Proposed DBMS for OTT Platforms in Line with New Age Requirements

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Abstract

Database management has become an enormous tool for on-demand content distribution services, proffering required information and providing custom services to the user. It also plays a major role for platforms to manage their data in such a way that data redundancy is minimized. This paper emphasizes improving the user experience for the platform by efficiently managing data. Keeping in mind all the new age requirements, especially after COVID-19 the sudden surge in subscription has led the stakeholders to try new things to lead the OTT market. Collection of shows being the starting point, this paper improvises the currently existing branches via various tables and suggests some new features on how the data collected can be utilized for introducing new and much-required query results for the consumer.

Keywords : **Database management, DBMS (Database management system), features, movies, OTT (Over-the-top), pandemic, shows**

I. INTRODUCTION

Unarguably, 2020 has been a year of COVID-19 pandemic which led to many businesses shutting down and giving a major rise to entrepreneurship opportunities throughout the world. The sectors which primarily provided services over the internet or the sectors which allowed the consumer to enjoy the services sitting at home saw a huge rise in their businesses. Due to various lockdowns imposed because of COVID-19 pandemic, one of the sectors which was already on the rise till the first two quarters of 2020- "Over-the-Top" (OTT) platforms, saw exponential growth in the number of subscriptions every month [1]. As per the reports of Boston Consulting Group (BCG), the subscriptions grew by over 60 %. The trend is expected to stay as life returns to normalcy, said BCG, pointing to the propensity of Indian consumers to now pay for content they are watching. OTT platforms are investing heavily in content creation and acquisition as they eye a large member base

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in India. Already, the number of hours spent per day on digital video in India, according to BCG, has risen by 14.5 % in the last two years.

As a result, popular OTT service providers such as YouTube, Netflix have seen an instrumental role in the growth of data streaming, recording a staggering 140 % rise in video streaming apps in Australia, India, Indonesia, South Korea, and Thailand [2]. These statistics show that there exists a strong opportunity for OTT service providers to capitalize on digital media as a strong communication channel [3].

As a result, the prime cause of quality, that is, competition comes into the party, as competition forces platforms to increase the features they offer to the consumer, the foremost of them being the user experience that binds the user to a platform [4] Due to this, many consumers constantly search for products that offer them better features at a cheaper rate. In this paper, we have introduced some of the features to make the user experience better and more efficient ways to manage the data for OTT platforms to equip them to handle queries better [5].

II. OUR CONTRIBUTIONS

The rise in the number of users using OTT platforms in the world, especially during the pandemic has encouraged these platforms to bring and adopt new technologies for a better understanding of their users. Media convergence is transforming the media business model. Film and television consumption over the internet is forcing the breakdown of the traditional value chain [6]. In this paper, we have inoculated a few unique features that are part of our OTT platform DBMS project and the same are enlisted for understanding users in a better way and providing them what they exactly need.

- Here the user is not only seen as a data generator but data is also acquired from the website itself, protecting privacy with encryption. Viewing hours are filtered according to the shows which are further classified into movies and shows, and with SQL it can be used to generate more complex queries too.

- While our system provides convenience even to new subscribers by using different combinations of relevant shows, related shows and genres in SQL, which not only helps us to collect data in these sectors for our new client but also enhance their experience on our platform apart from others.

- Our data sources include users as well as various websites and the goal of our system is to provide detailed information about the movies and series which can effectively work even with a small amount of user information.

- In addition to this, our project has the potential to sort the data according to genre, actor name, even actor's age, when a movie was released, Oscar nominations, PG rating, inspiration behind the movie, the director, as well as products related to a movie. SQL combinations can be applied at the same time for this.

- We can also fetch data directly from the respective OTT server and provide the data to the user to reduce data redundancy and provide the following data for each show including series too.

- From the beginning, its prime focus has been on online streaming platforms such as Netflix, Amazon Prime, etc. and the primary goal is to provide as much detailed information as possible right from the created database.

Paper Organization

Section III gives literature surveys of existing research papers, types of users of the database, and the SQL queries along with output screenshots for the determined models using the data grip platform. In section IV, we give the proposed system of our project consisting of the framework, Entity-Relationship Model, and Relational Model. In section V, we have given the experimental analysis of our project describing the software we used some sample queries. In section VI, we conclude and give the future scope of our work.

III. LITERATURE SURVEY

Since the COVID-19 pandemic, there has been an increase in the audience of OTT platforms making it a very competitive industry. Times have changed, from a single television being shared by many families in a neighbourhood to a nuclear family sharing a Netflix account and with it the content and need for content has also evolved [7]. These platforms put in their best efforts to collaborate with high-quality multimedia content that is based on many factors, like the directors,

actors, writers, production houses, ratings, academy nominations, etc. [8]. Due to this competition, the content becomes scattered among a range of OTT platforms making it a tedious task for viewers to watch the content they prefer. A viewer needs to buy, manage, and search multiple platforms to watch that single movie or that show.

Multiple papers and models are published that give us a broad idea of how the audience of OTT platforms has grown over time especially since the pandemic. Some papers have :

(i) Designed models to manage multimedia content,

(ii) Studied business models of different OTT platforms like Netflix, Hulu, etc.

(iii) That presents different views on how metadata can be modeled, classified, extracted, managed, and applied to support convenient handling of digital media [9].

Film and television consumption over the internet forces the breakdown of the traditional value chain [6].

The audiovisual, on-demand, distribution industry is aware that its competitive advantage comes from obtaining information from its users. Thus, Netflix has become the example for internal data management and the use of metadata demonstrating the use of information that is flexible and adaptable to its environment [10].

So, we felt the need to develop a model that can relieve the audience from the hassle of searching their favorite shows and movies on various platforms and many more.

A. Identification of the Different Types of Users and Queries

Our database is directed to three different types of users. These users have access to different information according to the category they fall in.

The three different types of users of our database are :

(1) Clients of the Database : The people who will use the database for finding information about movies. This group can be further divided into :

(a) General clients who would search the database for any basic information about the movies, their actors, director, awards won, etc.

(b) Specialized clients with more complicated search requests like finding all the movies written by a particular writer, finding movies that are inspired by real life incidents etc.

(2) Contributors to the Database : The people who will be adding new information to the database. These people are different from the system administrators because they can only add information based on some pre-specified constraints.

(3) System Administrators : These people manage, upgrade, alter, and program the database. They are the same as database administrators.

B. SQL Queries

(1) The following SQL query lists the number of actors in each country, sorted high to low. The output is shown in Fig. 1.

```
SELECT COUNT(Actor_id), Nationality
FROM Actors
GROUP BY Nationality
ORDER BY COUNT(Actor_id) DESC ;
```

Output(Fig. 1).

(2) The following SQL query lists the shows with IMDB rating = 10. The output is shown in Fig. 2.

```
SELECT b.`show name`, a.`IMDB rating`
FROM `Critics_Rating` a
JOIN `Show_id-name` b
ON a.show_id = b.show_id
WHERE `IMDB rating` = 10 ;
```

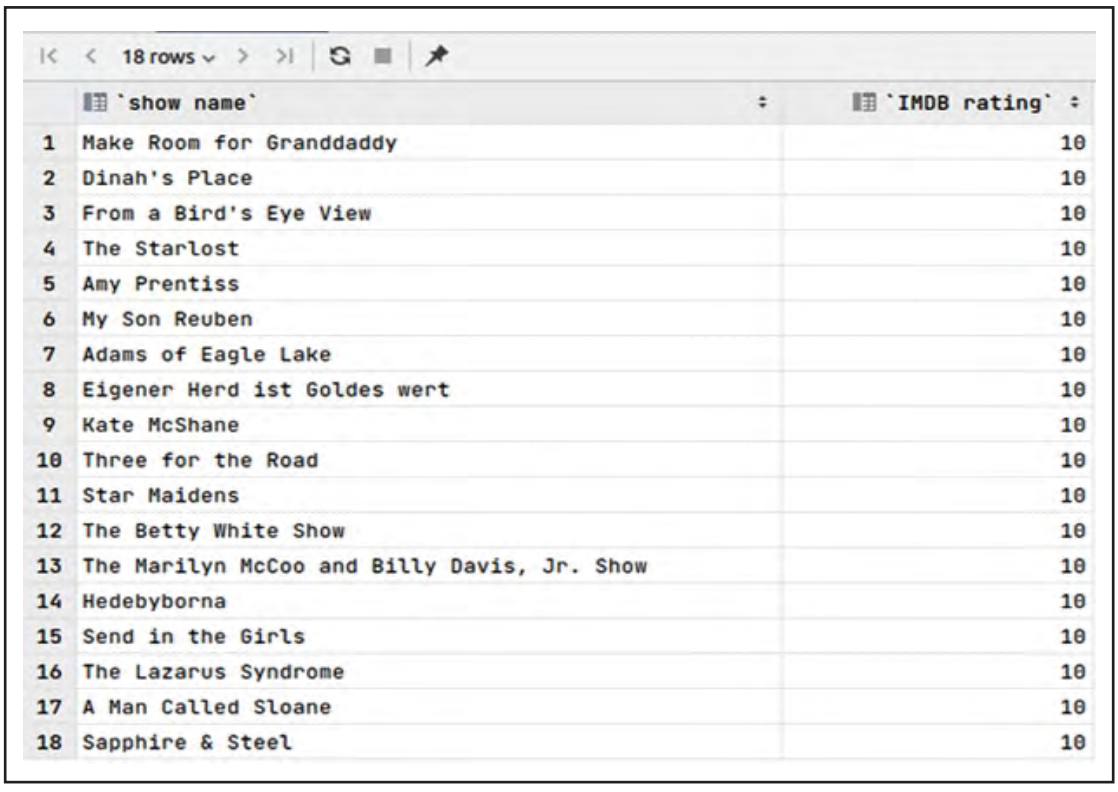
Output (Fig. 2).

(3) The following SQL query lists the show id, show Name and Writer for Shows whose writer is S. S. Wilson. The output is shown in Fig. 3.

```
SELECT a.`Show Name`, b. Writer, b.`Release year`
FROM `Show_id-name` a
```

	COUNT(Actor_id)	Nationality
1	24	India
2	24	Paraguay
3	24	Azerbaijan
4	24	USA
5	24	Russia
6	24	France
7	24	Spain
8	24	Brazil
9	24	Canada
10	24	Germany
11	24	Norway
12	24	Sweden
13	24	Japan
14	24	South Korea
15	24	Afghanistan
16	24	Albania
17	24	Algeria
18	24	Andorra
19	24	Angola
20	24	Antigua and Barbuda
21	24	Argentina
22	24	Armenia
23	24	Australia
24	24	Austria
25	24	Austrian Empire

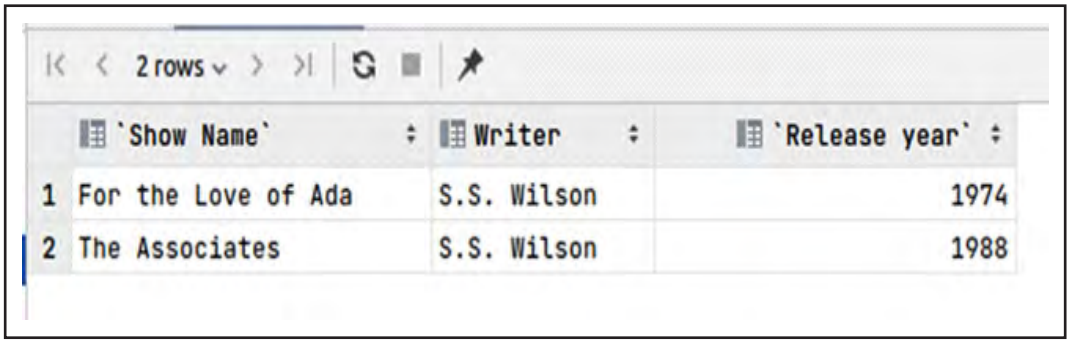
Fig. 1. Query 1



18 rows

	`show name`	`IMDB rating`
1	Make Room for Granddaddy	10
2	Dinah's Place	10
3	From a Bird's Eye View	10
4	The Starlost	10
5	Amy Prentiss	10
6	My Son Reuben	10
7	Adams of Eagle Lake	10
8	Eigener Herd ist Goldes wert	10
9	Kate McShane	10
10	Three for the Road	10
11	Star Maidens	10
12	The Betty White Show	10
13	The Marilyn McCoo and Billy Davis, Jr. Show	10
14	Hedebyborna	10
15	Send in the Girls	10
16	The Lazarus Syndrome	10
17	A Man Called Sloane	10
18	Sapphire & Steel	10

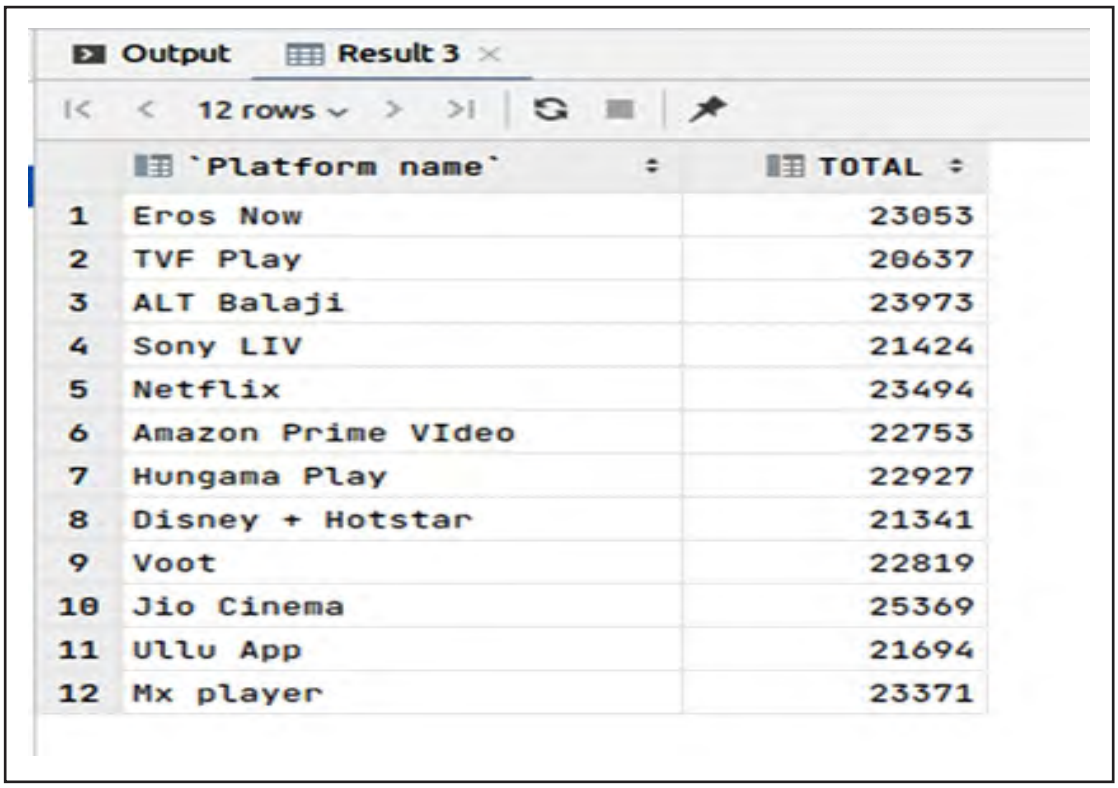
Fig. 2. Query 2



2 rows

	`Show Name`	Writer	`Release year`
1	For the Love of Ada	S.S. Wilson	1974
2	The Associates	S.S. Wilson	1988

Fig. 3. Query 3



Output | Result 3

12 rows

	`Platform name`	TOTAL
1	Eros Now	23053
2	TVF Play	20637
3	ALT Balaji	23973
4	Sony LIV	21424
5	Netflix	23494
6	Amazon Prime VIdeo	22753
7	Hungama Play	22927
8	Disney + Hotstar	21341
9	Voot	22819
10	Jio Cinema	25369
11	Ullu App	21694
12	Mx player	23371

Fig. 4. Query 4

JOIN `Collections_of_shows` b

ON a.Show_id = b.Show_id

WHERE b.Writer= 'S.S. Wilson'

Output (Fig. 3).

(4) If you want to know the views/month for each platform combined, then the group by query would be as follows. The output is shown in Fig. 4.

SELECT b.`Platform name`, SUM(`views/mo`) AS 'TOTAL'

FROM Statistics a

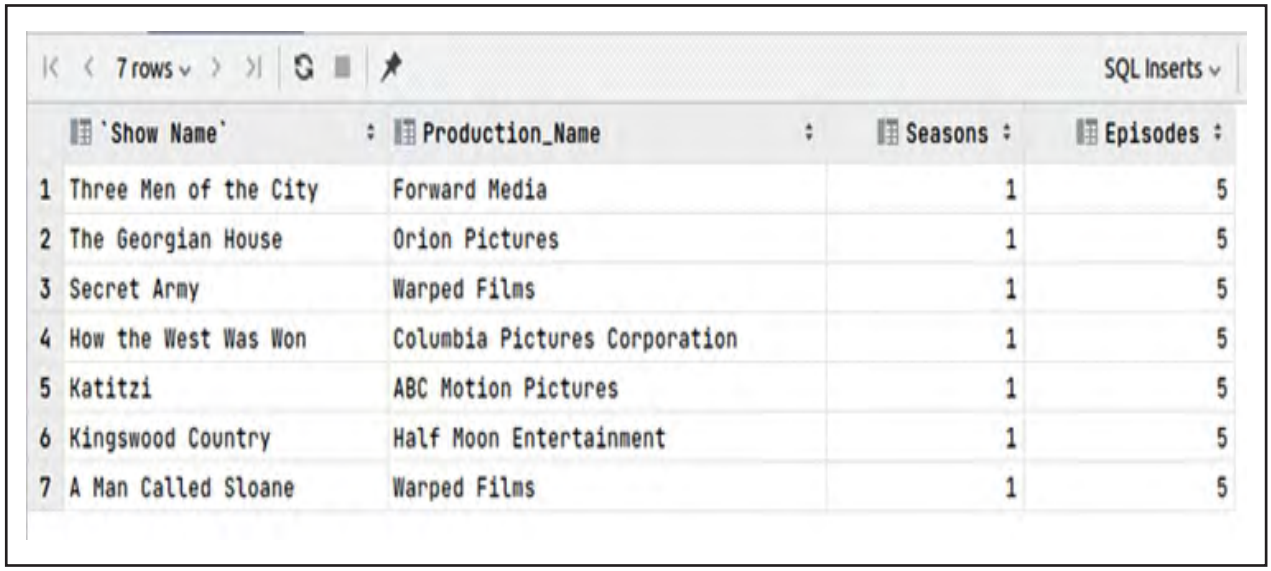
JOIN Platforms b

ON a.Platform_id = b.Platform_id

GROUP BY b.`Platform name`;

Output (Fig. 4).

(5) The following SQL query will list the shows having the total number of episodes less than 6 and number of seasons less than 2 along with the name of the production house that is producing the show. The output is shown in Fig. 5.



7 rows | SQL Inserts

	`Show Name`	Production_Name	Seasons	Episodes
1	Three Men of the City	Forward Media	1	5
2	The Georgian House	Orion Pictures	1	5
3	Secret Army	Warped Films	1	5
4	How the West Was Won	Columbia Pictures Corporation	1	5
5	Katitzi	ABC Motion Pictures	1	5
6	Kingswood Country	Half Moon Entertainment	1	5
7	A Man Called Sloane	Warped Films	1	5

Fig. 5. Query 5

	`Show Name`	Writer	`Release year`	Genre	`Actor name`	Age
1	Toma	Manya Starr	1985	Adventure	Henry Mancini	15
2	Harry O	Larry Cohen	1979	Adventure	Steve Guttenberg	14
3	Partridge Family 2200 AD	Joe Eszterhas	2015	Adventure	Noah Hathaway	38
4	The Sweeney	Joe Camp	2021	Adventure	Lance Henriksen	21
5	The Lost Islands	Stewart Raffill	1980	Adventure	Diane Keaton	40
6	We'll Get By	David Saperstein	1985	Adventure	Heather Langenkamp	17
7	Eight Is Enough	David Webb Peoples	2000	Adventure	Kelly McGillis	28
8	En by i provinsen	Stuart Gordon	2001	Adventure	Kelly McGillis	28
9	Grange Hill	Terry Rossio	1979	Adventure	Colm Meaney	17

Fig. 6. Query 6

```
SELECT b.Show_id,a.`Show Name`,c.Production_Name,b.Seasons,b.Episodes
FROM `Show_id-name` a
JOIN `TV_series` b
ON a.Show_id = b.Show_id
JOIN Productions c
ON b.Production_id = c.Production_id
WHERE Seasons<2
AND Episodes <6
ORDER BY b.Seasons;
```

Output (Fig. 5)

(6) The following SQL query will list the movies starring a male actor having age less than equal to 40, having genre Adventure and PG rating of U/A. The output is shown in Fig. 6.

SELECT a.`Show Name`,b.Writer, b.`Release year`, b.Genre,e.`Actor name`

FROM `Show_id-name` a

JOIN `Collections_of_shows` b ON a.Show_id = b.Show_id

JOIN Director c ON a.Show_id = c.Show_id

JOIN `Actor_id-Show_id` d ON a.Show_id = d.Show_id

JOIN Actors e ON d.Actor_id = e.Actor_id

JOIN PG_Rating f ON a.Show_id = f.Show_id

WHERE Age <= 40

AND Genre = 'Adventure'

AND `U/A` = 1

AND Gender = 'Male'

ORDER BY a.Show_id

Output (Fig. 6)

IV. PROPOSED SYSTEM

A. Framework

In our proposed system, the table "Collection of shows" inherits each table from our database [11].

Various other entities are connected to the main table which states various properties a show can constitute of. All the entities which are connected to the main table contain a foreign key as 'Show_id'. There are several other entities that are interconnected but not connected with the main table. For example, critics rating is connected directly to the collection of shows table as ratings will be purely for the shows and for which show_id is required for data generation. Thus, it is directly connected to the main table whereas the resolution table is connected to the subscription table because the resolution property is based on the platform on which the show is available.

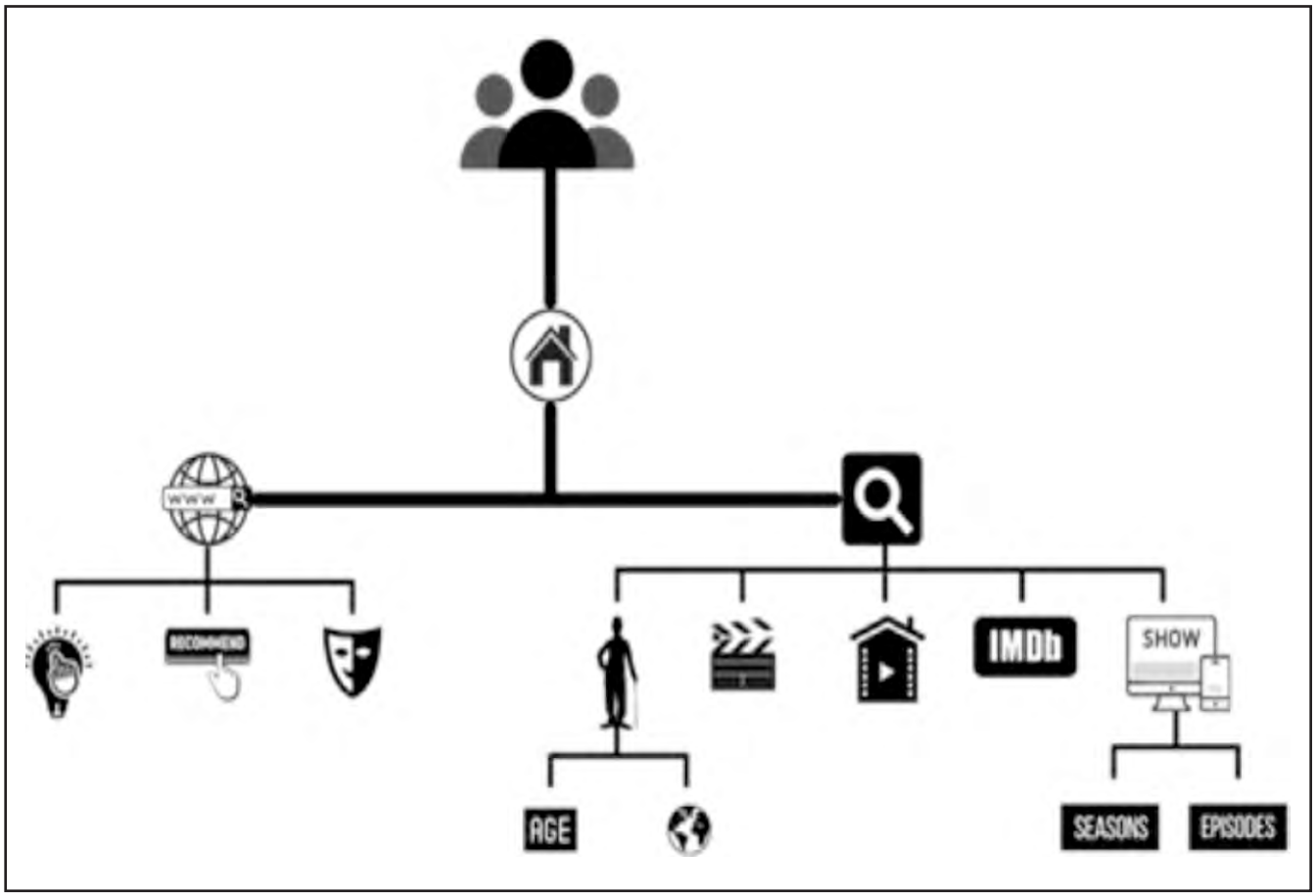


Fig. 7. Proposed System

B. Relational Model

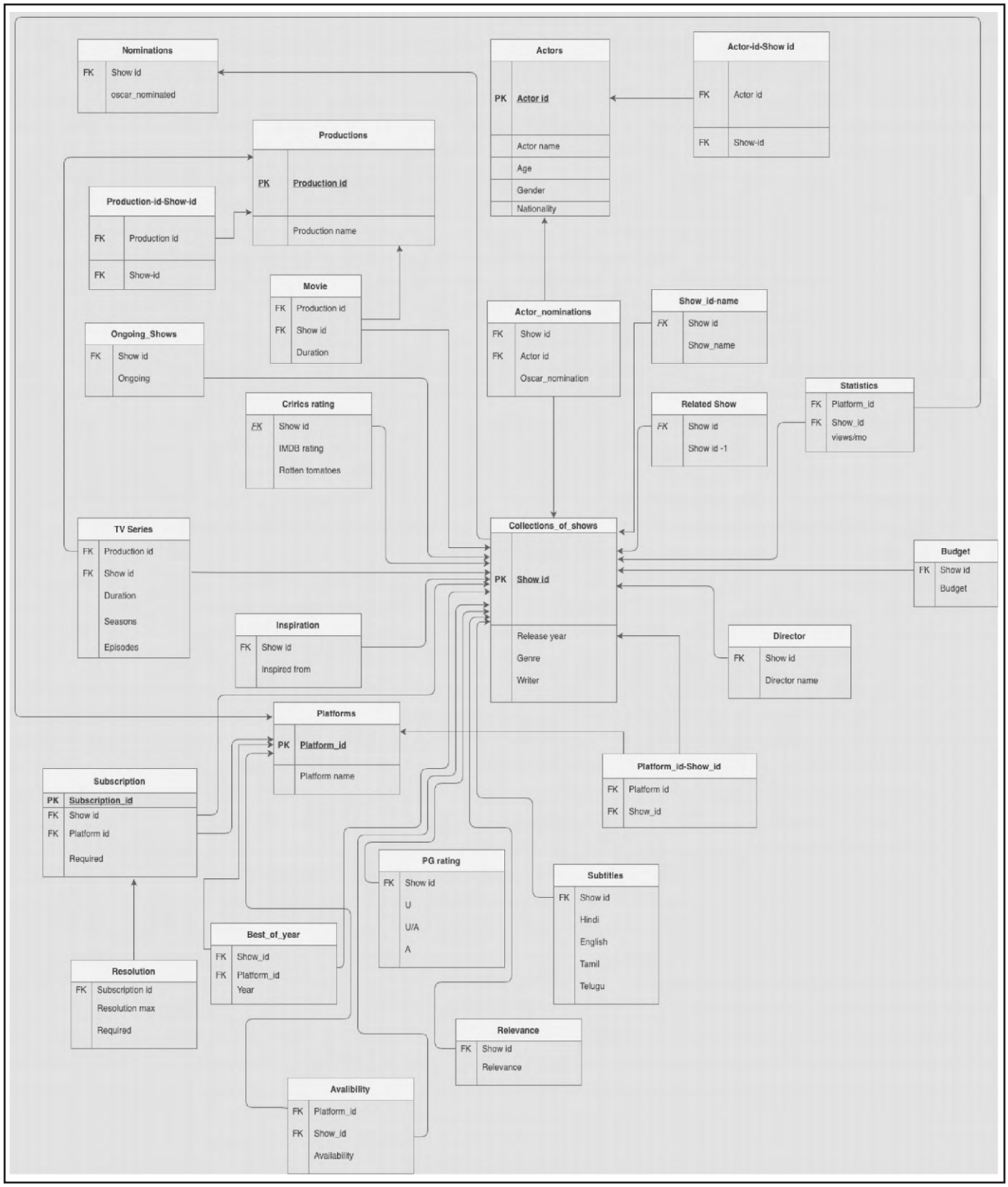


Fig. 8. Relational Model

C. Entity-Relationship Model

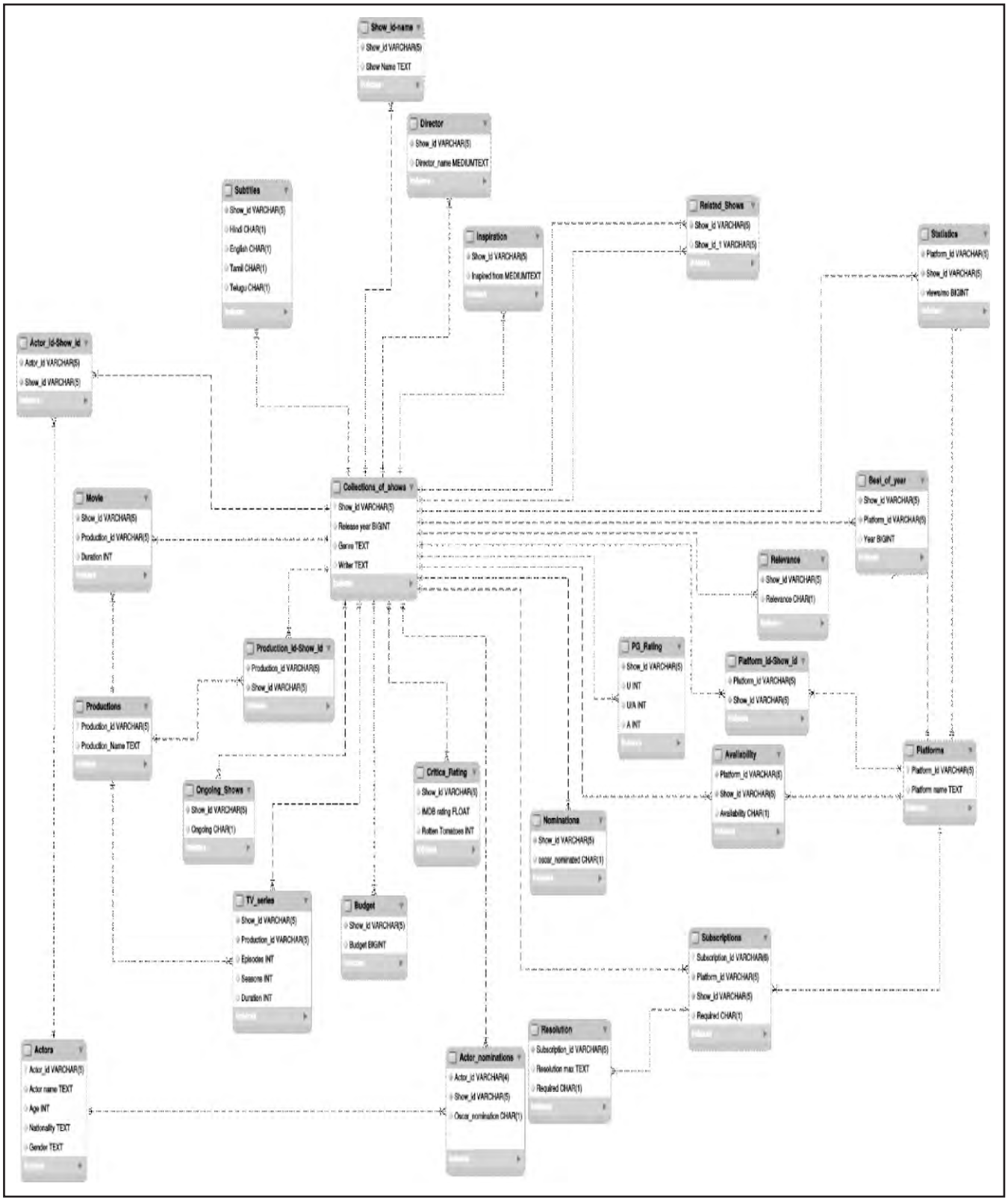


Fig. 9. E-R Model

D. Explaining Schemas

Table I gives the description of schemas.

TABLE I.

DESCRIPTION OF SCHEMAS

Schema Construct	Construct Description
Collection of shows	**Entity class, to model all the shows**
• Release year	Year in which the show is released
• Writer	Person who wrote the show
• Genre	Genre of the show
Show-id-name	**Entity class, to model name of the show**
• Show name	Name of the show
Actor	**Entity class, to model actors involved in the shows**
• Actor name	Name of the actor who has worked in the show
• Gender	Gender of actor
• Age	Age of actor
• Nationality	Nationality of actor
Actor-id-Show-id	**Entity class, to model the connectivity between actor and show**
Production-id-Show-id	**Entity class, to model the connectivity between production house and show**
Production	**Entity class, to model the name of production house**
• Production name	Name of the production house
Critics rating	**Entity class, to model rating of the show**
• IMDB	IMDB rating of the shows
• Rotten tomatoes	Rotten Tomatoes of the shows
PG rating	**Entity class, to model PG rating of the show**
• U	Suitable for age 4 or above
• U/A	Suitable for age 12 or above
• A	Suitable for age 18 or above
Platform-id-Show-id	**Entity class, to model the connectivity between platform and show**
Platforms	**Entity class, to model the name of platform**
• Platform name	Name of the platform on which the show is streaming
Subscriptions	**Entity class, to model whether subscription is required or not**
• Required(y/n)	Whether subscription is required or not
Availability	**Entity class. to model availability of the show on platform**
• Availability	Whether show is available on a certain platform or not
Relevance	**Entity class. to model the relevance of show**
• Relevance	Whether the show is popular currently or not
Duration	**Entity class, to model the duration of show**
• Duration	Duration of the show
Resolution	**Entity class, to model the resolution of the show**
• Resolution	Max resolution available for the show
• Required	Subscription required or not
TV series	**Entity class, to model the information about the TV show**

• Duration	Duration of the show
• Season	No. of seasons of show
• Episodes	Episodes per season
Subtitles	**Entity class, to model in which language the subtitles are available**
• Hindi	Available in Hindi
• English	Available in English
• Tamil	Available in Tamil
• Telugu	Available in Telugu
Ongoing	**Entity class, to model whether the show is ongoing or not**
• Ongoing	Whether the show is ongoing or not
Director	**Entity class, to model who is the director of the show**
• Director	Name of the director
Related shows	**Entity class, to model the shows which are related to each other**
Inspiration	**Entity class, to model from where the shows are inspired**
• Inspired from	From where the show is inspired
Nominations	**Entity class, to model whether the show is nominated for Oscar or not**
• Oscar nominated(y/n)	Whether the show is nominated or not
Budget	**Entity class, to model the budget of the show**
• Budget	Budget of the show
Statistics	**Entity class, to model the views/month of the shows**
• Views/month	Views/month of the shows
Best of year	**Entity class, to model the best show of the year**
• Year	In which the show of was awarded best of the year
Actor nomination	**Entity class, to model whether the actor is Oscar nominated or not**
• Actor Oscar nominated(y/n)	Whether the actor is nominated for Oscar or not

TABLE II.
KEYS TO TABLE III

Features	Description
F1	Here the user is not only seen as a data generator but we also acquire data from the website itself, protecting privacy, and encryption. As far as the viewing hours are concerned, we filter it according to the shows which are further classified into movies and shows (and with SQL it can be used to generate more complex queries too.)
F2	While our system provides convenience even to new subscribers by using different combinations of relevant shows, related shows and genres in SQL, which not only helps us to collect data in these sectors for our new client but also enhance their experience on our platform apart from others.
F3	Our data sources include users as well as various websites and the goal of our system is to provide as detailed information about the movies and series as possible which can effectively work even with a small amount of user information [12].
F4	In addition to this, our project has the potential to sort the data according to genre, actor name, even actor's age when a particular movie was released, Oscar nominations, PG rating, inspiration behind the movie and director as well as production related to that

	movie, and even using SQL combinations for this can be applied at the same time [13].
F5	Also, we fetch data directly from the respective OTT server and provide the data to the user to reduce data redundancy and provide the following data for each show including series too.
F6	From the beginning itself prime focus has been on online streaming platforms such as Netflix, Amazon Prime etc. and the primary goal is to provide as much detailed information as possible right from the created database.

TABLE III.

EXPERIMENTAL ANALYSIS

Research papers	F1	F2	F3	F4	F5	F6
Present paper	✓	✓	✓	✓	✓	✓
[10]	✓	□	□	□	✓	□
[14]	□	□	✓	□	□	□
[6]	□	□	□	✓	□	✓
[15]	✓	✓	□	□	✓	✓
[16]	□	□	□	✓	□	□
[17]	□	✓	□	□	□	□
[18]	□	✓	□	□	□	□
[19]	□	□	□	□	□	✓
[20]	□	□	□	✓	□	□
[21]	✓	✓	□	□	✓	✓
[22]	□	□	□	□	✓	□

V. EXPERIMENTAL ANALYSIS

Table II shows the keys to Table III. Table III shows the experimental analysis.

VI. CONCLUSION AND FUTURE WORK

The increase in usage of OTT platforms and other online multimedia services has called for an improved database management system. With the rise seen in subscription to various OTT service providers, a fight over quality of content and better user experience has emerged. One of the ways of achieving this is better management of data. By also providing more information to the user on the content and providing improved filters, the same can be achieved. This paper provides information on how a user can be given better experience with the suggested database management system. It can improve search and sorting of data according to genre, actor name, Oscar nominations, PG rating, inspiration behind the movie, director, as well as production related to a movie. While researchers are always finding ways to collect and use the data effectively, this research aims to contribute to the same and hopes that it helps in making better user experiences and better products.

AUTHORS' CONTRIBUTION

Everyone collectively conceived to undertake the topic and started the bibliometric analysis. Devansh S., Mustafa A. and Rushabh S. completed the Bibliometric analysis while Aryan S., Khushi S. and Charmi S. pre-processed the data and created dummy data for the fields required as per the criterion. While Mustafa A. and Devansh S. prepared the queries and ran each in a separate software, Aryan S., Charmi S., Khushi S., and Rushabh S. prepared the manuscript. Khushi S. and Charmi S. prepared the E-R model while everyone

else verified it and made necessary changes. Aryan S. and Devansh S. compared the features with the other published articles and provided the references. Rushabh S. made a description of all the schemas. Lastly, everyone proofread the manuscript and it was submitted. Nishant Doshi guided and mentored throughout the research process from start to end.

CONFLICT OF INTEREST

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter, or materials discussed in the manuscript.

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