BIRMINGHAM CITY
University

BIRMINGHAM CITY UNIVERSITY

COMPUTER SCIENCE MSc

CMP7245 DATABASE DESIGN & DEVELOPMENT

FINAL PROJECT

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Contents

Database Systems

There are many existing Database system. However eight of them are the most popular.

1- Centralized Database

2- Distributed Database

3- NoSQL Database

4- Cloud Database

5- Relational Database

6- Network Database

7- Object-oriented Database

8- Hierarchical Database

1- Centralized Database

A type of database that keeps information in a central database system. Users may easily Access saved data through several apps from various locations. These applications include the authentication process that allows users to Access data securely.

This database system generally used by banks, companies, universities because this type of systems needs their data from separate databases to be present in one location. Centralized Database System makes it easy to access information quickly. At the same time, this system has fair price when it compared with others.

Advantages

- Fair price : Fewer vendors are required to handle the data set.
- Easy to manage: “The database admin can control access and can make changes from a single physical location” (Onsman, 2018).
- It provides better data quality, which enables organizations to establish data standards.

Disadvantages

- This system’s size is large. That’s why response time can be long.
- Hard to update this system.
- If any server failure happened, all date going to lost. This means it can be big loss.

In conclusion, there are benefits and drawbacks to a Centralized Database System. It is simpler to project and administer, but it might have scalability and single points of failure problems.

2- Network Database

This database represent of data is in the form of nodes connected via links between them. It enables a generalised graph structure to be formed by allowing each record to have numerous children and parent nodes.

It can solve more complicated models such as components of 1 to M and M to N relations. Network Database enable for flexible relationship models between entities.

Advantage

- Flexible model: easy to manage relations.

Disadvantage

- Complicated system

3- Object-oriented Database

The data is represented and stored as objects which are like the objects used in the object-oriented programming language. This database has high performance and speed, include real-time system and 3D modelling.

Its flexible for: C++ ,C#, Python, Java

Advantage

- Large data sets can quickly save and accessed.

Disadvantages

- High complexity because of the performance problems.
- Hard to use from non-programmers because it needs experience.

4- Hierarchical Database

If the primary goal of data collecting is based on a clear hierarchy, such as several employees reporting to a single department, a hierarchical database model would be perfect.

Advantage

- Model's simplicity - "The model allows you to easily add and delete new information" (Nadeem, 2020)

Disadvantage

- Structure is inflexible.

Critical Evaluation of Database System

1- Distributed Database

In contrast to centralised database systems, which are physically spread across different locations in a computer network, distributed systems use an integrated collection of databases. Communications connections connect these database systems. These links make it easier for consumers to obtain the data. In a distributed system, data is partitioned and stored on multiple nodes, and each node is responsible for managing a portion of the data.

Advantages

- Such database systems are small. Therefore, response time will be short when compared to others.
- If one server failure, every data sets will not effect.
- This system can be cost-effective because this system can be deployed on low-price hardware.
- Better performance

Disadvantages

- Network traffic going to increase in this system.
- Database optimization is complicated.
- Ensuring data consistency in a distributed database system can be difficult.
- This system management can be challenging.

2- NoSQL Database

NoSQL databases are designed to manage enormous volumes of unstructured data that are constantly changing at breakneck query rates. The creation of NoSQL databases was spurred by the spike in demand for contemporary applications. Because NoSQL is a distributed database, the data is duplicated and spread out across numerous servers. These servers, which may be local or distant, preserve data accessibility.

It uses big data and real time web apps such as Twitter, Facebook, Google

Advantages

- It can be more cost-effective than other databases.
- Scalability - NoSQL databases have the potential to grow to store large databases over a distributed cluster of servers or handle more data.
- “Not all NoSQL databases contemplate the atomicity of instructions and the integrity of the data” (PandoraFMS, 2021).

Disadvantages

- This system more complex than traditional databases. This kind of systems needs specialized skills to manage.
- Ensuring data consistency in a NoSQL Database can be difficult. Especially, when data is distributed across multiple nodes.

3- Cloud Database

A type of database where data is stored in a virtual environment and executes over the cloud computing platform. A growing number of people are using Cloud Databases because of its scalability, flexibility, and affordability.

There are some cloud platforms which are popular:

Amazon Web Services (AWS)

Microsoft Azure

Google Cloud SQL

Advantages

- Cloud Databases are highly scalable.
- Highly flexible.
- Has affordable cost when compared with traditional databases.

Disadvantages

- Ensuring data consistency can be difficult.
- Data privacy may not be compliant.

4- Relational Database

This database stores data in the form of rows (tuple) and columns (attributes), and together forms a table (relation). A Relational Database uses SQL for storing, manipulating, as well as maintaining the data. Every table in the database has a key that distinguishes the data from those in other tables.

Relational databases are great for establishing data links between tables and for using SQL to query very big datasets. PostgreSQL, MySQL, SQLite, and Oracle are a few common relational database management systems.

Advantages

- Easy to use.
- Fast because of easy using.
- Data security because database admin has the authority of providing access to the data to users.

Disadvantage

- Relational Database has lots of rows and columns therefore, system use large memory.

In conclusion, since even non-technical database users can learn SQL syntax without the company needing to hire a database admin, relational databases only require SQL to access data files. SQL is an easy to learn language and cost-effective solution.

2- Database design

2.1- ERD

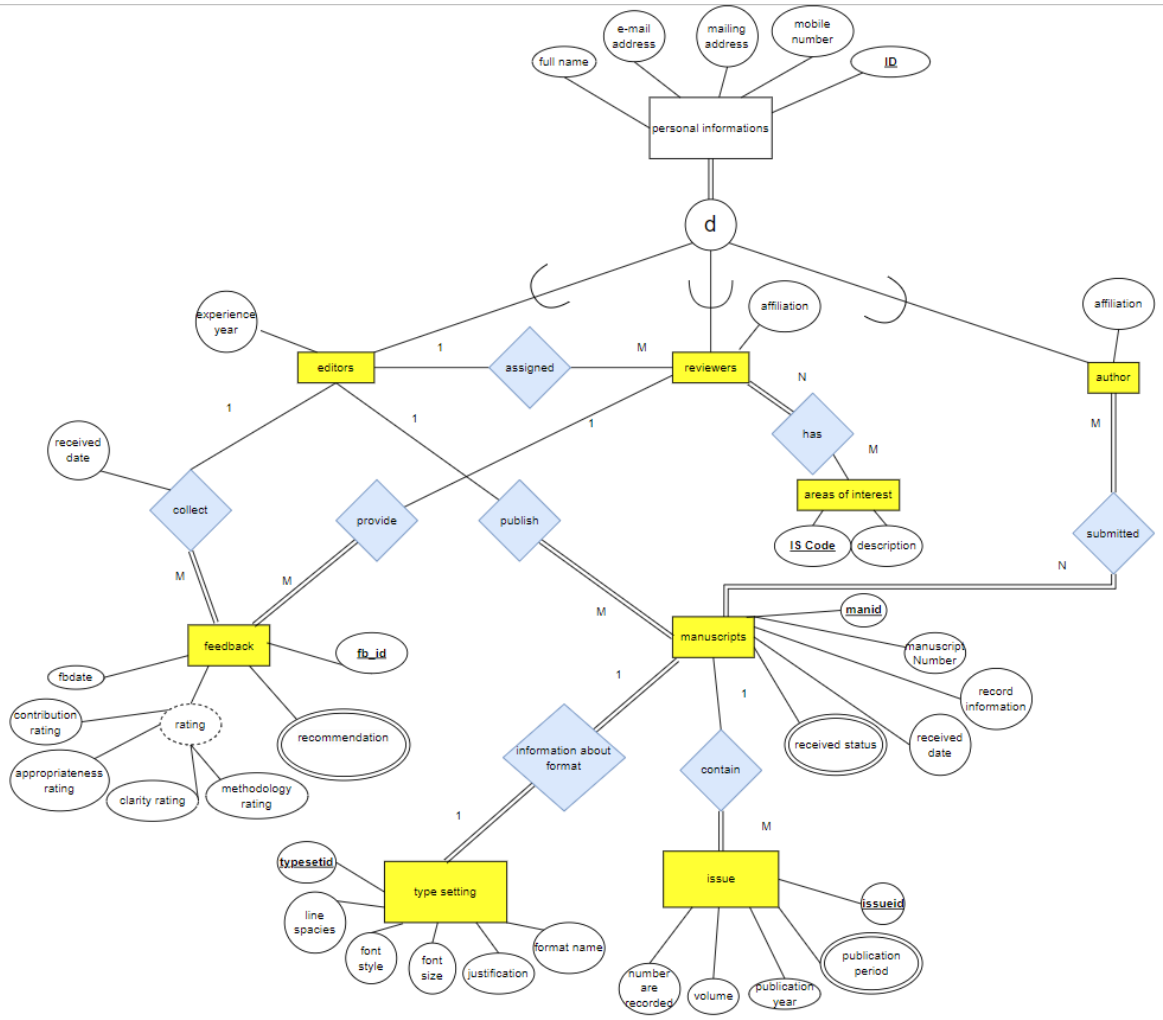


Figure 1- ER Diagram for the case study

2.2- Schema

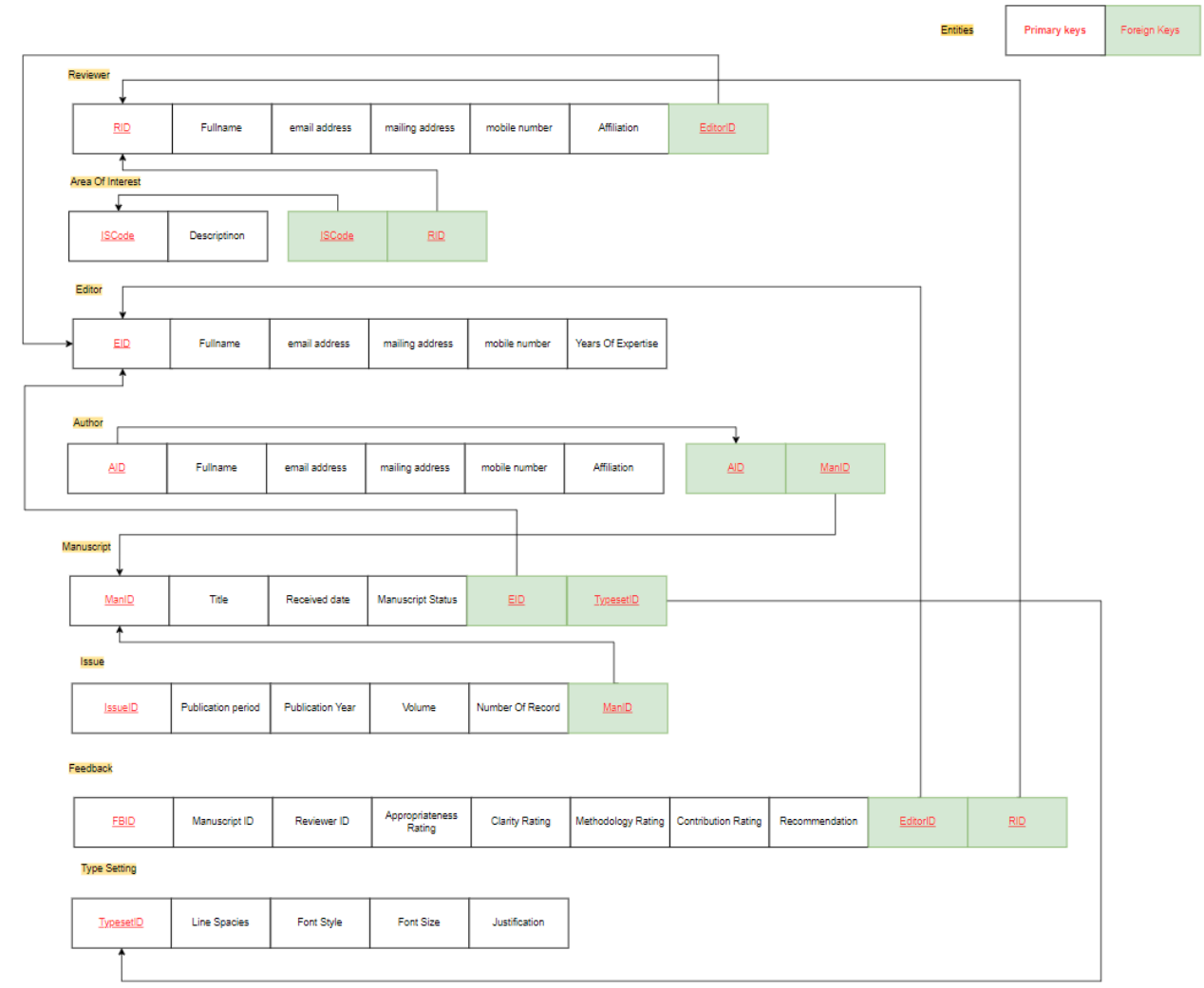


Figure 2- Database Schema for the case study

2.3- Assumptions and Changes

- The system only handles one journal and its issues.
- Reviewers can have many areas of interests at the same time area of interest can be associated with many reviewers (M to N relation).
- Every authors who have submitted manuscript are kept in the system, even if their manuscript were rejected.
- Manuscript are published in print format

3- Database Development

3.1- Physical Design of the System

Physical design of the system, from the MySQL server.

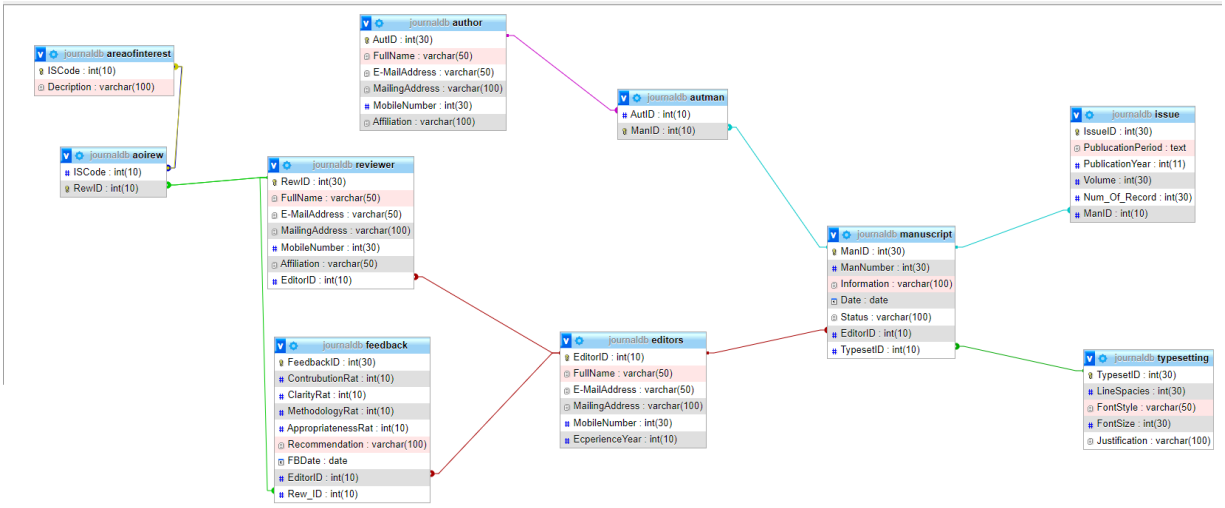


Figure 3- Physical Design

3.2- Tables

Tables general view

There are 10 tables for this system:

	Table	Action	Rows	Type	Collation	Size	Overhead
☐	aoirew	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	32.0 KiB	-
☐	areaofinterest	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	16.0 KiB	-
☐	author	Browse Structure Search Insert Empty Drop	13	InnoDB	latin1_swedish_ci	16.0 KiB	-
☐	autman	Browse Structure Search Insert Empty Drop	39	InnoDB	latin1_swedish_ci	32.0 KiB	-
☐	editors	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	16.0 KiB	-
☐	feedback	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	48.0 KiB	-
☐	issue	Browse Structure Search Insert Empty Drop	35	InnoDB	latin1_swedish_ci	32.0 KiB	-
☐	manuscript	Browse Structure Search Insert Empty Drop	39	InnoDB	latin1_swedish_ci	48.0 KiB	-
☐	reviewer	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	32.0 KiB	-
☐	typesetting	Browse Structure Search Insert Empty Drop	10	InnoDB	latin1_swedish_ci	16.0 KiB	-
	10 tables	Sum	186	InnoDB	latin1_swedish_ci	288.0 KiB	0 B

Figure 4- General view

Table: aoirew – between area of interest and reviewer

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	ISCode	int(10)			No	*None*			Change Drop More
2	RewID	int(10)			No	*None*			Change Drop More

Figure 5- aoirew table

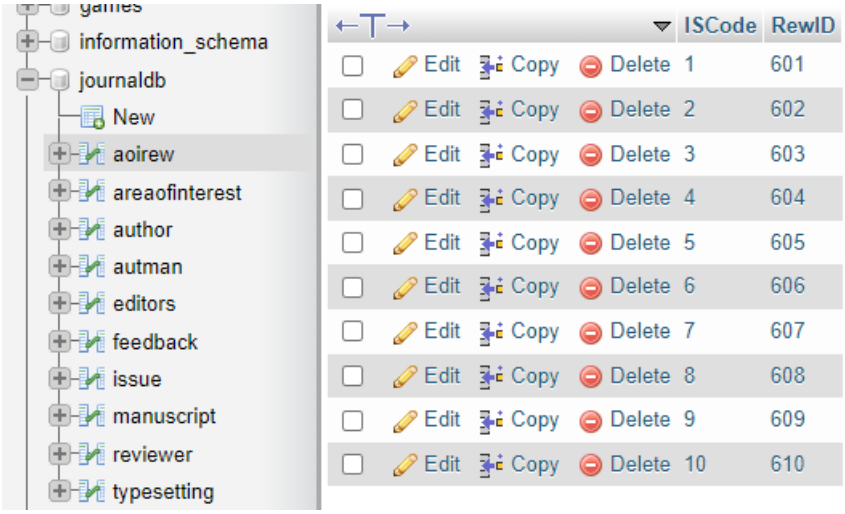


Figure 6- aoirew table values

Table: area of interest

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	ISCode	int(10)			No	*None*			Change Drop More
2	Decription	varchar(100)	latin1_swedish_ci		No	*None*			Change Drop More

Figure 7-areas of interest table

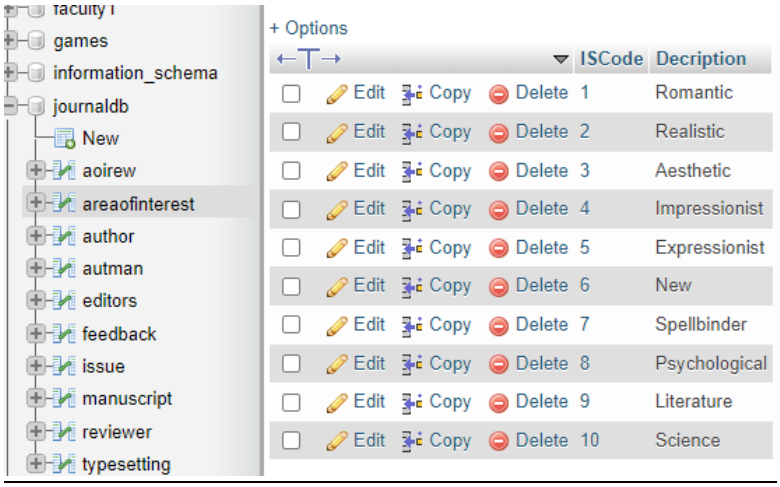


Figure 8- areas of interest table data

Table:author

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	AutID	int(30)			No	None			Change Drop More
2	FullName	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
3	E-MailAddress	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
4	MailingAddress	varchar(100)	latin1_swedish_ci		No	None			Change Drop More
5	MobileNumber	int(30)			No	None			Change Drop More
6	Affiliation	varchar(100)	latin1_swedish_ci		No	None			Change Drop More

Figure 9- author table

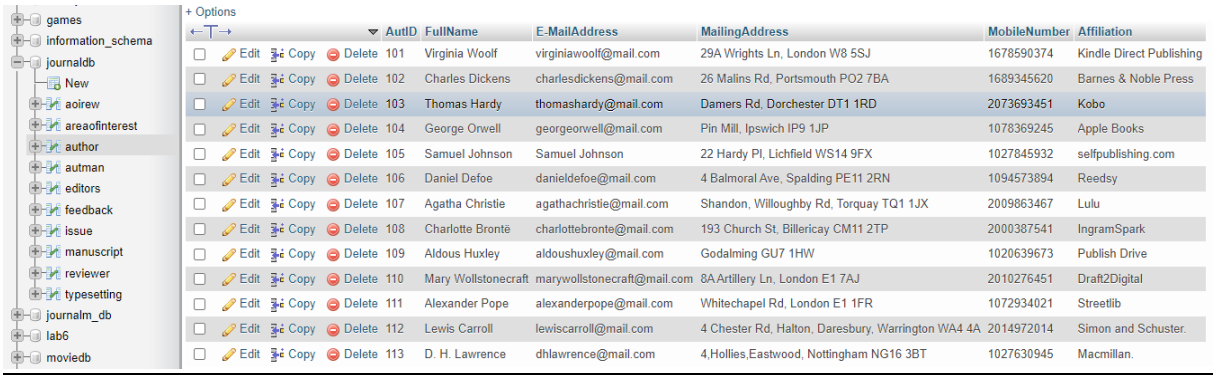


Figure 10- author table data

Table:autman- between author and manuscript

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	AutID	int(10)			No	None			Change Drop More
2	ManID	int(10)			No	None			Change Drop More

Figure 11- autman table

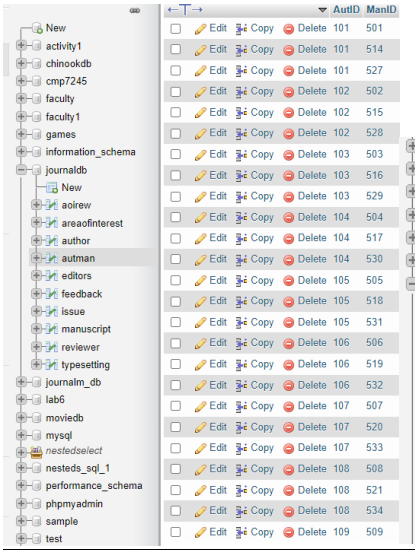


Figure 12- autman table data

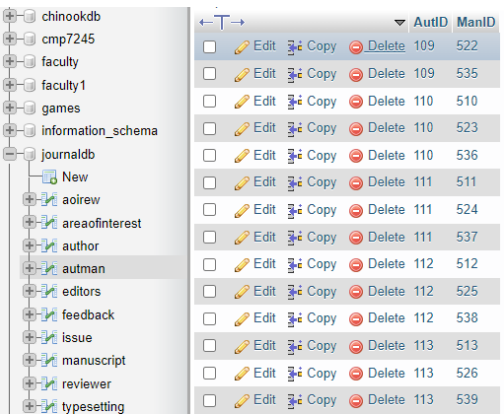


Figure 13- autman table data

Table:editors

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	EditorID	int(10)			No	None			Change Drop More
2	FullName	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
3	E-MailAddress	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
4	MailingAddress	varchar(100)	latin1_swedish_ci		No	None			Change Drop More
5	MobileNumber	int(30)			No	None			Change Drop More
6	EcperienceYear	int(10)			No	None			Change Drop More

Figure 14- editors table

Figure 15- editors table data

Table:feedback

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	FeedbackID	int(30)			No	None			Change Drop More
2	ContrubutionRat	int(10)			No	None			Change Drop More
3	ClarityRat	int(10)			No	None			Change Drop More
4	MethodologyRat	int(10)			No	None			Change Drop More
5	AppropriatenessRat	int(10)			No	None			Change Drop More
6	Recommendation	varchar(100)	latin1_swedish_ci		No	None			Change Drop More
7	FBDate	date			No	None			Change Drop More
8	EditorID	int(10)			No	None			Change Drop More
9	Rew_ID	int(10)			No	None			Change Drop More

Figure 16- feedback table

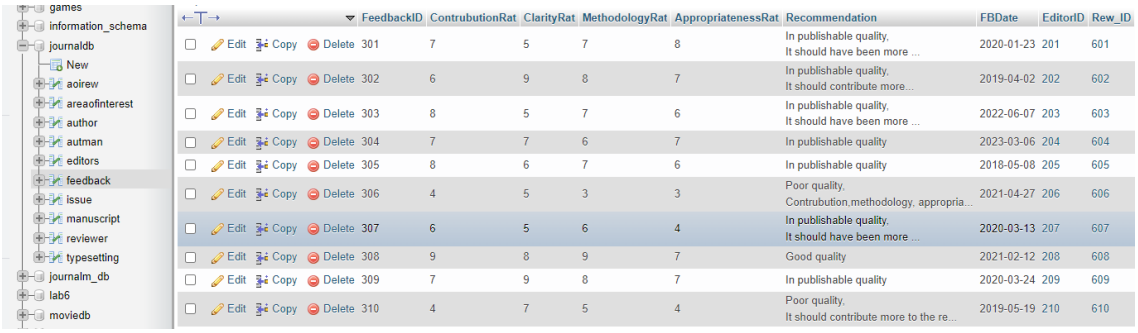
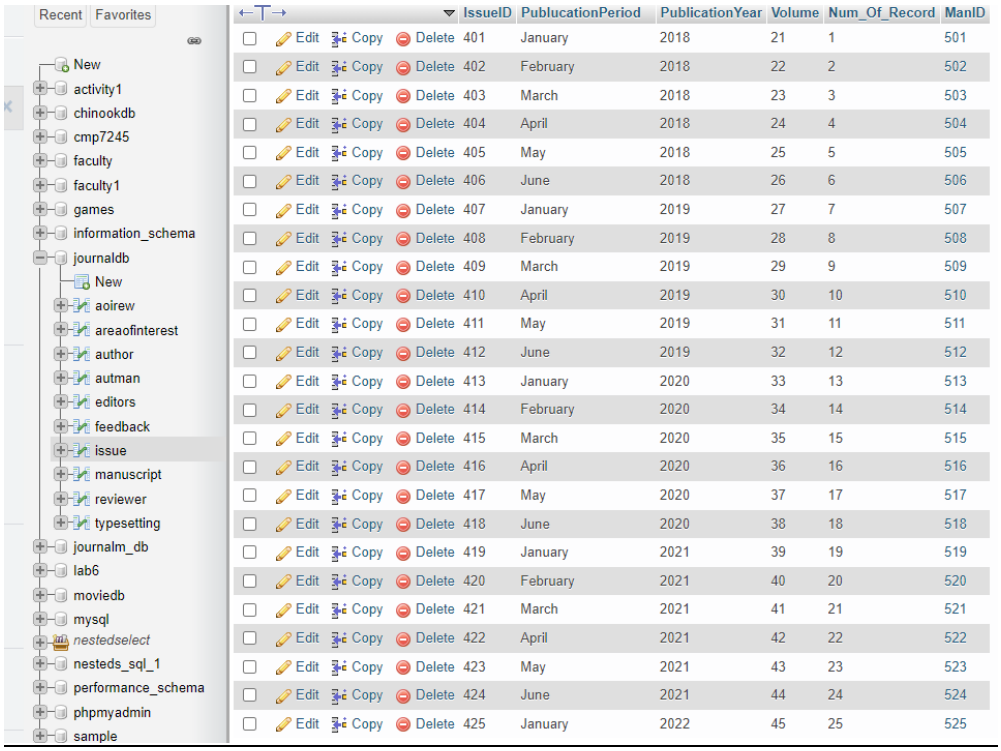


Figure 17- feedback table data

Table:issue

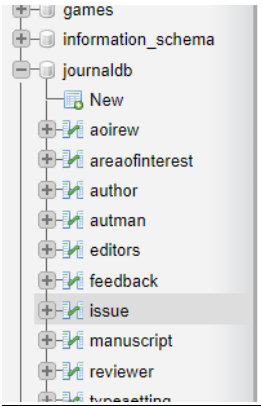
#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	IssueID	int(30)			No	None			Change Drop More
2	PublucationPeriod	text	latin1_swedish_ci		No	None			Change Drop More
3	PublicationYear	int(11)			No	None			Change Drop More
4	Volume	int(30)			No	None			Change Drop More
5	Num_Of_Record	int(30)			No	None			Change Drop More
6	ManID	int(10)			No	None			Change Drop More

Figure 18- issue table



	IssueID	PublucationPeriod	PublicationYear	Volume	Num_Of_Record	ManID
Edit Copy Delete	401	January	2018	21	1	501
Edit Copy Delete	402	February	2018	22	2	502
Edit Copy Delete	403	March	2018	23	3	503
Edit Copy Delete	404	April	2018	24	4	504
Edit Copy Delete	405	May	2018	25	5	505
Edit Copy Delete	406	June	2018	26	6	506
Edit Copy Delete	407	January	2019	27	7	507
Edit Copy Delete	408	February	2019	28	8	508
Edit Copy Delete	409	March	2019	29	9	509
Edit Copy Delete	410	April	2019	30	10	510
Edit Copy Delete	411	May	2019	31	11	511
Edit Copy Delete	412	June	2019	32	12	512
Edit Copy Delete	413	January	2020	33	13	513
Edit Copy Delete	414	February	2020	34	14	514
Edit Copy Delete	415	March	2020	35	15	515
Edit Copy Delete	416	April	2020	36	16	516
Edit Copy Delete	417	May	2020	37	17	517
Edit Copy Delete	418	June	2020	38	18	518
Edit Copy Delete	419	January	2021	39	19	519
Edit Copy Delete	420	February	2021	40	20	520
Edit Copy Delete	421	March	2021	41	21	521
Edit Copy Delete	422	April	2021	42	22	522
Edit Copy Delete	423	May	2021	43	23	523
Edit Copy Delete	424	June	2021	44	24	524
Edit Copy Delete	425	January	2022	45	25	525

Figure 19- issue table data



	IssueID	PublucationPeriod	PublicationYear	Volume	Num_Of_Record	ManID
Edit Copy Delete	426	February	2022	46	26	526
Edit Copy Delete	427	March	2022	47	27	527
Edit Copy Delete	428	April	2022	48	28	528
Edit Copy Delete	429	May	2022	49	29	529
Edit Copy Delete	430	June	2022	50	30	530
Edit Copy Delete	431	January	2023	51	31	531
Edit Copy Delete	432	February	2023	52	32	532
Edit Copy Delete	433	March	2023	53	33	533
Edit Copy Delete	434	April	2023	54	34	534
Edit Copy Delete	435	May	2023	55	35	535

Figure 20- issue table data

Table: manuscript

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	ManID	int(30)			No	None			Change Drop More
2	ManNumber	int(30)			No	None			Change Drop More
3	Information	varchar(100)	latin1_swedish_ci		No	None			Change Drop More
4	Date	date			No	None			Change Drop More
5	Status	varchar(100)	latin1_swedish_ci		No	None			Change Drop More
6	EditorID	int(10)			No	None			Change Drop More
7	TypesetID	int(10)			No	None			Change Drop More

Figure 21- manuscript table

Edit Copy Delete	501	1001	Distinguished	2018-01-01	Rejected	210	701
Edit Copy Delete	502	1002	Distinguished	2018-02-01	Published	202	703
Edit Copy Delete	503	1003	Document	2018-03-01	Rejected	209	702
Edit Copy Delete	504	1004	Composition	2018-04-01	Rejected	204	705
Edit Copy Delete	505	1005	Document	2018-05-01	Rejected	202	703
Edit Copy Delete	506	1006	Document	2018-06-01	Rejected	203	707
Edit Copy Delete	507	1007	Composition	2019-01-01	Rejected	206	701
Edit Copy Delete	508	1008	Composition	2019-02-01	Rejected	210	710
Edit Copy Delete	509	1009	Distinguished	2019-03-01	Published	207	709
Edit Copy Delete	510	1010	Distinguished	2019-05-01	Rejected	209	702
Edit Copy Delete	511	1011	Document	2019-06-01	Rejected	208	710
Edit Copy Delete	512	1012	Document	2020-01-01	Rejected	203	707
Edit Copy Delete	513	1013	Composition	2020-02-01	Received	210	710
Edit Copy Delete	514	1014	Composition	2020-03-01	Rejected	210	710
Edit Copy Delete	515	1015	Distinguished	2020-04-01	Rejected	209	706
Edit Copy Delete	516	1016	Distinguished	2020-05-01	Rejected	208	701
Edit Copy Delete	517	1017	Document	2020-06-01	Rejected	204	702
Edit Copy Delete	518	1018	Document	2021-01-01	Rejected	202	705
Edit Copy Delete	519	1019	Composition	2021-02-01	Published	201	705
Edit Copy Delete	520	1020	Composition	2021-03-01	Rejected	205	704
Edit Copy Delete	521	1021	Distinguished	2021-04-01	Rejected	209	706
Edit Copy Delete	522	1022	Distinguished	2021-05-01	Rejected	207	709
Edit Copy Delete	523	1023	Document	2021-06-01	Published	203	701
Edit Copy Delete	524	1024	Document	2022-01-01	Rejected	207	701
Edit Copy Delete	525	1025	Document	2022-02-01	Rejected	201	702

Figure 22- manuscript table data

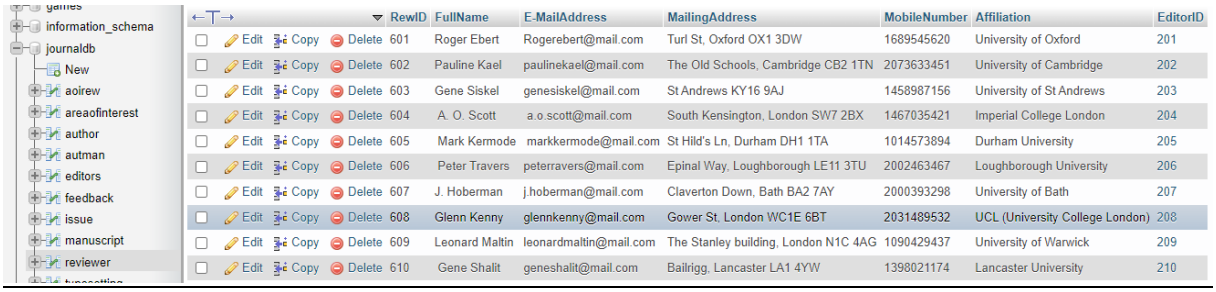
	ManID	ManNumber	Information	Date	Status	EditorID	TypesetID
Edit Copy Delete	526	1026	Composition	2022-03-01	Rejected	206	707
Edit Copy Delete	527	1027	Composition	2022-04-01	Rejected	202	709
Edit Copy Delete	528	1028	Distinguished	2022-05-01	Published	209	706
Edit Copy Delete	529	1029	Distinguished	2022-06-01	Rejected	210	703
Edit Copy Delete	530	1030	Document	2023-01-01	Published	201	702
Edit Copy Delete	531	1031	Document	2023-02-01	Published	203	708
Edit Copy Delete	532	1032	Composition	2023-03-01	Rejected	205	705
Edit Copy Delete	533	1033	Composition	2023-04-01	Rejected	207	704
Edit Copy Delete	534	1034	Distinguished	2023-05-01	Rejected	209	702
Edit Copy Delete	535	1035	Rejected	2023-06-01	Scheduled	201	703
Edit Copy Delete	536	1036	Distinguished	2024-01-01	Under Review	202	701
Edit Copy Delete	537	1037	Document	2024-02-01	Under Review	208	702
Edit Copy Delete	538	1038	Document	2024-03-01	Under Review	210	708
Edit Copy Delete	539	1039	Composition	2024-04-01	Under Review	209	710

Figure 23- manuscript table data

Table: reviewer

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	RewID	int(30)			No	None			Change Drop More
2	FullName	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
3	E-MailAddress	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
4	MailingAddress	varchar(100)	latin1_swedish_ci		No	None			Change Drop More
5	MobileNumber	int(30)			No	None			Change Drop More
6	Affiliation	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
7	EditorID	int(10)			No	None			Change Drop More

Figure 24-reviewer table



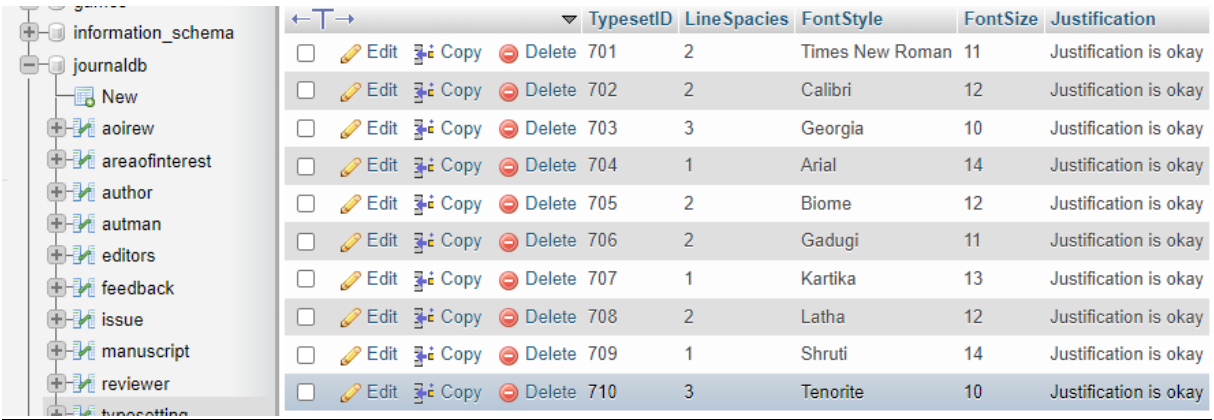
	RewID	FullName	E-MailAddress	MailingAddress	MobileNumber	Affiliation	EditorID
Edit Copy Delete	601	Roger Ebert	Rogerebert@mail.com	Turl St, Oxford OX1 3DW	1689545620	University of Oxford	201
Edit Copy Delete	602	Pauline Kael	paulinekael@mail.com	The Old Schools, Cambridge CB2 1TN	2073633451	University of Cambridge	202
Edit Copy Delete	603	Gene Siskel	genesiskel@mail.com	St Andrews KY16 9AJ	1458987156	University of St Andrews	203
Edit Copy Delete	604	A. O. Scott	a.o.scott@mail.com	South Kensington, London SW7 2BX	1467035421	Imperial College London	204
Edit Copy Delete	605	Mark Kermode	markkermode@mail.com	St Hild's Ln, Durham DH1 1TA	1014573894	Durham University	205
Edit Copy Delete	606	Peter Travers	peterravers@mail.com	Epinal Way, Loughborough LE11 3TU	2002463467	Loughborough University	206
Edit Copy Delete	607	J. Hoberman	j.hoberman@mail.com	Claverton Down, Bath BA2 7AY	2000393298	University of Bath	207
Edit Copy Delete	608	Glenn Kenny	glennkenny@mail.com	Gower St, London WC1E 6BT	2031489532	UCL (University College London)	208
Edit Copy Delete	609	Leonard Maltin	leonardmaltin@mail.com	The Stanley building, London N1C 4AG	1090429437	University of Warwick	209
Edit Copy Delete	610	Gene Shalit	geneshalit@mail.com	Bailrigg, Lancaster LA1 4YW	1398021174	Lancaster University	210

Figure 25- reviewer table data

Table :typesetting

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	TypesetID	int(30)			No	None			Change Drop More
2	LineSpacies	int(30)			No	None			Change Drop More
3	FontStyle	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
4	FontSize	int(30)			No	None			Change Drop More
5	Justification	varchar(100)	latin1_swedish_ci		No	None			Change Drop More

Figure 26- type setting table



	TypesetID	LineSpacies	FontStyle	FontSize	Justification
Edit Copy Delete	701	2	Times New Roman	11	Justification is okay
Edit Copy Delete	702	2	Calibri	12	Justification is okay
Edit Copy Delete	703	3	Georgia	10	Justification is okay
Edit Copy Delete	704	1	Arial	14	Justification is okay
Edit Copy Delete	705	2	Biome	12	Justification is okay
Edit Copy Delete	706	2	Gadugi	11	Justification is okay
Edit Copy Delete	707	1	Kartika	13	Justification is okay
Edit Copy Delete	708	2	Latha	12	Justification is okay
Edit Copy Delete	709	1	Shruti	14	Justification is okay
Edit Copy Delete	710	3	Tenorite	10	Justification is okay

Figure 27- type setting table data

3.3- Queries

1- Write a SQL query to find authors who living in London.

SELECT author.FullName, author.MailingAddress FROM author WHERE author.MailingAddress LIKE '%London%'

Figure 28

2- Write a SQL query to show which editor(s)has minimum 15 years experience.

SELECT editors.FullName, editors.EcperienceYear FROM editors WHERE editors.EcperienceYear >= 15

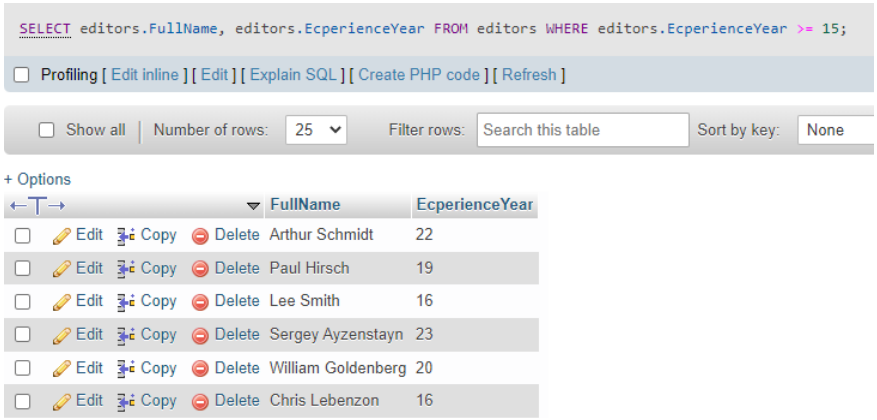


Figure 29

3- Write a SQL query to show manuscript 1036's editors's experience year.

SELECT manuscript.ManNumber, editors.FullName, editors.EcperienceYear FROM editors,manuscript WHERE manuscript.EditorID=editors.EditorID AND manuscript.ManNumber LIKE '1036'

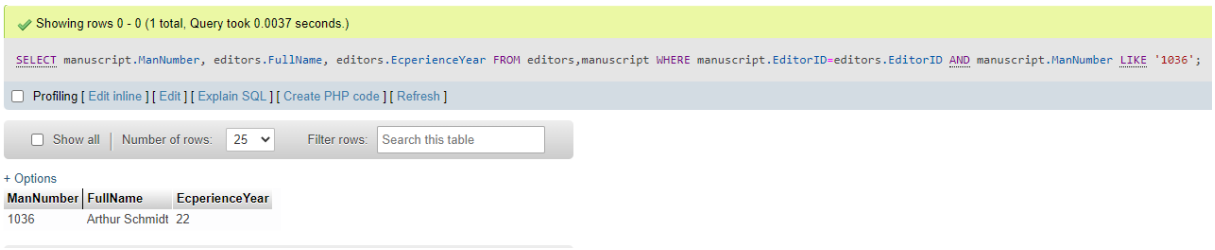
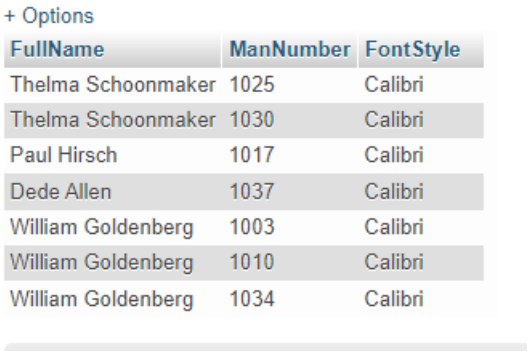


Figure 30

4- Write a SQL query to find which editors chose Calibri font style.

SELECT editors.FullName,manuscript.ManNumber, typesetting.FontStyle FROM editors,manuscript,typesetting WHERE typesetting.TypesetID=manuscript.TypesetID AND manuscript.EditorID=editors.EditorID AND typesetting.FontStyle LIKE 'Calibri'


+ Options

FullName	ManNumber	FontStyle
Thelma Schoonmaker	1025	Calibri
Thelma Schoonmaker	1030	Calibri
Paul Hirsch	1017	Calibri
Dede Allen	1037	Calibri
William Goldenberg	1003	Calibri
William Goldenberg	1010	Calibri
William Goldenberg	1034	Calibri

Figure 31

5- Write a SQL query to find which manuscript(s) published before 2021 however only in February.

SELECT manuscript.ManNumber, issue.PublicationYear, issue.PublucationPeriod FROM manuscript, issue WHERE issue.ManID=manuscript.ManID AND issue.PublicationYear <2021 AND issue.PublucationPeriod LIKE 'February%'

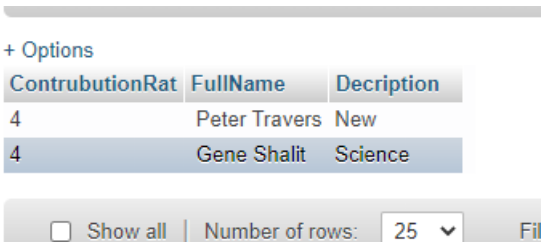
ManNumber	PublicationYear	PublucationPeriod
1002	2018	February
1008	2019	February
1014	2020	February

Show all | Number of rows: 25 Filter rov

Figure 32

6- Write a SQL query to show what is the area of interest for reviewers with a contribution rating of 4.

SELECT feedback.ContrubutionRat,reviewer.FullName,areaofinterest.Decription FROM feedback,reviewer,areaofinterest,aoirew WHERE feedback.Rew_ID=reviewer.RewID AND reviewer.RewID=aoirew.RewID AND aoirew.ISCode=areaofinterest.ISCode AND feedback.ContrubutionRat =4


+ Options

ContrubutionRat	FullName	Decription
4	Peter Travers	New
4	Gene Shalit	Science

Show all | Number of rows: 25 Fil

Figure 33

7- Write a SQL query to find which author published issue in May 2021.

SELECT author.FullName, issue.PublucationPeriod,issue.PublicationYear FROM author,autman,manuscript,issue WHERE issue.ManID=manuscript.ManID AND manuscript.ManID=autman.ManID AND autman.AutID=author.AutID AND issue.PublucationPeriod LIKE 'May' AND issue.PublicationYear LIKE '2021'

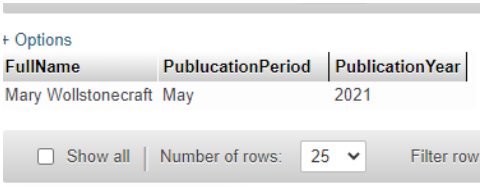


Figure 34

8- Write a SQL query to show published manuscript(s).

SELECT manuscript.ManNumber, manuscript.Status FROM manuscript WHERE manuscript.Status like 'Rejected'

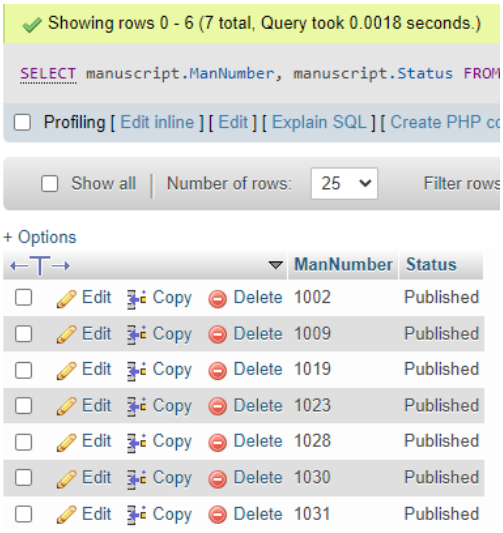


Figure 35

9- Write a SQL query to show scheduled manuscript's line spacies.

SELECT manuscript.ManNumber, manuscript.Status, typesetting.LineSpacies FROM manuscript,typesetting WHERE typesetting.TypesetID=manuscript.TypesetID AND manuscript.Status = 'Scheduled'

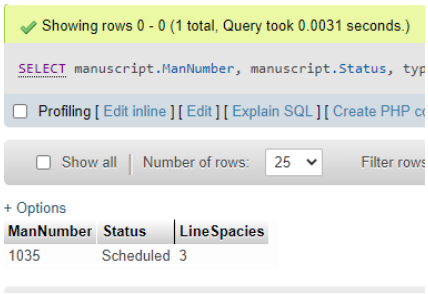


Figure 36

Conclusion

The Journal of E-commerce Researcher Knowledge is an extensive initiative that publishes and reviews manuscripts, in conclusion. Using MySQL, a relational database model was chosen in compliance with the case study's specifications. Additionally, in this system, all tables filled in and all relations are displayed. This study supported with queries.

References

1- CMP7245 Session pdf's
2- Javatpoint, 2021. DBMS | Types of Databases - javatpoint. https://www.javatpoint.com/types-of-databases
3- Nadeem, N., 2020. Hierarchical vs Relational Database https://dataintegrationinfo.com/hierarchical-vs-relational-database/
4- Onsman, A., 2018. Centralized Database Management System. https://www.tutorialspoint.com/articles/index.php?key=relational+database
5- PandoraFMS, 2021. NOSQL vs SQL. Key differences and when to choose each. https://pandorafms.com/blog/nosql-vs-sql-key-differences/