States	April 4, 2017	2017	74 min	NaN	Movies	Lo on r
5794	s5795	Movie	Louis C.K.: Hilarious	Louis C.K.	Louis C.K.	United States	September 16, 2016	2010	84 min	NaN	Movies	I Lo
5813	s5814	Movie	Louis C.K.: Live at the Comedy Store	Louis C.K.	Louis C.K.	United States	August 15, 2016	2015	66 min	NaN	Movies	The hilar

> Rating and duration are mismacthed and title contains director's name. This data can be deleted.

1. Null values in --> rating

In [9]:
```
df[df['rating'].isnull()]
```

Out[9]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	
5989	s5990	Movie	13TH: A Conversation with Oprah Winfrey & Ava ...	NaN	Oprah Winfrey, Ava DuVernay	NaN	January 26, 2017	2017	NaN	37 min	
6827	s6828	TV Show	Gargantia on the Verdurous Planet	NaN	Kaito Ishikawa, Hisako Kanemoto, Ai Kayano, Ka...	Japan	December 1, 2016	2013	NaN	1 Season	Int
7312	s7313	TV Show	Little Lunch	NaN	Flynn Curry, Olivia Deeble, Madison Lu, Oisín ...	Australia	February 1, 2018	2015	NaN	1 Season	K

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
7537	s7538	Movie	My Honor Was Loyalty	Alessandro Pepe	Leone Frisa, Paolo Vaccarino, Francesco Miglio...	Italy	March 1, 2017	2015	NaN	115 min

> Even director's name is null, so delete these reocrds.

1. Null values in --> date_added

In [10]:
```
df[df['date_added'].isnull()]
```

Out[10]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	lis
6066	s6067	TV Show	A Young Doctor's Notebook and Other Stories	NaN	Daniel Radcliffe, Jon Hamm, Adam Godley, Chris...	United Kingdom	NaN	2013	TV-MA	2 Seasons	Brit Sho Com TV D
6174	s6175	TV Show	Anthony Bourdain: Parts Unknown	NaN	Anthony Bourdain	United States	NaN	2018	TV-PG	5 Seasons	Docu
6795	s6796	TV Show	Frasier	NaN	Kelsey Grammer, Jane Leeves, David Hyde Pierce...	United States	NaN	2003	TV-PG	11 Seasons	Cla Cult Com
6806	s6807	TV Show	Friends	NaN	Jennifer Aniston, Courteney Cox, Lisa Kudrow, ...	United States	NaN	2003	TV-14	10 Seasons	Cla Cult Com
6901	s6902	TV Show	Gunslinger Girl	NaN	Yuuka Nanri, Kanako Mitsuhashi, Eri Sendai, Am...	Japan	NaN	2008	TV-14	2 Seasons	Cri
7196	s7197	TV Show	Kikoriki	NaN	Igor Dmitriev	NaN	NaN	2010	TV-Y	2 Seasons	Ki
7254	s7255	TV Show	La Familia P. Luche	NaN	Eugenio Derbez, Consuelo Duval, Luis Manuel Áv...	United States	NaN	2012	TV-14	3 Seasons	Interna TV S Sp Lan T

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	lis
7406	s7407	TV Show	Maron	NaN	Marc Maron, Judd Hirsch, Josh Brener, Nora Zeh...	United States	NaN	2016	TV-MA	4 Seasons	Con
7847	s7848	TV Show	Red vs. Blue	NaN	Burnie Burns, Jason Saldaña, Gustavo Sorola, G...	United States	NaN	2015	NR	13 Seasons	TV Ac Adve Com TV S
8182	s8183	TV Show	The Adventures of Figaro Pho	NaN	Luke Jurevicius, Craig Behenna, Charlotte Haml...	Australia	NaN	2015	TV-Y7	2 Seasons	Kids' Con

Director's name is also null and can't impute it --> so delete

FINAL UNDERSTANDING ON NULL VALUES

> 1. NULL VALUES IN DURATION, RATING AND DATE_ADDED WILL BE DELETED AND

In [11]:
```
df = df.dropna(subset=['duration', 'rating','date_added'])
df.isnull().sum()
```

Out[11]:
```
show_id            0
type               0
title              0
director        2621
cast             825
country          829
date_added         0
release_year       0
rating             0
duration           0
listed_in          0
description        0
dtype: int64
```

FINAL UNDERSTANDING

> 1. NULL VALUES IN DIRECTOR, COUNTRY AND CAST WILL BE REPLACED BY UNKNOWN

In [12]:
```
def null_to_unknow(Dataframe, col):
    df.loc[df[col].isnull(),col] = 'Unknown'
    print(df.loc[df[col].isnull(),col])
```

In [13]:
```
null_to_unknow(df, 'director')

null_to_unknow(df, 'cast')

null_to_unknow(df, 'country')
```

```
df.isnull().sum()
```

```
Series([], Name: director, dtype: object)
Series([], Name: cast, dtype: object)
Series([], Name: country, dtype: object)
```

Out[13]:

```
show_id         0
type            0
title           0
director        0
cast            0
country         0
date_added      0
release_year    0
rating          0
duration        0
listed_in       0
description     0
dtype: int64
```

Try to understand unique data present is each column

In [14]:

```
df.head(2)
```

Out[14]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_i
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Unknown	United States	September 25, 2021	2020	PG-13	90 min	Documentarie
1	s2	TV Show	Blood & Water	Unknown	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internationa TV Shows, T Dramas, T Mysterie

In [15]:

```
df['type'].value_counts()
```

Out[15]:

```
Movie      6126
TV Show    2664
Name: type, dtype: int64
```

> More movies than TV shows

In [16]:

```
df['title'].value_counts()
```

Out[16]:

```
Dick Johnson Is Dead                1
Cooked                              1
My Beautiful Broken Brain           1
Pee-wee's Big Holiday               1
Netflix Presents: The Characters    1
                                   ..
Sleepless Society: Insomnia         1
```

```
Palazuelos mi rey                1
Narcos: Mexico                   1
Love Is Blind                    1
Zubaan                           1
Name: title, Length: 8790, dtype: int64
```

> No duplicates in tittle

In [17]:

```
df['director'].value_counts()
```

Out[17]:

```
Unknown                        2621
Rajiv Chilaka                    19
Raúl Campos, Jan Suter           18
Suhas Kadav                      16
Marcus Raboy                     16
                               ... 
Raymie Muzquiz, Stu Livingston    1
Joe Menendez                      1
Eric Bross                        1
Will Eisenberg                    1
Mozez Singh                       1
Name: director, Length: 4527, dtype: int64
```

> Highest in director column is unknown.
>
> Some movies are directed by more than 1 director

In [18]:

```
df['cast'].value_counts()
```

Out[18]:

```
Unknown
                                                        825
David Attenborough
                                                         19
Vatsal Dubey, Julie Tejwani, Rupa Bhimani, Jigna Bhardwaj, Rajesh Kava, Mousam, Swapnil
                                                         14
Samuel West
                                                         10
Jeff Dunham
                                                          7

                                                        ...
Sanjay Dutt, Arjun Kapoor, Kriti Sanon, Zeenat Aman, Mohnish Bahl, Padmini Kolhapure, Kuna
l Kapoor, Suhasini Mulay                                  1
Lika Berning, Bobby van Jaarsveld, Marlee van der Merwe, Sonja Herholdt, Elize Cawood, Rou
el Beukes, Kevin Leo, Paul du Toit, Sylvaine Strike      1
Lisa Vicari, Dennis Mojen, Walid Al-Atiyat, Christina Hecke, Zoë Straub, Lisa Hagmeister,
Hans-Jochen Wagner, André Eisermann, Ernst Stötzner      1
Piotr Cyrwus, Mikołaj Kubacki, Anna Radwan, Marian Dziędziel, Jan Nowicki, Juliusz Chrząst
owski, Małgorzata Krzysica, Jacek Strama                 1
Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanana, Manish Chaudhary, Meghna Malik, Malkeet R
auni, Anita Shabdish, Chittaranjan Tripathy              1
Name: cast, Length: 7679, dtype: int64
```

> Movies have cast more than 1, so need to work on this to get understing for cast wise movie release.

In [19]:

```
df['country'].value_counts()
```

Out[19]:

```
United States                                2809
```

```
India                                             972
Unknown                                           829
United Kingdom                                    418
Japan                                             243
                                                 ...
Romania, Bulgaria, Hungary                          1
Uruguay, Guatemala                                  1
France, Senegal, Belgium                            1
Mexico, United States, Spain, Colombia              1
United Arab Emirates, Jordan                        1
Name: country, Length: 749, dtype: int64
```

> More movies from US follwed by India

In [20]:
```
df['rating'].value_counts()
```

Out[20]:
```
TV-MA       3205
TV-14       2157
TV-PG        861
R            799
PG-13        490
TV-Y7        333
TV-Y         306
PG           287
TV-G         220
NR            79
G             41
TV-Y7-FV       6
NC-17          3
UR             3
Name: rating, dtype: int64
```

In [21]:
```
df['listed_in'].value_counts()
```

Out[21]:
```
Dramas, International Movies                                362
Documentaries                                               359
Stand-Up Comedy                                             334
Comedies, Dramas, International Movies                      274
Dramas, Independent Movies, International Movies            252
                                                           ...
Crime TV Shows, International TV Shows, TV Sci-Fi & Fantasy   1
International TV Shows, TV Horror, TV Sci-Fi & Fantasy        1
Crime TV Shows, Kids' TV                                      1
Horror Movies, International Movies, Sci-Fi & Fantasy         1
Cult Movies, Dramas, Thrillers                                1
Name: listed_in, Length: 513, dtype: int64
```

> listed_in have multiple genre, -> need to split and work on this part as well like cast and director

In [22]:
```
df['release_year'].value_counts()
```

Out[22]:
```
2018    1146
2017    1030
2019    1030
2020     953
2016     901
        ...
1959       1
1925       1
1961       1
1947       1
```

```
1966       1
Name: release_year, Length: 74, dtype: int64
```

In [23]:
```
df['duration'].value_counts()
```

Out[23]:
```
1 Season     1791
2 Seasons     421
3 Seasons     198
90 min        152
94 min        146
             ...
16 min          1
186 min         1
193 min         1
189 min         1
191 min         1
Name: duration, Length: 220, dtype: int64
```

Get column added year/month/day from the date added field

In [24]:
```
df.reset_index(inplace = True, drop = True)
df['added_year'] = ''
for i in range(len(df)):
    df.loc[i,'added_year'] = df.loc[i,'date_added'][-4:]
```

In [25]:
```
df['date_added'].str.split()
```

Out[25]:
```
0       [September, 25,, 2021]
1       [September, 24,, 2021]
2       [September, 24,, 2021]
3       [September, 24,, 2021]
4       [September, 24,, 2021]
                 ...
8785     [November, 20,, 2019]
8786          [July, 1,, 2019]
8787      [November, 1,, 2019]
8788      [January, 11,, 2020]
8789         [March, 2,, 2019]
Name: date_added, Length: 8790, dtype: object
```

In [26]:
```
df.reset_index(inplace = True, drop = True)
df['added_month'] = ''
for i in range(len(df)):
    df.loc[i,'added_month'] = df.loc[i,'date_added'].split()[0]
```

In [27]:
```
df.reset_index(inplace = True, drop = True)
df['added_day'] = ''
for i in range(len(df)):
    df.loc[i,'added_day'] = df.loc[i,'date_added'].split()[1]
    df.loc[i,'added_day'] =  df.loc[i,'added_day'][:-1] # remove extra ,
```

In [87]:
```
df.head(2)
```

Out[87]:

show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_i

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_i
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Unknown	United States	September 25, 2021	2020	PG-13	90 min	Documentarie
1	s2	TV Show	Blood & Water	Unknown	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internationa TV Shows, T Dramas, T Mysterie

In [88]:
```
df.tail(2)
```

Out[88]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_i
8788	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	January 11, 2020	2006	PG	88 min	Children & Famil Movies Comedie
8789	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	March 2, 2019	2015	TV-14	111 min	Dramas Internationa Movies Music & Musical

In [30]:
```
df['added_year'].value_counts()
```

Out[30]:
```
2019    2016
2020    1879
2018    1648
2021    1498
2017    1185
2016     426
2015      82
2014      24
2011      13
2013      11
2012       3
2009       2
2008       2
2010       1
Name: added_year, dtype: int64
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8790 entries, 0 to 8789
Data columns (total 15 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   show_id       8790 non-null   object
 1   type          8790 non-null   object
```

```
 2   title         8790 non-null   object
 3   director      8790 non-null   object
 4   cast          8790 non-null   object
 5   country       8790 non-null   object
 6   date_added    8790 non-null   object
 7   release_year  8790 non-null   int64
 8   rating        8790 non-null   object
 9   duration      8790 non-null   object
 10  listed_in     8790 non-null   object
 11  description   8790 non-null   object
 12  added_year    8790 non-null   object
 13  added_month   8790 non-null   object
 14  added_day     8790 non-null   object
dtypes: int64(1), object(14)
memory usage: 1.0+ MB
```

In [32]:

```
df['added_year'] = df['added_year'].astype(int)

df['gap_ad_rls'] = df['added_year'] - df['release_year']

df.head()
```

Out[32]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	liste
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Unknown	United States	September 25, 2021	2020	PG-13	90 min	Document
1	s2	TV Show	Blood & Water	Unknown	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internat TV Show Drama Myst
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	Unknown	September 24, 2021	2021	TV-MA	1 Season	Crim Sh Internat TV Show
3	s4	TV Show	Jailbirds New Orleans	Unknown	Unknown	Unknown	September 24, 2021	2021	TV-MA	1 Season	Docus Reali
4	s5	TV Show	Kota Factory	Unknown	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA	2 Seasons	Internat TV Sh Romant Shows,

In [33]:

```
df['gap_ad_rls'].unique()
```

```
array([ 1,  0, 28,  3, 25, 23, 24, 11,  8,  4, 46, 43, 38, 34,  9, 20,  7,
```

Out[33]:
```
19, 18, 17, 10, 13, 12, 14, 16, 15, 27,  6,  2,  5, 39, 32, 31, 30,
22, 35, 29, 37, 41, 60, 21, 26, 36, 45, 62, 33, 40, 49, 57, 76, -1,
66, 64, 50, 47, 44, 93, 51, 55, 48, 42, -2, 54, 59, 61, 52, 63, -3,
72, 71, 75, 65, 73, 70, 74], dtype=int64)
```

> gap between add year and releas year always should be >= 0.
>
> if any negative value means, added before release ?? Not possible

In [34]:
```
df[df['gap_ad_rls'] < 0]
```

Out[34]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
1551	s1552	TV Show	Hilda	Unknown	Bella Ramsey, Ameerah Falzon-Ojo, Oliver Nelso...	United Kingdom, Canada, United States	December 14, 2020	2021	TV-Y7	2 Seasons
1696	s1697	TV Show	Polly Pocket	Unknown	Emily Tennant, Shannon Chan-Kent, Kazumi Evans...	Canada, United States, Ireland	November 15, 2020	2021	TV-Y	2 Seasons
2920	s2921	TV Show	Love Is Blind	Unknown	Nick Lachey, Vanessa Lachey	United States	February 13, 2020	2021	TV-MA	1 Season
3168	s3169	TV Show	Fuller House	Unknown	Candace Cameron Bure, Jodie Sweetin, Andrea Ba...	United States	December 6, 2019	2020	TV-PG	5 Seasons
3287	s3288	TV Show	Maradona in Mexico	Unknown	Diego Armando Maradona	Argentina, United States, Mexico	November 13, 2019	2020	TV-MA	1 Season
3369	s3370	TV Show	BoJack Horseman	Unknown	Will Arnett, Aaron Paul, Amy Sedaris, Alison B...	United States	October 25, 2019	2020	TV-MA	6 Seasons
3433	s3434	TV Show	The Hook Up Plan	Unknown	Marc Ruchmann, Zita Hanrot, Sabrina Ouazani, J...	France	October 11, 2019	2020	TV-MA	2 Seasons

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
4844	s4845	TV Show	Unbreakable Kimmy Schmidt	Unknown	Ellie Kemper, Jane Krakowski, Tituss Burgess, ...	United States	May 30, 2018	2019	TV-14	4 Seasons
4845	s4846	TV Show	Arrested Development	Unknown	Jason Bateman, Portia de Rossi, Will Arnett, M...	United States	May 29, 2018	2019	TV-MA	5 Seasons
5394	s5395	Movie	Hans Teeuwen: Real Rancour	Doesjka van Hoogdalem	Hans Teeuwen	Netherlands	July 1, 2017	2018	TV-MA	86 min
5657	s5659	TV Show	Sense8	Unknown	Tuppence Middleton, Brian J. Smith, Doona Bae,...	United States	December 23, 2016	2018	TV-MA	2 Seasons
5676	s5678	TV Show	Tokyo Trial	Unknown	Marcel Hensema, Paul Freeman, Irrfan Khan, Sta...	Canada, Japan, Netherlands	December 13, 2016	2017	TV-MA	1 Season
7053	s7064	Movie	Incoming	Eric Zaragosa	Scott Adkins, Aaron McCusker, Vahldin Prelic, ...	Serbia, United States	October 26, 2018	2019	TV-MA	89 min
7102	s7113	TV Show	Jack Taylor	Stuart Orme	Iain Glen, Killian Scott, Nora-Jane Noone, Tar...	United States, Ireland	March 31, 2013	2016	TV-MA	1 Season

In [35]:
```
df[df['gap_ad_rls'] < 0].shape
```

Out[35]:
```
(14, 16)
```

> These are the reocrds with flase info in realese year
>
> So replacing add year = releasee year

In [36]:
```
for i in range(len(df)):
    if df.loc[i,'gap_ad_rls'] < 0:
        df.loc[i,'added_year'] = df.loc[i,'release_year']
```

```
    else:
        continue

# recalculate the gap
df['gap_ad_rls'] = df['added_year'] - df['release_year']
```

In [37]:
```
df['gap_ad_rls'].unique()
```

Out[37]:
```
array([ 1,  0, 28,  3, 25, 23, 24, 11,  8,  4, 46, 43, 38, 34,  9, 20,  7,
       19, 18, 17, 10, 13, 12, 14, 16, 15, 27,  6,  2,  5, 39, 32, 31, 30,
       22, 35, 29, 37, 41, 60, 21, 26, 36, 45, 62, 33, 40, 49, 57, 76, 66,
       64, 50, 47, 44, 93, 51, 55, 48, 42, 54, 59, 61, 52, 63, 72, 71, 75,
       65, 73, 70, 74], dtype=int64)
```

Visual Analysis - Univariate, Bivariate after pre-processing of the data

Hints

The exploration should have a goal. As you explore the data, keep in mind that you want to answer which type of shows to produce and how to grow the business. Ensure each recommendation is backed by data. The company is looking for data-driven insights, not personal opinions or anecdotes. Assume that you are presenting your findings to business executives who have only a basic understanding of data science. Avoid unnecessary technical jargon.

Start by exploring a few questions:

> 1. What type of content is available in different countries?
> 2. How has the number of movies released per year changed over the last 20-30 years?
> 3. Comparison of tv shows vs. movies.
> 4. What is the best time to launch a TV show?
> 5. Analysis of actors/directors of different types of shows/movies.
> 6. Does Netflix has more focus on TV Shows than movies in recent years
> 7. Understanding what content is available in different countries

Evaluation Criteria (100 Points):

1. Defining Problem Statement and Analysing basic metrics (10 Points)
2. Observations on the shape of data, data types of all the attributes, conversion of categorical attributes to 'category' (If required), missing value detection, statistical summary (10 Points)
3. Non-Graphical Analysis: Value counts and unique attributes (10 Points)
4. Visual Analysis - Univariate, Bivariate after pre-processing of the data

Note: Pre-processing involves unnesting of the data in columns like Actor, Director, Country

4.1 For continuous variable(s): Distplot, countplot, histogram for univariate analysis (10 Points)

4.2 For categorical variable(s): Boxplot (10 Points)

4.3 For correlation: Heatmaps, Pairplots (10 Points)

1. Missing Value & Outlier check (Treatment optional) (10 Points)
2. Insights based on Non-Graphical and Visual Analysis (10 Points)

   6.1 Comments on the range of attributes

   6.2 Comments on the distribution of the variables and relationship between them

   6.3 Comments for each univariate and bivariate plot
3. Business Insights (10 Points) - Should include patterns observed in the data along with what you can infer from it
4. Recommendations (10 Points) - Actionable items for business. No technical jargon. No complications. Simple action items that everyone can understand

Submission Process:

Type your insights and recommendations in the rich-text editor.

Convert your jupyter notebook into PDF (Save as PDF using Chrome browser's Print command), upload it in your Google Drive (set the permission to allow public access), and paste that link in the text editor.

Alternatively, you can directly submit your PDF on the portal.

Optionally, you may add images/graphs in the text editor by taking screenshots or saving matplotlib graphs using plt.savefig(...).

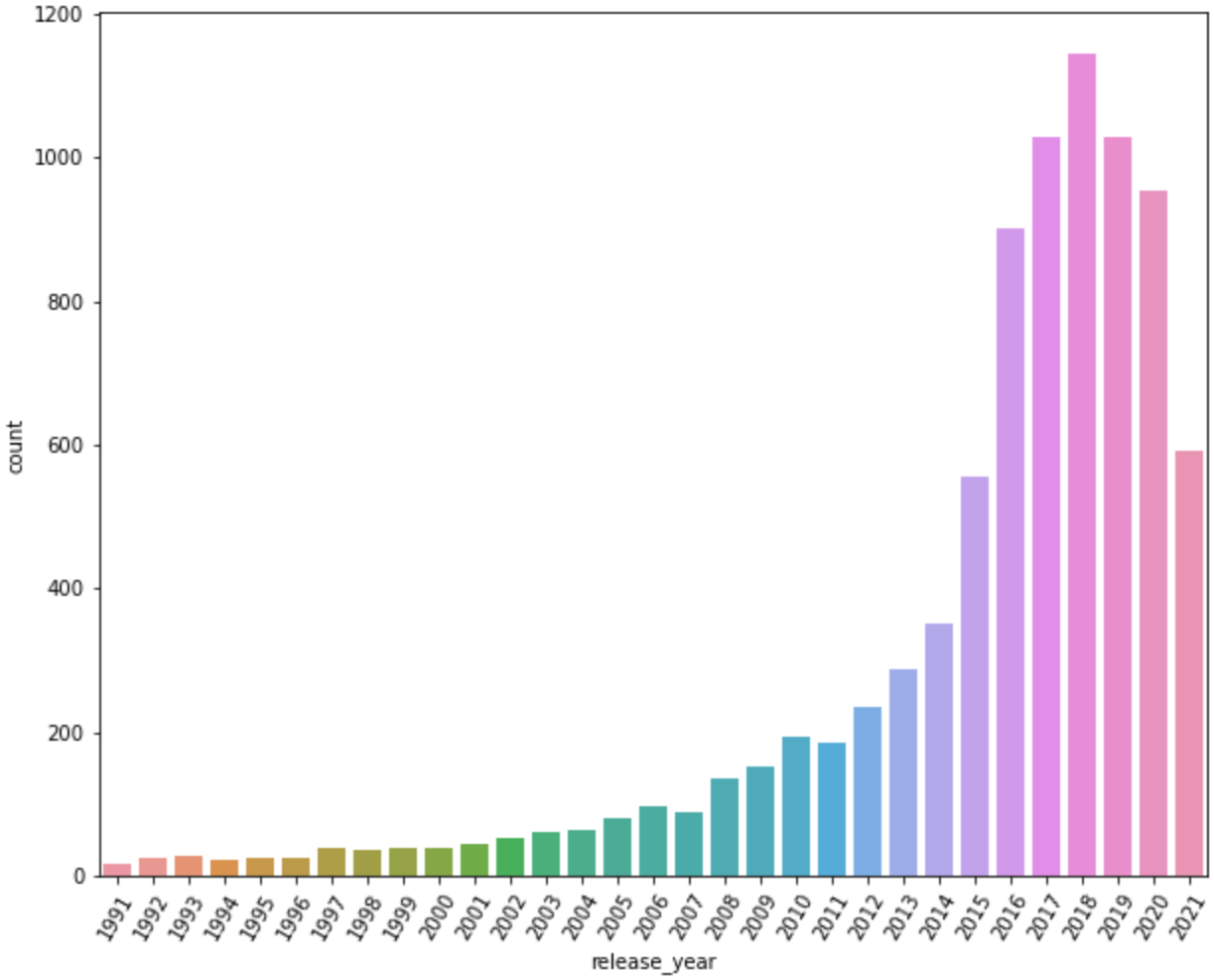
After submitting, you will not be allowed to edit your submission.

Trend of

> How has the number of movies released per year changed over the last 20-30 years?

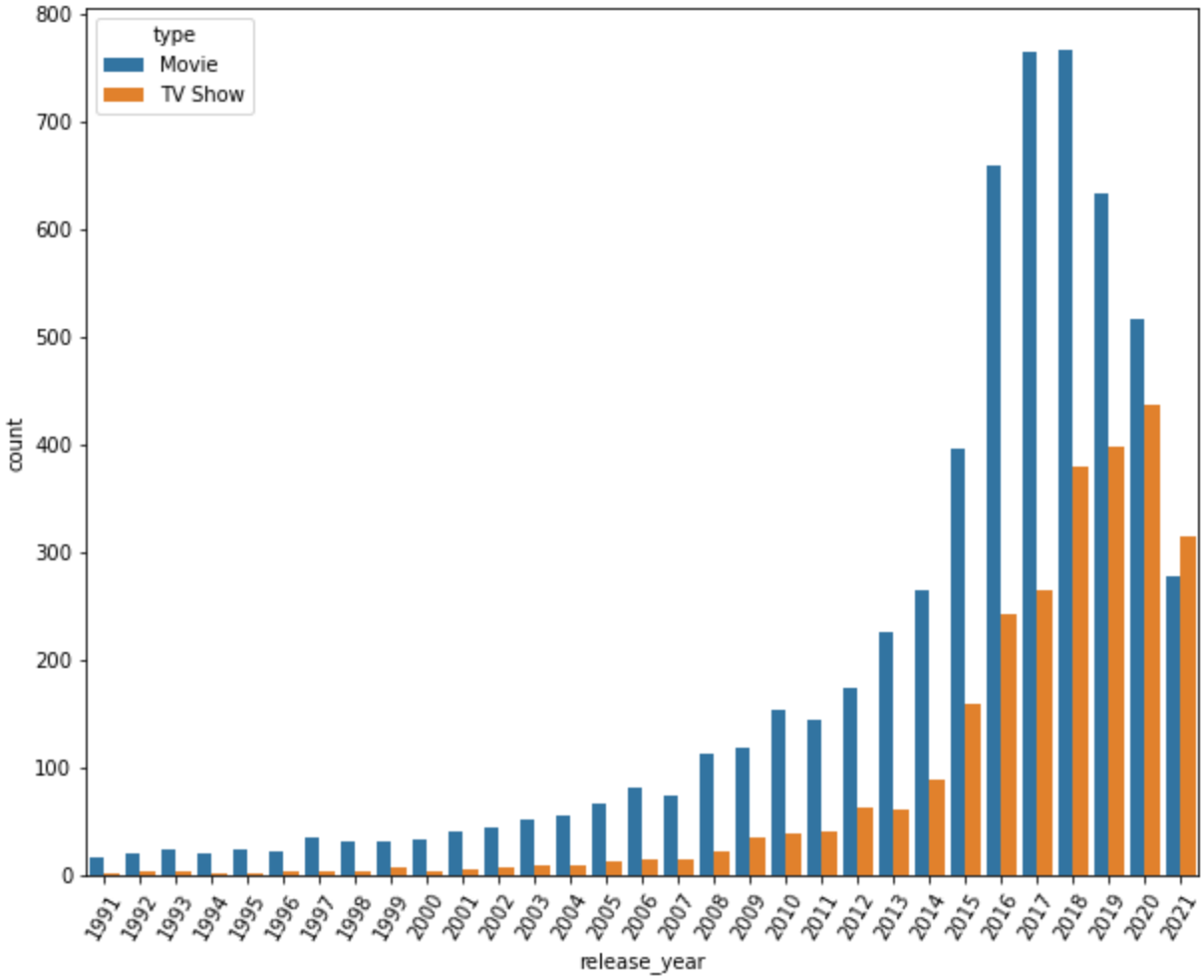
In [38]:

```
df_graph = df[df['release_year'] > 1990]
plt.figure(figsize=(10,8))
g = sns.countplot(x="release_year", data=df_graph)
g.tick_params(axis='x', rotation=60)
```



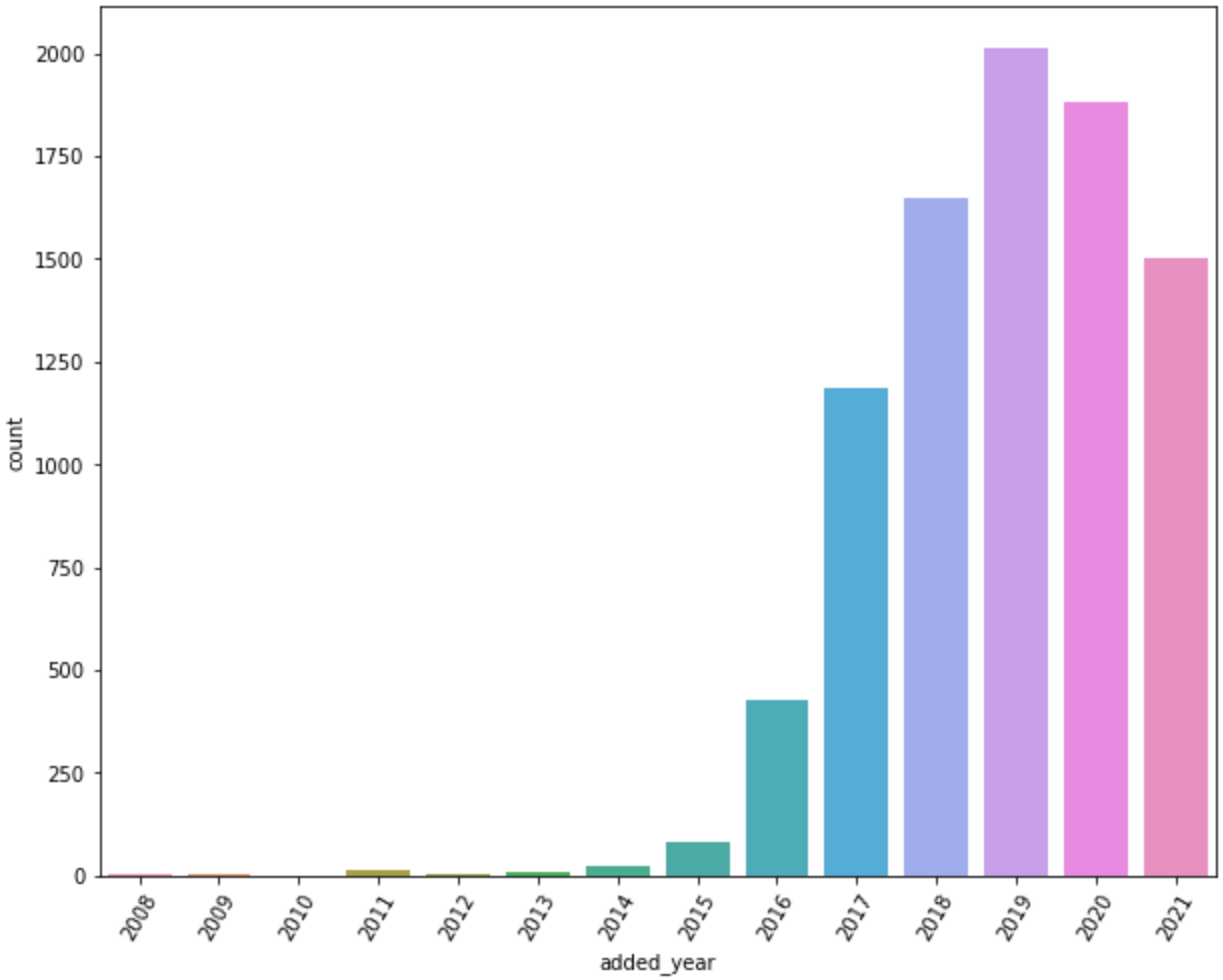
In [39]:

```
df_graph = df[df['release_year'] > 1990]
plt.figure(figsize=(10,8))
g = sns.countplot(x="release_year", data=df_graph, hue = 'type')
g.tick_params(axis='x', rotation=60)
```



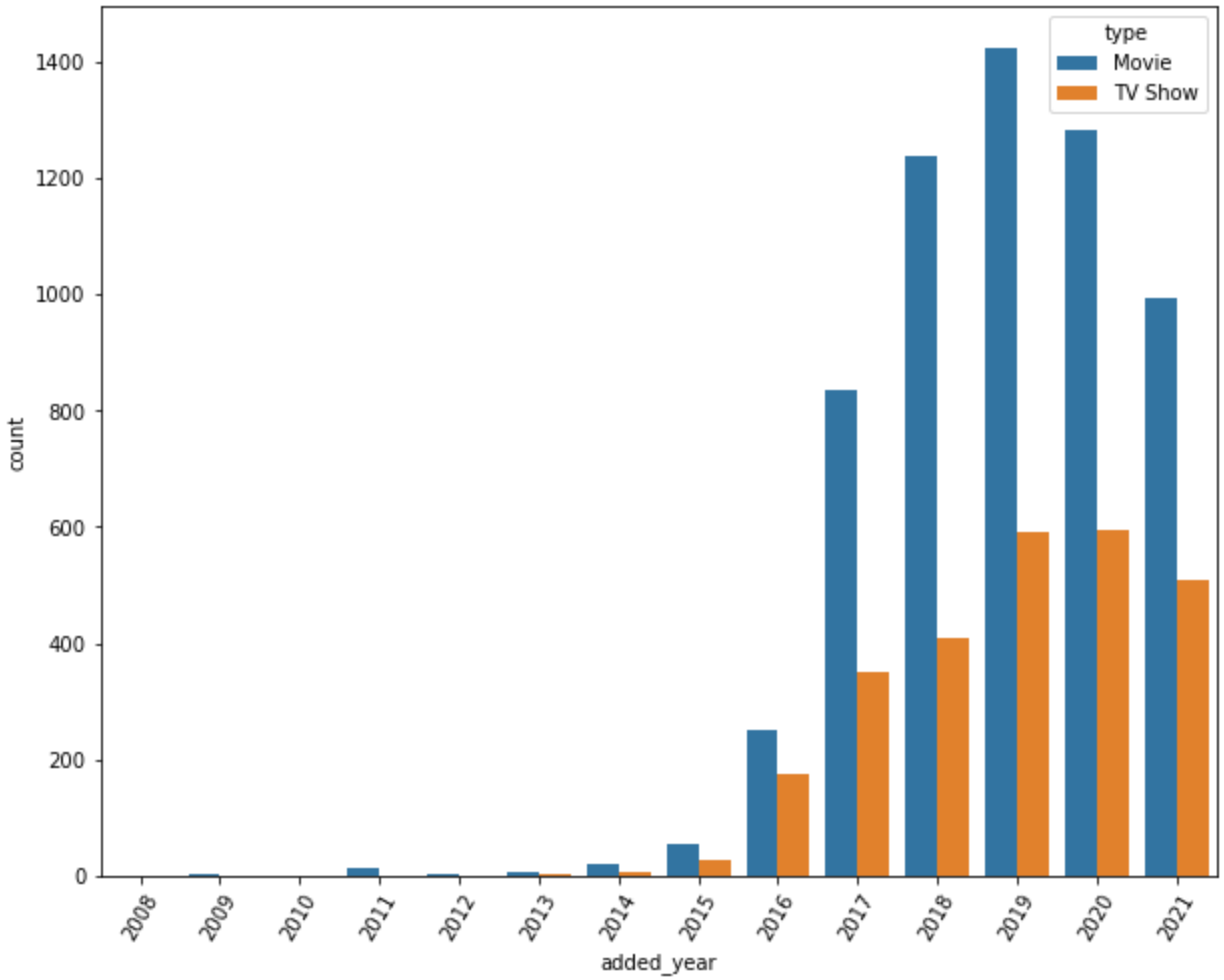
In [40]:

```
df_graph = df[df['added_year'] > 1990]
plt.figure(figsize=(10,8))
g = sns.countplot(x="added_year", data=df_graph)
g.tick_params(axis='x', rotation=60)
```



In [41]:

```
df_graph = df[df['added_year'] > 1990]
plt.figure(figsize=(10,8))
g = sns.countplot(x="added_year", data=df_graph, hue = 'type')
g.tick_params(axis='x', rotation=60)
```



Describe- over all, TV show and movies

In [42]:
```
df.describe()
```

Out[42]:

	release_year	added_year	gap_ad_rls
count	8790.000000	8790.000000	8790.000000
mean	2014.183163	2018.875540	4.692378
std	8.825466	1.572528	8.788835
min	1925.000000	2008.000000	0.000000
25%	2013.000000	2018.000000	0.000000
50%	2017.000000	2019.000000	1.000000
75%	2019.000000	2020.000000	5.000000
max	2021.000000	2021.000000	93.000000

In [43]:
```
# avarage gap added between TV shows and Movies
df[df['type'] == 'Movie'].describe()
```

Out[43]:

	release_year	added_year	gap_ad_rls
count	6126.000000	6126.000000	6126.000000
mean	2013.120144	2018.851453	5.731309

	release_year	added_year	gap_ad_rls
std	9.681723	1.560995	9.745544
min	1942.000000	2008.000000	0.000000
25%	2012.000000	2018.000000	0.000000
50%	2016.000000	2019.000000	2.000000
75%	2018.000000	2020.000000	7.000000
max	2021.000000	2021.000000	75.000000

In [44]:
```
df[df['type'] == 'TV Show'].describe()
```

Out[44]:

	release_year	added_year	gap_ad_rls
count	2664.000000	2664.000000	2664.000000
mean	2016.627628	2018.930931	2.303303
std	5.735194	1.597653	5.319352
min	1925.000000	2008.000000	0.000000
25%	2016.000000	2018.000000	0.000000
50%	2018.000000	2019.000000	0.000000
75%	2020.000000	2020.000000	2.000000
max	2021.000000	2021.000000	93.000000

From above graphs and decribe we can understand that

**Overall per year production is increasing over the years.

**Movies are realsed more in every year compare to TV shows.

**and same case with netflix- added more movies than the TV shows.

> another intresting fact, based on mean gap between date added and date realsed shows.

```
1. overall mean gap is -> 4.692378 years
2. For movies mean gap gap is -> 5.731309
3. for TV shows mean gap is -> 5.319352
But movies has outlier, older movies are added recently.
```

> so use median of gap between date added and date realsed shows.

```
1. overall mean gap is -> 1 years
2. For movies mean gap gap is -> 2
3. for TV shows mean gap is -> 0
```

**what we can understand from this is, more TV shows are released on netflix directly than movies.

In [45]:
```
df.head(2)
```

Out[45]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_i
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Unknown	United States	September 25, 2021	2020	PG-13	90 min	Documentarie
1	s2	TV Show	Blood & Water	Unknown	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internationa TV Shows, T Dramas, T Mysterie

Unnest data for better understanding

where there are multiple values present for each id

1. Unnest cast data to Actors column

In [46]:
```
df.head(2)
```

Out[46]:

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_i
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Unknown	United States	September 25, 2021	2020	PG-13	90 min	Documentarie
1	s2	TV Show	Blood & Water	Unknown	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	Internationa TV Shows, T Dramas, T Mysterie

In [89]:
```
constraint_cast = df['cast'].apply(lambda x: str(x).split(', ')).to_list()
#constraint_cast
```

In [48]:
```
df_new = pd.DataFrame(constraint_cast, index = df['show_id'])
df_new = df_new.stack()
df_new = pd.DataFrame(df_new.reset_index())
df_new.drop('level_1', axis = 1, inplace = True)
df_new.rename(columns = {0: 'Actors'}, inplace = True)
df_new
```

Out[48]:

	show_id	Actors
0	s1	Unknown
1	s2	Ama Qamata

	show_id	Actors
2	s2	Khosi Ngema
3	s2	Gail Mabalane
4	s2	Thabang Molaba
...	...	...
64836	s8807	Manish Chaudhary
64837	s8807	Meghna Malik
64838	s8807	Malkeet Rauni
64839	s8807	Anita Shabdish
64840	s8807	Chittaranjan Tripathy

64841 rows × 2 columns

In [49]:
```
df_fnl_temp_1 = df_new.merge(df[['show_id', 'type', 'title', 'director', 'country', 'date_
       'release_year', 'rating', 'duration', 'listed_in', 'description',
       'added_year', 'added_month', 'added_day', 'gap_ad_rls']], on = 'show_id', how = 'le
print(df_fnl_temp_1.shape)
df_fnl_temp_1.head(2)
```

```
(64841, 16)
```

Out[49]:

	show_id	Actors	type	title	director	country	date_added	release_year	rating	duration	listed_in
0	s1	Unknown	Movie	Dick Johnson Is Dead	Kirsten Johnson	United States	September 25, 2021	2020	PG-13	90 min	Documentaries
1	s2	Ama Qamata	TV Show	Blood & Water	Unknown	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, TV Dramas, TV Mysteries

2. Unnest director data to Directors (new column)

In [90]:
```
constraint_director = df['director'].apply(lambda x: str(x).split(', ')).to_list()
#constraint_director
```

In [51]:
```
df_new = pd.DataFrame(constraint_director, index = df['show_id'])
df_new = df_new.stack()
df_new = pd.DataFrame(df_new.reset_index())
df_new.drop('level_1', axis = 1, inplace = True)
df_new.rename(columns = {0: 'Directors'}, inplace = True)
df_new
```

Out[51]:

	show_id	Directors
0	s1	Kirsten Johnson

	show_id	Directors
1	s2	Unknown
2	s3	Julien Leclercq
3	s4	Unknown
4	s5	Unknown
...	...	...
9590	s8803	David Fincher
9591	s8804	Unknown
9592	s8805	Ruben Fleischer
9593	s8806	Peter Hewitt
9594	s8807	Mozez Singh

9595 rows × 2 columns

In [52]:
```
df_fnl_temp_1.columns
```

Out[52]:
```
Index(['show_id', 'Actors', 'type', 'title', 'director', 'country',
       'date_added', 'release_year', 'rating', 'duration', 'listed_in',
       'description', 'added_year', 'added_month', 'added_day', 'gap_ad_rls'],
      dtype='object')
```

In [53]:
```
df_fnl_temp_2 = df_new.merge(df_fnl_temp_1[['show_id', 'Actors', 'type', 'title', 'country
       'date_added', 'release_year', 'rating', 'duration', 'listed_in',
       'description', 'added_year', 'added_month', 'added_day', 'gap_ad_rls']], on = 'show
print(df_fnl_temp_2.shape)
df_fnl_temp_2.head(2)
```

```
(70702, 16)
```

Out[53]:

	show_id	Directors	Actors	type	title	country	date_added	release_year	rating	duration	listed_in
0	s1	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	United States	September 25, 2021	2020	PG-13	90 min	Documentaries
1	s2	Unknown	Ama Qamata	TV Show	Blood & Water	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, TV Dramas, TV Mysteries

3. Unnest genre data to Genre column

In [91]:
```
constraint_genre = df['listed_in'].apply(lambda x: str(x).split(', ')).to_list()
#constraint_genre
```

In [55]:
```
df_new = pd.DataFrame(constraint_genre, index = df['show_id'])
df_new = df_new.stack()
```

```
df_new = pd.DataFrame(df_new.reset_index())
df_new.drop('level_1', axis = 1, inplace = True)
df_new.rename(columns = {0: 'Genre'}, inplace = True)
df_new
```

Out[55]:

	show_id	Genre
0	s1	Documentaries
1	s2	International TV Shows
2	s2	TV Dramas
3	s2	TV Mysteries
4	s3	Crime TV Shows
...	...	...
19289	s8806	Children & Family Movies
19290	s8806	Comedies
19291	s8807	Dramas
19292	s8807	International Movies
19293	s8807	Music & Musicals

19294 rows × 2 columns

In [56]:
```
df_fnl_temp_2.columns
```

Out[56]:
```
Index(['show_id', 'Directors', 'Actors', 'type', 'title', 'country',
       'date_added', 'release_year', 'rating', 'duration', 'listed_in',
       'description', 'added_year', 'added_month', 'added_day', 'gap_ad_rls'],
      dtype='object')
```

In [57]:
```
df_fnl_temp_3 = df_new.merge(df_fnl_temp_2[['show_id', 'Directors', 'Actors', 'type', 'tit
       'date_added', 'release_year', 'rating', 'duration',
       'description', 'added_year', 'added_month', 'added_day', 'gap_ad_rls']], on = 'show
print(df_fnl_temp_3.shape)
df_fnl_temp_3.head(2)
```

```
(160988, 16)
```

Out[57]:

	show_id	Genre	Directors	Actors	type	title	country	date_added	release_year	rating	duration
0	s1	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	United States	September 25, 2021	2020	PG-13	90 min
1	s2	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	South Africa	September 24, 2021	2021	TV-MA	2 Seasons

4. Unnest country - country new column

In [92]:
```
constraint_country = df['country'].apply(lambda x: str(x).split(', ')).to_list()
#constraint_country
```

In [59]:
```
df_new = pd.DataFrame(constraint_country, index = df['show_id'])
df_new = df_new.stack()
df_new = pd.DataFrame(df_new.reset_index())
df_new.drop('level_1', axis = 1, inplace = True)
df_new.rename(columns = {0: 'Country'}, inplace = True)
df_new
```

Out[59]:

	show_id	Country
0	s1	United States
1	s2	South Africa
2	s3	Unknown
3	s4	Unknown
4	s5	India
...	...	...
10823	s8803	United States
10824	s8804	Unknown
10825	s8805	United States
10826	s8806	United States
10827	s8807	India

10828 rows × 2 columns

In [60]:
```
df_fnl_temp_3.columns
```

Out[60]:
```
Index(['show_id', 'Genre', 'Directors', 'Actors', 'type', 'title', 'country',
       'date_added', 'release_year', 'rating', 'duration', 'description',
       'added_year', 'added_month', 'added_day', 'gap_ad_rls'],
      dtype='object')
```

In [61]:
```
df_fnl_temp_4 = df_new.merge(df_fnl_temp_3[['show_id', 'Genre', 'Directors', 'Actors', 'ty
       'date_added', 'release_year', 'rating', 'duration', 'description',
       'added_year', 'added_month', 'added_day', 'gap_ad_rls']], on = 'show_id', how = 'le
print(df_fnl_temp_4.shape)
df_fnl_temp_4.head(2)
```

```
(201763, 16)
```

Out[61]:

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
0	s1	United States	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 mi

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
1	s2	South Africa	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	Season

In [62]:
```
df_fnl = df_fnl_temp_4.copy()
```

In [63]:
```
df_fnl.shape
```

Out[63]:
```
(201763, 16)
```

In [64]:
```
df_fnl.head(2)
```

Out[64]:

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
0	s1	United States	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 mi
1	s2	South Africa	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	Season

Actors wise data analysis

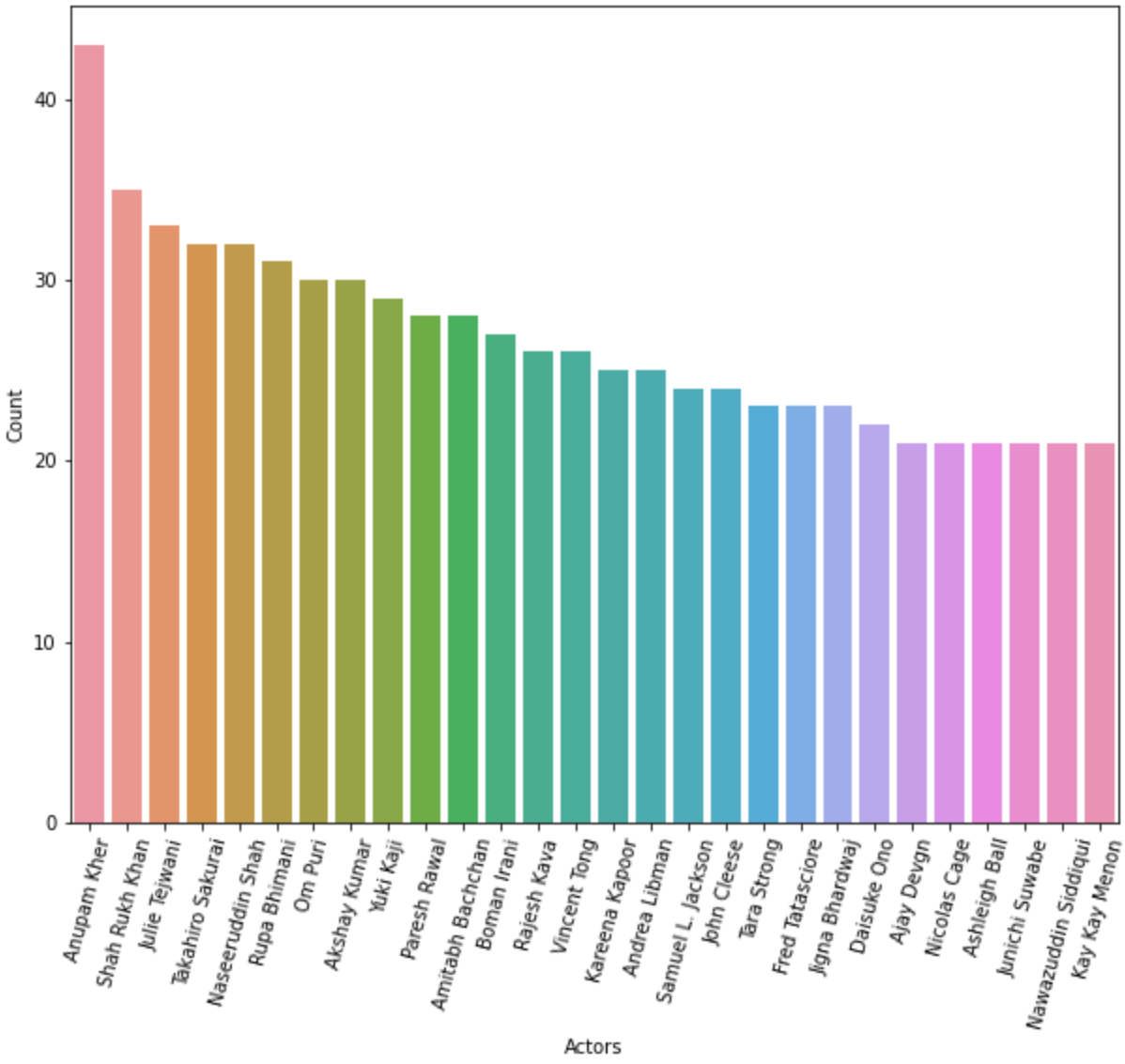
In [65]:
```
df_Actors = df_fnl.drop_duplicates(['show_id','Actors'])

df_Actors = df_Actors.groupby(['Actors',])['show_id'].count()

df_Actors = pd.DataFrame(df_Actors.reset_index())

df_Actors.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_Actors = df_Actors.sort_values('Count', ascending= False, ignore_index = True)
df_Actors = df_Actors[df_Actors['Actors'] != 'Unknown']

# df_Actors = df_Actors.merge(df_fnl[['Country','Actors']], on = 'Actors', how = 'left')
# df_Actors = df_Actors.drop_duplicates()
# df_Actors

df_Actors.head(2)
```

Out[65]:

	Actors	Count
1	Anupam Kher	43
2	Shah Rukh Khan	35

In [66]:
```
# Anlysis of at least 20 movies/TV shows
```

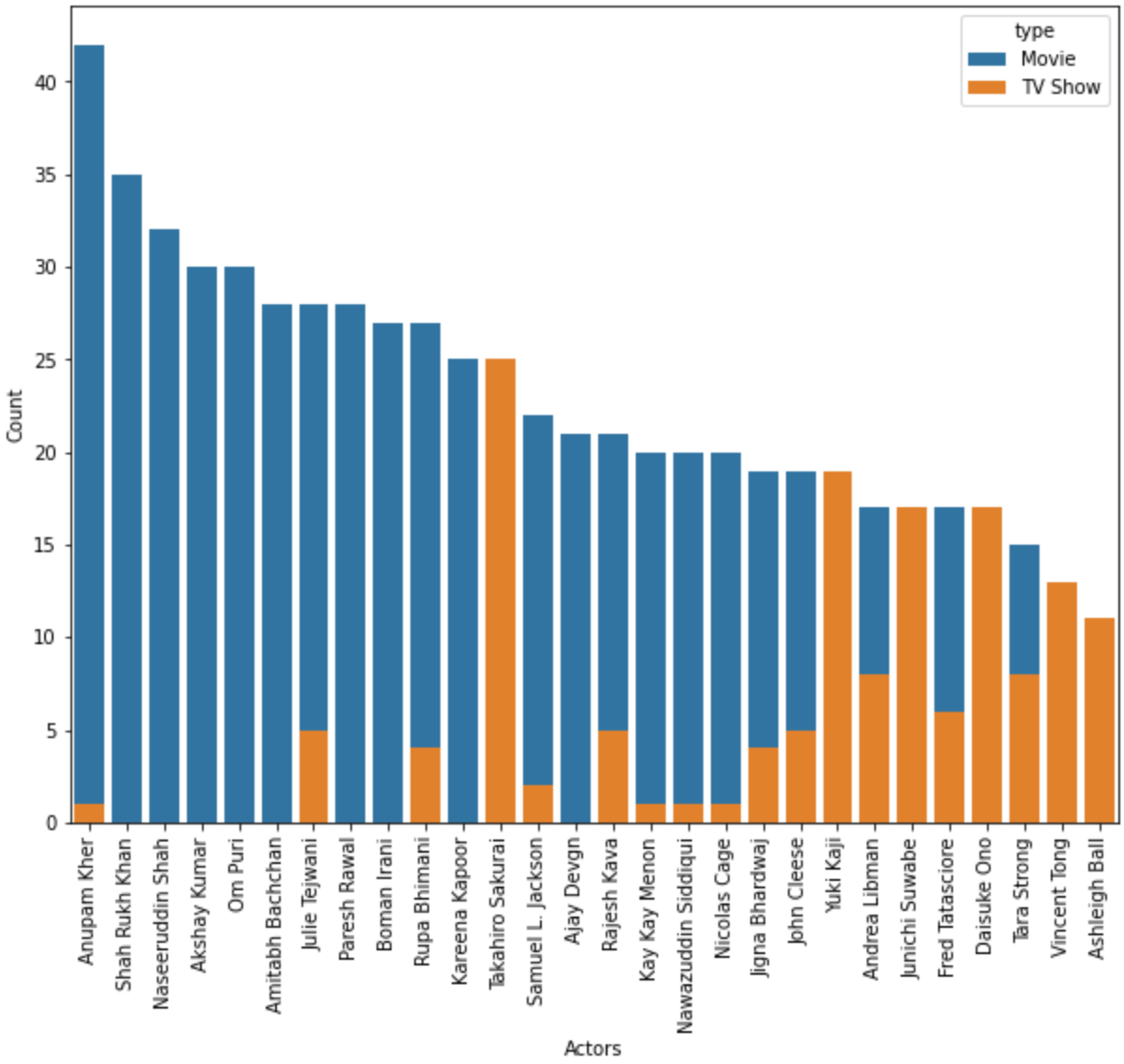
In [67]:
```
df_Actors_top_20 = df_Actors[df_Actors['Count'] > 20]
df_Actors_top_20 = df_Actors_top_20[df_Actors_top_20['Actors'] != 'Unknown']
plt.figure(figsize=(10,8))
g = sns.barplot(x="Actors", y='Count',data=df_Actors_top_20)
g.tick_params(axis='x', rotation=75)
```



In [68]:
```
# Lets understand  type of show for 20 actors
```

In [69]:
```
df_Actors = df_fnl.drop_duplicates(['show_id','Actors','type'])

df_Actors = df_Actors.groupby(['Actors','type'])['show_id'].count()

df_Actors = pd.DataFrame(df_Actors.reset_index())

df_Actors.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_Actors = df_Actors.sort_values('Count', ascending= False, ignore_index = True )

df_Actors = df_Actors[df_Actors['Actors'] != 'Unknown']

df_Actors_top_20['Actors'].to_list()

df_Actors_top_20_Genre = df_Actors[df_Actors['Actors'].isin(df_Actors_top_20['Actors'].to_
df_Actors_top_20_Genre = df_Actors_top_20_Genre[df_Actors_top_20_Genre['Actors'] != 'Unkno
```

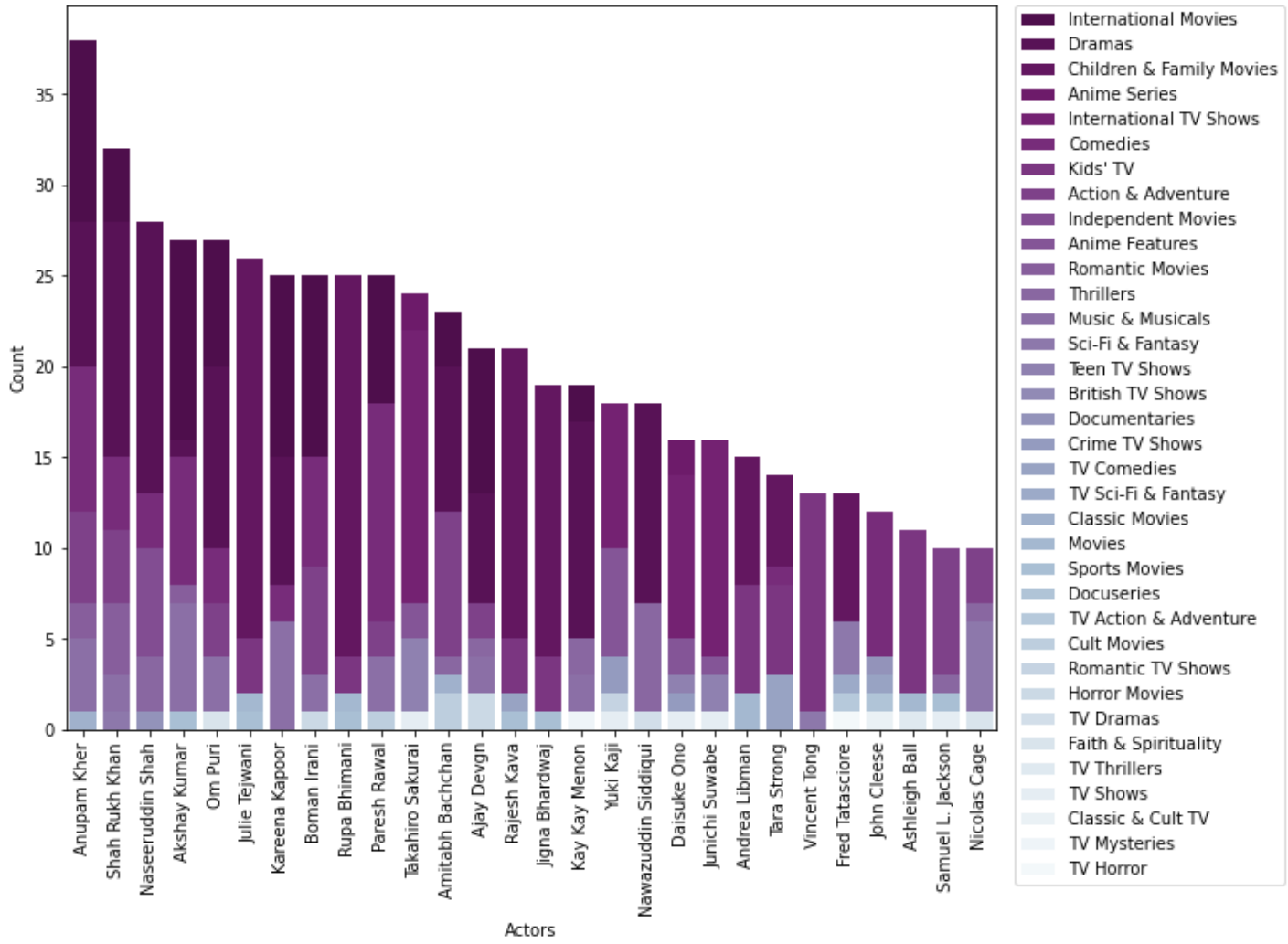
```
plt.figure(figsize=(10,8))
g = sns.barplot(x="Actors", y='Count',data=df_Actors_top_20_Genre, hue = 'type', dodge = F
g.tick_params(axis='x', rotation=90)

#place legend outside top right corner of plot
#plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
```



In [70]:

```
df_Actors = df_fnl.drop_duplicates(['show_id','Actors','Genre'])

df_Actors = df_Actors.groupby(['Actors','Genre'])['show_id'].count()

df_Actors = pd.DataFrame(df_Actors.reset_index())

df_Actors.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_Actors = df_Actors.sort_values('Count', ascending= False, ignore_index = True )

df_Actors = df_Actors[df_Actors['Actors'] != 'Unknown']

df_Actors_top_20['Actors'].to_list()

df_Actors_top_20_Genre = df_Actors[df_Actors['Actors'].isin(df_Actors_top_20['Actors'].to_
df_Actors_top_20_Genre = df_Actors_top_20_Genre[df_Actors_top_20_Genre['Actors'] != 'Unkno
plt.figure(figsize=(10,8))
g = sns.barplot(x="Actors", y='Count',data=df_Actors_top_20_Genre, hue = 'Genre', dodge =
g.tick_params(axis='x', rotation=90)

#place legend outside top right corner of plot
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
```

Out[70]: <matplotlib.legend.Legend at 0x23532cd46a0>



Top 20 productive actors analysis

> Only TV shows concentracted actors Takahiro Sakurai, Yoki kaji, Vincent Tong and Ashleigh ball - 4/20
>
> Top 10 productive actors are highly concetrated on movies and very less or nothing on TV shows.
>
> Genre wise, Top 20 actors are main focus is on international movies, Drams, international TV shows and comedies.

Directors wise data analysis

In [71]:
```
df_fnl.head(2)
```

Out[71]:

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
0	s1	United States	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 mi

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
1	s2	South Africa	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	Season

In [72]:
```
df_Directors = df_fnl.drop_duplicates(['show_id','Directors'])

df_Directors = df_Directors.groupby(['Directors',])['show_id'].count()

df_Directors = pd.DataFrame(df_Directors.reset_index())

df_Directors.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_Directors = df_Directors.sort_values('Count', ascending= False, ignore_index = True)
df_Directors = df_Directors[df_Directors['Directors'] != 'Unknown']

# df_Actors = df_Actors.merge(df_fnl[['Country','Actors']], on = 'Actors', how = 'left')
# df_Actors = df_Actors.drop_duplicates()
# df_Actors

df_Directors
```

Out[72]:

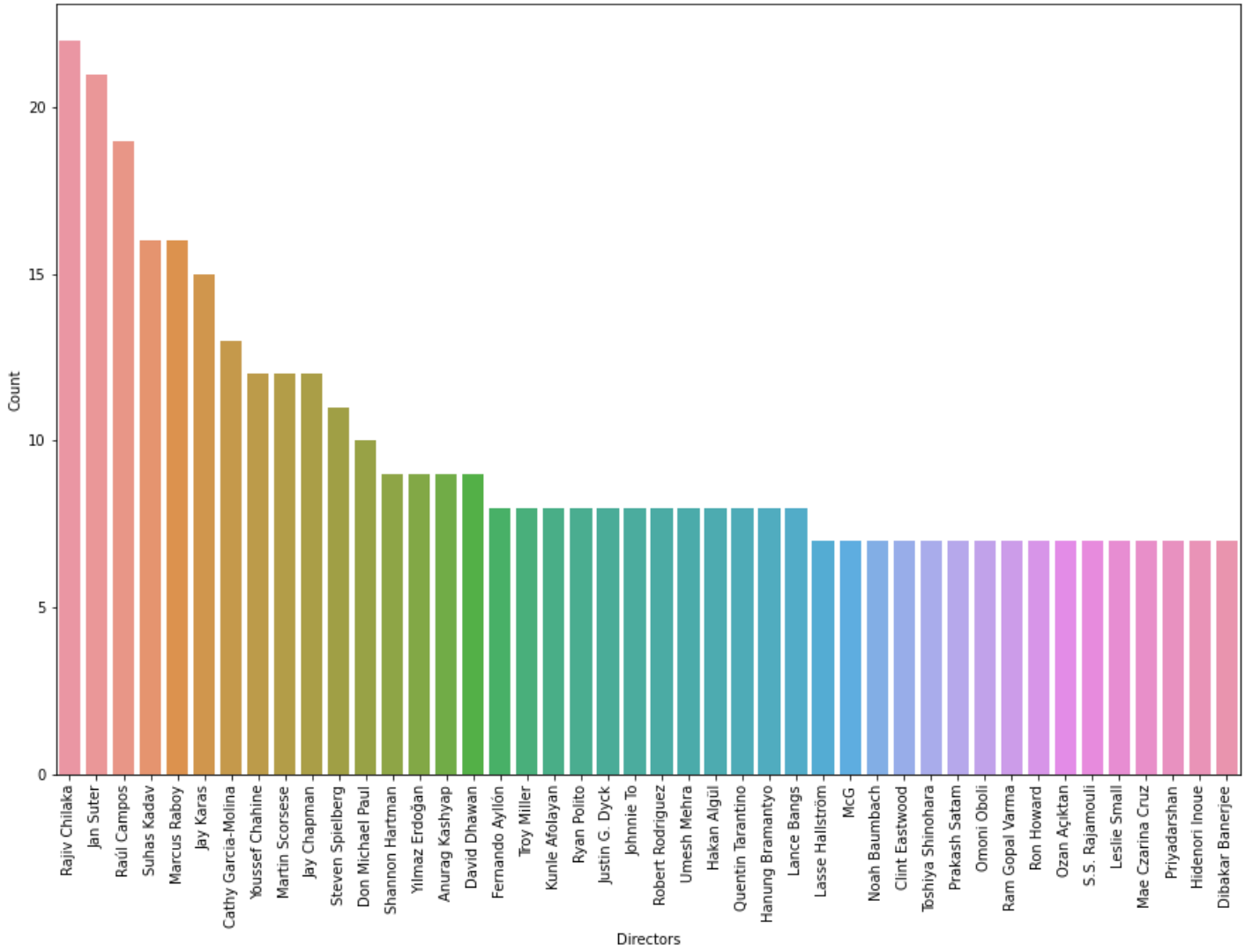
	Directors	Count
1	Rajiv Chilaka	22
2	Jan Suter	21
3	Raúl Campos	19
4	Suhas Kadav	16
5	Marcus Raboy	16
...	...	...
4987	Brandon Camp	1
4988	Juan Antin	1
4989	Juan Antonio de la Riva	1
4990	Juan Camilo Pinzon	1
4991	Ayush Raina	1

4991 rows × 2 columns

In [73]:
```
df_Directors_top_20 = df_Directors[df_Directors['Count'] > 6]
df_Directors_top_20.shape
```

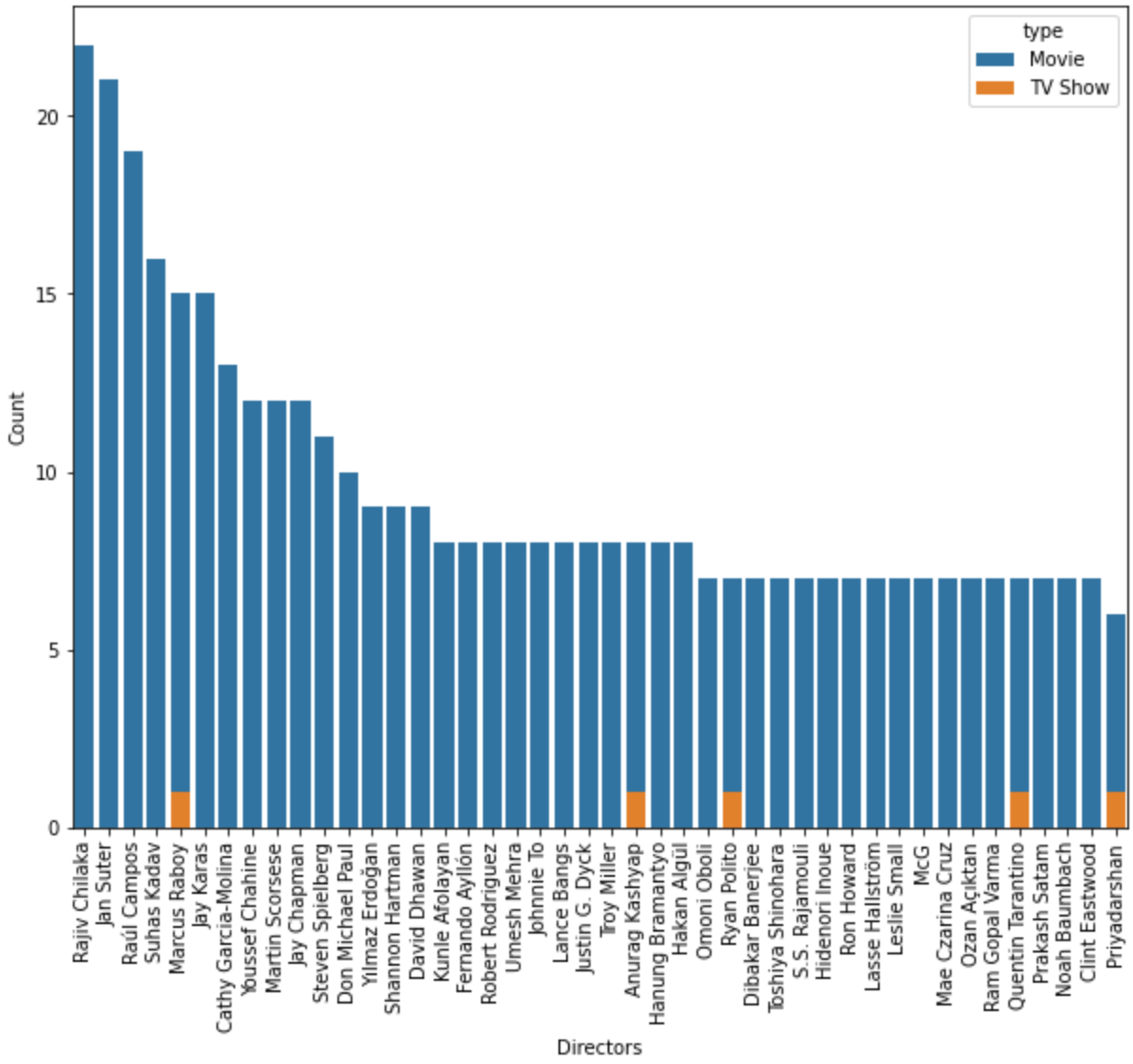
Out[73]:
```
(44, 2)
```

In [74]:
```
df_Directors_min_5 = df_Directors[df_Directors['Count'] > 6]
df_Directors_min_5 = df_Directors_min_5[df_Directors_min_5['Directors'] != 'Unknown']
plt.figure(figsize=(15,10))
g = sns.barplot(x="Directors", y='Count',data=df_Directors_min_5)
g.tick_params(axis='x', rotation=90)
```



In [75]:

```
df_Directors = df_fnl.drop_duplicates(['show_id','Directors','type'])

df_Directors = df_Directors.groupby(['Directors','type'])['show_id'].count()

df_Directors = pd.DataFrame(df_Directors.reset_index())

df_Directors.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_Directors = df_Directors.sort_values('Count', ascending= False, ignore_index = True )

df_Directors = df_Directors[df_Directors['Directors'] != 'Unknown']

df_Directors_min_5['Directors'].to_list()

df_Directors_top_5_type = df_Directors[df_Directors['Directors'].isin(df_Directors_min_5[
df_Directors_top_5_type = df_Directors_top_5_type[df_Directors_top_5_type['Directors'] !=
plt.figure(figsize=(10,8))
g = sns.barplot(x="Directors", y='Count',data=df_Directors_top_5_type, hue = 'type', dodge
g.tick_params(axis='x', rotation=90)

#place legend outside top right corner of plot
#plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)
```

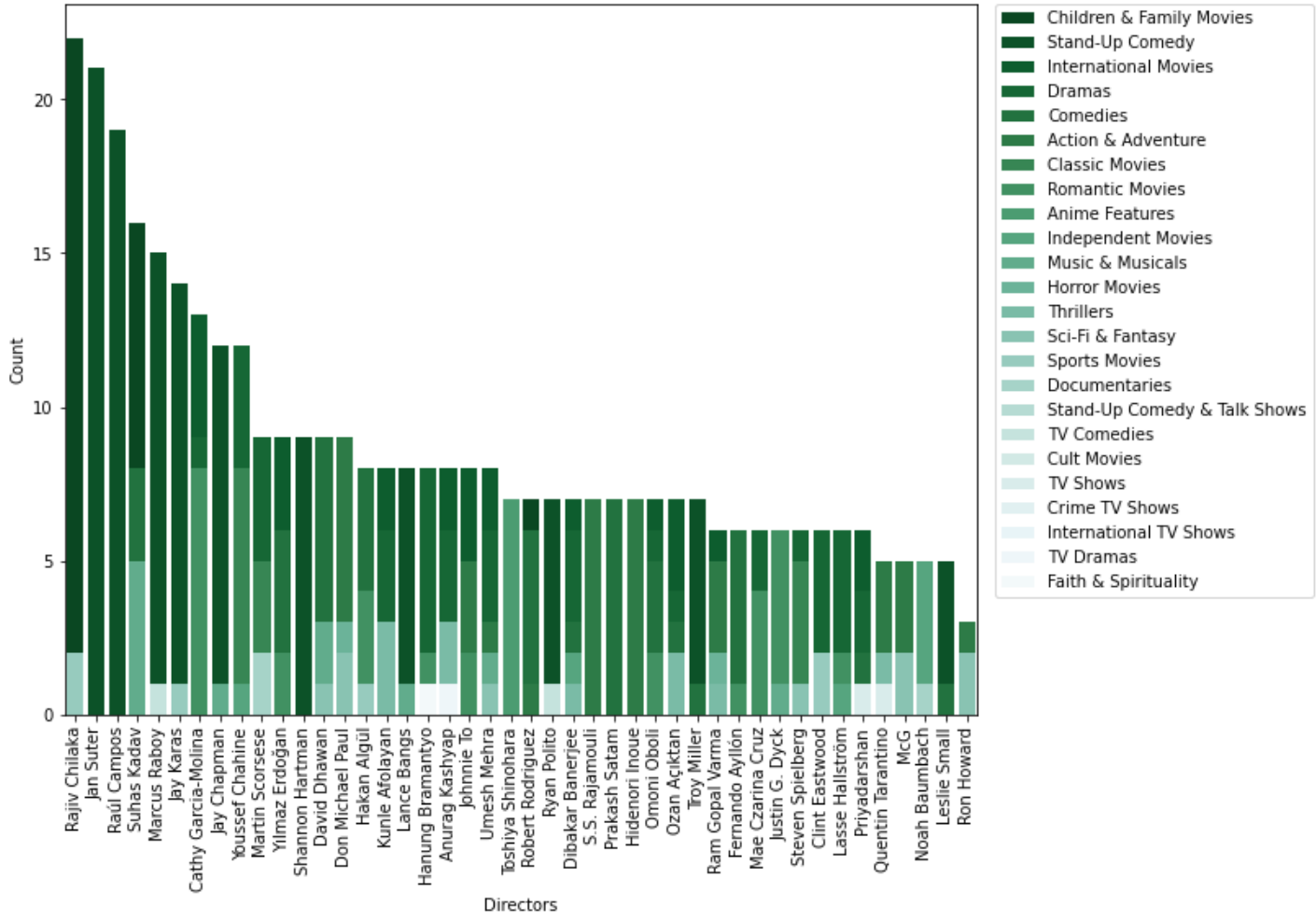


In [76]:

```
df_Directors = df_fnl.drop_duplicates(['show_id','Directors','Genre'])

df_Directors = df_Directors.groupby(['Directors','Genre'])['show_id'].count()

df_Directors = pd.DataFrame(df_Directors.reset_index())

df_Directors.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_Directors = df_Directors.sort_values('Count', ascending= False, ignore_index = True )

df_Directors = df_Directors[df_Directors['Directors'] != 'Unknown']

df_Directors_min_5['Directors'].to_list()

df_Directors_top_5_type = df_Directors[df_Directors['Directors'].isin(df_Directors_min_5['
df_Directors_top_5_type = df_Directors_top_5_type[df_Directors_top_5_type['Directors'] !=
plt.figure(figsize=(10,8))
g = sns.barplot(x="Directors", y='Count',data=df_Directors_top_5_type, hue = 'Genre', dodg
g.tick_params(axis='x', rotation=90)

#sns.palplot(sns.color_palette("BuGn_r", 10))
#place legend outside top right corner of plot
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0 )
```

Out[76]:

```
<matplotlib.legend.Legend at 0x2353d95c0d0>
```



Understand genre and country relationship

In [77]:
```
df_fnl.head(2)
```

Out[77]:

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
0	s1	United States	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 mi
1	s2	South Africa	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	Season

In [78]:
```
df_fnl['Country'].value_counts().index[:25].to_list()
```

Out[78]:
```
['United States',
 'India',
 'United Kingdom',
 'Unknown',
 'Japan',
 'France',
 'Canada',
 'Spain',
```

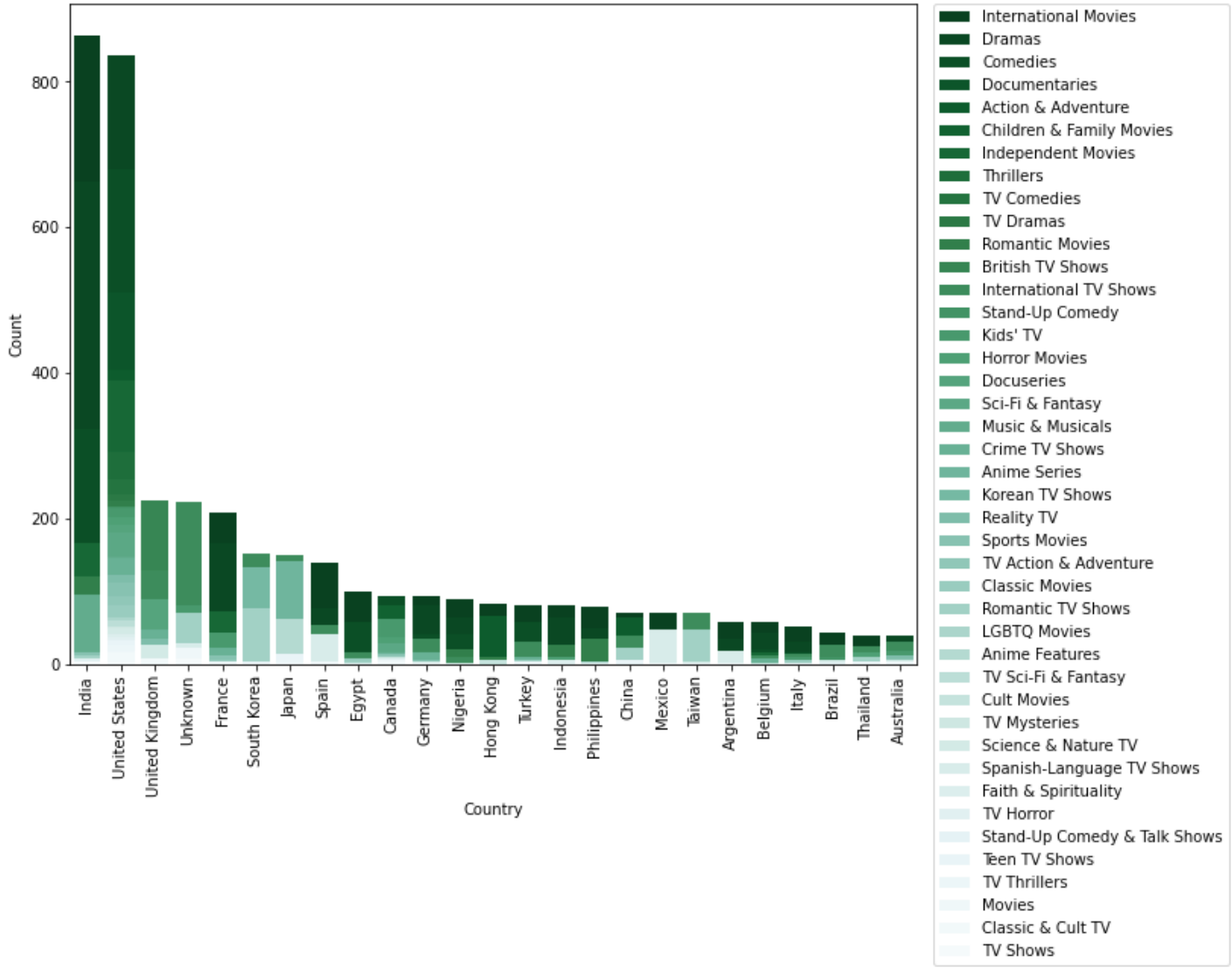
```
'South Korea',
'Germany',
'Mexico',
'China',
'Turkey',
'Australia',
'Nigeria',
'Hong Kong',
'Egypt',
'Indonesia',
'Taiwan',
'Belgium',
'Thailand',
'Philippines',
'Brazil',
'Argentina',
'Italy']
```

In [79]:

```
df_gr_cnty = df_fnl.drop_duplicates(['show_id','Genre','Country'])

df_gr_cnty = df_gr_cnty.groupby(['Country','Genre'])['show_id'].count()

df_gr_cnty = pd.DataFrame(df_gr_cnty.reset_index())

df_gr_cnty.rename(columns = {'show_id' : 'Count'}, inplace = True)
df_gr_cnty = df_gr_cnty.sort_values('Count', ascending= False, ignore_index = True )

df_fnl['Country'].value_counts().index[:25].to_list()
df_gr_cnty_top_25 = df_gr_cnty[df_gr_cnty['Country'].isin(df_fnl['Country'].value_counts()

#df_gr_cnty_top_25 = df_gr_cnty_top_25[df_gr_cnty_top_25['Country'] != 'Unknown']
plt.figure(figsize=(10,8))
g = sns.barplot(x="Country", y='Count',data=df_gr_cnty_top_25, hue = 'Genre', dodge = Fals
g.tick_params(axis='x', rotation=90)

# place legend outside top right corner of plot
plt.legend(bbox_to_anchor=(1.02, 1), loc='upper left', borderaxespad=0)

#df_gr_cnty_top_25
```

Out[79]:

```
<matplotlib.legend.Legend at 0x2353ce4b970>
```



Above graph is for top 25 countries by production and their genre

> India with international movie, dramas, comedies.
>
> US with international movie and TV shows

Relation between release year and added year gap

between contry, between acotrs and directors

In [80]:
```
df_fnl.head(2)
```

Out[80]:

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
0	s1	United States	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 mi

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
1	s2	South Africa	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	Season

In [81]:
```
df_actor_gap_mean = df_fnl.drop_duplicates(['Actors','gap_ad_rls'])

df_actor_gap_mean = df_fnl.groupby(['Actors'])['gap_ad_rls'].mean()

df_actor_gap_mean = pd.DataFrame(df_actor_gap_mean.reset_index())

df_actor_gap_mean.rename(columns = {'gap_ad_rls' : 'Mean'}, inplace = True)
df_actor_gap_mean = df_actor_gap_mean.sort_values('Mean', ascending= True, ignore_index =

df_actor_gap_mean.drop_duplicates(inplace = True, ignore_index = True)

df_actor_gap_mean
```

Out[81]:

	Actors	Mean
0	Jr.	0.000000
1	Kaustubh Kumar	0.000000
2	Kaustubh Narain	0.000000
3	Kavin Jay	0.000000
4	Kavya Bector	0.000000
...	...	...
36388	Vera-Ellen	66.000000
36389	Lloyd Bridges	70.000000
36390	Walter Huston	71.666667
36391	Dana Andrews	72.000000
36392	Jane Darwell	75.000000

36393 rows × 2 columns

In [82]:
```
df_actor_gap_mean = df_fnl.drop_duplicates(['Genre','gap_ad_rls'])

df_actor_gap_mean = df_fnl.groupby(['Genre'])['gap_ad_rls'].mean()

df_actor_gap_mean = pd.DataFrame(df_actor_gap_mean.reset_index())

df_actor_gap_mean.rename(columns = {'gap_ad_rls' : 'Mean'}, inplace = True)
df_actor_gap_mean = df_actor_gap_mean.sort_values('Mean', ascending= True, ignore_index =

df_actor_gap_mean.drop_duplicates(inplace = True, ignore_index = True)

df_actor_gap_mean
```

Out[82]:

	Genre	Mean

	Genre	Mean
0	Stand-Up Comedy & Talk Shows	0.317164
1	TV Mysteries	0.685402
2	TV Thrillers	0.773438
3	TV Horror	0.821467
4	Crime TV Shows	1.117922
5	TV Action & Adventure	1.233099
6	Reality TV	1.296599
7	Science & Nature TV	1.350318
8	Spanish-Language TV Shows	1.732767
9	TV Dramas	1.813053
10	International TV Shows	1.884666
11	TV Shows	1.928783
12	British TV Shows	1.946081
13	TV Sci-Fi & Fantasy	1.971014
14	Korean TV Shows	1.975045
15	Docuseries	1.979858
16	Stand-Up Comedy	2.125926
17	TV Comedies	2.285714
18	Romantic TV Shows	2.603477
19	LGBTQ Movies	3.379475
20	Faith & Spirituality	3.852573
21	Kids' TV	3.890450
22	Teen TV Shows	3.923181
23	Anime Series	4.003080
24	Documentaries	4.050270
25	Movies	4.508600
26	Independent Movies	4.941834
27	Thrillers	5.033770
28	International Movies	5.426642
29	Horror Movies	5.554802
30	Children & Family Movies	6.047078
31	Dramas	6.392468
32	Sports Movies	6.657740
33	Comedies	6.962888
34	Romantic Movies	7.217873
35	Sci-Fi & Fantasy	7.680208

	Genre	Mean
36	Music & Musicals	8.147221
37	Anime Features	8.305263
38	Action & Adventure	9.499591
39	Classic & Cult TV	11.550000
40	Cult Movies	20.641597
41	Classic Movies	41.619944

In [83]:
```
df_actor_gap_mean = df_fnl.drop_duplicates(['Directors','gap_ad_rls'])

df_actor_gap_mean = df_fnl.groupby(['Directors'])['gap_ad_rls'].mean()

df_actor_gap_mean = pd.DataFrame(df_actor_gap_mean.reset_index())

df_actor_gap_mean.rename(columns = {'gap_ad_rls' : 'Mean'}, inplace = True)
df_actor_gap_mean = df_actor_gap_mean.sort_values('Mean', ascending= True, ignore_index =

df_actor_gap_mean.drop_duplicates(inplace = True, ignore_index = True)

df_actor_gap_mean
```

Out[83]:

	Directors	Mean
0	Ryan Koo	0.000000
1	Gary Cohen	0.000000
2	Gary Andrews	0.000000
3	Nag Ashwin	0.000000
4	Garrett Bradley	0.000000
...	...	...
4987	Roy Boulting	73.000000
4988	Anthony Veiller	73.000000
4989	Frank Capra	73.090909
4990	Anatole Litvak	74.000000
4991	John Ford	74.666667

4992 rows × 2 columns

Understanding

> Gap between relase year and added year for Genre, Tv related shows are released very soon and Cult Movies & classic movies have more gap.
>
> Actor and direcotrs have outlier and only one movie has been released under them in many cases, so nothing can be infered from this.

In [84]:
```
df_fnl.head(2)
```

Out[84]:

	show_id	Country	Genre	Directors	Actors	type	title	date_added	release_year	rating	duratio
0	s1	United States	Documentaries	Kirsten Johnson	Unknown	Movie	Dick Johnson Is Dead	September 25, 2021	2020	PG-13	90 mi
1	s2	South Africa	International TV Shows	Unknown	Ama Qamata	TV Show	Blood & Water	September 24, 2021	2021	TV-MA	Season

In [85]:
```
df_fnl['rating'].unique()
```

Out[85]:
```
array(['PG-13', 'TV-MA', 'PG', 'TV-14', 'TV-PG', 'TV-Y', 'TV-Y7', 'R',
       'TV-G', 'G', 'NC-17', 'NR', 'TV-Y7-FV', 'UR'], dtype=object)
```

In [86]:
```
df_fnl['rating'].nunique()
```

Out[86]:
```
14
```

FINAL RECOMENDATION TO THE BUSSINESS:

> OVERALL TREND IS MORE MOVIES ARE RELAESING COMPARED TO TV SHOWS.

> NETFLIX AVERAGE GAP BETWEEN RELEASE AND ADD YEAR IS LESS FOR TV SHOWS COMPARED MOVIES.

> CONTINUE TO ADD DIRECT TO NETFLIX TV SHOWS. WHICH ARE EVEN HAVING BETTER RATING COMPARED TO MOVIES.

> GENRES GOOD TO ADD MORE --> Stand-Up Comedy & Talk Shows, INTRENATIONAL MOVIES, DRAMAS AND COMEDIES.

> GENRES NOT IN DEMAND --> FAITH AND SPRITUALITY AND CLASIC CULT TV.

> TOP 5 MARKETS ARE --> 'United States', 'India','United Kingdom','Japan', 'France'

> CONTINUE TO FOCUS ON GENRE AND COUNTRY MENTIONED ABOVE.