1 Microsoft Studios Movie Analysis

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1.1 Overview

Microsoft is planning to create a new movie studio and has requested actionable insights of what types of films are currently doing the best at the box office. This project analyzes the factors of a successful movie. The datasets consists of multiples websites such as "Box Office Mojo", "IMDB", and etc. In order to determine the most successful movie, various factors were analyzed including "production budget", "gross revenue", "genres" and 'studios". The methods that were required to perform the exploratory data analysis (EDA) in the movie industry included: storing and cleaning the data, and visualization of data using seaborn and matplotib. The description of the methodology and the recommendations in order to be successful as a movie studio are written below.

1.2 Business Problem

Microsoft has announced that they will create a new movie studio however, they have no prior knowledge of the movie industry, and they need help so that their movie studio can be successful.

The goal is to provide Microsoft with a data-driven analysis of the movie industry and determine the factors of a successful movie. The following factors of a successful movie were investigated:

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1. What are the most profitable movies and how are the budgets related?
2. Which movie studios are some of the biggest competitors?
3. Which movie genres are the most popular in the movie industry
4. Which directors tend to add the most value?

1.3 Data Understanding

The data was imported from a wide range of movie related data in .csv files from Box Office Mojo, IMDB, and The Numbers

In order to target the relevant data, each data-frame had to be analyzed and cleaned to locate the necessary fields including movie ratings, gross and net revenue, directors, and studios.

The .csv files imported are the following:

1. imdb_title_crew :each record represents a director and a writer
2. imdb_title_ratings: each record represents the rating and number of votes
3. imdb_name_basics: each record represents a directors full primary name
4. imdb_title_principals: needed to join data frames together
5. imdb_title_basics: each record represents a movie title and related genres
6. tn_movie_budgets: each record represents a movie's worldwide gross and production budget

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1.4 Data Preparation

After reviewing the data scheme and the related fields within the given data frames. The following fields were selected for analysis, including but not limited to movie title, gross and net revenue, genres, studios, and directors.

All data types for the file labeled 'tn_movie_budgets" were objects and the fields were changed to their relevant types, such as worldwide gross and production budget were changed to integers so that a statistical analysis could be conducted. Additionally a new variable was created to calculated the net profit which is worldwide gross subtracted by the production budget. One additional filter used were removing movies that had a zero domestic gross and net profit. The analysis was to find most profitable movies so movies that made $0 in revenue were eliminated.

Records with missing studios, genres, and directors were removed from the analysis. Additionally the top two profitable movies Avatar and Titanic were removed due to their extremely high worldwide gross revenue.

Loading the Data with Pandas

Importing data and libraries to prepare for analysis

In [1]:
```
# Import standard packages
import os
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from glob import glob

%matplotlib inline
```
executed in 7.39s, finished 10:47:22 2022-02-11

In [2]:
```
# Here you run your code to explore the data
#importing data using glob
import os
from glob import glob
import pandas as pd

csv_files = glob("data/zippedData/*.csv.gz")
csv_files

csv_files_dict = {}
for filename in csv_files:
    filename_cleaned = os.path.basename(filename).replace(".csv", "").replace(".'
    filename_df = pd.read_csv(filename, index_col=0)

    csv_files_dict[filename_cleaned] = filename_df
```
executed in 5.52s, finished 10:47:28 2022-02-11

In [3]:
```
csv_files
```
executed in 13ms, finished 10:47:28 2022-02-11

Out[3]:
```
['data/zippedData\\bom.movie_gross.csv.gz',
 'data/zippedData\\imdb.name.basics.csv.gz',
 'data/zippedData\\imdb.title.akas.csv.gz',
 'data/zippedData\\imdb.title.basics.csv.gz',
 'data/zippedData\\imdb.title.crew.csv.gz',
 'data/zippedData\\imdb.title.principals.csv.gz',
 'data/zippedData\\imdb.title.ratings.csv.gz',
 'data/zippedData\\tmdb.movies.csv.gz',
 'data/zippedData\\tn.movie_budgets.csv.gz']
```

In [4]:
```
csv_files_dict.keys()
```
executed in 13ms, finished 10:47:28 2022-02-11

Out[4]:
```
dict_keys(['bom_movie_gross_gz', 'imdb_name_basics_gz', 'imdb_title_akas_gz',
'imdb_title_basics_gz', 'imdb_title_crew_gz', 'imdb_title_principals_gz', 'imdb
_title_ratings_gz', 'tmdb_movies_gz', 'tn_movie_budgets_gz'])
```

1.4.1 Question 1:

What are the most profitable movies and how much were the production budgets?

Gross & Net Revenue

The website "The Numbers" has movie revenue data. However the data had to be cleaned and transformed in order to perform a statistical analysis.

In [5]:
```
#import 'tn_movie_budgets'
tn_movie_budgets_df = csv_files_dict['tn_movie_budgets_gz']
```
executed in 13ms, finished 10:47:29 2022-02-11

In [6]:
```
tn_movie_budgets_df.shape
```
executed in 13ms, finished 10:47:29 2022-02-11

Out[6]:
```
(5782, 5)
```

In [7]:
```
tn_movie_budgets_df.info()
```
executed in 30ms, finished 10:47:29 2022-02-11

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 5782 entries, 1 to 82
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   release_date       5782 non-null   object
 1   movie              5782 non-null   object
 2   production_budget  5782 non-null   object
 3   domestic_gross     5782 non-null   object
 4   worldwide_gross    5782 non-null   object
dtypes: object(5)
memory usage: 271.0+ KB
```

Noticed that no null values exists in the data set, however all data types are objects.

In [8]:
```
tn_movie_budgets_df.head()
```
executed in 28ms, finished 10:47:30 2022-02-11

Out[8]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

Important observations:

- Release dates are all object type -> change to datetime
- Budget costs are all object type -> change to integers

In [9]:
```
#change release_date to datetime
tn_movie_budgets_df['release_date'] = pd.to_datetime(tn_movie_budgets_df['release
```
executed in 846ms, finished 10:47:31 2022-02-11

In [10]:
```
tn_movie_budgets_df.head()
```
executed in 28ms, finished 10:47:32 2022-02-11

Out[10]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	2009-12-18	Avatar	$425,000,000	$760,507,625	$2,776,345,279
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
3	2019-06-07	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	2015-05-01	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

In [11]:
```
# change worldwide_gross to integers
tn_movie_budgets_df['worldwide_gross'] = tn_movie_budgets_df['worldwide_gross'].s
tn_movie_budgets_df['worldwide_gross']
```
executed in 13ms, finished 10:47:32 2022-02-11

Out[11]:
```
id
1     $2776345279
2     $1045663875
3      $149762350
4     $1403013963
5     $1316721747
         ...
78            $0
79       $240495
80         $1338
81            $0
82       $181041
Name: worldwide_gross, Length: 5782, dtype: object
```

In [12]:
```
tn_movie_budgets_df['worldwide_gross'] = tn_movie_budgets_df['worldwide_gross'].s
tn_movie_budgets_df['worldwide_gross']
```

executed in 13ms, finished 10:47:32 2022-02-11

Out[12]:
```
id
1     2776345279
2     1045663875
3      149762350
4     1403013963
5     1316721747
         ...
78            0
79       240495
80         1338
81            0
82       181041
Name: worldwide_gross, Length: 5782, dtype: object
```

In [13]:
```
tn_movie_budgets_df['worldwide_gross'] = pd.to_numeric(tn_movie_budgets_df['worlc
tn_movie_budgets_df['worldwide_gross']
```

executed in 28ms, finished 10:47:33 2022-02-11

Out[13]:
```
id
1     2776345279
2     1045663875
3      149762350
4     1403013963
5     1316721747
         ...
78            0
79       240495
80         1338
81            0
82       181041
Name: worldwide_gross, Length: 5782, dtype: int64
```

In [14]:
```
tn_movie_budgets_df['production_budget'] = tn_movie_budgets_df['production_budget
tn_movie_budgets_df['production_budget'] = tn_movie_budgets_df['production_budget
tn_movie_budgets_df['production_budget'] = pd.to_numeric(tn_movie_budgets_df['prc
tn_movie_budgets_df['production_budget']
```

executed in 30ms, finished 10:47:33 2022-02-11

Out[14]:
```
id
1     425000000
2     410600000
3     350000000
4     330600000
5     317000000
        ...
78        7000
79        6000
80        5000
81        1400
82        1100
Name: production_budget, Length: 5782, dtype: int64
```

In [15]:
```
tn_movie_budgets_df['domestic_gross'] = tn_movie_budgets_df['domestic_gross'].str
tn_movie_budgets_df['domestic_gross'] = tn_movie_budgets_df['domestic_gross'].str
tn_movie_budgets_df['domestic_gross'] = pd.to_numeric(tn_movie_budgets_df['domest
tn_movie_budgets_df['domestic_gross']
```

executed in 29ms, finished 10:47:34 2022-02-11

Out[15]:
```
id
1     760507625
2     241063875
3      42762350
4     459005868
5     620181382
        ...
78            0
79        48482
80         1338
81            0
82       181041
Name: domestic_gross, Length: 5782, dtype: int64
```

Analysis is for profitable movies, so let's remove movies that has $0 gross revenue.

In [16]:
```
#remove movies that had a $0 domestic gross.
tn_movie_budgets_df = tn_movie_budgets_df[tn_movie_budgets_df['domestic_gross'] !
```

executed in 14ms, finished 10:47:34 2022-02-11

In [17]:
```
tn_movie_budgets_df.shape
```

executed in 13ms, finished 10:47:34 2022-02-11

Out[17]:
```
(5234, 5)
```

Create new column that calculates net profit. Net Profit equals Worldwide Gross subtracted by Production Budget.

In [18]:
```
#calculate net profit
tn_movie_budgets_df['worldwide_net'] = tn_movie_budgets_df['worldwide_gross'] - t
```

executed in 14ms, finished 10:47:35 2022-02-11

```
C:\Users\ZAPTOS\AppData\Local\Temp/ipykernel_13768/3204409985.py:2: SettingWith
CopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  tn_movie_budgets_df['worldwide_net'] = tn_movie_budgets_df['worldwide_gross']
- tn_movie_budgets_df['production_budget']
```

In [19]:
```
tn_movie_budgets_df.head()
```
executed in 14ms, finished 10:47:35 2022-02-11

Out[19]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	worldwide_net
1	2009-12-18	Avatar	425000000	760507625	2776345279	2351345279
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	635063875
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	-200237650
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	1072413963
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	999721747

In [20]:
```
tn_movie_budgets_df[tn_movie_budgets_df['worldwide_net'] < 0].sample(5, random_st
```
executed in 29ms, finished 10:47:35 2022-02-11

Out[20]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	worldwide_net
66	2009-11-20	The Missing Person	2000000	17896	17896	-1982104
94	2000-12-22	Thirteen Days	80000000	34566746	66554547	-13445453
81	2012-06-01	Hardflip	1000000	96734	96734	-903266
74	1991-08-30	Beastmaster 2: Through the Portal of Time	6000000	773490	773490	-5226510
85	2003-02-28	Spider	10000000	1641788	1641788	-8358212

In [21]:
```
#remove movies that had a negative worldwide net.
tn_movie_budgets_df = tn_movie_budgets_df[tn_movie_budgets_df['worldwide_net'] >
```
executed in 12ms, finished 10:47:36 2022-02-11

In [22]:
```
tn_movie_budgets_df.shape
```
executed in 13ms, finished 10:47:36 2022-02-11

Out[22]: (3611, 6)

In [23]:
```
tn_movie_budgets_df.head()
```
executed in 27ms, finished 10:47:36 2022-02-11

Out[23]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	worldwide_net
1	2009-12-18	Avatar	425000000	760507625	2776345279	2351345279
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	635063875
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	1072413963
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	999721747
6	2015-12-18	Star Wars Ep. VII: The Force Awakens	306000000	936662225	2053311220	1747311220

In [24]:
```
# change index
tn_movie_budgets_df.set_index('movie', inplace=True)
```
executed in 12ms, finished 10:47:37 2022-02-11

In [25]:
```
# drop 'domestic_gross' column
tn_movie_budgets_df = tn_movie_budgets_df.drop(['domestic_gross'], axis=1)
```
executed in 13ms, finished 10:47:37 2022-02-11

In [26]:
```
tn_movie_budgets_df.shape
```
executed in 13ms, finished 10:47:37 2022-02-11

Out[26]:
```
(3611, 4)
```

In [27]:
```
#find missing values
tn_movie_budgets_df.isna().sum()
```
executed in 13ms, finished 10:47:38 2022-02-11

Out[27]:
```
release_date         0
production_budget    0
worldwide_gross      0
worldwide_net        0
dtype: int64
```

Lets find the highest worldwide gross films

In [28]:
```
#sort based highest worldwide gross movies
tn_movie_budgets_df = tn_movie_budgets_df.sort_values(by='worldwide_gross', ascer
```
executed in 14ms, finished 10:47:38 2022-02-11

In [29]:
```
tn_movie_budgets_df.head(10)
```
executed in 27ms, finished 10:47:38 2022-02-11

Out[29]:

movie	release_date	production_budget	worldwide_gross	worldwide_net
Avatar	2009-12-18	425000000	2776345279	2351345279
Titanic	1997-12-19	200000000	2208208395	2008208395
Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
Jurassic World	2015-06-12	215000000	1648854864	1433854864
Furious 7	2015-04-03	190000000	1518722794	1328722794
The Avengers	2012-05-04	225000000	1517935897	1292935897
Avengers: Age of Ultron	2015-05-01	330600000	1403013963	1072413963
Black Panther	2018-02-16	200000000	1348258224	1148258224
Harry Potter and the Deathly Hallows: Part II	2011-07-15	125000000	1341693157	1216693157

Lets remove the outliers, Avatar & Titanic are the top 2 worldwide grossing films which made over $2 Biliion in profits and are eliminated from the data set.

In [30]:
```
# remove top two rows
tn_movie_budgets_df = tn_movie_budgets_df.iloc[2: , :]
tn_movie_budgets_df.head(10)
```

executed in 28ms, finished 10:47:39 2022-02-11

Out[30]:

movie	release_date	production_budget	worldwide_gross	worldwide_net
Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
Jurassic World	2015-06-12	215000000	1648854864	1433854864
Furious 7	2015-04-03	190000000	1518722794	1328722794
The Avengers	2012-05-04	225000000	1517935897	1292935897
Avengers: Age of Ultron	2015-05-01	330600000	1403013963	1072413963
Black Panther	2018-02-16	200000000	1348258224	1148258224
Harry Potter and the Deathly Hallows: Part II	2011-07-15	125000000	1341693157	1216693157
Star Wars Ep. VIII: The Last Jedi	2017-12-15	317000000	1316721747	999721747
Jurassic World: Fallen Kingdom	2018-06-22	170000000	1305772799	1135772799

In [31]:
```
ww_gross_top10_df = tn_movie_budgets_df.head(10)
ww_gross_top10_df
```

executed in 14ms, finished 10:47:39 2022-02-11

Out[31]:

movie	release_date	production_budget	worldwide_gross	worldwide_net
Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
Jurassic World	2015-06-12	215000000	1648854864	1433854864
Furious 7	2015-04-03	190000000	1518722794	1328722794
The Avengers	2012-05-04	225000000	1517935897	1292935897
Avengers: Age of Ultron	2015-05-01	330600000	1403013963	1072413963
Black Panther	2018-02-16	200000000	1348258224	1148258224
Harry Potter and the Deathly Hallows: Part II	2011-07-15	125000000	1341693157	1216693157
Star Wars Ep. VIII: The Last Jedi	2017-12-15	317000000	1316721747	999721747
Jurassic World: Fallen Kingdom	2018-06-22	170000000	1305772799	1135772799

In [32]:
```
ww_gross_top10_df = ww_gross_top10_df.reset_index()
```

executed in 14ms, finished 10:47:39 2022-02-11

In [33]:
```
#new dataframe movies sorted by highest net profit
ww_net_top10_df = tn_movie_budgets_df.sort_values(by='worldwide_net', ascending=F
ww_net_top10_df
```

executed in 29ms, finished 10:47:40 2022-02-11

Out[33]:

movie	release_date	production_budget	worldwide_gross	worldwide_net
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
Jurassic World	2015-06-12	215000000	1648854864	1433854864
Furious 7	2015-04-03	190000000	1518722794	1328722794
The Avengers	2012-05-04	225000000	1517935897	1292935897
Harry Potter and the Deathly Hallows: Part II	2011-07-15	125000000	1341693157	1216693157
Black Panther	2018-02-16	200000000	1348258224	1148258224
Jurassic World: Fallen Kingdom	2018-06-22	170000000	1305772799	1135772799
Frozen	2013-11-22	150000000	1272469910	1122469910
Beauty and the Beast	2017-03-17	160000000	1259199706	1099199706

now the most profitable movies

In [34]:
```
ww_net_top10_df = ww_net_top10_df.reset_index()
```

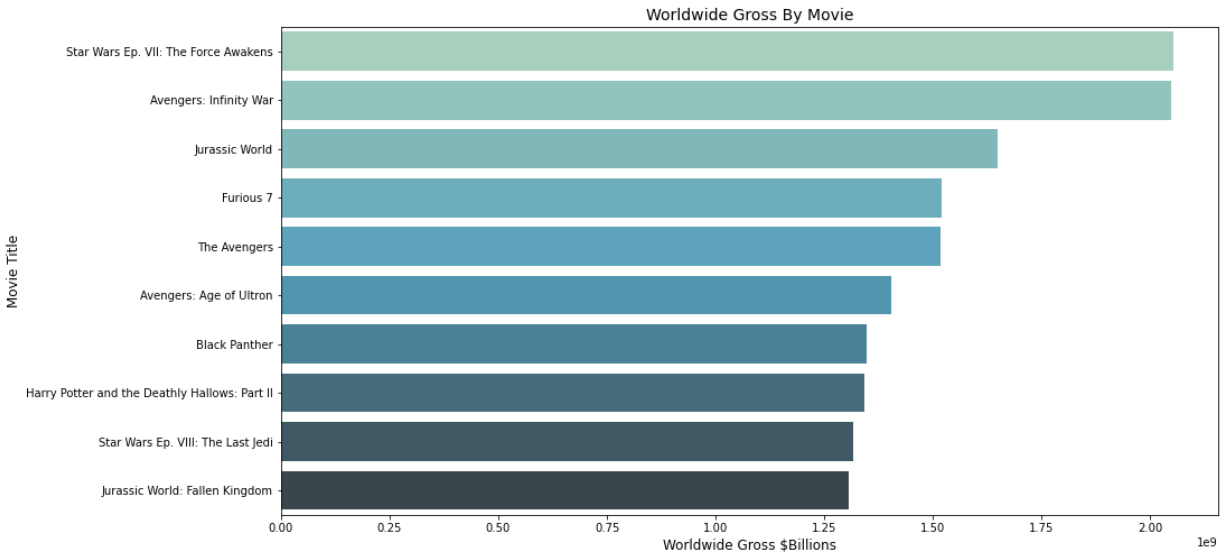
executed in 91ms, finished 10:47:40 2022-02-11

In [35]:
```
ww_net_top10_df
```
executed in 92ms, finished 10:47:40 2022-02-11

Out[35]:

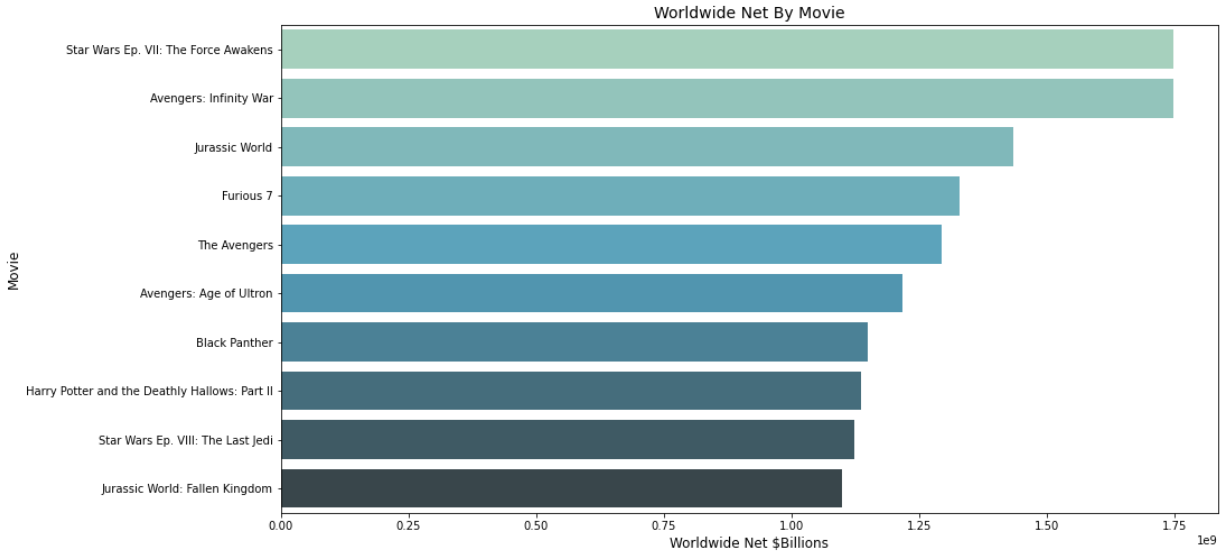
	movie	release_date	production_budget	worldwide_gross	worldwide_net
0	Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
1	Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
2	Jurassic World	2015-06-12	215000000	1648854864	1433854864
3	Furious 7	2015-04-03	190000000	1518722794	1328722794
4	The Avengers	2012-05-04	225000000	1517935897	1292935897
5	Harry Potter and the Deathly Hallows: Part II	2011-07-15	125000000	1341693157	1216693157
6	Black Panther	2018-02-16	200000000	1348258224	1148258224
7	Jurassic World: Fallen Kingdom	2018-06-22	170000000	1305772799	1135772799
8	Frozen	2013-11-22	150000000	1272469910	1122469910
9	Beauty and the Beast	2017-03-17	160000000	1259199706	1099199706

In [36]:
```
plt.figure(figsize=(15,8))
ax30 = sns.barplot(x=ww_gross_top10_df['worldwide_gross'], y=ww_gross_top10_df['m
plt.xlabel('Worldwide Gross $Billions', fontsize=12)
plt.ylabel('Movie Title', fontsize=12)
plt.title('Worldwide Gross By Movie', fontsize=14);
```
executed in 471ms, finished 10:47:40 2022-02-11



In [37]:
```
plt.figure(figsize=(15,8))
ax31 = sns.barplot(x=ww_net_top10_df['worldwide_net'], y=ww_gross_top10_df['movie
plt.xlabel('Worldwide Net $Billions', fontsize=12)
plt.ylabel('Movie', fontsize=12)
plt.title('Worldwide Net By Movie', fontsize=14);
```

executed in 293ms, finished 10:47:41 2022-02-11



The top grossed and the top net profit movies are not equal. Lets further examine.

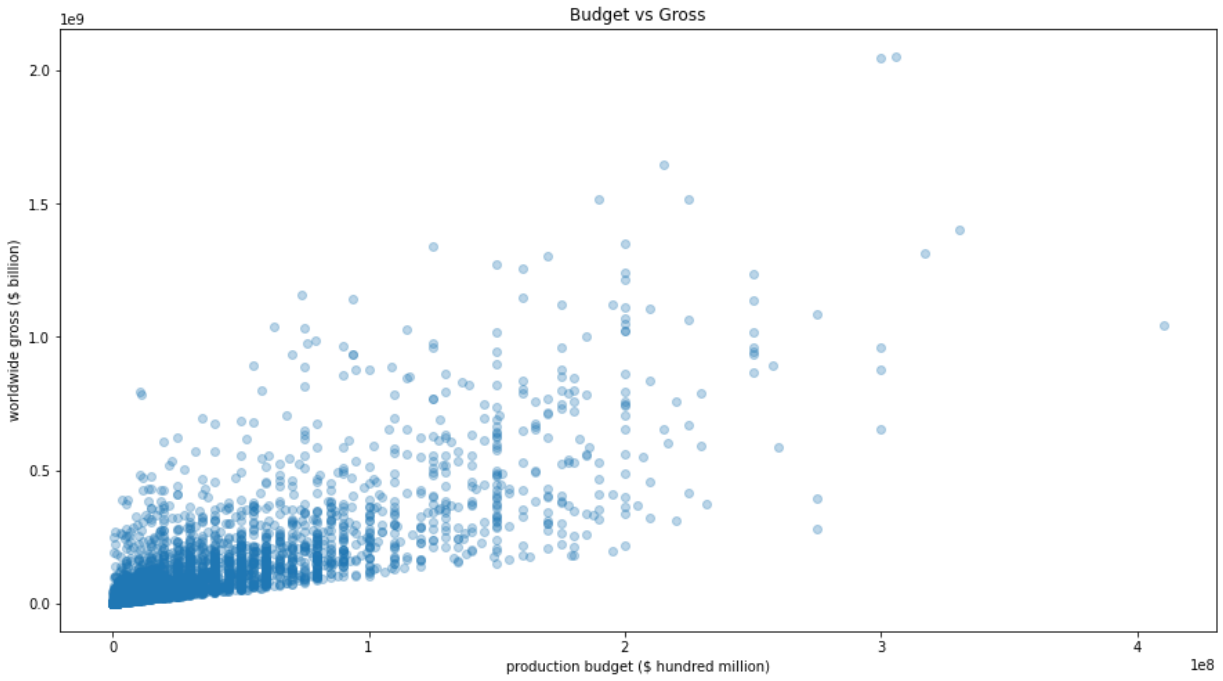
Examine the overall trend of production budget versus worldwide gross to see if there is any correlation.

In [38]:
```
fig, ax = plt.subplots(figsize=(15, 8))

ax.scatter(
    x=tn_movie_budgets_df["production_budget"],
    y=tn_movie_budgets_df["worldwide_gross"],
    alpha=0.3
)

ax.set_xlabel("production budget ($ hundred million)")
ax.set_ylabel("worldwide gross ($ billion)")
ax.set_title("Budget vs Gross");
plt.savefig('fig01_Budget_Gross_Var');
```

executed in 360ms, finished 10:47:41 2022-02-11



The positive trend line is leading us to believe that higher production budget equals to higher gross sales. However one plot is not enough to make that conclusion.

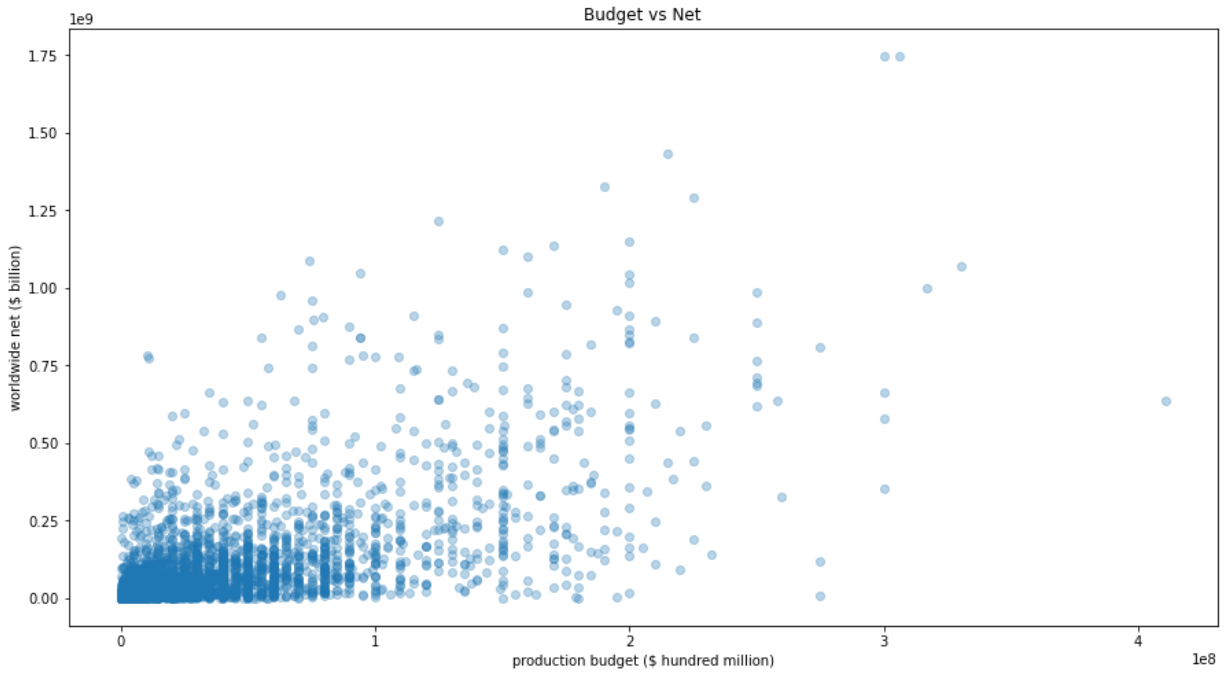
The plot below shots production budget versus net profit. Which is showing a trend line that is negative meaning that spending too much money does risk of declining the profit margin.

In [39]:
```
fig, ax = plt.subplots(figsize=(15, 8))

ax.scatter(
    x=tn_movie_budgets_df["production_budget"],
    y=tn_movie_budgets_df["worldwide_net"],
    alpha=0.3
)

ax.set_xlabel("production budget ($ hundred million)")
ax.set_ylabel("worldwide net ($ billion)")
ax.set_title("Budget vs Net");
```

executed in 227ms, finished 10:47:41 2022-02-11



the trend line for the worldwide net is not as positive as the trend line as the worldwide gross. Meaning that pouring more money does not always correlate to higher box office numbers.

In [40]:
```
tn_movie_df = tn_movie_budgets_df.sort_values(by='worldwide_net', ascending=False
```

executed in 14ms, finished 10:47:41 2022-02-11

In [41]:
```
tn_movie_df.head()
```
executed in 94ms, finished 10:47:41 2022-02-11

Out[41]:

movie	release_date	production_budget	worldwide_gross	worldwide_net
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
Jurassic World	2015-06-12	215000000	1648854864	1433854864
Furious 7	2015-04-03	190000000	1518722794	1328722794
The Avengers	2012-05-04	225000000	1517935897	1292935897

So what is the recommendation? Lets look into the most profitable top 25 movies and use the mean as a target of success

In [42]:
```
tn_movie_df1 = tn_movie_df.head(25)
```
executed in 123ms, finished 10:47:41 2022-02-11

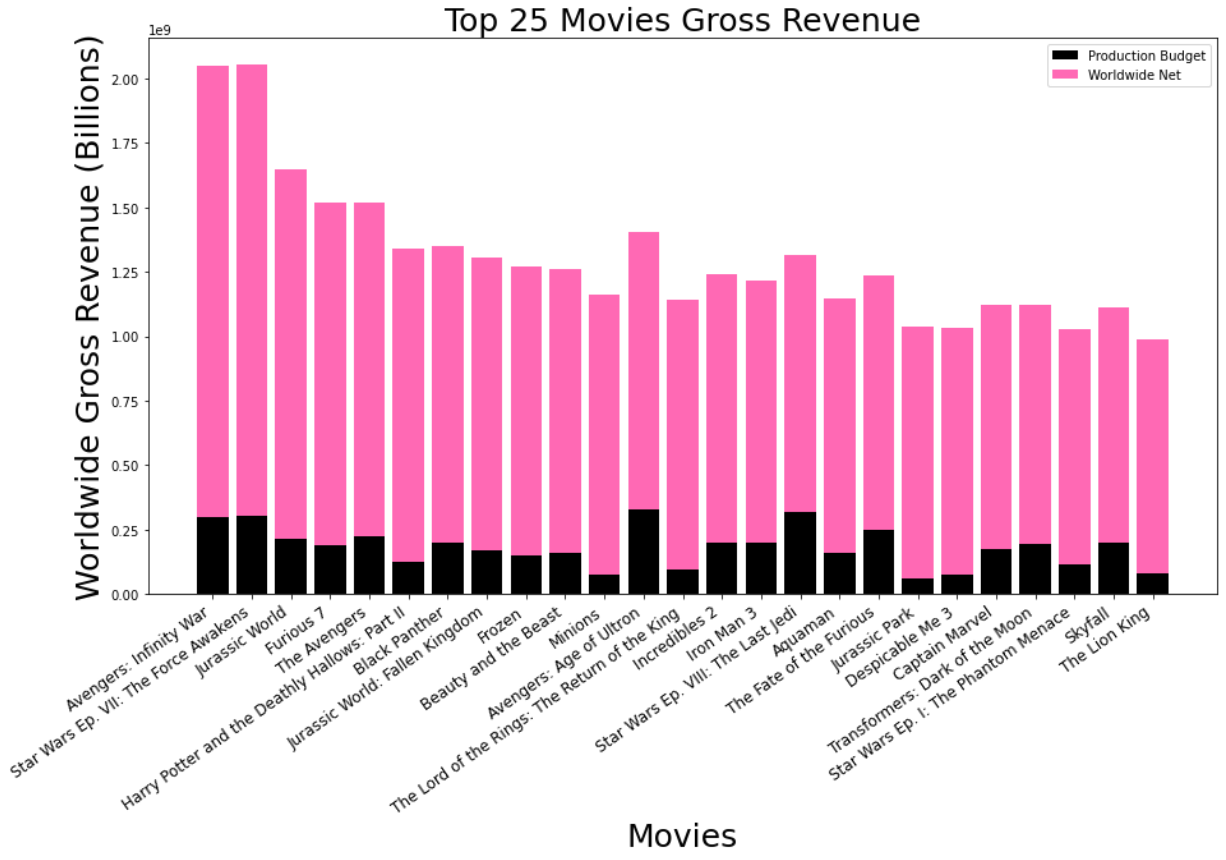
In [43]:
```
plt.figure(figsize=(15,8))

movies = tn_movie_df1.index
budget_gross = tn_movie_df1.production_budget
ww_net = tn_movie_df1.worldwide_net
ww_gross = tn_movie_df1.worldwide_gross

plt.bar(range(len(movies)), budget_gross, color='black')
plt.bar(range(len(movies)), ww_net, color='hotpink', bottom=budget_gross)
plt.title('Top 25 Movies Gross Revenue', fontsize=25)
plt.xlabel('Movies', fontsize=25)
plt.ylabel('Worldwide Gross Revenue (Billions)', fontsize=25)
plt.xticks(range(len(movies)), movies, rotation=35, horizontalalignment='right',

plt.legend(['Production Budget', 'Worldwide Net'])
plt.savefig('fig02_Top_25_Gross')
plt.show();
```

executed in 873ms, finished 10:47:42 2022-02-11



In [44]:
```
tn_movie_df1.mean()
```
executed in 27ms, finished 10:47:42 2022-02-11

```
C:\Users\ZAPTOS\AppData\Local\Temp/ipykernel_13768/2454665950.py:1: FutureWarni
ng: DataFrame.mean and DataFrame.median with numeric_only=None will include dat
etime64 and datetime64tz columns in a future version.
  tn_movie_df1.mean()
```

Out[44]:
```
production_budget    1.827560e+08
worldwide_gross      1.304786e+09
worldwide_net        1.122030e+09
dtype: float64
```

In [45]:
```
tn_movie_df1.head()
```
executed in 121ms, finished 10:47:43 2022-02-11

Out[45]:

movie	release_date	production_budget	worldwide_gross	worldwide_net
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200
Star Wars Ep. VII: The Force Awakens	2015-12-18	306000000	2053311220	1747311220
Jurassic World	2015-06-12	215000000	1648854864	1433854864
Furious 7	2015-04-03	190000000	1518722794	1328722794
The Avengers	2012-05-04	225000000	1517935897	1292935897

Question 1 Conclusion:

Question #1: What are the most profitable movies and how are the production budgets related?

Recommendation #1: We discovered that the highest grossed movies are not equal to the movies with the most profits. Meaning that pouring money into a movie does not guarantee a success in the box office. Instead, the top 25 most profitable movies were investigated, and found that the mean production budget is $182,756,000.00 and is the recommended production budget for a successful movie

Top 25 Profitable Movies average values are

1. production_budget $ 182,756,000.00
2. worldwide_gross $ 1,304,786,000.00
3. worldwide_net $ 1,122,030,000.00

1.4.2 Question 2:

Which movie studio made the most profitable movies?

Lets find our biggest competitors

In [46]:
```
bom_movie_gross_df = csv_files_dict['bom_movie_gross_gz']
bom_movie_gross_df.head()
```
executed in 23ms, finished 10:47:48 2022-02-11

Out[46]:

title	studio	domestic_gross	foreign_gross	year
Toy Story 3	BV	415000000.0	652000000	2010
Alice in Wonderland (2010)	BV	334200000.0	691300000	2010
Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
Inception	WB	292600000.0	535700000	2010
Shrek Forever After	P/DW	238700000.0	513900000	2010

In [47]:
```
bom_movie_gross_df.shape
```
executed in 19ms, finished 10:47:49 2022-02-11

Out[47]: (3387, 4)

In [48]:
```
bom_movie_gross_df = bom_movie_gross_df.drop(['domestic_gross', 'foreign_gross',
bom_movie_gross_df.head()
```
executed in 13ms, finished 10:47:49 2022-02-11

Out[48]:

title	studio
Toy Story 3	BV
Alice in Wonderland (2010)	BV
Harry Potter and the Deathly Hallows Part 1	WB
Inception	WB
Shrek Forever After	P/DW

In [49]:
```
# drop movies with missing studios
bom_movie_gross_df = bom_movie_gross_df.dropna()
```
executed in 16ms, finished 10:47:50 2022-02-11

In [50]:
```
bom_movie_gross_df.shape
```
executed in 13ms, finished 10:47:50 2022-02-11

Out[50]: (3382, 1)

In [51]:
```
# join two dataframes together
budget_studio_df = tn_movie_budgets_df.join(bom_movie_gross_df, how='inner')
budget_studio_df.head()
```

executed in 40ms, finished 10:47:51 2022-02-11

Out[51]:

	release_date	production_budget	worldwide_gross	worldwide_net	studio
10 Cloverfield Lane	2016-03-11	5000000	108286422	103286422	Par.
12 Strong	2018-01-19	35000000	71118378	36118378	WB
12 Years a Slave	2013-10-18	20000000	181025343	161025343	FoxS
127 Hours	2010-11-05	18000000	60217171	42217171	FoxS
13 Hours: The Secret Soldiers of Benghazi	2016-01-15	50000000	69411370	19411370	Par.

In [52]:
```
budget_studio_df.shape
```

executed in 20ms, finished 10:47:52 2022-02-11

Out[52]:
```
(978, 5)
```

In [53]:
```
budget_studio_df.isna().sum()
```

executed in 22ms, finished 10:47:52 2022-02-11

Out[53]:
```
release_date         0
production_budget    0
worldwide_gross      0
worldwide_net        0
studio               0
dtype: int64
```

In [54]:
```
budget_studio_df.dropna()
```
executed in 24ms, finished 10:47:53 2022-02-11

Out[54]:

	release_date	production_budget	worldwide_gross	worldwide_net	studio
10 Cloverfield Lane	2016-03-11	5000000	108286422	103286422	Par.
12 Strong	2018-01-19	35000000	71118378	36118378	WB
12 Years a Slave	2013-10-18	20000000	181025343	161025343	FoxS
127 Hours	2010-11-05	18000000	60217171	42217171	FoxS
13 Hours: The Secret Soldiers of Benghazi	2016-01-15	50000000	69411370	19411370	Par.
...	...	...	...	...	...
Zookeeper	2011-07-08	80000000	170805525	90805525	Sony
Zoolander 2	2016-02-12	50000000	55348693	5348693	Par.
Zootopia	2016-03-04	150000000	1019429616	869429616	BV
[Rec] 2	2010-07-09	5600000	18527766	12927766	Magn.
mother!	2017-09-15	30000000	42531076	12531076	Par.

978 rows × 5 columns

In [55]:
```
# top 10 profitable movies with studios
budget_studio_df1 = budget_studio_df.sort_values(by='worldwide_net', ascending=Fa
budget_studio_df1
```
executed in 30ms, finished 10:47:56 2022-02-11

Out[55]:

	release_date	production_budget	worldwide_gross	worldwide_net	studio
Avengers: Infinity War	2018-04-27	300000000	2048134200	1748134200	BV
Jurassic World	2015-06-12	215000000	1648854864	1433854864	Uni.
Furious 7	2015-04-03	190000000	1518722794	1328722794	Uni.
Black Panther	2018-02-16	200000000	1348258224	1148258224	BV
Jurassic World: Fallen Kingdom	2018-06-22	170000000	1305772799	1135772799	Uni.
Frozen	2013-11-22	150000000	1272469910	1122469910	BV
Minions	2015-07-10	74000000	1160336173	1086336173	Uni.
Avengers: Age of Ultron	2015-05-01	330600000	1403013963	1072413963	BV
Incredibles 2	2018-06-15	200000000	1242520711	1042520711	BV
Iron Man 3	2013-05-03	200000000	1215392272	1015392272	BV

Buena Vista and Universal have been dominating the box office

In [56]:
```
# Studios that made the most movies
top5_studio = budget_studio_df.studio.value_counts().head(5)
top5_studio
```
executed in 21ms, finished 10:47:59 2022-02-11

Out[56]:
```
Fox     102
Uni.     99
WB       89
Sony     69
Par.     66
Name: studio, dtype: int64
```

In [57]:
```
budget_studio_df['studio'].value_counts()
```
executed in 19ms, finished 10:48:03 2022-02-11

Out[57]:
```
Fox         102
Uni.         99
WB           89
Sony         69
Par.         66
           ...
Kino          1
Studio 8      1
PNT           1
GrtIndia      1
Mira.         1
Name: studio, Length: 66, dtype: int64
```

In [58]:
```
budget_studio_df.groupby(['studio']).sum()
```
executed in 27ms, finished 10:48:04 2022-02-11

Out[58]:

studio	production_budget	worldwide_gross	worldwide_net
3D	5000000	16515203	11515203
A24	85100000	373422743	288322743
Affirm	7000000	31471492	24471492
Anch.	7500000	9778625	2278625
Annapurna	72000000	90742338	18742338
...	...	...	...
W/Dim.	172500000	593027548	420527548
WB	7627000000	21789247510	14162247510
WB (NL)	2006600000	8421247281	6414647281
Wein.	657000000	2749234686	2092234686
Yash	11000000	72989781	61989781

66 rows × 3 columns

Sort and Aggregate the data

In [59]:
```
# sort and aggregate the data
budget_studio_df_agg = budget_studio_df.groupby(['studio']).agg('sum')
```
executed in 18ms, finished 10:48:06 2022-02-11

In [60]:
```
budget_studio_df_agg = budget_studio_df_agg.sort_values('worldwide_net', ascendir
budget_studio_df_agg
```
executed in 15ms, finished 10:48:07 2022-02-11

Out[60]:

studio	production_budget	worldwide_gross	worldwide_net
BV	8898800000	32908386178	24009586178
Uni.	5439200000	26465414604	21026214604
Fox	7499500000	26637599733	19138099733
WB	7627000000	21789247510	14162247510
Sony	4894000000	17487527176	12593527176
Par.	4485000000	14252759641	9767759641
WB (NL)	2006600000	8421247281	6414647281
LGF	1833287650	6824229290	4990941640
P/DW	1294000000	5057237115	3763237115
LG/S	1181500000	3463378248	2281878248

In [61]:
```
budget_studio_df_agg.index
```
executed in 15ms, finished 10:48:10 2022-02-11

Out[61]:
```
Index(['BV', 'Uni.', 'Fox', 'WB', 'Sony', 'Par.', 'WB (NL)', 'LGF', 'P/DW',
       'LG/S'],
      dtype='object', name='studio')
```

In [62]:
```
font = {'family' : 'Arial',
        'weight' : 'bold',
        'size' : 15}

plt.rc('font', **font)
```
executed in 12ms, finished 10:48:11 2022-02-11

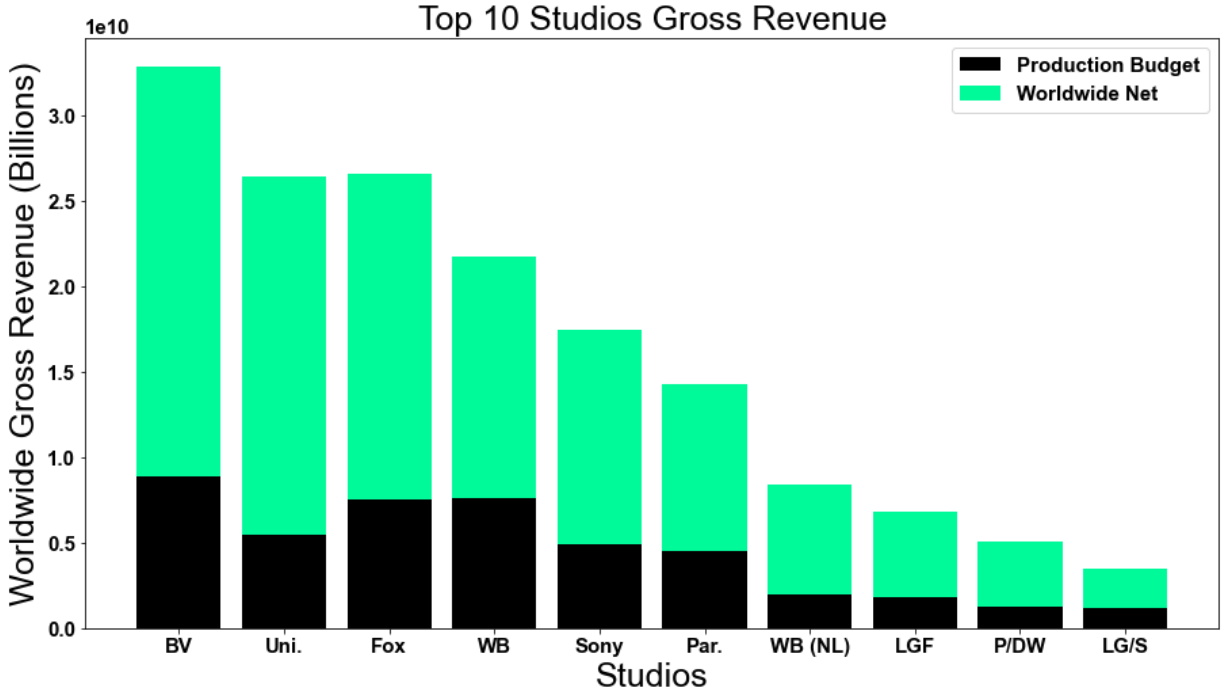
In [63]:
```
plt.figure(figsize=(15,8))

studios = budget_studio_df_agg.index
budget_gross = budget_studio_df_agg.production_budget
ww_net = budget_studio_df_agg.worldwide_net
ww_gross = budget_studio_df_agg.worldwide_gross

plt.bar(range(len(studios)), budget_gross, color='black')
plt.bar(range(len(studios)), ww_net, color='mediumspringgreen', bottom=budget_gro
plt.title('Top 10 Studios Gross Revenue', fontsize=25)
plt.xlabel('Studios', fontsize=25)
plt.ylabel('Worldwide Gross Revenue (Billions)', fontsize=25)
plt.xticks(range(len(studios)), studios)

plt.legend(['Production Budget', 'Worldwide Net'])
plt.savefig('fig03_Top10_studios')
plt.show();
```

executed in 453ms, finished 10:48:12 2022-02-11



In [64]:
```
budget_studio_df_agg.describe()
```
executed in 41ms, finished 10:48:13 2022-02-11

Out[64]:

	production_budget	worldwide_gross	worldwide_net
count	1.000000e+01	1.000000e+01	1.000000e+01
mean	4.515889e+09	1.633070e+10	1.181481e+10
std	2.863154e+09	1.035378e+10	7.666173e+09
min	1.181500e+09	3.463378e+09	2.281878e+09
25%	1.876616e+09	7.223484e+09	5.346868e+09
50%	4.689500e+09	1.587014e+10	1.118064e+10
75%	6.984425e+09	2.529637e+10	1.789414e+10
max	8.898800e+09	3.290839e+10	2.400959e+10

In [65]:
```
budget_studio_df_agg.median()
```
executed in 12ms, finished 10:48:14 2022-02-11

Out[65]:
```
production_budget    4.689500e+09
worldwide_gross      1.587014e+10
worldwide_net        1.118064e+10
dtype: float64
```

In [66]:
```
budget_studio_df_agg.head()
```
executed in 12ms, finished 10:48:14 2022-02-11

Out[66]:

studio	production_budget	worldwide_gross	worldwide_net
BV	8898800000	32908386178	24009586178
Uni.	5439200000	26465414604	21026214604
Fox	7499500000	26637599733	19138099733
WB	7627000000	21789247510	14162247510
Sony	4894000000	17487527176	12593527176

Question 2 Conclusions:

Question #2: Which movie studios are some of the biggest competitors?

Recommendation #2: Similarly, the top 5 movie studios that make the most movies are the not the same as the top 5 movie studios that made the most profits.

The top five studios that make the most movies are not the top 5 studios that make the most profit. The competition should focus on the top 5 profitable studios

The top 5 studios that made the most movies are in order

1. Fox 102
2. Universal 99
3. Warner Brothers 89
4. Sony 69
5. Paramount 66

The top 5 studios that made the most profit are in order

```
1. Buena Vista $23 Billion
2. Universal   $21 Billion
3. Fox         $19 Billion
4. Warner Bros $14 Billion
5. Sony        $12 Billion
```

1.4.3 Question 3:

What are the most common and profitable genres?

Gross Revenue by Genre

Lets explore movie genres that made the most profit

In [67]:
```
imdb_title_basics_df = csv_files_dict['imdb_title_basics_gz']
imdb_title_basics_df.shape
```

executed in 7ms, finished 10:48:15 2022-02-11

Out[67]: (146144, 5)

In [68]:
```
imdb_title_basics_df.head()
```

executed in 28ms, finished 10:48:15 2022-02-11

Out[68]:

tconst	primary_title	original_title	start_year	runtime_minutes	genres
tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama
tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy

In [69]:
```
imdb_title_basics_df = imdb_title_basics_df.drop(['start_year', 'runtime_minutes'
imdb_title_basics_df.head()
```
executed in 29ms, finished 10:48:16 2022-02-11

Out[69]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action,Crime,Drama
tt0066787	One Day Before the Rainy Season	Biography,Drama
tt0069049	The Other Side of the Wind	Drama
tt0069204	Sabse Bada Sukh	Comedy,Drama
tt0100275	The Wandering Soap Opera	Comedy,Drama,Fantasy

In [70]:
```
imdb_title_basics_df.isna().sum()
```
executed in 150ms, finished 10:48:16 2022-02-11

Out[70]:
```
primary_title       0
genres           5408
dtype: int64
```

In [71]:
```
imdb_title_basics_df = imdb_title_basics_df.dropna()
```
executed in 45ms, finished 10:48:17 2022-02-11

In [72]:
```
imdb_title_basics_df.isna().sum()
```
executed in 29ms, finished 10:48:17 2022-02-11

Out[72]:
```
primary_title    0
genres           0
dtype: int64
```

In [73]:
```
# explode method used to seperate genres
imdb_title_basics_df_explode = imdb_title_basics_df.assign(genres=imdb_title_basi
```
executed in 408ms, finished 10:48:18 2022-02-11

In [74]:
```
imdb_title_basics_df_explode.head()
```
executed in 13ms, finished 10:48:19 2022-02-11

Out[74]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0063540	Sunghursh	Crime
tt0063540	Sunghursh	Drama
tt0066787	One Day Before the Rainy Season	Biography
tt0066787	One Day Before the Rainy Season	Drama

In [75]:
```
imdb_title_basics_df_explode.duplicated().value_counts()
```
executed in 113ms, finished 10:48:19 2022-02-11

Out[75]:
```
False    223085
True       6465
dtype: int64
```

In [76]:
```
imdb_title_basics_df_explode.shape
```
executed in 12ms, finished 10:48:20 2022-02-11

Out[76]:
```
(229550, 2)
```

In [77]:
```
imdb_title_basics_df_explode = imdb_title_basics_df_explode.drop_duplicates()
```
executed in 122ms, finished 10:48:21 2022-02-11

In [78]:
```
imdb_title_basics_df_explode.shape
```
executed in 14ms, finished 10:48:21 2022-02-11

Out[78]:
```
(223085, 2)
```

In [79]:
```
imdb_title_basics_df_explode.head()
```
executed in 14ms, finished 10:48:22 2022-02-11

Out[79]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0063540	Sunghursh	Crime
tt0063540	Sunghursh	Drama
tt0066787	One Day Before the Rainy Season	Biography
tt0066787	One Day Before the Rainy Season	Drama

In [80]:
```
imdb_title_basics_df_explode = imdb_title_basics_df_explode.drop_duplicates(subse
```
executed in 108ms, finished 10:48:22 2022-02-11

In [81]:
```
imdb_title_basics_df_explode.info()
```
executed in 44ms, finished 10:48:23 2022-02-11

```
<class 'pandas.core.frame.DataFrame'>
Index: 131336 entries, tt0063540 to tt9916754
Data columns (total 2 columns):
 #   Column         Non-Null Count   Dtype 
---  ------         --------------   ----- 
 0   primary_title  131336 non-null  object
 1   genres         131336 non-null  object
dtypes: object(2)
memory usage: 3.0+ MB
```

In [82]:
```
imdb_title_basics_df_explode.dropna()
```
executed in 62ms, finished 10:48:23 2022-02-11

Out[82]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0066787	One Day Before the Rainy Season	Biography
tt0069049	The Other Side of the Wind	Drama
tt0069204	Sabse Bada Sukh	Comedy
tt0100275	The Wandering Soap Opera	Comedy
...	...	...
tt9916428	The Secret of China	Adventure
tt9916538	Kuambil Lagi Hatiku	Drama
tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Documentary
tt9916706	Dankyavar Danka	Comedy
tt9916754	Chico Albuquerque - Revelações	Documentary

131336 rows × 2 columns

In [83]:
```
imdb_title_basics_df_explode.head()
```
executed in 14ms, finished 10:48:24 2022-02-11

Out[83]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0066787	One Day Before the Rainy Season	Biography
tt0069049	The Other Side of the Wind	Drama
tt0069204	Sabse Bada Sukh	Comedy
tt0100275	The Wandering Soap Opera	Comedy

In [84]:
```
imdb_title_basics_df_explode.shape
```
executed in 13ms, finished 10:48:24 2022-02-11

Out[84]: (131336, 2)

In [85]:
```
imdb_title_basics_df_explode.head()
```
executed in 13ms, finished 10:48:25 2022-02-11

Out[85]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0066787	One Day Before the Rainy Season	Biography
tt0069049	The Other Side of the Wind	Drama
tt0069204	Sabse Bada Sukh	Comedy
tt0100275	The Wandering Soap Opera	Comedy

In [86]:
```
imdb_title_basics_df_explode.shape
```
executed in 14ms, finished 10:48:25 2022-02-11

Out[86]: (131336, 2)

In [87]:
```
imdb_title_basics_df_explode.dropna()
```
executed in 61ms, finished 10:48:26 2022-02-11

Out[87]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0066787	One Day Before the Rainy Season	Biography
tt0069049	The Other Side of the Wind	Drama
tt0069204	Sabse Bada Sukh	Comedy
tt0100275	The Wandering Soap Opera	Comedy
...	...	...
tt9916428	The Secret of China	Adventure
tt9916538	Kuambil Lagi Hatiku	Drama
tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Documentary
tt9916706	Dankyavar Danka	Comedy
tt9916754	Chico Albuquerque - Revelações	Documentary

131336 rows × 2 columns

In [88]:
```
imdb_title_basics_df_explode.reset_index()
```
executed in 29ms, finished 10:48:26 2022-02-11

Out[88]:

	tconst	primary_title	genres
0	tt0063540	Sunghursh	Action
1	tt0066787	One Day Before the Rainy Season	Biography
2	tt0069049	The Other Side of the Wind	Drama
3	tt0069204	Sabse Bada Sukh	Comedy
4	tt0100275	The Wandering Soap Opera	Comedy
...	...	...	...
131331	tt9916428	The Secret of China	Adventure
131332	tt9916538	Kuambil Lagi Hatiku	Drama
131333	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Documentary
131334	tt9916706	Dankyavar Danka	Comedy
131335	tt9916754	Chico Albuquerque - Revelações	Documentary

131336 rows × 3 columns

In [89]:
```
#Do a count of all movies grouped by genre.
movie_by_genre = imdb_title_basics_df_explode.groupby('genres', as_index=False)['
```
executed in 46ms, finished 10:48:27 2022-02-11

In [90]:
```
movie_by_genre = movie_by_genre.head(10)
```
executed in 12ms, finished 10:48:27 2022-02-11

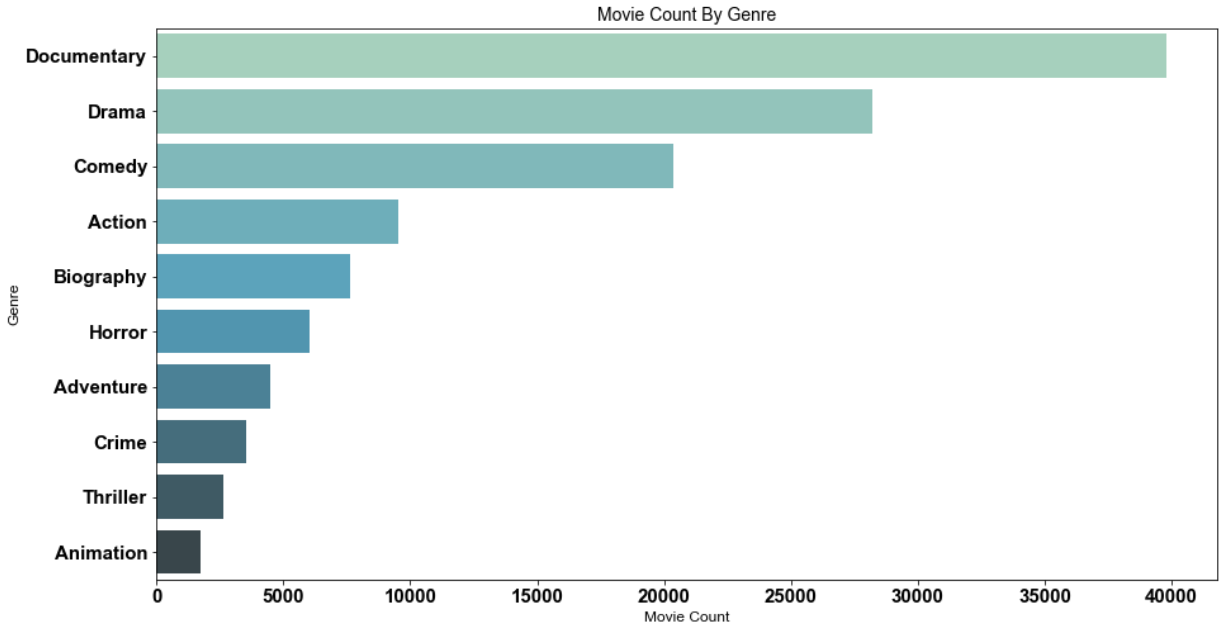
In [91]:
```
movie_by_genre
```
executed in 14ms, finished 10:48:28 2022-02-11

Out[91]:

	genres	primary_title
7	Documentary	39816
8	Drama	28226
5	Comedy	20389
0	Action	9541
4	Biography	7656
13	Horror	6039
2	Adventure	4502
6	Crime	3540
24	Thriller	2659
3	Animation	1760

In [92]:
```
#Plot the above findings.
plt.figure(figsize=(15,8))
ax3 = sns.barplot(x=movie_by_genre['primary_title'], y=movie_by_genre['genres'],
plt.xlabel('Movie Count', fontsize=12)
plt.ylabel('Genre', fontsize=12)
plt.title('Movie Count By Genre', fontsize=14)
plt.savefig('fig04_CountGenre');
```

executed in 355ms, finished 10:48:29 2022-02-11



We can see that that the top 5 genres produced are:

1. Documentary
2. Drama
3. Comedy
4. Action
5. Biography

We can see that documentary, drama and comedy dominate the quantity of movie genres but do popular genres make the most profit?

In [93]:
```
imdb_title_basics_df_explode.head()
```
executed in 14ms, finished 10:48:29 2022-02-11

Out[93]:

tconst	primary_title	genres
tt0063540	Sunghursh	Action
tt0066787	One Day Before the Rainy Season	Biography
tt0069049	The Other Side of the Wind	Drama
tt0069204	Sabse Bada Sukh	Comedy
tt0100275	The Wandering Soap Opera	Comedy

In [94]:
```
imdb_title_basics_df_explode = imdb_title_basics_df_explode.reset_index()
```
executed in 14ms, finished 10:48:30 2022-02-11

In [95]:
```
imdb_title_basics_df_explode.head()
```
executed in 14ms, finished 10:48:30 2022-02-11

Out[95]:

	tconst	primary_title	genres
0	tt0063540	Sunghursh	Action
1	tt0066787	One Day Before the Rainy Season	Biography
2	tt0069049	The Other Side of the Wind	Drama
3	tt0069204	Sabse Bada Sukh	Comedy
4	tt0100275	The Wandering Soap Opera	Comedy

In [96]:
```
imdb_title_basics_df_explode = imdb_title_basics_df_explode.set_index('primary_ti
```
executed in 44ms, finished 10:48:31 2022-02-11

In [97]:
```
imdb_title_basics_df_explode.head()
```
executed in 14ms, finished 10:48:31 2022-02-11

Out[97]:

	tconst	genres
primary_title		
Sunghursh	tt0063540	Action
One Day Before the Rainy Season	tt0066787	Biography
The Other Side of the Wind	tt0069049	Drama
Sabse Bada Sukh	tt0069204	Comedy
The Wandering Soap Opera	tt0100275	Comedy

In [98]:
```
budget_studio_df.head()
```
executed in 122ms, finished 10:48:31 2022-02-11

Out[98]:

	release_date	production_budget	worldwide_gross	worldwide_net	studio
10 Cloverfield Lane	2016-03-11	5000000	108286422	103286422	Par.
12 Strong	2018-01-19	35000000	71118378	36118378	WB
12 Years a Slave	2013-10-18	20000000	181025343	161025343	FoxS
127 Hours	2010-11-05	18000000	60217171	42217171	FoxS
13 Hours: The Secret Soldiers of Benghazi	2016-01-15	50000000	69411370	19411370	Par.

In [99]:
```
budget_genres_df = imdb_title_basics_df_explode.join(budget_studio_df, how='inner
budget_genres_df.head()
```
executed in 471ms, finished 10:48:32 2022-02-11

Out[99]:

	tconst	genres	release_date	production_budget	worldwide_gross	worldwide_net
10 Cloverfield Lane	tt1179933	Drama	2016-03-11	5000000	108286422	103286422
12 Strong	tt1413492	Action	2018-01-19	35000000	71118378	36118378
12 Years a Slave	tt2024544	Biography	2013-10-18	20000000	181025343	161025343
127 Hours	tt1542344	Adventure	2010-11-05	18000000	60217171	42217171
2 Guns	tt1272878	Action	2013-08-02	61000000	132493015	71493015

In [100]:
```
budget_genres_df.shape
```
executed in 12ms, finished 10:48:32 2022-02-11

Out[100]:
```
(922, 7)
```

In [101]:
```
budget_genres_df.info()
```
executed in 110ms, finished 10:48:32 2022-02-11

```
<class 'pandas.core.frame.DataFrame'>
Index: 922 entries, 10 Cloverfield Lane to Zootopia
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype         
---  ------             --------------  -----         
 0   tconst             922 non-null    object        
 1   genres             922 non-null    object        
 2   release_date       922 non-null    datetime64[ns]
 3   production_budget  922 non-null    int64         
 4   worldwide_gross    922 non-null    int64         
 5   worldwide_net      922 non-null    int64         
 6   studio             922 non-null    object        
dtypes: datetime64[ns](1), int64(3), object(3)
memory usage: 57.6+ KB
```

In [102]:
```
budget_genres_df = budget_genres_df.dropna()
```
executed in 91ms, finished 10:48:32 2022-02-11

In [103]:
```
budget_genres_df.shape
```
executed in 90ms, finished 10:48:32 2022-02-11

Out[103]:
```
(922, 7)
```

In [104]:
```
top10_genres = budget_genres_df.genres.value_counts().head(10)
```
executed in 108ms, finished 10:48:32 2022-02-11

In [105]:
```
top10_genres
```
executed in 91ms, finished 10:48:32 2022-02-11

Out[105]:
```
Action         280
Comedy         194
Drama          152
Adventure      115
Biography       69
Horror          49
Crime           37
Documentary     10
Animation        7
Thriller         3
Name: genres, dtype: int64
```

In [106]:
```
budget_genres_df.groupby(['genres']).sum()
```
executed in 109ms, finished 10:48:32 2022-02-11

Out[106]:

genres	production_budget	worldwide_gross	worldwide_net
Action	26653000000	91416243861	64763243861
Adventure	10459400000	38431466605	27972066605
Animation	521000000	2506321855	1985321855
Biography	1725170000	7452572524	5727402524
Comedy	5188470000	18253299913	13064829913
Crime	1165000000	3769878307	2604878307
Documentary	168000000	911781493	743781493
Drama	3232147650	11858474641	8626326991
Fantasy	67000000	130804869	63804869
Horror	600100000	5170494544	4570394544
Mystery	157000000	712999446	555999446
Romance	50200000	126931325	76731325
Thriller	114900000	382028742	267128742

In [107]:
```
budget_genres_df_agg = budget_genres_df.groupby(['genres']).sum()
```
executed in 107ms, finished 10:48:33 2022-02-11

In [108]:
```
budget_genres_df_agg = budget_genres_df_agg.sort_values('worldwide_gross', ascend
budget_genres_df_agg
```
executed in 108ms, finished 10:48:33 2022-02-11

Out[108]:

genres	production_budget	worldwide_gross	worldwide_net
Action	26653000000	91416243861	64763243861
Adventure	10459400000	38431466605	27972066605
Comedy	5188470000	18253299913	13064829913
Drama	3232147650	11858474641	8626326991
Biography	1725170000	7452572524	5727402524
Horror	600100000	5170494544	4570394544
Crime	1165000000	3769878307	2604878307
Animation	521000000	2506321855	1985321855
Documentary	168000000	911781493	743781493
Mystery	157000000	712999446	555999446

In [109]:
```
budget_genres_df_agg.index
```
executed in 91ms, finished 10:48:33 2022-02-11

Out[109]:
```
Index(['Action', 'Adventure', 'Comedy', 'Drama', 'Biography', 'Horror',
       'Crime', 'Animation', 'Documentary', 'Mystery'],
      dtype='object', name='genres')
```

In [110]:
```
font = {'family' : 'Arial',
        'weight' : 'bold',
        'size'   : 18}

plt.rc('font', **font)
```
executed in 15ms, finished 10:49:09 2022-02-11

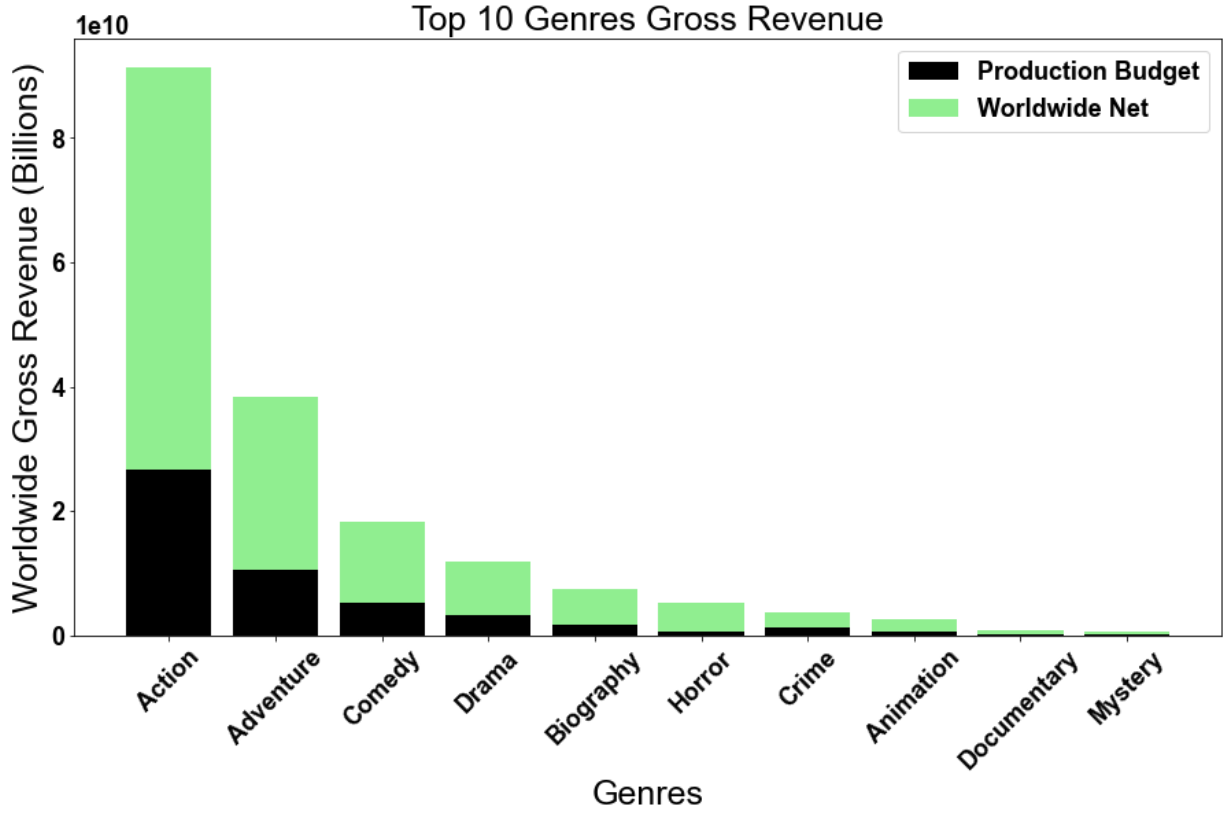
In [111]:
```
plt.figure(figsize=(15,8))

genres = budget_genres_df_agg.index
budget_gross = budget_genres_df_agg.production_budget
ww_net = budget_genres_df_agg.worldwide_net
ww_gross = budget_genres_df_agg.worldwide_gross

plt.bar(range(len(genres)), budget_gross, color='black')
plt.bar(range(len(genres)), ww_net, color='lightgreen', bottom=budget_gross)
plt.title('Top 10 Genres Gross Revenue', fontsize=25)
plt.xlabel('Genres', fontsize=25)
plt.ylabel('Worldwide Gross Revenue (Billions)', fontsize=25)
plt.xticks(range(len(genres)), genres)
plt.tick_params(axis="x", labelrotation=45)

plt.legend(['Production Budget', 'Worldwide Net'])
plt.savefig('fig05_Top10_genres')
plt.show();
```

executed in 444ms, finished 10:49:10 2022-02-11



In [112]:
```
budget_genres_df_agg.mean()
```

executed in 22ms, finished 10:49:12 2022-02-11

Out[112]:
```
production_budget    4.986929e+09
worldwide_gross      1.804835e+10
worldwide_net        1.306142e+10
dtype: float64
```

In [113]:
```
budget_genres_df_agg.describe()
```
executed in 26ms, finished 10:49:13 2022-02-11

Out[113]:

	production_budget	worldwide_gross	worldwide_net
count	1.000000e+01	1.000000e+01	1.000000e+01
mean	4.986929e+09	1.804835e+10	1.306142e+10
std	8.256121e+09	2.819454e+10	1.994740e+10
min	1.570000e+08	7.129994e+08	5.559994e+08
25%	5.407750e+08	2.822211e+09	2.140211e+09
50%	1.445085e+09	6.311534e+09	5.148899e+09
75%	4.699389e+09	1.665459e+10	1.195520e+10
max	2.665300e+10	9.141624e+10	6.476324e+10

Question 3 Conclusions:

Question #3: Which movie genres are the most popular in the movie industry

Recommendation #3: Even though the top 3 movies genres produced are Documentary, Drama, and Comedy. When profit and gross revenue is calculated, the top 3 movie genres changes significantly. The top 3 movie genres that produce the most revenues are Action, Adventure, and Comedy. Here the movie genre Action is on top and the worldwide gross $ is double the amount of Adventure which comes in second.

The top 5 movie profitable genres are

1. Action
2. Adventure
3. Comedy
4. Drama
5. Biography

1.4.4 Question 4:

Which directors tend to add the most value? Lets locate the top directors

In [114]:
```
budget_genres_df.head()
```
executed in 24ms, finished 10:49:14 2022-02-11

Out[114]:

	tconst	genres	release_date	production_budget	worldwide_gross	worldwide_net
10 Cloverfield Lane	tt1179933	Drama	2016-03-11	5000000	108286422	103286422
12 Strong	tt1413492	Action	2018-01-19	35000000	71118378	36118378
12 Years a Slave	tt2024544	Biography	2013-10-18	20000000	181025343	161025343
127 Hours	tt1542344	Adventure	2010-11-05	18000000	60217171	42217171
2 Guns	tt1272878	Action	2013-08-02	61000000	132493015	71493015

In [115]:
```
budget_genres_df = budget_genres_df.reset_index()
```
executed in 30ms, finished 10:49:14 2022-02-11

In [116]:
```
budget_genres_df.head()
```
executed in 30ms, finished 10:49:15 2022-02-11

Out[116]:

	index	tconst	genres	release_date	production_budget	worldwide_gross	worldwide_n
0	10 Cloverfield Lane	tt1179933	Drama	2016-03-11	5000000	108286422	10328642
1	12 Strong	tt1413492	Action	2018-01-19	35000000	71118378	3611837
2	12 Years a Slave	tt2024544	Biography	2013-10-18	20000000	181025343	16102534
3	127 Hours	tt1542344	Adventure	2010-11-05	18000000	60217171	4221717
4	2 Guns	tt1272878	Action	2013-08-02	61000000	132493015	7149301

In [117]:
```
budget_genres_df = budget_genres_df.set_index('tconst')
budget_genres_df.head()
```

executed in 30ms, finished 10:49:16 2022-02-11

Out[117]:

tconst	index	genres	release_date	production_budget	worldwide_gross	worldwide_net
tt1179933	10 Cloverfield Lane	Drama	2016-03-11	5000000	108286422	103286422
tt1413492	12 Strong	Action	2018-01-19	35000000	71118378	36118378
tt2024544	12 Years a Slave	Biography	2013-10-18	20000000	181025343	161025343
tt1542344	127 Hours	Adventure	2010-11-05	18000000	60217171	42217171
tt1272878	2 Guns	Action	2013-08-02	61000000	132493015	71493015

In [118]:
```
imdb_title_crew_df = csv_files_dict['imdb_title_crew_gz']
imdb_title_crew_df.head()
```

executed in 14ms, finished 10:49:16 2022-02-11

Out[118]:

tconst	directors	writers
tt0285252	nm0899854	nm0899854
tt0438973	NaN	nm0175726,nm1802864
tt0462036	nm1940585	nm1940585
tt0835418	nm0151540	nm0310087,nm0841532
tt0878654	nm0089502,nm2291498,nm2292011	nm0284943

In [119]:
```
imdb_title_crew_df.shape
```

executed in 13ms, finished 10:49:17 2022-02-11

Out[119]: (146144, 2)

In [120]:
```
imdb_title_principals_df = csv_files_dict['imdb_title_principals_gz']
imdb_title_principals_df.head()
```
executed in 14ms, finished 10:49:17 2022-02-11

Out[120]:

tconst	ordering	nconst	category	job	characters
tt0111414	1	nm0246005	actor	NaN	["The Man"]
tt0111414	2	nm0398271	director	NaN	NaN
tt0111414	3	nm3739909	producer	producer	NaN
tt0323808	10	nm0059247	editor	NaN	NaN
tt0323808	1	nm3579312	actress	NaN	["Beth Boothby"]

In [121]:
```
imdb_title_principals_df.shape
```
executed in 14ms, finished 10:49:18 2022-02-11

Out[121]: (1028186, 5)

In [122]:
```
imdb_principals_crew_df = imdb_title_principals_df.join(imdb_title_crew_df, how='
imdb_principals_crew_df.head()
```
executed in 791ms, finished 10:49:19 2022-02-11

Out[122]:

tconst	ordering	nconst	category	job	characters	directors	
tt0063540	10	nm0006210	composer	NaN	NaN	nm0712540	nm0023551,nm11943
tt0063540	1	nm0474801	actor	NaN	["Kundan S. Prasad","Bajrangi"]	nm0712540	nm0023551,nm11943
tt0063540	2	nm0904537	actress	NaN	["Munni","Laila-E-Aasmaan"]	nm0712540	nm0023551,nm11943
tt0063540	3	nm0756379	actor	NaN	["Ganeshi N. Prasad"]	nm0712540	nm0023551,nm11943
tt0063540	4	nm0474876	actor	NaN	["Dwarka N. Prasad"]	nm0712540	nm0023551,nm11943

In [123]:
```
imdb_principals_crew_df = imdb_principals_crew_df.drop(['category', 'job', 'chara
imdb_principals_crew_df.head(2)
```
executed in 234ms, finished 10:49:20 2022-02-11

Out[123]:

tconst	ordering	nconst	directors	writers
tt0063540	10	nm0006210	nm0712540	nm0023551,nm1194313,nm0347899,nm1391276
tt0063540	1	nm0474801	nm0712540	nm0023551,nm1194313,nm0347899,nm1391276

In [124]:
```
imdb_principals_crew_df = imdb_principals_crew_df.drop(['directors', 'writers',
```
executed in 45ms, finished 10:49:21 2022-02-11

In [125]:
```
budget_crew_df = budget_genres_df.join(imdb_principals_crew_df, how='inner')
budget_crew_df.shape
```
executed in 451ms, finished 10:49:22 2022-02-11

Out[125]: (9118, 8)

In [126]:
```
budget_crew_df.head()
```
executed in 28ms, finished 10:49:23 2022-02-11

Out[126]:

tconst	index	genres	release_date	production_budget	worldwide_gross	worldwide_net	stu
tt0359950	The Secret Life of Walter Mitty	Adventure	2013-12-25	91000000	187861183	96861183	F
tt0359950	The Secret Life of Walter Mitty	Adventure	2013-12-25	91000000	187861183	96861183	F
tt0359950	The Secret Life of Walter Mitty	Adventure	2013-12-25	91000000	187861183	96861183	F
tt0359950	The Secret Life of Walter Mitty	Adventure	2013-12-25	91000000	187861183	96861183	F
tt0359950	The Secret Life of Walter Mitty	Adventure	2013-12-25	91000000	187861183	96861183	F

In [127]:
```
budget_crew_df = budget_crew_df.drop_duplicates(subset='index')
```
executed in 14ms, finished 10:49:23 2022-02-11

In [128]:
```
budget_crew_df.shape
```
executed in 14ms, finished 10:49:24 2022-02-11

Out[128]: (919, 8)

In [129]:
```
budget_crew_df.info()
```
executed in 27ms, finished 10:49:24 2022-02-11

```
<class 'pandas.core.frame.DataFrame'>
Index: 919 entries, tt0359950 to tt7784604
Data columns (total 8 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   index              919 non-null    object
 1   genres             919 non-null    object
 2   release_date       919 non-null    datetime64[ns]
 3   production_budget  919 non-null    int64
 4   worldwide_gross    919 non-null    int64
 5   worldwide_net      919 non-null    int64
 6   studio             919 non-null    object
 7   nconst             919 non-null    object
dtypes: datetime64[ns](1), int64(3), object(4)
memory usage: 64.6+ KB
```

In [130]:
```
budget_crew_df = budget_crew_df.set_index('nconst')
budget_crew_df.head()
```
executed in 30ms, finished 10:49:25 2022-02-11

Out[130]:

nconst	index	genres	release_date	production_budget	worldwide_gross	worldwide_n
nm0788640	The Secret Life of Walter Mitty	Adventure	2013-12-25	91000000	187861183	968611
nm0787834	A Walk Among the Tombstones	Action	2014-09-19	28000000	62108587	341085
nm0189777	Jurassic World	Action	2015-06-12	215000000	1648854864	143385486
nm0002201	The Three Stooges	Comedy	2012-04-13	30000000	54052249	2405224
nm0174807	Tangled	Adventure	2010-11-24	260000000	586477240	32647724

In [131]:
```
imdb_name_basics_df = csv_files_dict['imdb_name_basics_gz']
imdb_name_basics_df.head()
```

executed in 29ms, finished 10:49:26 2022-02-11

Out[131]:

nconst	primary_name	birth_year	death_year	primary_profession
nm0061671	Mary Ellen Bauder	NaN	NaN	miscellaneous,production_manager,producer
nm0061865	Joseph Bauer	NaN	NaN	composer,music_department,sound_department
nm0062070	Bruce Baum	NaN	NaN	miscellaneous,actor,writer
nm0062195	Axel Baumann	NaN	NaN	camera_department,cinematographer,art_department
nm0062798	Pete Baxter	NaN	NaN	production_designer,art_department,set_decorator

In [132]:
```
imdb_name_basics_df = imdb_name_basics_df.drop(['birth_year', 'death_year', 'prim
                                                'known_for_titles'], axis=1)
imdb_name_basics_df.head()
```

executed in 42ms, finished 10:49:26 2022-02-11

Out[132]:

nconst	primary_name
nm0061671	Mary Ellen Bauder
nm0061865	Joseph Bauer
nm0062070	Bruce Baum
nm0062195	Axel Baumann
nm0062798	Pete Baxter

In [133]:
```
budget_director_df = budget_crew_df.join(imdb_name_basics_df, how='inner')
budget_director_df.head()
```

executed in 1.29s, finished 10:49:28 2022-02-11

Out[133]:

nconst	index	genres	release_date	production_budget	worldwide_gross	worldwide_net	s
nm0000093	Kick-Ass 2	Action	2013-08-16	28000000	63129909	35129909	
nm0000165	The Dark Tower	Action	2017-08-04	60000000	113461527	53461527	
nm0000184	Rogue One: A Star Wars Story	Action	2016-12-16	200000000	1049102856	849102856	
nm0000226	The Karate Kid	Action	2010-06-11	40000000	351774938	311774938	
nm0000384	Silver Linings Playbook	Comedy	2012-11-16	21000000	236412453	215412453	

In [134]:
```
budget_director_df.shape
```

executed in 13ms, finished 10:49:29 2022-02-11

Out[134]:
```
(919, 8)
```

In [135]:
```
budget_director_df.info()
```

executed in 28ms, finished 10:49:29 2022-02-11

```
<class 'pandas.core.frame.DataFrame'>
Index: 919 entries, nm0000093 to nm9195200
Data columns (total 8 columns):
 #   Column             Non-Null Count  Dtype         
---  ------             --------------  -----         
 0   index              919 non-null    object        
 1   genres             919 non-null    object        
 2   release_date       919 non-null    datetime64[ns]
 3   production_budget  919 non-null    int64         
 4   worldwide_gross    919 non-null    int64         
 5   worldwide_net      919 non-null    int64         
 6   studio             919 non-null    object        
 7   primary_name       919 non-null    object        
dtypes: datetime64[ns](1), int64(3), object(4)
memory usage: 64.6+ KB
```

In [136]:
```
budget_director_df = budget_director_df.set_index('index')
budget_director_df.head()
```

executed in 30ms, finished 10:49:30 2022-02-11

Out[136]:

index	genres	release_date	production_budget	worldwide_gross	worldwide_net	studio	prima
Kick-Ass 2	Action	2013-08-16	28000000	63129909	35129909	Uni.	
The Dark Tower	Action	2017-08-04	60000000	113461527	53461527	Sony	Rc
Rogue One: A Star Wars Story	Action	2016-12-16	200000000	1049102856	849102856	BV	Geo
The Karate Kid	Action	2010-06-11	40000000	351774938	311774938	Sony	
Silver Linings Playbook	Comedy	2012-11-16	21000000	236412453	215412453	Wein.	Dan

In [137]:
```
budget_director_df = budget_director_df.reset_index()
```

executed in 12ms, finished 10:49:31 2022-02-11

In [138]:
```
budget_director_df.head()
```

executed in 27ms, finished 10:49:31 2022-02-11

Out[138]:

	index	genres	release_date	production_budget	worldwide_gross	worldwide_net	studio	pr
0	Kick-Ass 2	Action	2013-08-16	28000000	63129909	35129909	Uni.	
1	The Dark Tower	Action	2017-08-04	60000000	113461527	53461527	Sony	
2	Rogue One: A Star Wars Story	Action	2016-12-16	200000000	1049102856	849102856	BV	G
3	The Karate Kid	Action	2010-06-11	40000000	351774938	311774938	Sony	
4	Silver Linings Playbook	Comedy	2012-11-16	21000000	236412453	215412453	Wein.	D

In [139]:
```
budget_director_df['index'].duplicated().value_counts()
```
executed in 12ms, finished 10:49:32 2022-02-11

Out[139]:
```
False    919
Name: index, dtype: int64
```

In [140]:
```
budget_director_df.sort_values(by='worldwide_net', ascending=False)
```
executed in 29ms, finished 10:49:33 2022-02-11

Out[140]:

	index	genres	release_date	production_budget	worldwide_gross	worldwide_net	stu
373	Avengers: Infinity War	Action	2018-04-27	300000000	2048134200	1748134200	
213	Jurassic World	Action	2015-06-12	215000000	1648854864	1433854864	
62	Furious 7	Action	2015-04-03	190000000	1518722794	1328722794	
852	Black Panther	Action	2018-02-16	200000000	1348258224	1148258224	
214	Jurassic World: Fallen Kingdom	Action	2018-06-22	170000000	1305772799	1135772799	
...	...	...	...	...	...	...	
834	Palo Alto	Drama	2014-05-09	1000000	1156309	156309	
640	Locke	Drama	2014-04-25	2000000	2088390	88390	
195	Circumstance	Drama	2011-08-26	900000	958978	58978	F
366	Hugo	Adventure	2011-11-23	180000000	180047784	47784	
432	Stoker	Drama	2013-03-01	12000000	12034913	34913	F

919 rows × 8 columns

In [141]:
```
budget_director_df.drop('release_date', axis=1)
```
executed in 28ms, finished 10:49:33 2022-02-11

Out[141]:

	index	genres	production_budget	worldwide_gross	worldwide_net	studio	primary_r
0	Kick-Ass 2	Action	28000000	63129909	35129909	Uni.	Bra
1	The Dark Tower	Action	60000000	113461527	53461527	Sony	Ron Hc
2	Rogue One: A Star Wars Story	Action	200000000	1049102856	849102856	BV	George L
3	The Karate Kid	Action	40000000	351774938	311774938	Sony	Will S
4	Silver Linings Playbook	Comedy	21000000	236412453	215412453	Wein.	Danny El
...	...	...	...	...	...	...	
914	Snatched	Drama	42000000	57852177	15852177	Fox	Sw M
915	Book Club	Documentary	10000000	91113683	81113683	Par.	Jeanne W
916	Trolls	Adventure	125000000	344150134	219150134	Fox	Thomas
917	Unbroken	Drama	65000000	163527824	98527824	Uni.	Helen E C
918	Tower Heist	Action	85000000	150422946	65422946	Uni.	Eric Ehrer

919 rows × 7 columns

In [142]:
```
budget_director_df['primary_name'].duplicated().value_counts()
```
executed in 14ms, finished 10:49:34 2022-02-11

Out[142]:
```
False    741
True     178
Name: primary_name, dtype: int64
```

In [143]:
```
budget_director_df = budget_director_df.sort_values(by='worldwide_net', ascending
```
executed in 12ms, finished 10:49:34 2022-02-11

In [144]:
```
budget_director_df.head(10)
```
executed in 28ms, finished 10:49:35 2022-02-11

Out[144]:

	index	genres	release_date	production_budget	worldwide_gross	worldwide_net	studi
373	Avengers: Infinity War	Action	2018-04-27	300000000	2048134200	1748134200	B
213	Jurassic World	Action	2015-06-12	215000000	1648854864	1433854864	Un
62	Furious 7	Action	2015-04-03	190000000	1518722794	1328722794	Un
852	Black Panther	Action	2018-02-16	200000000	1348258224	1148258224	B
214	Jurassic World: Fallen Kingdom	Action	2018-06-22	170000000	1305772799	1135772799	Un
59	Frozen	Adventure	2013-11-22	150000000	1272469910	1122469910	B
749	Minions	Adventure	2015-07-10	74000000	1160336173	1086336173	Un
261	Avengers: Age of Ultron	Action	2015-05-01	330600000	1403013963	1072413963	B
758	Incredibles 2	Action	2018-06-15	200000000	1242520711	1042520711	B
370	Iron Man 3	Action	2013-05-03	200000000	1215392272	1015392272	B

In [145]:
```
budget_director_df1 = budget_director_df.groupby(['primary_name']).agg('sum')
```
executed in 14ms, finished 10:49:36 2022-02-11

In [146]:
```
budget_director_df1 = budget_director_df1.sort_values('worldwide_net', ascending=
budget_director_df1
```

executed in 29ms, finished 10:49:36 2022-02-11

Out[146]:

primary_name	production_budget	worldwide_gross	worldwide_net
Jack Kirby	1090000000	5739154163	4649154163
Patrick Crowley	385000000	2954627663	2569627663
Brian Tyler	480000000	2908580226	2428580226
Don Murphy	507000000	2693025208	2186025208
Carolynne Cunningham	750000000	2922948044	2172948044
Stan Lee	708000000	2622541317	1914541317
Jon Kilik	415000000	2280429965	1865429965
Kevin Feige	635600000	2449988305	1814388305
Janet Healy	150000000	1921478284	1771478284
Randy Newman	400000000	1812467851	1412467851

In [147]:
```
font = {'family' : 'Arial',
        'weight' : 'bold',
        'size'   : 18}

plt.rc('font', **font)
```

executed in 14ms, finished 10:49:37 2022-02-11

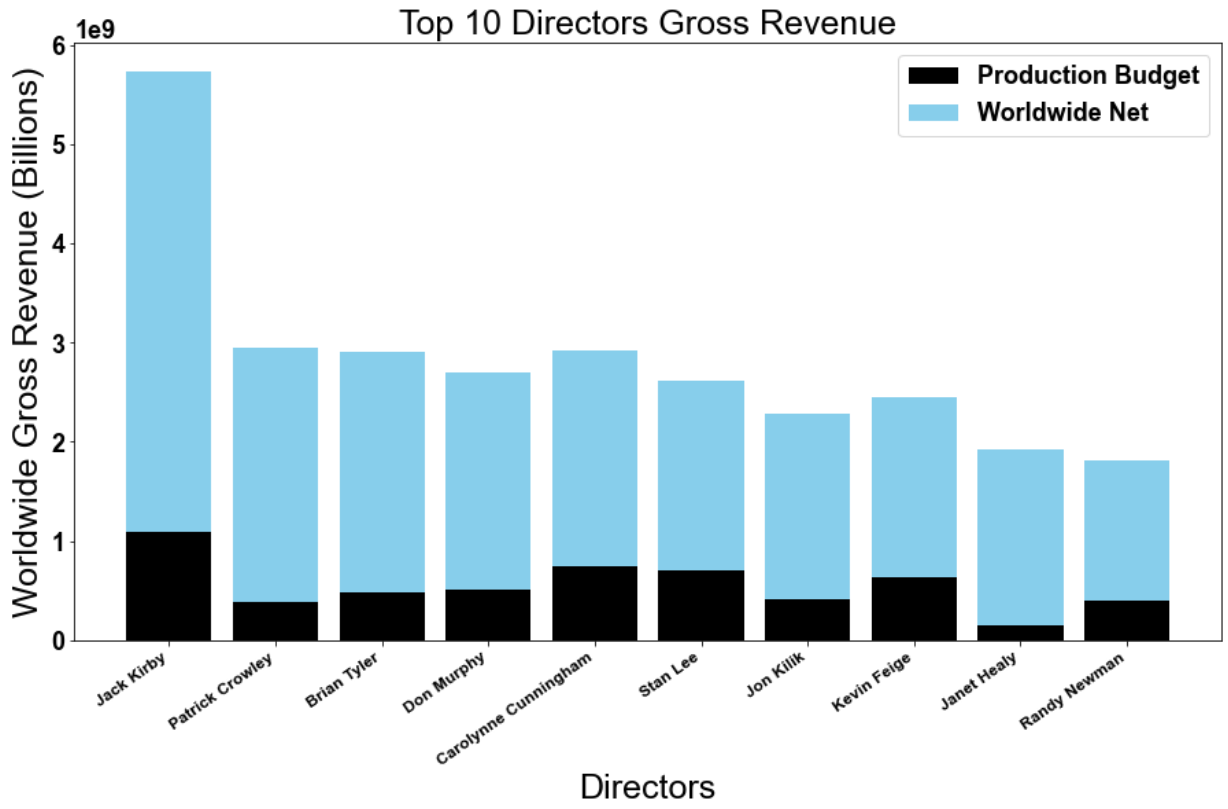
In [148]:
```
plt.figure(figsize=(15,8))

director = budget_director_df1.index
budget_gross = budget_director_df1.production_budget
ww_net = budget_director_df1.worldwide_net
ww_gross = budget_director_df1.worldwide_gross

plt.bar(range(len(director)), budget_gross, color='black')
plt.bar(range(len(director)), ww_net, color='skyblue', bottom=budget_gross)
plt.title('Top 10 Directors Gross Revenue', fontsize=25)
plt.xlabel('Directors', fontsize=25)
plt.ylabel('Worldwide Gross Revenue (Billions)', fontsize=25)
plt.xticks(range(len(director)), director, rotation=35, horizontalalignment='righ

plt.legend(['Production Budget', 'Worldwide Net'])
plt.show();
```

executed in 290ms, finished 10:49:38 2022-02-11



In [149]:
```
budget_director_df2 = budget_director_df1.reset_index()
```

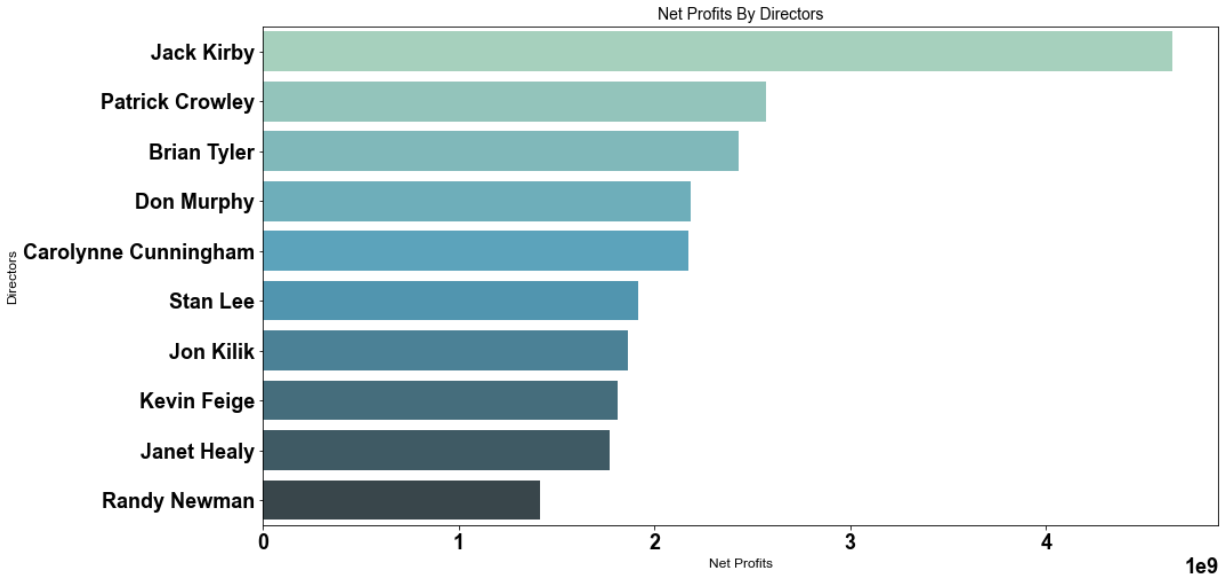
executed in 12ms, finished 10:49:39 2022-02-11

In [150]:
```
budget_director_df2.head()
```
executed in 12ms, finished 10:49:43 2022-02-11

Out[150]:

	primary_name	production_budget	worldwide_gross	worldwide_net
0	Jack Kirby	1090000000	5739154163	4649154163
1	Patrick Crowley	385000000	2954627663	2569627663
2	Brian Tyler	480000000	2908580226	2428580226
3	Don Murphy	507000000	2693025208	2186025208
4	Carolynne Cunningham	750000000	2922948044	2172948044

In [151]:
```
#Plot the above findings.
plt.figure(figsize=(15,8))
ax40 = sns.barplot(x=budget_director_df2['worldwide_net'], y=budget_director_df2[
plt.xlabel('Net Profits', fontsize=12)
plt.ylabel('Directors', fontsize=12)
plt.title('Net Profits By Directors', fontsize=14)
plt.savefig('fig06_NetDirector');
```
executed in 321ms, finished 10:49:44 2022-02-11



Question 4 Conclusions:

Question #4: Which directors tend to add the most value? Recommendation #4: The top 10 directors that made the most profitable movies are listed. We recommend hiring a director from the list below.

We recommend creating a movie hiring one of the top 10 most profitable directors

1.5 Data Modeling

Each data frame has their own relevant data and in order to minimize the amount of deleted data, I found the data frames that were required and only removed missing or irrelevant data. I then created the final joint data frame by combining all of the data frames together. This assisted in the visualization and understanding of the film industry but also reduced the data to 1200 movies.

1.6 Conclusions

While there are many other factors that contribute to the success of a movie, based on this analysis the following recommendations will result in a successful business venture for Microsoft's new movie studio.

1. Recommend that Microsoft should budget the production around $182,000,000.00
2. Buena Vista and Universal have been dominating the box office recently. Recommend to consider these studios as competitors and analyze their work to find out what is a competitive advantage Microsoft can have.
3. Recommend that Microsoft focus on the top 3 profitable movie genres which are Action, Adventure and Comedy.
4. Recommend that Microsoft hires Jack Kirby or one of the top 10 profitable directors.

Further Analysis – For future analysis, I would like to investigate the relationship of highly rated movies and the net profit revenues.