IBC International Training Center (IBCITC) Database Course Project

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Baylor University

MIS 4340: Foundations of Database System Development

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1. Coversheet

Baylor University

GROUP PROJECT COVER SHEET

Group No: 4

Course: MIS 4340

Session No: 01

Assessment Title: Group Project

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This assignment cover sheet is **valid only with your signature**. The cover sheet is to be provided with the digital submission of the assignment. Marks will be released upon a signed cover sheet is received.

2. Requirement Analysis

2.1 Stakeholders

The primary stakeholders of the IBC International Training Center (IBCITC) are its management and employees. With 7 locations in Texas, IBCITC offers various training programs such as Language, IT, and Art, serving thousands of trainees.

Secondary stakeholders include participating trainees and overseas instructors recruited by IBCITC for its academic programs. These stakeholders rely on the organization's state-of-the-art learning environments and resources.

2.2 Objectives

The primary objective is to develop a comprehensive database system for IBCITC to effectively manage data related to employees, programs, locations, rooms, technologies, courses, training schedules, and events. This system aims to streamline data management processes and enhance organizational efficiency.

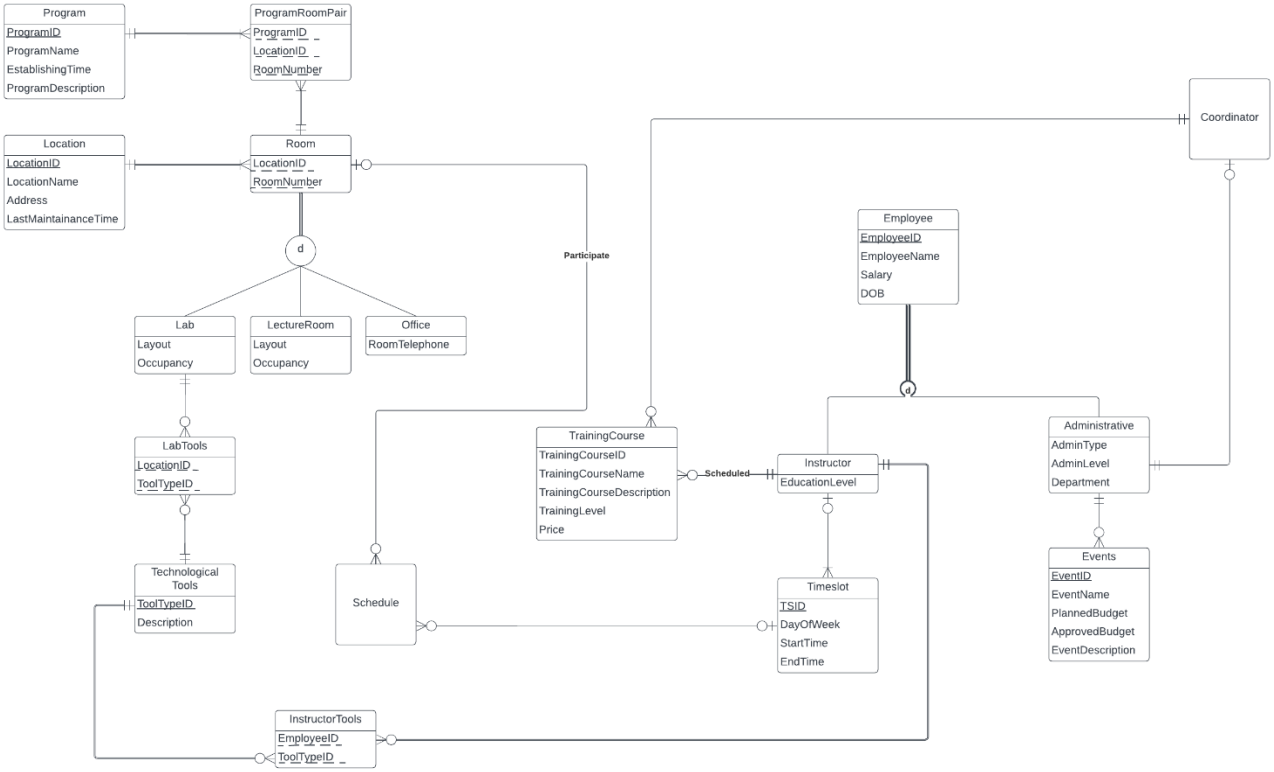
Secondary objectives involve improving data management processes by establishing relationships between various entities within the organization and creating a scheduling system to optimize resource allocation. This includes scheduling instructors for multiple sections of training courses while ensuring each section is assigned to a single instructor.

2.3 Scope

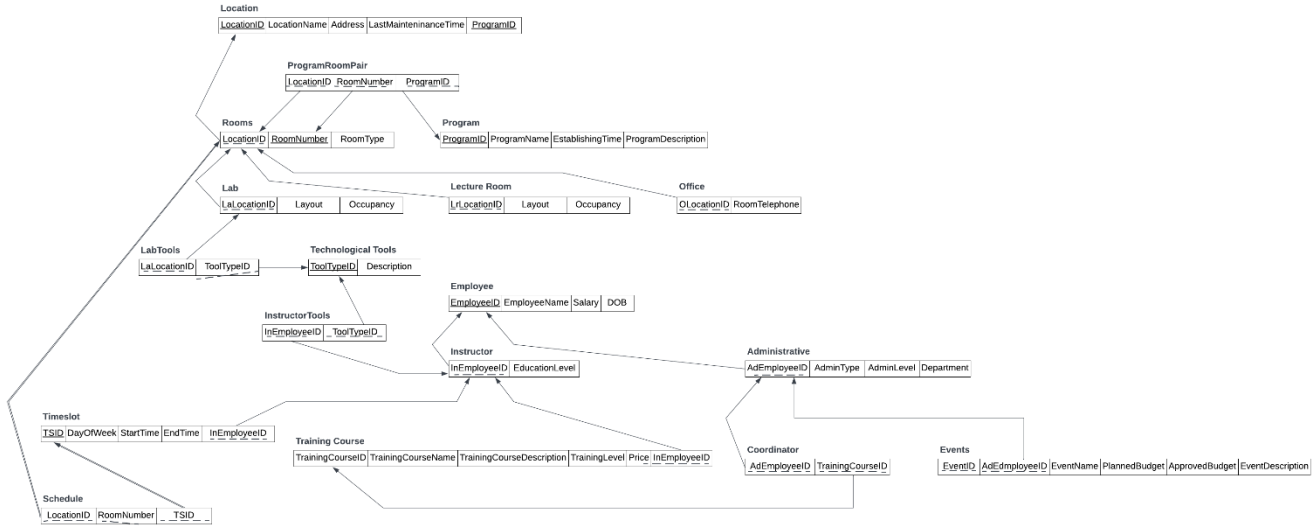
The scope of the project encompasses staff management (employees, instructors, and administrative staff), program management (including program identification and attributes such as name, description, and establishment time), location management (including identification, address, and maintenance), room management (identifying rooms by location and number, specifying room types and attributes), timeslot management, training course management (including descriptions, levels, and pricing), technology management, and event management. Areas not covered in the project scope

include financial management, existing internal and external systems, and customer relationship management (CRM). These aspects may require further analysis and integration with the database system in future iterations.

3. Entity-Relationship (E/R) Model



4. Relational Model



5. SQL Statements and Queries

5.1 List the EmployeeID and Salary of all employees.

SELECT EmployeeID, Salary FROM S_EMPLOYEE_t

Results | Explain | Describe | Saved SQL | History

EMPLOYEEID	SALARY
1	144000
2	299000
3	254000
4	142000
5	144000

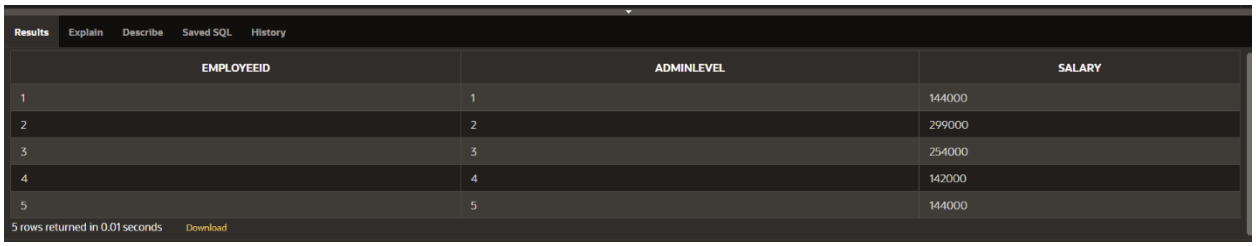
5 rows returned in 0.01 seconds Download

5.2 List the EmployeeID, AdminLevel and Salary of all administrative staff.

SELECT S_EMPLOYEE_t.EmployeeID, S_ADMINISTRATIVE_T.AdminLevel, S_EMPLOYEE_t.Salary

FROM S_EMPLOYEE_t

JOIN S_ADMINISTRATIVE_T ON S_EMPLOYEE_t.EmployeeID = S_ADMINISTRATIVE_T.AdEmployeeID



Results | Explain | Describe | Saved SQL | History

EMPLOYEEID	ADMINLEVEL	SALARY
1	1	144000
2	2	299000
3	3	254000
4	4	142000
5	5	144000

5 rows returned in 0.01 seconds Download

5.3. List all instructors who are scheduled to teach courses that have the price over 500$.

SELECT S_EMPLOYEE_t.EmployeeID, S_EMPLOYEE_t.EmployeeName

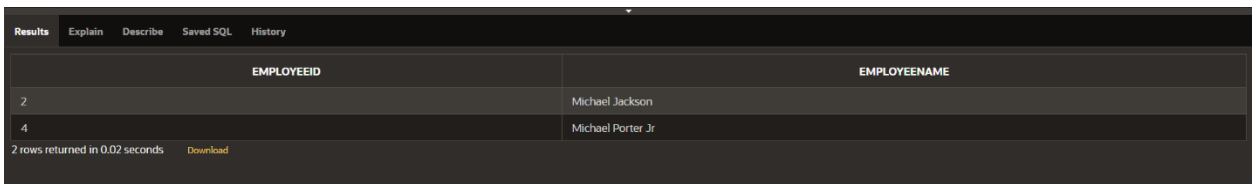
FROM S_EMPLOYEE_t

JOIN S_INSTRUCTOR_t ON S_EMPLOYEE_t.EmployeeID = S_INSTRUCTOR_t.InEmployeeID

JOIN S_TRAINING_COURSE_t ON S_INSTRUCTOR_t.InEmployeeID =

S_TRAINING_COURSE_t.InEmployeeID

WHERE S_TRAINING_COURSE_t.Price > 500;



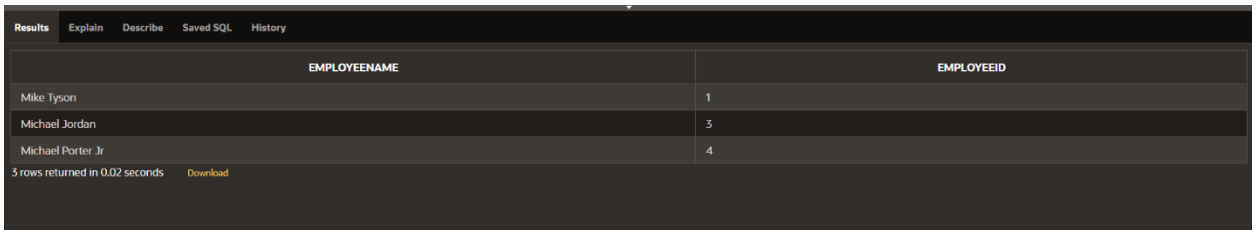
Results | Explain | Describe | Saved SQL | History

EMPLOYEEID	EMPLOYEENAME
2	Michael Jackson
4	Michael Porter Jr

2 rows returned in 0.02 seconds Download

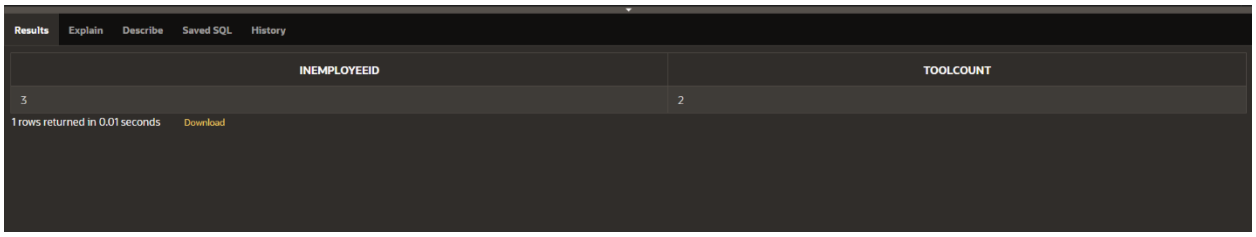
5.4. List the EmployeeID and EmployeeName of all instructors with an Education Level of Master. Display the Staff name in a single field in the format of: LastName, FirstName and have the field alias of 'Emp_FullName'.

```
SELECT EmployeeName, EmployeeID
FROM S_INSTRUCTOR_t
INNER JOIN S_EMPLOYEE_t on S_INSTRUCTOR_t.InEmployeeID = S_EMPLOYEE_t.EmployeeID
Where S_INSTRUCTOR_t.EducationLevel = 'Master'
```



5.5. List all instructors who are trained to use more than one technological tool. For each instructor in the results, display the EmployeeID and count of technological tools on which the instructor has been trained.

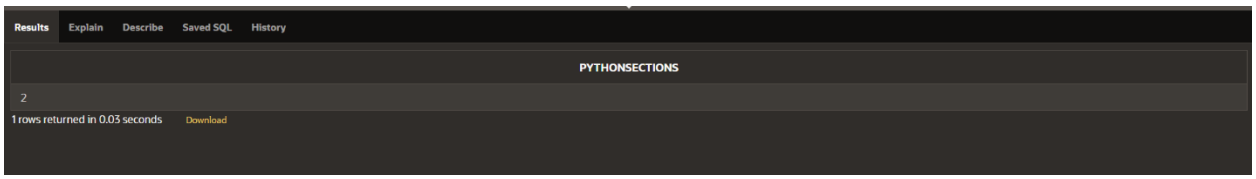
```
SELECT S_INSTRUCTOR_t.InEmployeeID, COUNT(S_INSTRUCTOR_TOOLS_t.ToolTypeID) as ToolCount
FROM S_INSTRUCTOR_t
JOIN S_INSTRUCTOR_TOOLS_t ON S_INSTRUCTOR_t.InEmployeeID =
S_INSTRUCTOR_TOOLS_t.InEmployeeID
GROUP BY S_INSTRUCTOR_t.InEmployeeID
HAVING COUNT(S_INSTRUCTOR_TOOLS_t.ToolTypeID) > 1;
```



Only one instructor is trained to use more than one technical tool.

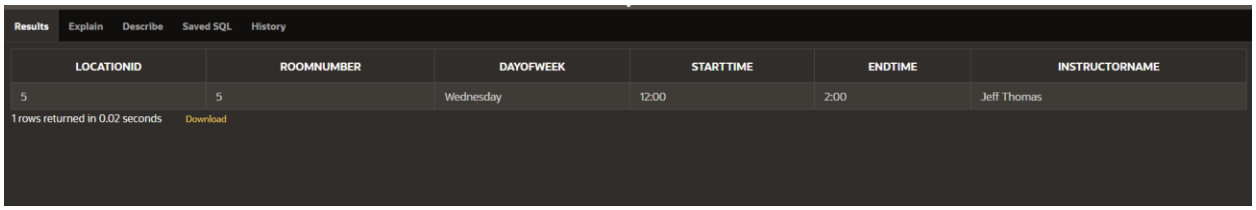
5.6. Count the total number of sections scheduled for the Course "Python" in 2024.

```
SELECT COUNT(TrainingCourseID) as PythonSections

FROM S_TRAINING_COURSE_t

WHERE TrainingCourseName = 'Python'
```



5.7. List all schedules for the year 2024 with the instructor "Jeff Thomas."

```
SELECT S_SCHEDULE_t.LocationID, S_SCHEDULE_t.RoomNumber, S_TIMESLOT_t.DayOfWeek,

S_TIMESLOT_t.StartTime, S_TIMESLOT_t.EndTime, S_EMPLOYEE_t.EmployeeName AS

InstructorName

FROM S_SCHEDULE_t

JOIN S_TIMESLOT_t ON S_SCHEDULE_t.TSID = S_TIMESLOT_t.TSID

JOIN S_INSTRUCTOR_t ON S_TIMESLOT_t.InEmployeeID = S_INSTRUCTOR_t.InEmployeeID

JOIN S_EMPLOYEE_t ON S_INSTRUCTOR_t.InEmployeeID = S_EMPLOYEE_t.EmployeeID

WHERE S_EMPLOYEE_t.EmployeeName = 'Jeff Thomas'
```



6. Critical Reflection

Our team effectively collaborated, despite initial unfamiliarity. Going into this project, not all of us knew each other, but even with this, we all got along very well. During our initial meeting, we outlined project expectations and divided tasks into three main components: ERD diagram and requirement analysis, relational schema development, and SQL database creation with reflection. It was particularly important that we had a structured plan to go off. This clear outline allowed us to work efficiently and timely. Time management was essential for our success. The in-class project days helped us stay on track and regroup. We also had to meet in-person and meet over Zoom to yield completion.

This project provided valuable lessons for future tasks. Firstly, the significance of a clear plan for project management cannot be overstated. Clarity regarding roles and deadlines is crucial to prevent delays. Secondly, collaborative group work provided beneficial by allowing for peer review consistently. Throughout this project we worked in small teams at each part which enabled us to ask questions to each other and check each other's work as we went along. Overall, it was an effective team project where no problems arose, and the team collaborated effectively.

Despite our efforts to optimize, there remain areas for improvement. Even though we started the project early, a lapse in group meetings for several weeks resulted in miscommunication and a loss of project direction. Despite this, we ran into little hiccups when we returned to our work.

When running our code, we encountered up to hundreds of errors. Many of which were difficult to understand and fix. Errors such as “ORA-02291: integrity constraint” were difficult to determine the source of. We often found that a small typo massively affected our script. For example, there were times when there would be a colon in our code instead of a semi-colon. However, it was very satisfying to fix these small mistakes and see the code run successfully.

The largest friction point we experienced was the inability to work simultaneously on SQL. We began the project by dividing the ERD among us while being able to edit simultaneously on LucidChart.

Once we started creating tables in SQL, we did it individually. When we realized that all tables needed to be on one singular device to run, we realized that there was no way to collaborate on the same database. This created issues when consolidating our SQL tables and scripts. Besides these issues, our project ran smoothly, and we are proud of what we produced.

7. Discussion

7.1 Three Noteworthy Features

One notable aspect is the seamless storage and management of data, a fundamental feature for any database. Our database excels in this regard, providing a reliable platform for users to securely input and access data with ease. Its primary function is to ensure the preservation and accessibility of valuable information, crucial for our company's operations. Centralizing all data minimizes the risk of loss and streamlines updates, a significant advantage given the potential consequences of data loss. With data consolidated in one place, users can effortlessly retrieve, modify, or remove information, ensuring accuracy and consistency across the system. This unified approach eliminates confusion stemming from outdated data, empowering users to make informed decisions promptly. In essence, our database not only simplifies data handling but also accelerates the company's decision-making processes.

Another standout feature of the database is its relational architecture, enabling seamless interconnection between multiple tables. While each data table is created independently, they are linked through foreign keys, facilitating easy data integration. Previously, connecting or merging data was challenging, but with this relational structure, users can effortlessly establish relationships between disparate datasets. By leveraging foreign keys, disparate data entries can now be viewed collectively, enhancing data analysis and comprehension.

The third remarkable aspect of this database is its robust data filtering capabilities. By enabling users to apply filters, the database facilitates the rapid and precise extraction of specific information, thereby boosting productivity and supporting informed decision-making. With the ability to sort and filter data effectively and efficiently, users can select from multiple data tables and refine their search criteria to retrieve only the relevant data. This feature speeds up finding necessary information, whether through simple searches or more intricate inquiries. By leveraging

the database's filtering functionality, users can navigate extensive datasets with ease, ensuring that they access the information they need in a timely manner.

7.2 Possible Improvements

While our database boasts several accomplishments, there remain areas ripe for improvement. One such enhancement involves optimizing queries to enhance database performance, delivering users more efficient and tailored results. This optimization would not only streamline user experience but also boost overall database efficiency. Simplification is another key target for improvement, as the database can sometimes feel overly complex and challenging to navigate. Simplifying its structure would minimize user errors and enhance usability.

Additionally, integrating indexing is essential for optimizing query performance. By strategically creating indexes on frequently accessed columns, such as those used in "WHERE," "ORDER BY," and "JOIN" clauses, the database can swiftly locate relevant data without exhaustive table scans. This indexing strategy would significantly improve usability, efficiency, and overall performance.

Furthermore, implementing data partitioning based on criteria like dates or locations can expedite query performance by narrowing the search scope to specific partitions. This enhancement would further enhance database efficiency and user experience.

Database maintenance is also crucial for ensuring long-term performance. Regular tasks such as purging old data, rebuilding indexes, and updating statistics would prevent degradation over time, maintaining the database in optimal condition for users.

Lastly, upgrading hardware is a potential improvement to ensure the database can accommodate increasing user demands without resource constraints. This upgrade would ultimately enhance user experience and database efficiency.

In summary, the integration of optimized queries, simplification, indexing, data partitioning, database maintenance, and hardware upgrades would collectively elevate our database and significantly improve user satisfaction.

7.3 Impacts on Stakeholders

This database is poised to revolutionize operations for stakeholders, particularly IBC. Firstly, it consolidates all instructor, employee, and admin data into a single accessible repository, alleviating the burden of managing vast amounts of information. With IBC boasting a substantial workforce and corresponding data, this database offers a streamlined solution to their organizational needs.

Beyond employee data, the database encompasses vital information essential for IBC's operations, such as room allocations, course offerings, and skill proficiencies. Through interconnected keys, all pertinent data is seamlessly linked, enabling IBC to effortlessly access comprehensive insights. For instance, scheduling becomes a breeze as IBC can quickly ascertain which classes are taught by specific instructors, with details on tools, proficiency levels, and timing readily available.

Moreover, the database simplifies financial tracking by presenting class prices and instructor workload. Additionally, the ease of updating and modifying data ensures that IBC can adapt swiftly to evolving requirements. In essence, this database promises unparalleled ease and efficiency, empowering IBC to optimize its operations effectively.