Varazdin Development and Entrepreneurship Agency and **University North**
in cooperation with
Faculty of Management University of Warsaw
Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat
Polytechnic of Medimurje in Cakovec

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DEVELOPING BUSINESS - IT ALIGNMENT SKILLS THROUGH DATA MANAGEMENT: HIGHER EDUCATION EXAMPLE

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ABSTRACT

Business-IT alignment (BITA) skills are one of the top concerns in companies since a misunderstanding is a common issue between the business units and the informatics department. BITA is becoming even more important with the challenges that the digital transformation is posing. Accordingly, top-level managers coming from the business domain are expected to have profound knowledge about information technology (IT) and related topics. The goal of this paper is to present an educational approach for developing BITA skills in the graduate-level course of Data Management in Business Administration university program. A project assignment is designed with the purpose of strengthening the BITA skills of business students. Additional objectives of the project are related to the learning outcomes of the course. Those include acquiring knowledge about databases and database modeling in order to empower students for gaining insights from data and recognizing the opportunities for business improvement in the digital economy. In order to meet the research goal of the article, the steps in the project assignment are shown. Students are required to simulate a business environment. Firstly, the business environment of a company which is encountered with digital disruption in their industry is designed. After that, actions for business improvement are defined. Then, modeling of a relational database that can support subsequent business requests is carried out. In the end, programming skills in SQL are applied to gain quality information needed for business actions. The presented project assignment incorporates a combination of business, IT, and digital skills which foster business development. Since employees and managers with strong BITA capabilities help companies to mitigate risks of losing time and money, and overseeing business opportunities for growth, the presented educational approach can be of great value to educators in higher education and business.

Keywords: *Business-IT Alignment, Data Analysis Skills, Digital Skills, Education, Relational Database Modeling*

1. INTRODUCTION

Information technology (IT) has enabled the fast growth of businesses by changing the way companies organize their business processes, communicate with their customers and potential customers, and deliver their services (Silvius, De Waal, & Smit, 2009). As IT has become such an integral part of the business model it has drawn the interest of many academics, executives and consultants to the topic of optimizing the interdependency between IT infrastructure and business goals (Luftman & Kempaiah, 2007), giving birth to the field known as Business and IT alignment (BITA). BITA can be defined as the extent of alignment between information technology and business strategy (Jia, Wang, & Ge, 2018).

With the growing importance of digitalization and the disruptive effect of trends such as social media, data analytics and cloud computing, enterprises who fail to act proactively in their IT strategy risk losing their competitive advantage (Diallo et al. 2014, Horlach, Drews, & Schirmer, 2016). This presents a pressing problem for middle and top management as the driving forces of forming an organization's strategy. The SIM IT trend study (Kappelman, Mclean, Johnson, & Gerhart, 2015) list the most important skills for IT middle management as (i) teamwork; (ii) technical knowledge; (iii) problem solving, and; (iv) people management. Hence, the diverse skillset of the modern manager includes not only technical skills but also so-called "soft" skills. This clash of business and IT know-how falls directly into the area of BITA and highlights the importance of the subject in the current business landscape. Recent studies also show that large firms are actively taking part in the trend of digital transformation and as such look to extract added values from the vast amount of data at their disposal (Ivančić, Bosilj Vukšić, & Spremić, 2019). With larger value given to data in general, middle and top management need to be data "literate" to maximize the efficiency of decisions. A significant part of BITA is data management and analytics and the latest research shows that they currently draw the largest amount of investment in the industry (Kappelman et al., 2018). The rise of interest and influx of funds bolsters the need for IT management and workers to possess data-centric reasoning among other BITA skills to enable the synergy between Business and IT inside the organization. The Faculty of Economics and Business (FEB) Zagreb educates future managers and leaders. As such, it is crucial for economics and business students to possess BITA skills. The Data Management course is a part of the Managerial Informatics masters' degree at the Business Administration university program. The Managerial Informatics program aims to equip students with a complete skill set that includes equally business strategy and technical knowledge. On top of that, students from other business and economics programs at the faculty regularly enroll in the course. Therefore, this paper aims to present an educational approach for developing interdisciplinary BITA skills of business students in the graduate-level course of Data Management. The remainder of this paper is structured as follows. After the introduction, the employed methodological approach is displayed. After that, the main section of the chapter envelopes the steps of the chosen project assignment. In the end, a discussion of the presented educational approach regarding the skills it is developing is presented, alongside the contribution of the paper and the concluding remarks.

2. METHODOLOGY AND PROJECT ASSINGMENT DESCRIPTION

In order to meet the research goal of the article, an educational approach for developing interdisciplinary BITA skills is presented. For that purpose, a project assignment task is developed. Therefore, the steps in the chosen project assignment are presented in the next chapter and can be defined as follows: (i) setting business environment and requests; (ii) relational database modeling, and; (iii) query deployment to support business actions. The second step is employed with the assistance of MySQL and Oracle SQL Developer software. Logical modeling is done in MySQL, while the physical modeling is deployed in SQL Developer. The third step, i.e. query deployment is entirely conducted in Oracle's SQL Developer. Before conducting and writing a project assignment, students are required to simulate a business environment of a chosen company. After that, business goals with accompanying business requests are set which aim at optimizing the selected domains of a company. A special focus is put on the consideration of how digital trends and digital disruption is affecting the particular business niche the company is operating in. In accordance with these trends, particular business requests aiming at business development and improvement are defined (strategic level focus). Since the execution of business actions is in the hands of business units (operational level), business actions and database requests are connected to particular organizational departments.

Then, modeling of a relational database that can support subsequent business requests is carried out. In the end, to gain quality information needed for business actions, programming skills in SQL are applied. The information gained at this step is used in particular organizational departments for conducting predefined business actions.

3. DATA MANAGEMENT COURSE PROJECT ASSINGMENT EXAMPLE

3.1. Setting business environment and requests

In order to meet the learning goals of the course, the business situation of a company is simulated. The simulated business environment in this example is about a rent a car company, which deals in rentals of various automotive vehicles to customers. The industry is largely affected by disruptive technological business models such as Uber and Lyft, which provide cheap transportation alternatives, therefore pushing rent-a-car companies to constantly improve the quality of their services. The rent a car company decided to do a full structural adjustment of their business practices with help from data analytics. This has resulted in particular business actions in their Marketing, Human Resources, and Business Development departments. The goal of business changes with respect to the department in charge are the following:

1. Create a new promotional campaign for business customers. Business customers count for a large percentage of the total number of customers in the last several years. Hence, they are evaluated as an untapped customer niche (Marketing Department).
2. Replace older outdated models in the rental car portfolio with a larger number of popular models. Popular models are the ones having a high demand with previous customers (Business Development Department).
3. Increase employee morale and incentive by rewarding the most active ones (Human Resources Department).

For accomplishing these goals, a functioning and accurate relational database is required from which we can gather information to support the planned business actions. Modeling of the relational database that is in the function of supporting business decisions is presented in the following paragraph.

3.2. Relational database modeling

Modeling can be defined as a process that begins with the analysis of the information system requirements and results in the creation of a database (Varga, 2016). Modeling is done through multiple steps which all develop different aspects of the database. The steps in modeling a relational database are (i) conceptual modeling; (ii) logical modeling, and; (iii) physical modeling. To build a working database, the person in charge of modeling it must not only be proficient at the technical aspect of development but must also thoroughly understand the business logic behind the database, so that it functions in an efficient manner.

3.2.1. Conceptual and logical modeling

The first step of relational database modeling is conceptual modeling, with a goal of giving a complete, consistent and non-redundant description of the data in an information system (Varga, 2016). The tool for achieving this goal is building an Entity-Relationship (ER) diagram which shows all the Tables, also known as entities in a database and the relationships between them. This step requires the designer of the database to understand the interoperability of different business units and how to optimize their interdependencies.

Figure following on the next page

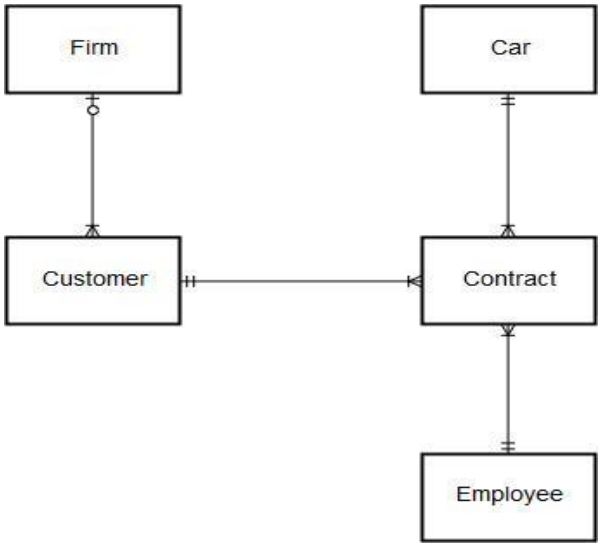


Figure 1: Entity-Relation diagram for the Rent a car project (Authors' work)

Figure 1 presents the ER diagram of the rent-a-car project. The company demands 5 different tables inside their database: (i) Customer – this table would collect all the personal information for each customer who rents a car; (ii) Firm – a special table which would keep legal information about Firms in which customers work when they rent cars for business use; (iii) Car – the list of all vehicles available in the rent a car company; (iv) Employee – the list of employees of the rent a car company, and; (v) Contract – a table which would store information of each rental contract. Diagram displayed in Figure 1 uses a simplified Martin notation also known as "Crows feet" notation because of its specific symbol of relation. "The feet" symbol stands for many, "|" stands for one, and "o" stands for optional. In the ER model of the project assignment, each contract must have only one employee, car and customer, which is logical when considering the legal background of the document. Every employee, car, and customer can be present in many contracts but need to be at least inside one to be present inside the system. This is due to the fact that we are operating a rental service in which vehicles are returned and then rented again to new customers by various employees. The last relation on the diagram is between the Firm table and the Customer table. Each firm must have at least one employee, who is a customer, to be present in the system but can also an unlimited number of them. The customer, on the other hand, doesn't have to be employed at any firm to rent a vehicle. Logical modeling continues on conceptual modeling as it provides the reasoning behind the connection of different tables. Logical modeling presents attributes (columns) of the tables and connects different tables by specifying which columns serve as primary and foreign keys. A primary key is a column or group of columns in the table which value can be used to uniquely identify each row of the table. The foreign key is a value of a primary key of a table which is found in another table and can be used to link together rows from two different tables. The result of logical modeling is a relational schema (Figure 2).

Figure following on the next page

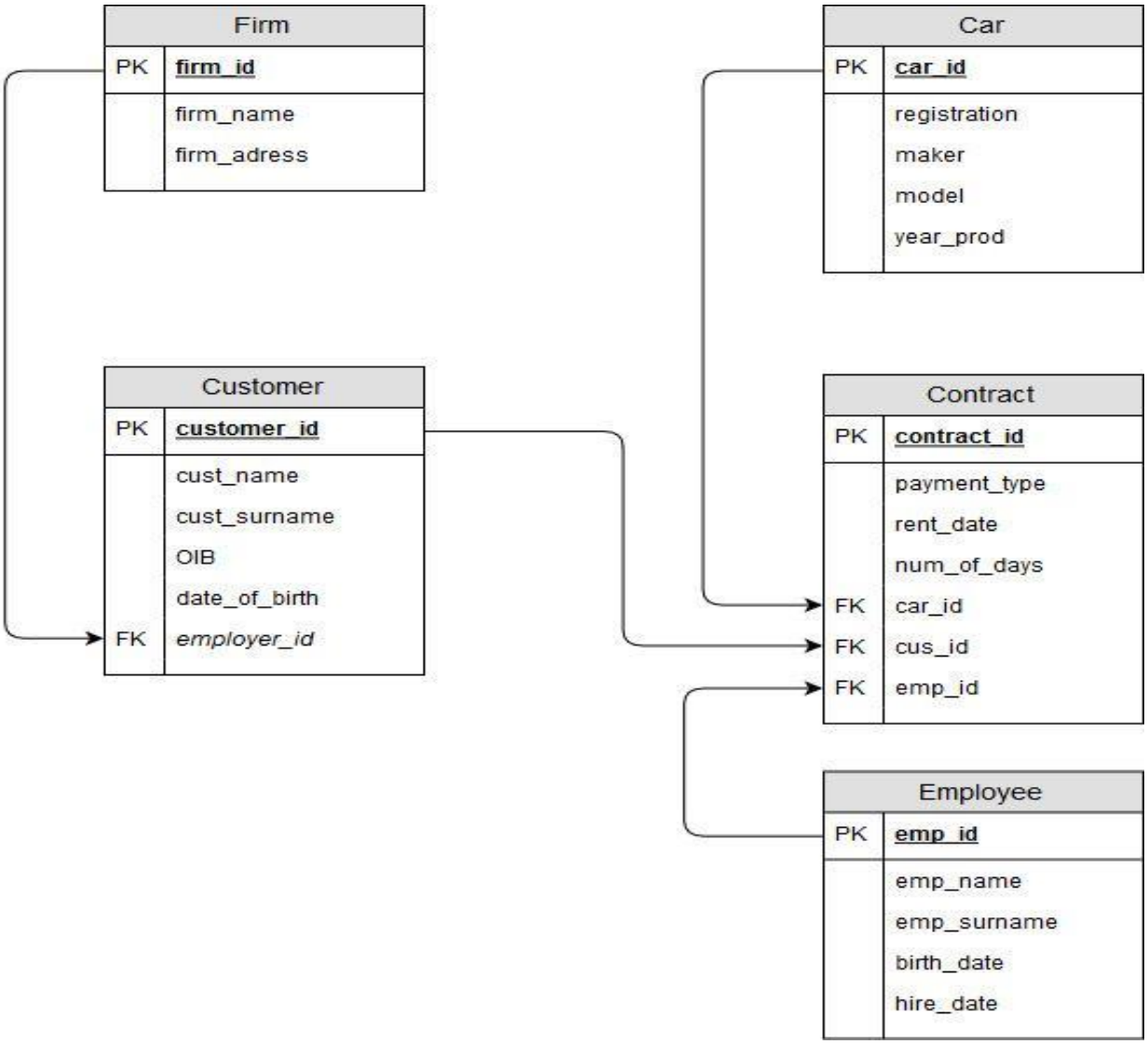


Figure 2: Relationship schema of the Rent a car project (Authors' work)

As seen in Figure 2, we will collect various data to use for information gathering. In the Firm table, the data collected is about the name and legal address of the partnering company. The Customer table will have primarily personal data such as the name, OIB (personal identification and VAT number) and the birthday of the customer. A similar data will be gathered for the employees with the addition of the hiring date. Vehicle information such as maker, model, registration and year when it was produced will be stored in the Car table. The final table, Contract, is combining information from the other tables with payment type and rental details to give a complete view of each transaction in the business. This is made possible by three foreign keys inside of it, from which we can reference relevant rows from other tables.Through both modeling steps, the vital part is to transfer the business logic into the database. The tables have to gather the needed information and be connected so the data is available to the different apartments which all possess a need for different aspects through which to view the data.

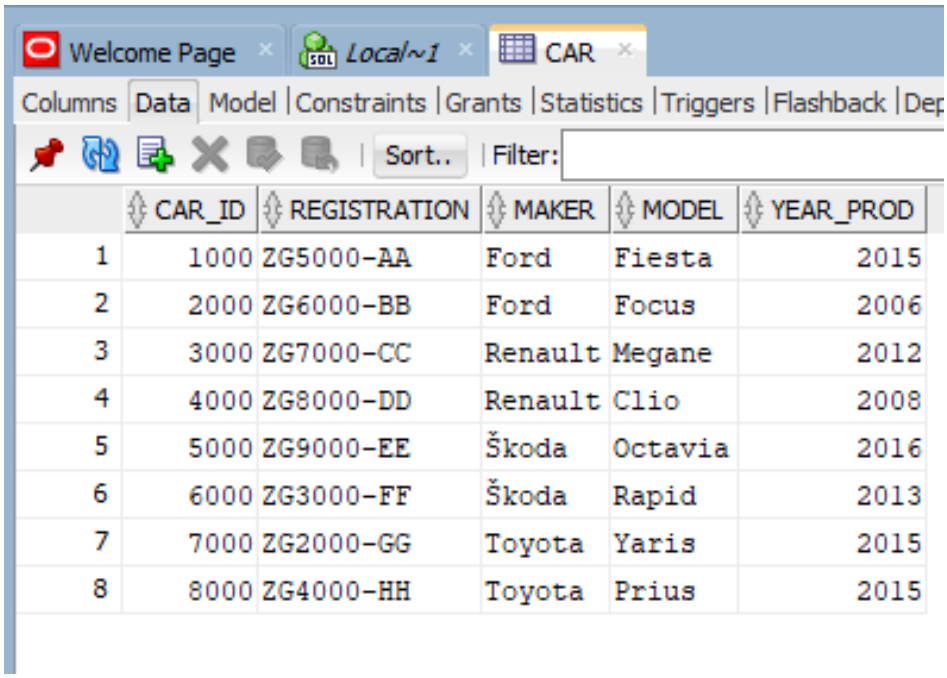
3.2.2. Physical modeling

Physical modeling is the step in which the actual database is constructed. Most relational databases are built and manipulated using Structured Query Language. The chosen program to use for creating the database is SQL Developer by the Oracle Corporation, as it provides all the necessary tools for the completion of the project.

The exemplary syntax for the creation of a table can be seen in the example below:

```
CREATE TABLE Car
(car_id NUMBER (4) NOT NULL,
registartion VARCHAR (12),
maker VARCHAR (15),
model VARCHAR (15),
year_prod NUMBER (4),
CONSTRAINT car_unique UNIQUE (car_id,registration));
INSERT INTO car VALUES
(1000, 'ZG5000-AA', 'Ford', 'Fiesta', 2015);
INSERT INTO car VALUES
(2000, 'ZG6000-BB', 'Ford', 'Focus', 2006); …
```

The result is the creation of the Car table and subsequent insertion of relevant data into it (Figure 3). All the other tables were created in the same manner with different attribute names and data types. The data types used in the project were mainly NUMBER, DATE, and VARCHAR2 for different textual values. During this phase of the project, the need for technical expertise arose. The syntax has to be correct and complete for the creation of the table. Even though SQL Developer provides a graphical interface to interact with, there is still a need for technological skills for correct usage.



	CAR_ID	REGISTRATION	MAKER	MODEL	YEAR_PROD
1	1000	ZG5000-AA	Ford	Fiesta	2015
2	2000	ZG6000-BB	Ford	Focus	2006
3	3000	ZG7000-CC	Renault	Megane	2012
4	4000	ZG8000-DD	Renault	Clio	2008
5	5000	ZG9000-EE	Škoda	Octavia	2016
6	6000	ZG3000-FF	Škoda	Rapid	2013
7	7000	ZG2000-GG	Toyota	Yaris	2015
8	8000	ZG4000-HH	Toyota	Prius	2015

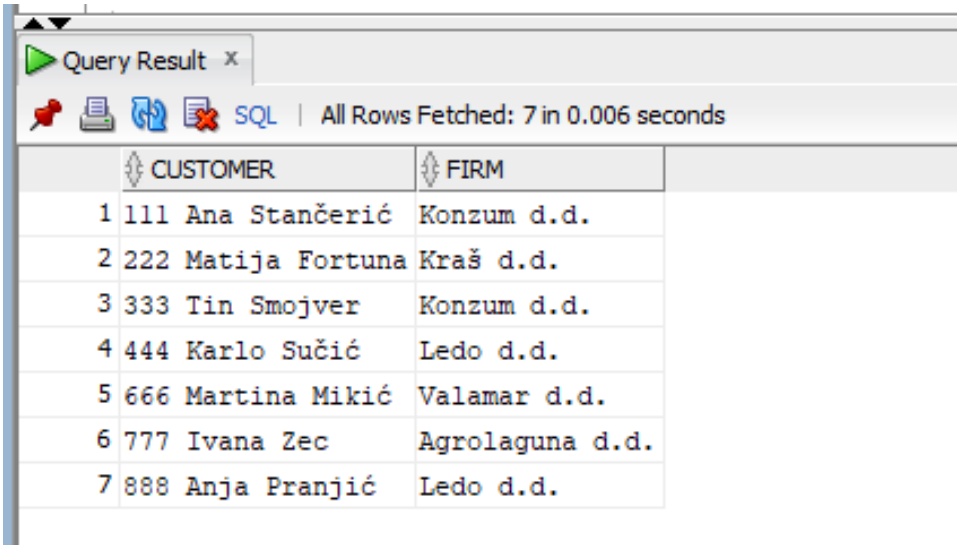
Figure 3: Car table inside SQL Developer (Authors' work)

3.3. Query deployment to support business actions

As the database has been prepared in the previous steps, we can address the business issues identified in section 3.1. As stated in section 3.1., the first problem regarded the Marketing Department and involved the creation of special promotions for business customers. To accomplish this, we need to create a list of all customers who rented vehicles for business use and their respective companies. This task involves filtering all customers who have some value in the company_id field and attaching to them the relevant row from the Firm table.

The used query is as follows:
SELECT CONCAT(CONCAT(k.customer_id,' '), k.cust_name||' '||k.cust_surname) "CUSTOMER",
p.firm_name "FIRM"
FROM customer k left join firm p on k.employer_id=p.firm_id
WHERE firm_id is not null;

The result of a query is visible in Figure 4. Once the relevant information is in place, they can be used to send promotional material.


Query Result

SQL | All Rows Fetched: 7 in 0.006 seconds

	CUSTOMER	FIRM
1	111 Ana Stančerić	Konzum d.d.
2	222 Matija Fortuna	Kraš d.d.
3	333 Tin Smojver	Konzum d.d.
4	444 Karlo Sučić	Ledo d.d.
5	666 Martina Mikić	Valamar d.d.
6	777 Ivana Zec	Agrolaguna d.d.
7	888 Anja Pranjić	Ledo d.d.

Figure 4: Marketing query and results (Authors' work)

The second issue was more complex and thus requires two queries. The Business Development Department wants to increase service quality by replacing old vehicles in their fleet with new vehicles, which proved as the most popular by previous experience. The first query will help us determine which cars are outdated. We will accomplish this by filtering the Car table to show cars whose year of production is more than ten years apart from the current date. Furthermore, we will order the results by year so that we can remove the oldest ones first. The query and its results are presented in Figure 5. The second part of the solution is to find the most popular models in the current fleet so that we can increase the number of those models. We can do this by taking the list of models from the Car table and adding to them the number of rental contracts in the Contract. Finally, we order the results from the highest number of rental contracts the least, so that we can choose the best available model if the first one cannot be attained for some reason. The second query result is visible in Figure 6. The employed queries are as follows:
SELECT car_id "ID", maker "Maker", model "Model", registration "Registration number", year_prod "Year of production"
FROM car
WHERE 2019 - year_prod > 10
ORDER BY year_prod;

SELECT a.maker||' '||a.model "Car", COUNT(v.contract_id) "Number of rides"
FROM car a LEFT JOIN contract v ON a.car_id=v.car_id
GROUP BY a.maker||' '||a.model
order by COUNT(v.contract_id) desc;

Query Result

SQL | All Rows Fetched: 2 in 0.004 seconds

	ID	Maker	Model	Registration number	Year of production
1	2000	Ford	Focus	ZG6000-BB	2006
2	4000	Renault	Clio	ZG8000-DD	2008

Figure 5: Business Development query No. 1 and results (Authors' work)

Query Result

SQL | All Rows Fetched: 8 in 0.008 seconds

	Car	Number of rides
1	Renault Megane	4
2	Toyota Yaris	3
3	Škoda Octavia	2
4	Ford Fiesta	1
5	Škoda Rapid	1
6	Toyota Prius	1
7	Ford Focus	0
8	Renault Clio	0

Figure 6: Business Development query No. 2 and results (Authors' work)

The last problem we are addressing is of internal nature and involves the Human Resources Department which wants to reward the best employees. We will, therefore, gather the list of employees and attach to them their respective number of realized contracts. This way we can reward the best-sellers among them and give incentives to all employees to focus more on their sales skills. The query is:

```
SELECT a.maker||' '||a.model "Car", COUNT(v.contract_id) "Number of rides"
FROM car a LEFT JOIN contract v ON a.car_id=v.car_id
GROUP BY a.maker||' '||a.model
order by COUNT(v.contract_id) desc;
```

Query Result

SQL | All Rows Fetched: 5 in 0.011 seconds

	Employee	Number of rides sold
1	Marija Marić	4
2	Ivana Ivić	3
3	Ivo Ivić	2
4	Ante Antić	2
5	Pero Perić	1

Figure 7: Human Resources query and results (Authors' work)

4. DISCUSSION AND CONCLUSION

This paper presents the educational approach to developing BITA skills and reasoning. In order to do so, a project assignment is designed and a project assignment steps are presented. A business environment is simulated, and business actions set. Business actions have been chosen with respect to the digital trends affecting the chosen rent-a-car industry. Moreover, a relational database is created to support business actions' execution.

Through the presented example, valuable information is gained which helped make four important business improvements, related to respectively, Marketing Department, Business Development Department, and Human Resources Department. To accomplish project assignment objective, BITA skills to model, deploy and manipulate the database, and connect it to strategic reasoning and operational business activities are required. By employing BITA skills, the business side is analyzed, aspects for a strategic focus are chosen, the technical solution is built in an efficient manner, and knowledge is combined to produce added value to the company. The presented project assignment incorporates a combination of business, IT, and digital skills which foster business development (Kappelman et al., 2015). Therefore, here presented educational approach is suitable for developing BITA skills. Accordingly, the paper contributes to the ever compelling issue of strengthening the students', and consequently employees' and managers', capabilities in the BITA body of literature (Luftman & Kempaiah, 2007; Mora, Wang, Raisinghani, & Muravchik, 2017). Employees and managers with strong BITA capabilities help companies to mitigate risks of losing time and money and overseeing business opportunities for growth, which in the end leads to the higher organizational performance (Gerow, Grover, Thatcher, & Roth, 2014; Silvius et al., 2009). Moreover, BITA skills have been identified as essential by the companies in the last decade (Kappelman et al., 2018b, 2015). Hence, incorporating here presented educational approach in courses stems beyond the university setting and has practical repercussions for the business sector also. Additionally, the approach can be of great value not only to educators in higher education but also to the professionals working with the business sector, such as human resource departments and training organizations.

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