Netflix

Problem Statement:

Netflix is one of the most popular media and video streaming platforms. They have over 10000 movies or tv shows available on their platform, as of mid-2021, they have over 222M Subscribers globally. This tabular dataset consists of listings of all the movies and tv shows available on Netflix, along with details such as - cast, directors, ratings, release year, duration, etc. Business Problem Analyze the data and generate insights that could help Netflix ijn deciding which type of shows/movies to produce and how they can grow the business in different countries

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.

1. Start by exploring a few questions: 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

In [ ]:
```
!gdown https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/origi
```

```
Downloading...
From: https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/000/940/origi
nal/netflix.csv
To: /content/netflix.csv
100% 3.40M/3.40M [00:00<00:00, 39.9MB/s]
```

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

In [ ]:
```
data = pd.read_csv('netflix.csv')
data
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	September 24, 2021	2021	TV-MA
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	September 24, 2021	2021	TV-MA
...	...	...	...	...	...	...	...	...	...
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	November 20, 2019	2007	R
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	July 1, 2019	2018	TV-Y7
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	November 1, 2019	2009	R
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy	United States	January 11, 2020	2006	PG

	show_id	type	title	director	cast	country	date_added	release_year	rating
					Chase, Kate Ma...				
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	March 2, 2019	2015	TV-14

8807 rows × 12 columns

Before Analysing the data we have identifying the missing values and other uncleaned datas within the given data : so for that we have to check nullvalues which are checked as below

In [ ]:
```
data.isna().sum(axis = 0)
```

Out[ ]:
```
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
```

Checking information{datatype,non_nullvalues,etc..} about data provided we use .info() as given below

In [ ]:
```
data.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
```

After the above information it is clear that data type of date_added column is nothing but string so inorder to change its datatypewe can use pd.to_datetime() to change its datatype from string to datetime dtype so that all operation associated with date time could be applied

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

In [ ]:
```
data.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   datetime64[ns]
 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: datetime64[ns](1), int64(1), object(10)
memory usage: 825.8+ KB
```

Now coming to problem solvings

Q1.How has the number of movies released per year changed over the last 20-30 years?

to attempt this first we have to filter out the movies type from the data provided so as to work easily upon it for that i had applied method as below

In [ ]:
```
data['type'].value_counts()
```

Out[ ]:
```
Movie      6131
TV Show    2676
Name: type, dtype: int64
```

In [ ]:
```
data_movie = data.loc[data['type'] == 'Movie']
data_movie
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020
6	s7	Movie	My Little Pony: A New Generation	Robert Cullen, José Luis Ucha	Vanessa Hudgens, Kimiko Glenn, James Marsden, ...	NaN	September 24, 2021	2021
7	s8	Movie	Sankofa	Haile Gerima	Kofi Ghanaba, Oyafunmike Ogunlano, Alexandra D...	United States, Ghana, Burkina Faso, United Kin...	September 24, 2021	1993
9	s10	Movie	The Starling	Theodore Melfi	Melissa McCarthy, Chris O'Dowd, Kevin Kline, T...	United States	September 24, 2021	2021
12	s13	Movie	Je Suis Karl	Christian Schwochow	Luna Wedler, Jannis Niewöhner, Milan Peschel, ...	Germany, Czech Republic	September 23, 2021	2021
...	...	...	...	...	...	...	...	...
8801	s8802	Movie	Zinzana	Majid Al Ansari	Ali Suliman, Saleh Bakri, Yasa, Ali Al-Jabri, ...	United Arab Emirates, Jordan	March 9, 2016	2015
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	November 20, 2019	2007
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	November 1, 2019	2009
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	January 11, 2020	2006
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal,	India	March 2, 2019	2015

show_id	type	title	director	cast	country	date_added	release_year	r
				Sarah-Jane Dias, Raaghav Chanan...				

6131 rows × 12 columns

since this data is not sorted inorder to sort acoording to release year we can use .sort_values()

In [ ]:
```python
data_movie_sorted = data_movie.sort_values('release_year',ascending=False)
data_movie_sorted
```

the sorted Movies need to be grouped by and also counted to get information of number of movies released according to year wise for that below text works

In [ ]:
```python
movie_released_year_wise = data_movie_sorted.groupby(['release_year'])['release_yea
```

since the data format is in series to convert we can use .to_frame()

In [ ]:
```python
movie_released_year_wise =movie_released_year_wise.to_frame()
```

changing the name of columns as per requirement we can do this

In [ ]:
```python
movie_released_year_wise.columns = ['Number_of_movies']
```

For getting number of movies according to latest year we can use .tail() for fetching bottom 30 rows as question ask for 30 - 40 years from current movie release

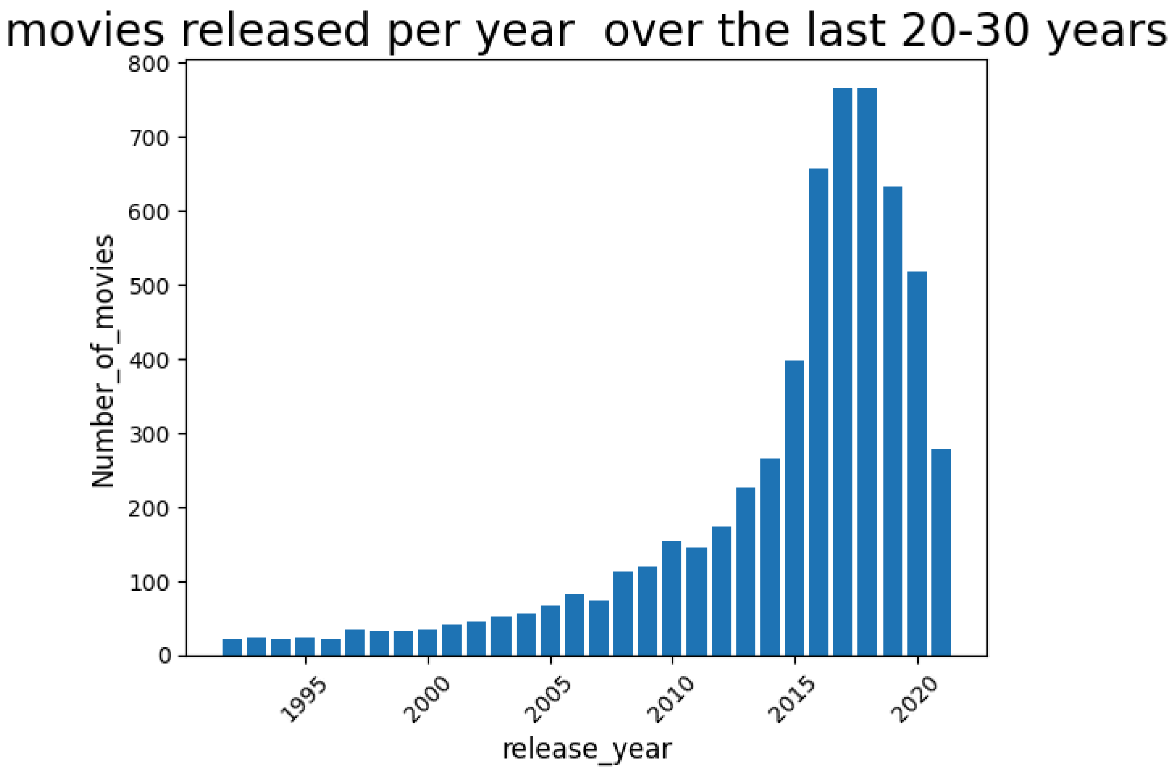
In [ ]:
```python
Movie_30year_released= movie_released_year_wise.reset_index().tail(30)
Movie_30year_released
```

Out[ ]:

	release_year	Number_of_movies
43	1992	20
44	1993	24
45	1994	20
46	1995	23
47	1996	21
48	1997	34
49	1998	32
50	1999	32
51	2000	33
52	2001	40
53	2002	44
54	2003	51
55	2004	55
56	2005	67
57	2006	82
58	2007	74
59	2008	113
60	2009	118
61	2010	154
62	2011	145
63	2012	173
64	2013	225
65	2014	264
66	2015	398
67	2016	658
68	2017	767
69	2018	767
70	2019	633
71	2020	517
72	2021	277

in order to better understand this graph we can use bar plot ranging across years comparing number of movie released values w.r.t years

In [ ]:
```
plt.bar(Movie_30year_released['release_year'],Movie_30year_released['Number_of_movi
plt.xlabel('release_year',fontsize=12)
plt.ylabel('Number_of_movies',fontsize=12)
plt.title('movies released per year  over the last 20-30 years',fontsize=20)
plt.xticks(rotation= 45)
plt.show()
```



--- **Analysis** : from the above graph it is clear that the platform have rich content of recently released movies as the graph goes up from 2005 to 2020 which shows that platform have most of thier Movies which are released in these years

--- **Recommendation** : the platform can add more of content form movies earlier than 2005 as it would help them increase their customer base as because there could be possiblity of people whoc like old movies which were released way back

Dealing with missing values, comma seperated columns ,NAN,filtering etc..

In [ ]:
```
data
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	2021-09-25	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...	South Africa	2021-09-24	2021	TV-MA
2	s3	TV Show	Ganglands	Julien Leclercq	Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...	NaN	2021-09-24	2021	TV-MA
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	2021-09-24	2021	TV-MA
4	s5	TV Show	Kota Factory	NaN	Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...	India	2021-09-24	2021	TV-MA
...	...	...	...	...	...	...	...	...	...
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	2019-11-20	2007	R
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	2019-07-01	2018	TV-Y7
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	2019-11-01	2009	R
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy	United States	2020-01-11	2006	PG

	show_id	type	title	director	cast	country	date_added	release_year	rating
					Chase, Kate Ma...				
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	2019-03-02	2015	TV-14

8807 rows × 12 columns

Dealing with comma seperated values

to check whether a column in data contains "," {comma} which could be containing data in nested form we can use syntax .str.contains for identifying them summing up would help in knowing the number of column having them

```
In [ ]: data['director'].str.contains(",").sum()
Out[ ]: 614
```

```
In [ ]: data['cast'].str.contains(",").sum()
Out[ ]: 7101
```

```
In [ ]: data['country'].str.contains(",").sum()
Out[ ]: 1320
```

```
In [ ]: data['listed_in'].str.contains(",").sum()
Out[ ]: 6787
```

It is clear from above observation that directo,cast,country,listed_in in the provided data are having elemeent with comma seperated or nested data

Inorder to deal with Nested columns we can use concept of unwrapping whose elements are seperated by "," using .str.split() for splitting the string into list and assigning back to their respective columns by process below

```
In [ ]: data['director'] = data['director'].str.split(",")
        data['cast'] =data['cast'].str.split(",")
        data['country'] = data['country'].str.split(",")
        data['listed_in'] = data['listed_in'].str.split(",")
```

So data below shows the element in list form assigned back into their columns {director,country,cast,listed_in}

```
In [ ]: data
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	[Kirsten Johnson]	NaN	[United States]	2021-09-25	2020	PG-1
1	s2	TV Show	Blood & Water	NaN	[Ama Qamata, Khosi Ngema, Gail Mabalane, Th...	[South Africa]	2021-09-24	2021	TV M
2	s3	TV Show	Ganglands	[Julien Leclercq]	[Sami Bouajila, Tracy Gotoas, Samuel Jouy, ...	NaN	2021-09-24	2021	TV M
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	2021-09-24	2021	TV M
4	s5	TV Show	Kota Factory	NaN	[Mayur More, Jitendra Kumar, Ranjan Raj, Al...	[India]	2021-09-24	2021	TV M
...	...	...	...	...	...	...	...	...	.
8802	s8803	Movie	Zodiac	[David Fincher]	[Mark Ruffalo, Jake Gyllenhaal, Robert Downe...	[United States]	2019-11-20	2007	
8803	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	2019-07-01	2018	TV-Y
8804	s8805	Movie	Zombieland	[Ruben Fleischer]	[Jesse Eisenberg, Woody Harrelson, Emma Ston...	[United States]	2019-11-01	2009	
8805	s8806	Movie	Zoom	[Peter Hewitt]	[Tim Allen, Courteney Cox, Chevy Chase, Kat...	[United States]	2020-01-11	2006	P

	show_id	type	title	director	cast	country	date_added	release_year	rating
8806	s8807	Movie	Zubaan	[Mozez Singh]	[Vicky Kaushal, Sarah-Jane Dias, Raaghav Cha...	[India]	2019-03-02	2015	TV-14

8807 rows × 12 columns

Exploding the data in list format in columns so as to tranform all element in list back into single and same columns however this process would generate more number of rows which is our aim

we can start by exploding 'Director' Column

```
In [ ]: data_exploded = data.explode('director',ignore_index =True)
        data_exploded
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	[United States]	September 25, 2021	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	[Ama Qamata, Khosi Ngema, Gail Mabalane, Th...	[South Africa]	September 24, 2021	2021	TV-MA
2	s3	TV Show	Ganglands	Julien Leclercq	[Sami Bouajila, Tracy Gotoas, Samuel Jouy, ...	NaN	September 24, 2021	2021	TV-MA
3	s4	TV Show	Jailbirds New Orleans	NaN	NaN	NaN	September 24, 2021	2021	TV-MA
4	s5	TV Show	Kota Factory	NaN	[Mayur More, Jitendra Kumar, Ranjan Raj, Al...	[India]	September 24, 2021	2021	TV-MA
...	...	...	...	...	...	...	...	...	...
9607	s8803	Movie	Zodiac	David Fincher	[Mark Ruffalo, Jake Gyllenhaal, Robert Downe...	[United States]	November 20, 2019	2007	R
9608	s8804	TV Show	Zombie Dumb	NaN	NaN	NaN	July 1, 2019	2018	TV-Y7
9609	s8805	Movie	Zombieland	Ruben Fleischer	[Jesse Eisenberg, Woody Harrelson, Emma Ston...	[United States]	November 1, 2019	2009	R
9610	s8806	Movie	Zoom	Peter Hewitt	[Tim Allen, Courteney Cox, Chevy Chase, Kat...	[United States]	January 11, 2020	2006	PG

	show_id	type	title	director	cast	country	date_added	release_year	rating
9611	s8807	Movie	Zubaan	Mozez Singh	[Vicky Kaushal, Sarah-Jane Dias, Raaghav Cha...	[India]	March 2, 2019	2015	TV-14

9612 rows × 12 columns

Exploding 'cast' column

```
In [ ]: data_exploded = data_exploded.explode('cast',ignore_index =True)
        data_exploded
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	[United States]	September 25, 2021	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata	[South Africa]	September 24, 2021	2021	TV-MA
2	s2	TV Show	Blood & Water	NaN	Khosi Ngema	[South Africa]	September 24, 2021	2021	TV-MA
3	s2	TV Show	Blood & Water	NaN	Gail Mabalane	[South Africa]	September 24, 2021	2021	TV-MA
4	s2	TV Show	Blood & Water	NaN	Thabang Molaba	[South Africa]	September 24, 2021	2021	TV-MA
...	...	...	...	...	...	...	...	...	...
70807	s8807	Movie	Zubaan	Mozez Singh	Manish Chaudhary	[India]	March 2, 2019	2015	TV-14
70808	s8807	Movie	Zubaan	Mozez Singh	Meghna Malik	[India]	March 2, 2019	2015	TV-14
70809	s8807	Movie	Zubaan	Mozez Singh	Malkeet Rauni	[India]	March 2, 2019	2015	TV-14
70810	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	[India]	March 2, 2019	2015	TV-14
70811	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	[India]	March 2, 2019	2015	TV-14

70812 rows × 12 columns

similar process for 'country' column

```
In [ ]: data_exploded = data_exploded.explode('country',ignore_index =True)
        data_exploded
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA
2	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA
3	s2	TV Show	Blood & Water	NaN	Gail Mabalane	South Africa	September 24, 2021	2021	TV-MA
4	s2	TV Show	Blood & Water	NaN	Thabang Molaba	South Africa	September 24, 2021	2021	TV-MA
...	...	...	...	...	...	...	...	...	...
89410	s8807	Movie	Zubaan	Mozez Singh	Manish Chaudhary	India	March 2, 2019	2015	TV-14
89411	s8807	Movie	Zubaan	Mozez Singh	Meghna Malik	India	March 2, 2019	2015	TV-14
89412	s8807	Movie	Zubaan	Mozez Singh	Malkeet Rauni	India	March 2, 2019	2015	TV-14
89413	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	March 2, 2019	2015	TV-14
89414	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	March 2, 2019	2015	TV-14

89415 rows × 12 columns

And lastly 'Listed_in' column

In [ ]:
```
data_exploded = data_exploded.explode('listed_in',ignore_index =True)
data_exploded
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	NaN	United States	September 25, 2021	2020	PG-13
1	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA
2	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA
3	s2	TV Show	Blood & Water	NaN	Ama Qamata	South Africa	September 24, 2021	2021	TV-MA
4	s2	TV Show	Blood & Water	NaN	Khosi Ngema	South Africa	September 24, 2021	2021	TV-MA
...	...	...	...	...	...	...	...	...	...
202060	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	March 2, 2019	2015	TV-14
202061	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	March 2, 2019	2015	TV-14
202062	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	March 2, 2019	2015	TV-14
202063	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	March 2, 2019	2015	TV-14
202064	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	March 2, 2019	2015	TV-14

202065 rows × 12 columns

Finally through this process original data with 8807 rows get converted into 202065 rows

In [ ]:
```
data_exploded
```

in this exploded data we have to check how many number of null/nan values we have so as to get better insight of missing values by using .isna().sum() we can do it as shown below

In [ ]:
```
data_exploded[['director','cast','country','rating','duration','date_added']].isna(
```

Out[ ]:
```
director      50643
cast           2149
country       11897
rating           67
duration          3
date_added      158
dtype: int64
```

Cleaning

there could be possibilty where all the three columns director , cast , country is all missing in same rows for which we can't use predictive technique to generate information for other columns as which we are going to do further so those rows are of no need for that we need to identify them at first place as shown below

In [ ]:
```
data_exploded[['director','cast','country','rating','duration','date_added']].loc[p
    'director','cast','country','rating','duration','date_added']]).sum(axis=1)== 3
```

Out[ ]:

	director	cast	country	rating	duration	date_added
85	NaN	NaN	NaN	TV-MA	1 Season	September 24, 2021
86	NaN	NaN	NaN	TV-MA	1 Season	September 24, 2021
353	NaN	NaN	NaN	TV-MA	1 Season	September 24, 2021
354	NaN	NaN	NaN	TV-MA	1 Season	September 24, 2021
355	NaN	NaN	NaN	TV-MA	1 Season	September 24, 2021
...	...	...	...	...	...	...
197394	NaN	NaN	NaN	TV-MA	1 Season	December 27, 2017
197395	NaN	NaN	NaN	TV-MA	1 Season	December 27, 2017
202006	NaN	NaN	NaN	TV-Y7	2 Seasons	July 1, 2019
202007	NaN	NaN	NaN	TV-Y7	2 Seasons	July 1, 2019
202008	NaN	NaN	NaN	TV-Y7	2 Seasons	July 1, 2019

187 rows × 6 columns

In [ ]:
```
row_to_drop = data_exploded.loc[pd.isnull(data_exploded[[
    'director','cast','country','rating','duration','date_added']]).sum(axis=1)== 3
```

dropping those rows permanently we use.drop(......, inplace =True)

```
In [ ]: data_exploded.drop(row_to_drop.index, inplace=True)
```

```
In [ ]: data_exploded
```

Filling Categorical missing values using prediction through other column values

Director: missing data_exploded directors name {nan} could be repalced with the director names using {type,listed_in'} for most accurate prediction

changing data type of type and listed_in

```
In [ ]: data_exploded['type'] = data_exploded['type'].astype(str)
        data_exploded['listed_in'] = data_exploded['listed_in'].astype(str)
```

applying proces: using group by apply , lambda fucntion and x.mode(), .fillna() we can replace the missing value as shown below : 1. grouping will assure that same type and listed_in wold have same director_name too thats why i took these 2 parameter further lambda fucntion will fill all the null/nan values in the column of director of group made with the mode of all the maximum occuring director name in the same group and this will happen for all the group for all missing director further if there is any group where all director name are empty it will be replaced with 'no_director'

```
In [ ]: data_exploded['director']=data_exploded.groupby(['type','listed_in'])['director'].t
            lambda x: x.fillna(x.mode().iloc[0] if not x.mode().empty else 'No_director'))
```

```
In [ ]: data_exploded['director'].isna().sum()
```

```
Out[ ]: 0
```

now there is no null values as from above syntax an all null values have been filled to check we can do--->

```
In [ ]: data_exploded['director'].value_counts().sum()
```

```
Out[ ]: 201878
```

Similarly filling missing value of Cast

```
In [ ]: data_exploded.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201878 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   show_id       201878 non-null  object
 1   type          201878 non-null  object
 2   title         201878 non-null  object
 3   director      201878 non-null  object
 4   cast          199913 non-null  object
 5   country       190168 non-null  object
 6   date_added    201721 non-null  object
 7   release_year  201878 non-null  int64 
 8   rating        201813 non-null  object
 9   duration      201875 non-null  object
 10  listed_in     201878 non-null  object
 11  description   201878 non-null  object
dtypes: int64(1), object(11)
memory usage: 20.0+ MB
```

In [ ]:
```
data['cast'].isna().sum()
```

Out[ ]:
```
825
```

number of cast missing are 825

To fill the null values in 'cast' column i will apply the same process using {type,Listed_in,country,director} for accurate prediction

In [ ]:
```
data_exploded['cast']=data_exploded.groupby(['type','listed_in','director'])['cast'
    lambda x: x.fillna(x.mode().iloc[0] if not x.mode().empty else 'No_cast'))
```

to check we can use.isna().sum()

In [ ]:
```
data_exploded['cast'].isna().sum()
```

Out[ ]:
```
0
```

Similarly Filling missing value of country i will use type,listed_in,director,cast

In [ ]:
```
data_exploded.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201878 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   show_id       201878 non-null  object
 1   type          201878 non-null  object
 2   title         201878 non-null  object
 3   director      201878 non-null  object
 4   cast          201878 non-null  object
 5   country       190168 non-null  object
 6   date_added    201721 non-null  object
 7   release_year  201878 non-null  int64 
 8   rating        201813 non-null  object
 9   duration      201875 non-null  object
 10  listed_in     201878 non-null  object
 11  description   201878 non-null  object
dtypes: int64(1), object(11)
memory usage: 20.0+ MB
```

In [ ]:
```
data_exploded['country']=data_exploded.groupby(['type','listed_in','director','cast
```

In [ ]:
```
data_exploded['country'].isna().sum()
```

Out[ ]:
```
0
```

In [ ]:
```
data_exploded.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201878 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   show_id       201878 non-null  object
 1   type          201878 non-null  object
 2   title         201878 non-null  object
 3   director      201878 non-null  object
 4   cast          201878 non-null  object
 5   country       201878 non-null  object
 6   date_added    201721 non-null  object
 7   release_year  201878 non-null  int64 
 8   rating        201813 non-null  object
 9   duration      201875 non-null  object
 10  listed_in     201878 non-null  object
 11  description   201878 non-null  object
dtypes: int64(1), object(11)
memory usage: 20.0+ MB
```

------------------------- All Missing value in director,cast,country have been filled now-------
----

Q.2 What is the best time to launch a TV show?

To deal with this problem we will use the original uncleaned data as all the type that is Tv show and Movies are all availble and have no missing value similarly dates also have no missing values

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

In [ ]:
```
Tv_show_data = data.loc[data['type']=='TV Show'].reset_index()
```

we will extract tv shows only

In [ ]:
```
Tv_show_data
```

now changing data type of dat_added to perform operation on this column

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

To get month name from date column we use .dt.month_name() as syntax

In [ ]:
```
Tv_show_data['month'] = Tv_show_data['date_added'].dt.month_name()
```

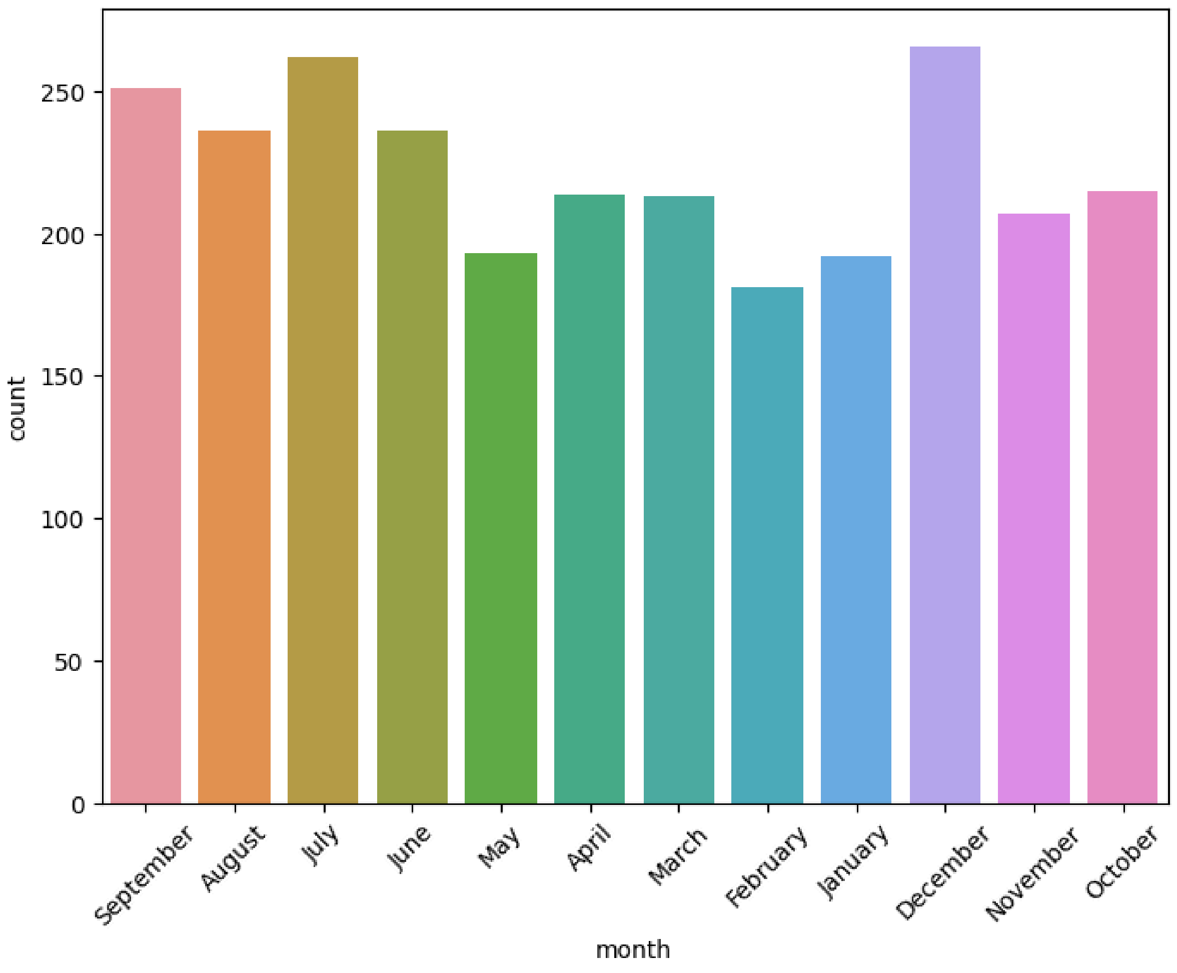
to count the number of unique tv shows we can perform the operation as below

In [ ]:
```
Tv_show_data['show_id'].nunique()
```

Out[ ]:
```
2676
```

In [ ]:
```
Tv_show_data_monthwise = Tv_show_data[['show_id','month']]
```

In [ ]:
```
plt.figure(figsize =(8,6))
sns.countplot(x='month',data= Tv_show_data_monthwise)
plt.xticks(rotation = 45)
plt.show()
```



Insights: From the above graph it is clear that december has the highest number of tv_shows released on platform and it can be said that this month is the best time to release Tv shows as it have a trend from the data available

Recommendations: all the other months february,january and may should be need to be looked upon as these month have lowest number of tv shows released in ordor to engage more users this month need to release more tv shows.

Q4.Analysis of actors/directors of different types of shows/movies.

Since this question contains lots of analysis so i have broken down the question into two parts below i have done halaf of the analysis only for Movies and remaining Half i have i attempted in the last part of this notebook while doing other analysis in between

In [ ]:
```
Movies = data_exploded[data_exploded['type']=='Movie']
TV_show = data_exploded[data_exploded['type']=='TV Show']
```

In [ ]:
```
Movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 145883 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   show_id       145883 non-null  object
 1   type          145883 non-null  object
 2   title         145883 non-null  object
 3   director      145883 non-null  object
 4   cast          145883 non-null  object
 5   country       145883 non-null  object
 6   date_added    145883 non-null  object
 7   release_year  145883 non-null  int64 
 8   rating        145876 non-null  object
 9   duration      145880 non-null  object
 10  listed_in     145883 non-null  object
 11  description   145883 non-null  object
dtypes: int64(1), object(11)
memory usage: 14.5+ MB
```

In [ ]:
```
TV_show.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 55995 entries, 1 to 201939
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   show_id       55995 non-null  object
 1   type          55995 non-null  object
 2   title         55995 non-null  object
 3   director      55995 non-null  object
 4   cast          55995 non-null  object
 5   country       55995 non-null  object
 6   date_added    55838 non-null  object
 7   release_year  55995 non-null  int64 
 8   rating        55937 non-null  object
 9   duration      55995 non-null  object
 10  listed_in     55995 non-null  object
 11  description   55995 non-null  object
dtypes: int64(1), object(11)
memory usage: 5.6+ MB
```

In [ ]:
```
Movies.reset_index(inplace =True)
```

In [ ]:
```
Movies = Movies.copy()
Movies
```

we have splitted the string values in duration column to fetch the time from it inorder analyses duration

In [ ]:
```
Movies['duration'].str.split(" ")
```

Out[ ]:
```
0          [90, min]
1          [91, min]
2          [91, min]
3          [91, min]
4          [91, min]
             ...    
145878    [111, min]
145879    [111, min]
145880    [111, min]
145881    [111, min]
145882    [111, min]
Name: duration, Length: 145883, dtype: object
```

In [ ]:
```
Movies['duration'] = Movies['duration'].str.split(" ")
```

to fetch the first element which is a numeric value we do .str[0] which will fetch the first value from list in the values of duration of column

In [ ]:
```
Movies['durations'] = Movies['duration'].str[0]
```

In [ ]:
```
Movies['durations_in_min'] = Movies['durations']
```

In [ ]:
```
Movies.drop(['duration','durations'],axis = 1,inplace =True)
```

Now below we can see all the number of null vales to be more clear with the data

In [ ]:
```
Movies.isna().sum(axis = 0)
```

Out[ ]:
```
index              0
show_id            0
type               0
title              0
director           0
cast               0
country            0
date_added         0
release_year       0
rating             7
listed_in          0
description        0
durations_in_min   3
dtype: int64
```

the below process will remove the entire row of there is any missing value in it since from above observation we can see there were 10 missing values so we do dropna , for any columns having missing value in it

In [ ]:
```
Movies.dropna(how='any',axis = 0,inplace = True)
```

In [ ]:
```
Movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 145873 entries, 0 to 145882
Data columns (total 13 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   index             145873 non-null  int64
 1   show_id           145873 non-null  object
 2   type              145873 non-null  object
 3   title             145873 non-null  object
 4   director          145873 non-null  object
 5   cast              145873 non-null  object
 6   country           145873 non-null  object
 7   date_added        145873 non-null  object
 8   release_year      145873 non-null  int64
 9   rating            145873 non-null  object
 10  listed_in         145873 non-null  object
 11  description       145873 non-null  object
 12  durations_in_min  145873 non-null  object
dtypes: int64(2), object(11)
memory usage: 15.6+ MB
```

After cleaning Movies table now analysis of Actor working in different type of Movies

In [ ]:
```
Movies
```

In [ ]:
```
Cast_rating= Movies.groupby(['rating','cast'])['rating','cast'].value_counts().rese
```

```
<ipython-input-584-3d1e52f57f73>:1: FutureWarning: Indexing with multiple keys (im
plicitly converted to a tuple of keys) will be deprecated, use a list instead.
  Cast_rating= Movies.groupby(['rating','cast'])['rating','cast'].value_counts().r
eset_index().drop(0,axis= 1)
```

Below table will provide the ratings of movies the cast have worked in the below table analysis could be used to understand the performance of movies the cast have worked ,obviously the users would love to watch cast with better movies rating

In [ ]:
```
Cast_rating
```

Out[ ]:

	rating	cast
0	G	Adam West
1	G	Adrian Hall
2	G	Adrián Salzedo
3	G	Agnes Moorehead
4	G	Alan Napier
...	...	...
34936	UR	Paul Hamy
34937	UR	Rob Schneider
34938	UR	Adam Sandler
34939	UR	Hafsia Herzi
34940	UR	Lise Danvers

34941 rows × 2 columns

1. Actor and Director with most content

In [ ]:
```
Cast_director = Movies.groupby(['cast','director'])['cast','director'].value_counts
```

```
<ipython-input-595-16d44b54161f>:1: FutureWarning: Indexing with multiple keys (im
plicitly converted to a tuple of keys) will be deprecated, use a list instead.
  Cast_director = Movies.groupby(['cast','director'])['cast','director'].value_cou
nts().reset_index()
```

In [ ]:
```
Cast_director
```

Out[ ]:

	cast	director	0
0	Jr.	Sam Macaroni	1
1	"Riley" Lakdhar Dridi	Rebecca Zlotowski	3
2	'Najite Dede	Aniedi Anwah	3
3	2Mex	Ava DuVernay	3
4	50 Cent	Brian A. Miller	2
...	...	...	...
47742	Çetin Tekindor	Çagan Irmak	2
47743	Úrsula Corberó	Julio Medem	3
47744	İbrahim Büyükak	Bedran Güzel	2
47745	Şahin Irmak	Hakan Algül	3
47746	Ṣọpẹ́ Dìrísù	Remi Weekes	2

47747 rows × 3 columns

In [ ]:
```
Cast_director.rename({0:'count'} ,axis = 1,inplace =True)
```

checking the number of times director and cast came together for Movies and finding who among them came maximum number of time together as shown below

In [ ]:
```
Cast_director.sort_values('count',ascending =False).head(20)
```

Out[ ]:

	cast	director	count
7470	Christian Slater	Lars von Trier	36
36276	Stellan Skarsgård	Lars von Trier	33
23688	Mahmoud Hemeida	Youssef Chahine	33
42457	Charlotte Gainsbourg	Lars von Trier	33
39127	Uma Thurman	Lars von Trier	33
36094	Sophie Kennedy Clark	Lars von Trier	33
36209	Stacy Martin	Lars von Trier	33
723	Ahmed Saleh	Jehane Noujaim	33
35310	Shia LaBeouf	Lars von Trier	33
42915	Donnie Yen	Wilson Yip	26
45891	No_cast	Matthew Salleh	24
19343	Julie Tejwani	Rajiv Chilaka	23
993	Alan Cumming	Raja Gosnell	23
35941	Soma Bhatia	Nora Twomey	21
35942	Soma Chhaya	Nora Twomey	21
37339	Tamannaah Bhatia	S.S. Rajamouli	21
21528	Kumiko Watanabe	Toshiya Shinohara	21
34277	Sathyaraj	S.S. Rajamouli	21
31224	Ramya Krishnan	S.S. Rajamouli	21
46558	Robin Wright	Ari Folman	21

the above analysis shows the maximum time the cast and director collab for movies which are avaliable on platform this will help in deciding the number of content which are less availbale with respect to above parameter

Inorder to check the Most available Genre movie we do as below to get insights

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

In [ ]:
```
Movies['year_added'] = Movies['date_added'].dt.year
```

In [ ]:
```
Movie_genre = Movies.groupby(['listed_in','director','show_id'])['listed_in'].aggre
```

In [ ]:
```
Movie_genre.columns =['count_of_movies']
```

In [ ]:
```
Movie_genre.reset_index(inplace =True)
```

In [ ]:
```
Movie_genre.drop('count_of_movies', inplace=True,axis=1)
```

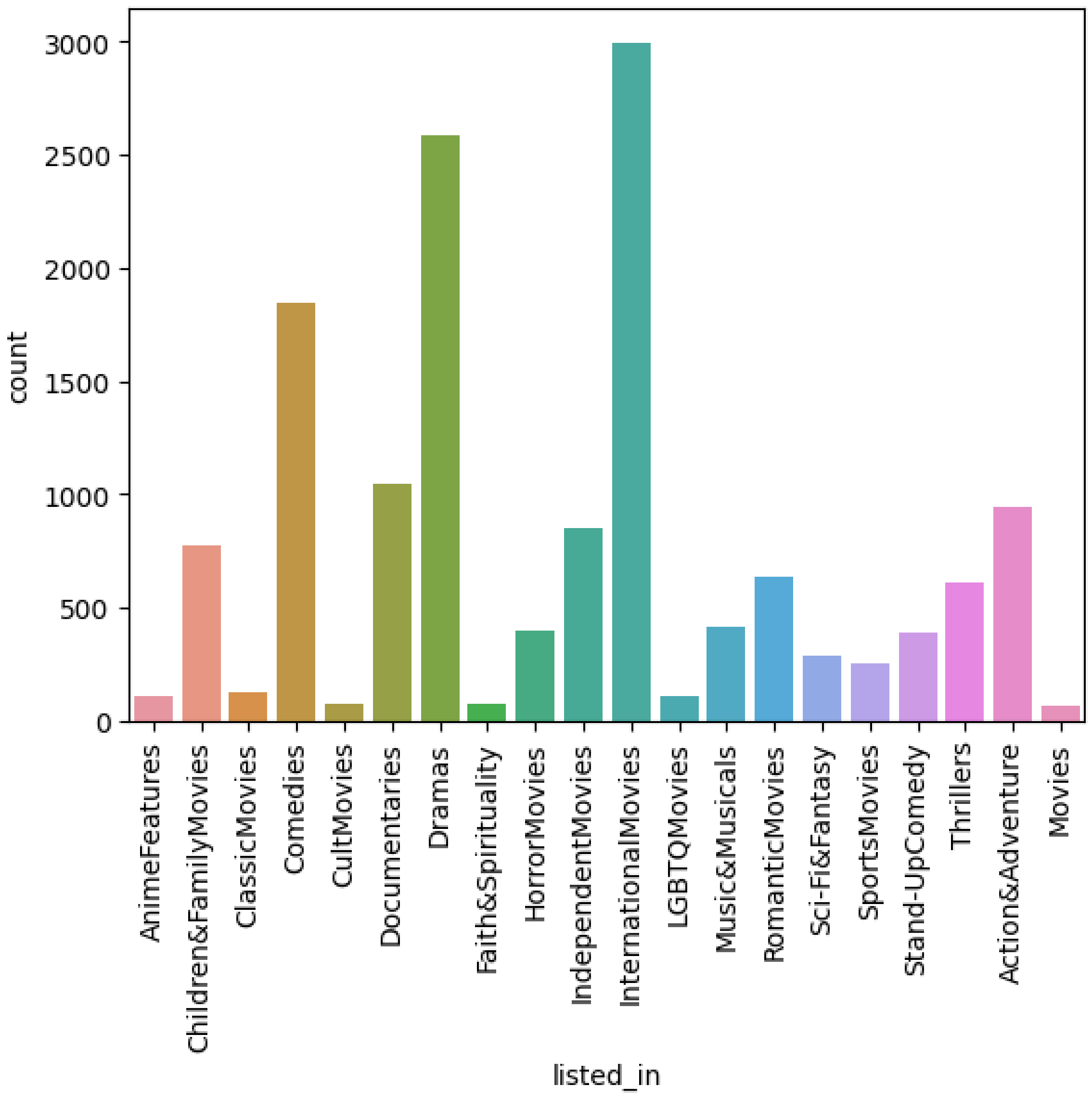
In [ ]:
```
Movie_genre['listed_in'] = Movie_genre['listed_in'].str.split(" ")
```

In [ ]:
```
Movie_genre['listed_in'] = Movie_genre['listed_in'].str.join("")
```

In [ ]:
```
Movie_genre['listed_in'].value_counts()
```

Out[ ]:
```
InternationalMovies      2995
Dramas                   2582
Comedies                 1844
Documentaries            1047
Action&Adventure          939
IndependentMovies         852
Children&FamilyMovies     775
RomanticMovies            638
Thrillers                 608
Music&Musicals            416
HorrorMovies              399
Stand-UpComedy            386
Sci-Fi&Fantasy            289
SportsMovies              251
ClassicMovies             127
LGBTQMovies               113
AnimeFeatures             108
CultMovies                 77
Faith&Spirituality         71
Movies                     63
Name: listed_in, dtype: int64
```

In [ ]:
```
sns.countplot(x='listed_in',data= Movie_genre)
plt.xticks(rotation =90)
plt.show()
```



Insights: The above insights says that the the platform contain maximum of international movies,dramas and comedies movies and least among them are faith& spirituality movie, classic movies and anime feature

recommendation: Netflix should increase faith& spirituality movie, classic movies and anime feature as it would help them increase the user base who watch such content

Q5. Does Netflix have more focus on TV Shows than movies in recent years

In [ ]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 13 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   datetime64[ns]
 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
 12  years         8797 non-null   float64
dtypes: datetime64[ns](1), float64(1), int64(1), object(10)
memory usage: 894.6+ KB
```

From the original data it is clear that type and release year have all availablecolumn for analysis so we no need any cleaning and get analysis from this data itself except for doing input of year column in which the movies and tv shows were added on platform and filling null values if any

In [ ]:
```
data['years'] = data['date_added'].dt.year
```

In [ ]:
```
data['years'].isna().sum()
```

Out[ ]:
```
10
```

for recent year we will check for years greater than 2010

In [ ]:
```
Netflix_year_data = data.loc[data['years'] >= 2010 , ['type','years']]
```

In [ ]:
```
Netflix_year_data['years'].fillna(0,inplace =True)
```

In [ ]:
```
Netflix_year_data['years'].astype(int)
```

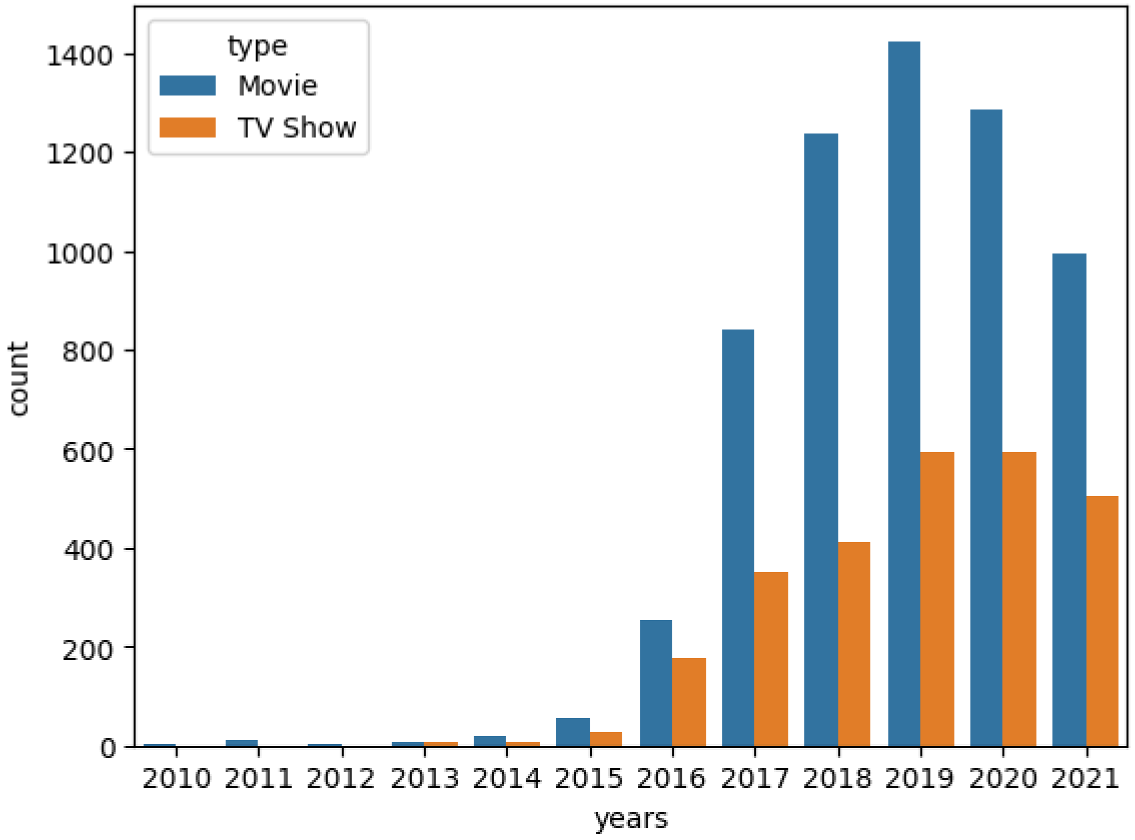
In [ ]:
```
Netflix_year_data['years']=  Netflix_year_data['years'].astype(int)
```

In [ ]:
```
Netflix_year_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 8793 entries, 0 to 8806
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   type    8793 non-null   object
 1   years   8793 non-null   int64
dtypes: int64(1), object(1)
memory usage: 206.1+ KB
```

In [ ]:
```
sns.countplot(x='years',data= Netflix_year_data , hue='type')
```

Out[ ]:
```
<Axes: xlabel='years', ylabel='count'>
```



Insight: from above data it is clear that Netflix have more focused on Movies than tv shows as in all year from 2010 till 2021 the Movies shows on platform were more as comparision to Tv shows

Recommendation: Ntflix need to more focus on Tv shows for increasing user base

Q6:Understanding what content is available in different countries

To deal with this problem we will use already filtered and cleaned data , Which is data_exploded!!

```
In [ ]: data_exploded.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201878 entries, 0 to 202064
Data columns (total 12 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   show_id       201878 non-null  object
 1   type          201878 non-null  object
 2   title         201878 non-null  object
 3   director      201878 non-null  object
 4   cast          201878 non-null  object
 5   country       201878 non-null  object
 6   date_added    201721 non-null  object
 7   release_year  201878 non-null  int64 
 8   rating        201813 non-null  object
 9   duration      201875 non-null  object
 10  listed_in     201878 non-null  object
 11  description   201878 non-null  object
dtypes: int64(1), object(11)
memory usage: 20.0+ MB
```

we have all available data for our analysis but we need to clean and align the listed_in column having unproper alignment and multiple occurence

In [ ]:
```
country_genre =data_exploded[['listed_in','country']].copy()
country_genre['listed_in'] = country_genre['listed_in'].str.split(" ")
country_genre['listed_in'] = country_genre['listed_in'].str.join("")
```

In [ ]:
```
country_genre['listed_in'].unique()
```

Out[ ]:
```
array(['Documentaries', 'InternationalTVShows', 'TVDramas', 'TVMysteries',
       'CrimeTVShows', 'TVAction&Adventure', 'RomanticTVShows',
       'TVComedies', 'TVHorror', 'Children&FamilyMovies', 'Dramas',
       'IndependentMovies', 'InternationalMovies', 'BritishTVShows',
       'RealityTV', 'Comedies', 'Spanish-LanguageTVShows', 'Thrillers',
       'Docuseries', 'RomanticMovies', 'Music&Musicals', 'HorrorMovies',
       'Sci-Fi&Fantasy', 'TVThrillers', "Kids'TV", 'Action&Adventure',
       'TVSci-Fi&Fantasy', 'ClassicMovies', 'AnimeFeatures',
       'SportsMovies', 'AnimeSeries', 'KoreanTVShows', 'Science&NatureTV',
       'TeenTVShows', 'CultMovies', 'TVShows', 'Faith&Spirituality',
       'LGBTQMovies', 'Stand-UpComedy', 'Movies',
       'Stand-UpComedy&TalkShows', 'Classic&CultTV'], dtype=object)
```

In [ ]:
```
country_genre  = country_genre.groupby(['country','listed_in']).value_counts().rese
country_genre
```

Out[ ]:

	country	listed_in	counts
0		ClassicMovies	9
1		Documentaries	2
2		Dramas	40
3		IndependentMovies	9
4		InternationalMovies	41
...	...	...	...
2045	West Germany	Documentaries	2
2046	West Germany	InternationalMovies	2
2047	Zimbabwe	Comedies	12
2048	Zimbabwe	InternationalMovies	12
2049	Zimbabwe	RomanticMovies	12

2050 rows × 3 columns

we can make count plot(bar plot) for above observation!!

In [ ]:
```
country_genre_counts = country_genre.groupby('listed_in')['country'].value_counts(
```

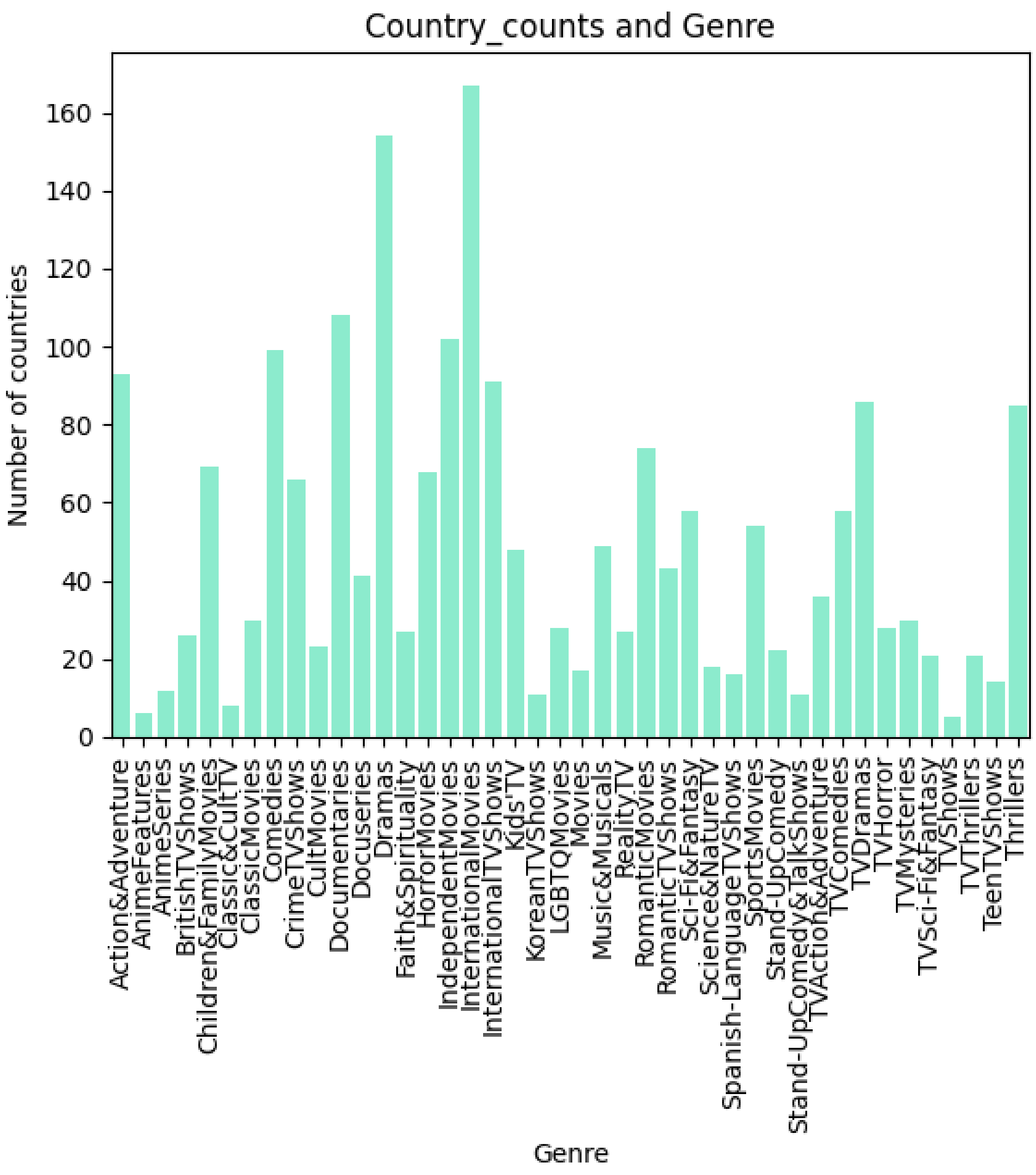
In [ ]:
```
country_genre_counts
```

Out[ ]:

	listed_in	country	counts_of_genre_countrywise
0	Action&Adventure	Angola	1
1	Action&Adventure	Argentina	1
2	Action&Adventure	Australia	1
3	Action&Adventure	Bahamas	1
4	Action&Adventure	Belgium	1
...	...	...	...
2045	Thrillers	Turkey	1
2046	Thrillers	United Arab Emirates	1
2047	Thrillers	United Kingdom	1
2048	Thrillers	United States	1
2049	Thrillers	Vietnam	1

2050 rows × 3 columns

In [ ]:
```
sns.countplot(data=country_genre_counts, x='listed_in', color='aquamarine').set(tit
plt.xticks(rotation = 90)
plt.show()
```



Insight the above insight shows that *international movies, drama* having most of the countries of origin

To get country wise data which having the most genre produced by them are fetched as follows

The below process is done to fetch the the most popular genre in all country for better understanding

In [ ]:
```
country_genre_counts
```

Out[ ]:

	listed_in	country	counts_of_genre_countrywise
0	Action&Adventure	Angola	1
1	Action&Adventure	Argentina	1
2	Action&Adventure	Australia	1
3	Action&Adventure	Bahamas	1
4	Action&Adventure	Belgium	1
...	...	...	...
2045	Thrillers	Turkey	1
2046	Thrillers	United Arab Emirates	1
2047	Thrillers	United Kingdom	1
2048	Thrillers	United States	1
2049	Thrillers	Vietnam	1

2050 rows × 3 columns

In [ ]:
```
country_genre_max_counts = country_genre_counts.groupby('country').apply(lambda x:
```

In [ ]:
```
country_genre_max_counts.drop("counts_of_genre_countrywise",axis= 1,inplace=True)
```

country producing thier most content in the respective genre we can get through by below code

i had checked for Comedy , Action and adventure, Children&FamilyMovies

comedy

In [ ]:
```
country_genre_max_counts.loc[country_genre_max_counts['listed_in'] == 'Comedies']
```

Out[ ]:

	listed_in	country
24	Comedies	Croatia
50	Comedies	Jordan
60	Comedies	Malaysia
68	Comedies	Netherlands
73	Comedies	Pakistan
76	Comedies	Peru
79	Comedies	Portugal
81	Comedies	Romania
98	Comedies	Syria
107	Comedies	Uruguay
115	Comedies	Bangladesh
125	Comedies	Colombia
135	Comedies	Ghana
150	Comedies	Kenya
166	Comedies	Peru
169	Comedies	Portugal
173	Comedies	Saudi Arabia
177	Comedies	Slovenia
183	Comedies	Sweden
193	Comedies	Uruguay
197	Comedies	Zimbabwe

Action and adventure

In [ ]:
```
country_genre_max_counts.loc[country_genre_max_counts['listed_in'] == 'Action&Adver
```

Out[ ]:

	listed_in	country
4	Action&Adventure	Angola
5	Action&Adventure	Argentina
7	Action&Adventure	Australia
10	Action&Adventure	Bahamas
12	Action&Adventure	Belgium
...	...	...
188	Action&Adventure	Turkey
190	Action&Adventure	United Arab Emirates
191	Action&Adventure	United Kingdom
192	Action&Adventure	United States
195	Action&Adventure	Vietnam

93 rows × 2 columns

Children&FamilyMovies

In [ ]:
```
country_genre_max_counts.loc[country_genre_max_counts['listed_in'] == 'Children&Fam
```

Out[ ]:

	listed_in	country
20	Children&FamilyMovies	Cayman Islands
29	Children&FamilyMovies	East Germany
51	Children&FamilyMovies	Kazakhstan
55	Children&FamilyMovies	Lebanon
59	Children&FamilyMovies	Malawi
77	Children&FamilyMovies	Philippines
80	Children&FamilyMovies	Qatar
110	Children&FamilyMovies	West Germany
117	Children&FamilyMovies	Belgium
123	Children&FamilyMovies	Chile
155	Children&FamilyMovies	Mauritius
171	Children&FamilyMovies	Romania

Documentaries

In [ ]:
```
country_genre_max_counts.loc[country_genre_max_counts['listed_in'] == 'Documentarie
```

Out[ ]:

	listed_in	country
1	Documentaries	Afghanistan
6	Documentaries	Armenia
13	Documentaries	Bermuda
14	Documentaries	Botswana
30	Documentaries	Ecuador
38	Documentaries	Guatemala
45	Documentaries	Iraq
63	Documentaries	Mongolia
66	Documentaries	Namibia
70	Documentaries	Nicaragua
74	Documentaries	Palestine
75	Documentaries	Panama
83	Documentaries	Samoa
85	Documentaries	Senegal
94	Documentaries	Sri Lanka

Q4. Actor/Director - Analysis basis on Genre,duration,country,year they were added

Creating a new table applying cleaning and changing data type

In [ ]:
```
Actor_director =data_exploded.copy()
```

In [ ]:
```
Actor_director['listed_in'] = Actor_director['listed_in'].str.split(" ")
Actor_director['listed_in'] = Actor_director['listed_in'].str.join("")
Actor_director['date_added'] = pd.to_datetime(Actor_director['date_added'])
Actor_director['years'] = Actor_director['date_added'].dt.year
Actor_director['years'].fillna(0,inplace =True)
Actor_director['years']=  Actor_director['years'].astype(int)
```

In [ ]:
```
Actor_director.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 201878 entries, 0 to 202064
Data columns (total 13 columns):
 #   Column        Non-Null Count   Dtype
---  ------        --------------   -----
 0   show_id       201878 non-null  object
 1   type          201878 non-null  object
 2   title         201878 non-null  object
 3   director      201878 non-null  object
 4   cast          201878 non-null  object
 5   country       201878 non-null  object
 6   date_added    201721 non-null  datetime64[ns]
 7   release_year  201878 non-null  int64
 8   rating        201813 non-null  object
 9   duration      201875 non-null  object
 10  listed_in     201878 non-null  object
 11  description   201878 non-null  object
 12  years         201878 non-null  int64
dtypes: datetime64[ns](1), int64(2), object(10)
memory usage: 21.6+ MB
```

Checking Alignment of listed_in column values

In [ ]:
```
Actor_director['listed_in'].value_counts()
```

Out[ ]:
```
Dramas                        29802
InternationalMovies           28237
Comedies                      20827
InternationalTVShows          12819
Action&Adventure              12216
IndependentMovies              9834
Children&FamilyMovies          9764
TVDramas                       8941
Thrillers                      7107
RomanticMovies                 6410
TVComedies                     4953
CrimeTVShows                   4723
HorrorMovies                   4571
Kids'TV                        4552
Sci-Fi&Fantasy                 4037
Music&Musicals                 3075
RomanticTVShows                3040
Documentaries                  2403
AnimeSeries                    2312
TVAction&Adventure             2287
Spanish-LanguageTVShows        2122
BritishTVShows                 1800
SportsMovies                   1529
ClassicMovies                  1443
TVMysteries                    1280
KoreanTVShows                  1121
CultMovies                     1077
TVSci-Fi&Fantasy               1045
AnimeFeatures                  1044
TVHorror                        941
LGBTQMovies                     838
Docuseries                      814
TVThrillers                     768
TeenTVShows                     741
Faith&Spirituality              719
RealityTV                       707
Stand-UpComedy                  540
Movies                          410
TVShows                         336
Classic&CultTV                  272
Stand-UpComedy&TalkShows        267
Science&NatureTV                154
Name: listed_in, dtype: int64
```

Seperating Movies and TV show table for Analysis seperately

Tv Shows

In [ ]:
```
tvshow = Actor_director.loc[Actor_director['type']=='TV Show']
```

In [ ]:
```
tvshow
```

In [ ]:
```
tvshow['duration'].info()
```

In [ ]:
```
tvshow_new = tvshow.copy()
```

In [ ]:
```
tvshow_new
```

In [ ]:
```
tvshow_new['duration']  =  tvshow_new['duration'].str.split(" ")
```

In [ ]:
```
tvshow_new["Seasons"] = tvshow_new["duration"].str[0]
```

In [ ]:
```
tvshow_new['Seasons'] = tvshow_new['Seasons'].astype(int)
```

In [ ]:
```
tvshow_new
```

In [ ]:
```
tvshow_new['Seasons'].unique()
```

Out[ ]:
```
array([ 2,  1,  9,  4,  5,  3,  6,  7, 10,  8, 17, 13, 15, 12, 11])
```

In [ ]:
```
tvshow_new[['Seasons','show_id']].groupby(['show_id','Seasons'])['show_id'].aggrega
```

In [ ]:
```
Cleaned_tvshowdata = tvshow_new[['Seasons','show_id']].groupby(['show_id','Seasons'
```

In [ ]:
```
Cleaned_tvshowdata.drop(0,axis= 1,inplace =True)
```

In [ ]:
```
Cleaned_tvshowdata
```

Out[ ]:

	show_id	Seasons
0	s100	1
1	s1004	1
2	s1005	2
3	s101	2
4	s1013	2
...	...	...
2591	s98	2
2592	s989	1
2593	s99	1
2594	s994	1
2595	s998	1

2596 rows × 2 columns

generating plot to analyse the data with to check which seasons duration have how many number of shows

In [ ]:
```
season_counts= Cleaned_tvshowdata['Seasons'].value_counts()
season_counts
```

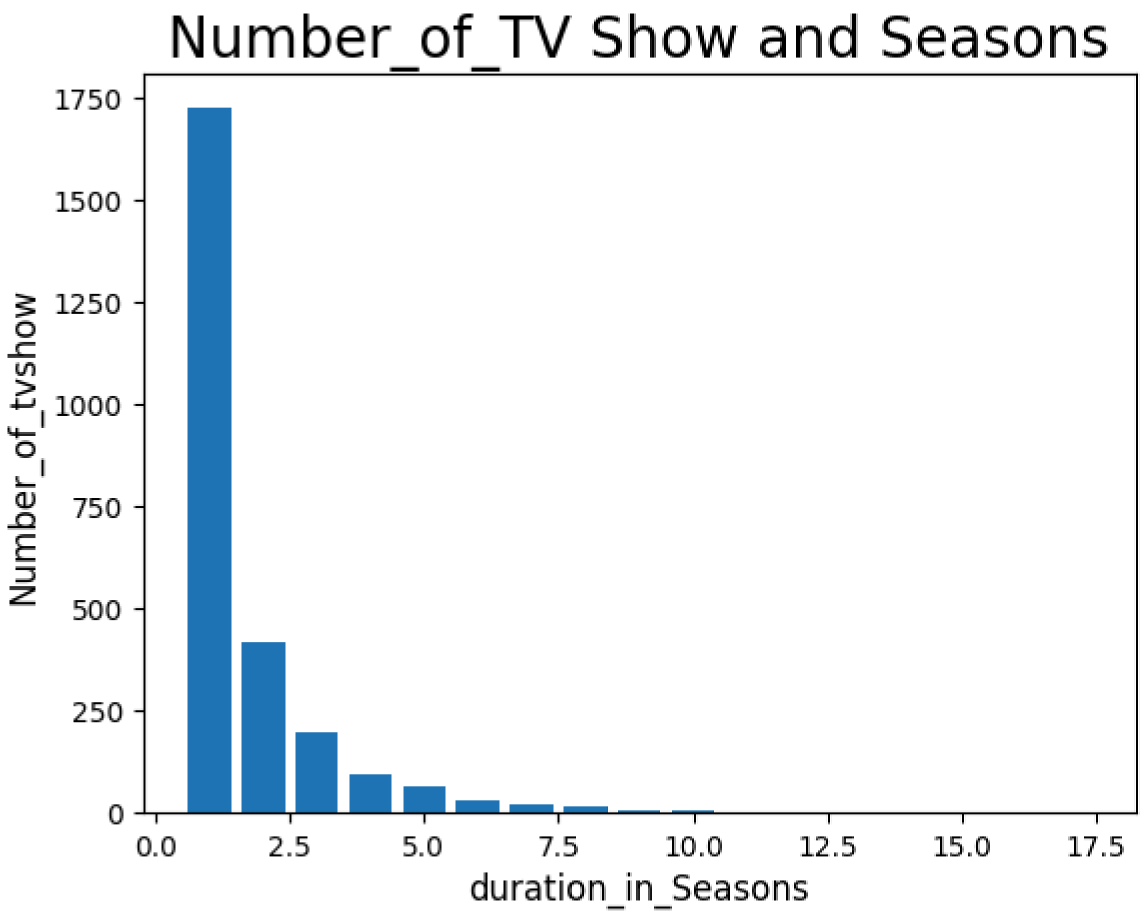
Out[ ]:
```
1      1721
2       419
3       197
4        95
5        65
6        33
7        23
8        17
9         9
10        7
13        3
15        2
12        2
11        2
17        1
Name: Seasons, dtype: int64
```

In [ ]:

In [ ]:

In [ ]:
```
y = Cleaned_tvshowdata['Seasons'].value_counts()
x= y.index
plt.bar(x,y)
plt.xlabel('duration_in_Seasons',fontsize=12)
plt.ylabel('Number_of_tvshow',fontsize=12)
plt.title('Number_of_TV Show and Seasons',fontsize=20)
```

Out[ ]:
```
Text(0.5, 1.0, 'Number_of_TV Show and Seasons')
```



Insights: Most of the content on netflix platform are of Tv less than 2.5 seasons

Recommendation: Incentive,offers or schemes should be provided to users to watch greater than 2.5 seasons of Tv shows for more retention rate

Q-now checking the number of Tv shows added according to years at the platform so we will use tvshow_new dataframe as we have already cleaned it

In [ ]:
```
tvshow_new
```

In [ ]:
```
cleaned_yearwise_tvshow_data = tvshow_new[['years','show_id']].groupby(['show_id','
```

In [ ]:
```
cleaned_yearwise_tvshow_data
```

In [ ]:
```
cleaned_yearwise_tvshow_data.drop(0,axis= 1,inplace =True)
```

In [ ]:
```
cleaned_yearwise_tvshow_data
```

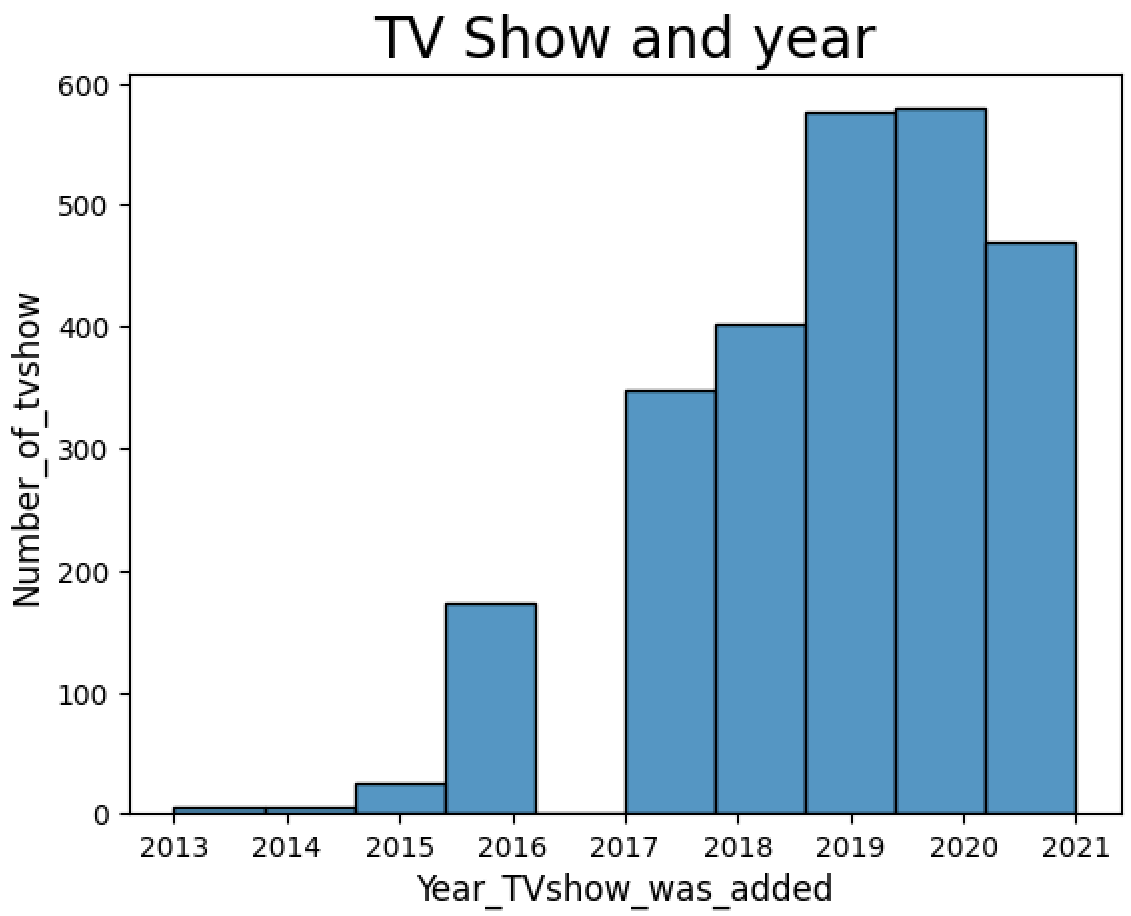
for visualising this *univariate* data analysis we will use Histplot using seaborn library

In [ ]:

In [ ]:

In [ ]:

In [ ]:
```
sns.histplot(cleaned_yearwise_tvshow_data[cleaned_yearwise_tvshow_data['years'] >=
plt.xlabel('Year_TVshow_was_added',fontsize=12)
plt.ylabel('Number_of_tvshow',fontsize=12)
plt.title('TV Show and year',fontsize=20)
plt.show()
```



```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```

Insights: most of the tv shows added were from 2017 till 2021

```
In [ ]:
```

if we want to check which cast/Actor have worked in most of the tv shows

```
In [ ]: Actorwise_tvshow_data = tvshow_new[['cast','show_id']].groupby(['show_id','cast']).
        Actorwise_tvshow_data.drop(0,axis= 1,inplace =True)
```

```
In [ ]: cast_inmost_Tvshows = Actorwise_tvshow_data['cast'].value_counts().head(10).to_fram
```

```
In [ ]: cast_inmost_Tvshows.columns = ['cast_name','their_number_of_shows']
```

```
In [ ]: cast_inmost_Tvshows
```

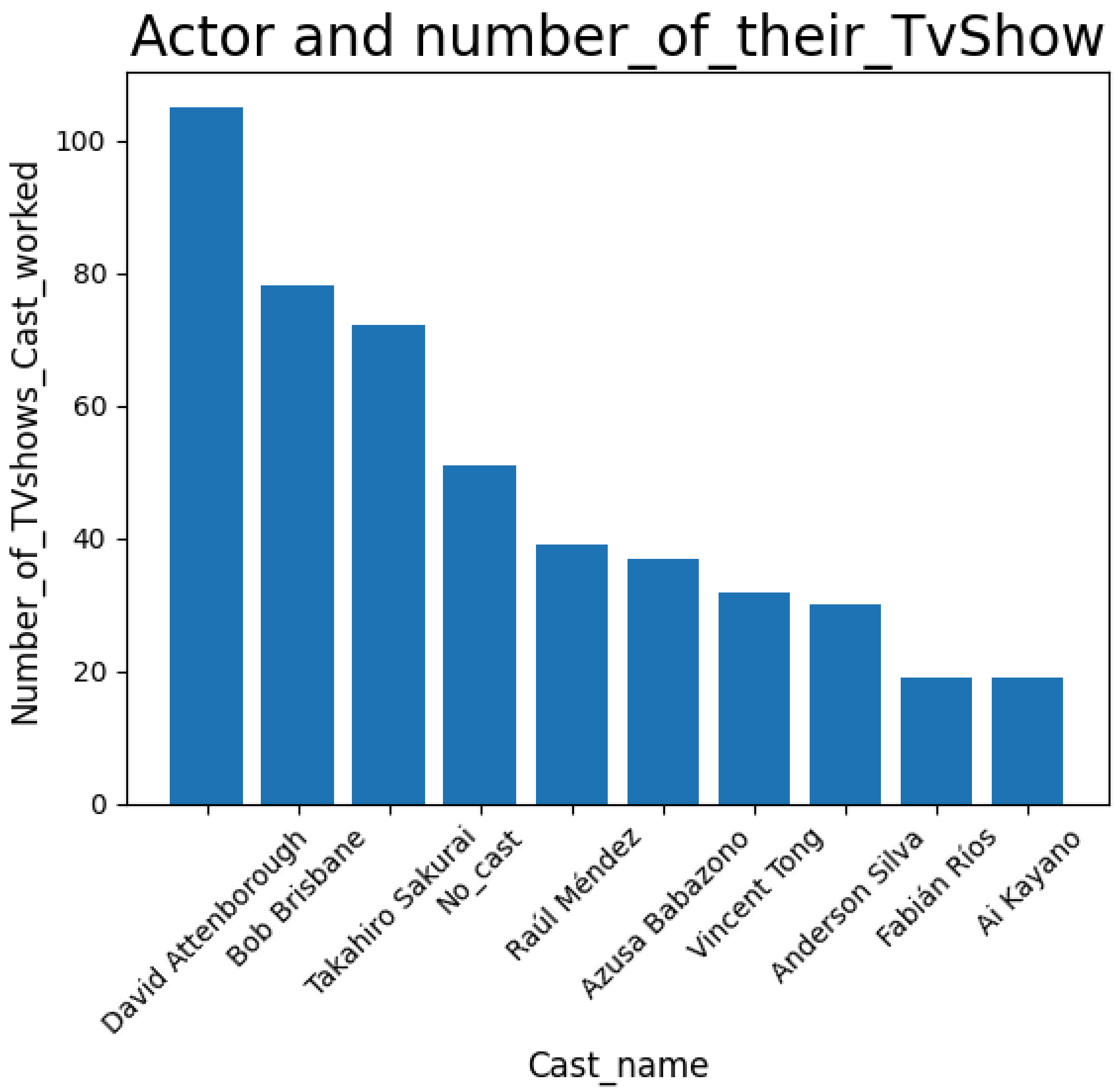
```
In [ ]:
```

In [ ]:

In [ ]:

In [ ]:
```
x= cast_inmost_Tvshows['cast_name']
y = cast_inmost_Tvshows['their_number_of_shows']

plt.bar(x,y)
plt.xlabel('Cast_name',fontsize=12)
plt.ylabel('Number_of_TVshows_Cast_worked',fontsize=12)
plt.title('Actor and number_of_their_TvShow',fontsize=20)
plt.xticks(rotation= 45)
plt.show()
```



Insights:: from the graph it is visible that David Attenborough , Bob Brisbane , Takahiro Sakurai are the Actors who have their maximum number of Tv shows available on Netflix platform

Recommendation: netflix with the cast with less available contnet on platform should be increased with their other tv shows

In [ ]:

Movies (actor and director analysis) here we will use Actor_director data that we cleaned it

In [ ]:
```
Actor_director
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rat
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	No_cast	United States	2021-09-25	2020	PG
1	s2	TV Show	Blood & Water	Alan Poul	Ama Qamata	South Africa	2021-09-24	2021	
2	s2	TV Show	Blood & Water	Alan Poul	Ama Qamata	South Africa	2021-09-24	2021	
3	s2	TV Show	Blood & Water	Rob Seidenglanz	Ama Qamata	South Africa	2021-09-24	2021	
4	s2	TV Show	Blood & Water	Alan Poul	Khosi Ngema	South Africa	2021-09-24	2021	
...	...	...	...	...	...	...	...	...	
202060	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	2019-03-02	2015	TV
202061	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	2019-03-02	2015	TV
202062	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	2019-03-02	2015	TV
202063	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	2019-03-02	2015	TV
202064	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	2019-03-02	2015	TV

201878 rows × 13 columns

Here we will extract Movies from the data and clean and filter it to analysis on metrics

Q2. remaining analysis

In [ ]:
```
Movies_new =Actor_director.loc[Actor_director['type'] == 'Movie']
```

In [ ]:
```
Movies_new
```

Out[ ]:

	show_id	type	title	director	cast	country	date_added	release_year	rati
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	No_cast	United States	2021-09-25	2020	PG-
159	s7	Movie	My Little Pony: A New Generation	Robert Cullen	Vanessa Hudgens	No_data	2021-09-24	2021	
160	s7	Movie	My Little Pony: A New Generation	Robert Cullen	Kimiko Glenn	No_data	2021-09-24	2021	
161	s7	Movie	My Little Pony: A New Generation	Robert Cullen	James Marsden	No_data	2021-09-24	2021	
162	s7	Movie	My Little Pony: A New Generation	Robert Cullen	Sofia Carson	No_data	2021-09-24	2021	
...	...	...	...	...	...	...	...	...	
202060	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	2019-03-02	2015	TV-
202061	s8807	Movie	Zubaan	Mozez Singh	Anita Shabdish	India	2019-03-02	2015	TV-
202062	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	2019-03-02	2015	TV-
202063	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	2019-03-02	2015	TV-
202064	s8807	Movie	Zubaan	Mozez Singh	Chittaranjan Tripathy	India	2019-03-02	2015	TV-

145883 rows × 13 columns

Countries with most number of movies

```
In [ ]: Movies_new1 = Movies_new[['show_id','country']].groupby(['show_id','country']).valu
        Movies_new1.drop(0,axis= 1,inplace =True)
```

we have to align countries as they are similar but not aligned so we are facing repetative values

```
In [ ]: Movies_new1['country'] = Movies_new1['country'].str.split(" ")
```

```
In [ ]: Movies_new1['country'] = Movies_new1['country'].str.join("")
```

```
In [ ]: Movies_new1
```

```
In [ ]: Movies_new2 = Movies_new1['country'].value_counts().reset_index()
```

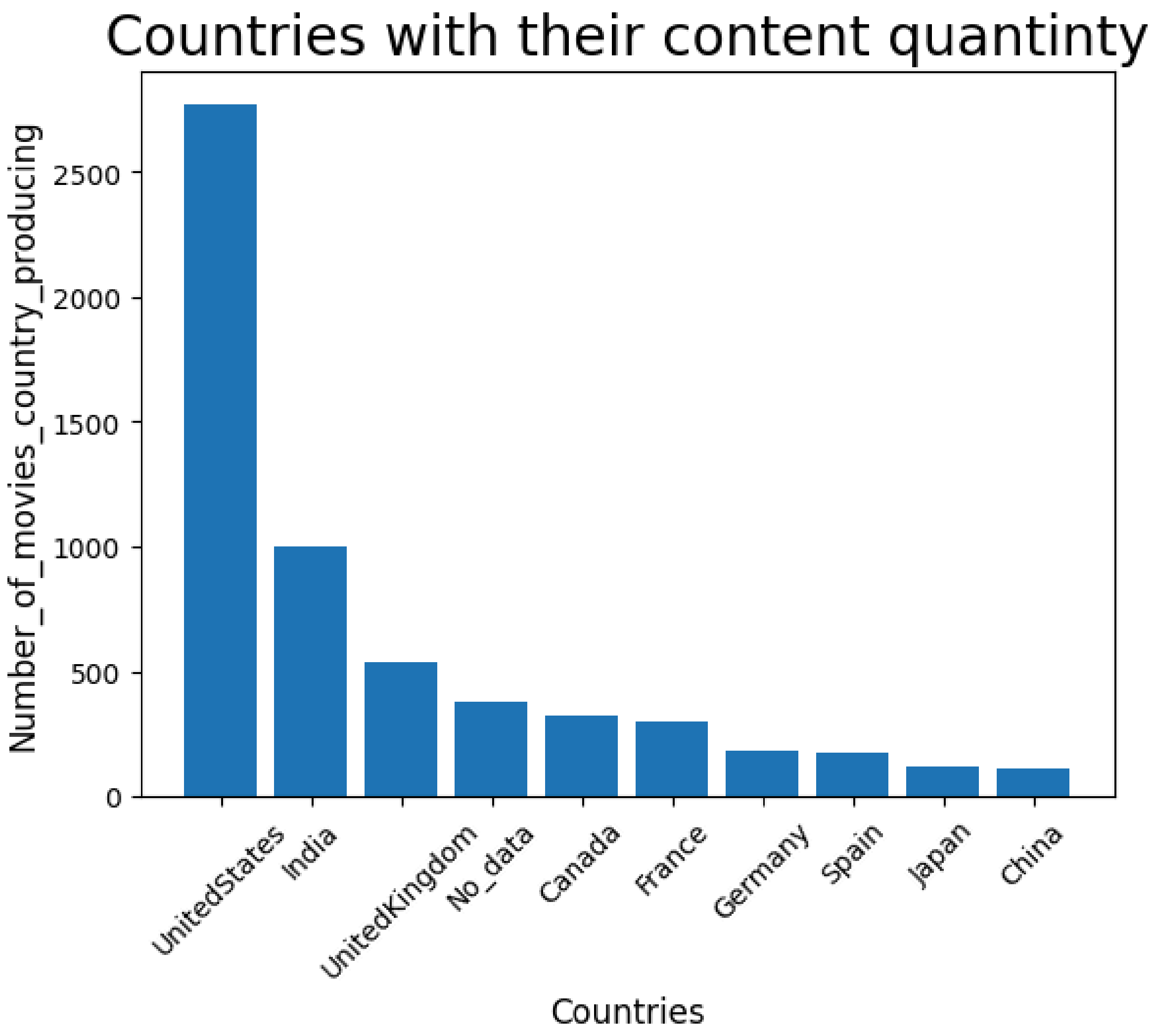
```
In [ ]: Movies_new2.columns =['country','Number_of_movies']
```

```
In [ ]: movie = Movies_new2.head(10)
```

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]: x= movie['country']
        y = movie['Number_of_movies']
        plt.bar(x,y)
        plt.xlabel('Countries',fontsize=12)
        plt.ylabel('Number_of_movies_country_producing',fontsize=12)
        plt.title('Countries with their content quantinty',fontsize=20)
        plt.xticks(rotation= 45)
        plt.show()
```



Insight: it is clear that United States have the most available movies on netflix followed by india and united kingdom

Recommendation: countries like japan,china ,cpain, germany movies are less available on paltform so the netflix should decide on increasing there content from those countries which have less content on it ass more users across the globe fromm different countries could acess their native countries movies

```
In [ ]:
```

```
In [ ]:
```

```
In [ ]:
```