

# SW COMPANY DATABASE SYSTEM

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Frogger-Software

Milestone/Version	Date
M2V2	11/01/2021
M2V1	10/18/2021
M1V3	10/05/2021
M1V2	10/04/2021
M1V1	09/14/2021

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## Section I: Project Description

Software company FrogX has outsourced a database company to remake their company database. The new database must encompass all major aspects of the company's structure.

The company has shares which can be owned by the public. The CEO has the most shares. The CEO coordinates with the board of directors and the heads of department. The heads of department are responsible for their department. The software department manages the products that FrogX sells. The marketing department advertises for the products.

FrogX has many software products/services that it offers to its users. Some services are free and some require a paid subscription. The services are offered on a number of platforms.

Each department has many employees. All employees have a manager. Many employees are also in teams. Employees are assigned to a campus. Even if they are working remotely, an employee has a campus for in-person meetings.

Each campus has many amenities, including wellness centers and dining halls. The wellness centers provide physical fitness programs that change daily. The dining halls have meals that change daily.

Campuses may also have visitors. Visitors must register with security to verify their permissions. Campuses also have contracted janitors.

## Section II: Use Cases

Tim Frog, the CEO of FrogX, wants to see how many employees FrogX has. Using his company credentials, Mr. Frog logs into the company database. Mr. Frog can sort the employees by attributes such as their name or which department they belong to.

Tim Frog receives a bonus if FrogX reaches an annual sales goal. The board of directors will award Tim with stocks depending on how the company performs. Over the course of the year, Tim accumulates bonuses and receives stock at the end of the year.

Woz Stevenson is a new hire at FrogX. Woz is visited by his roommate Joe. Joe gets a visitor pass from the front desk to pass through security checkpoints around the campus. Joe is authorized to use the wellness centers and dining halls around the campus because he is a visitor.

Mike Rooster is on the board of directors. He wants to see how well the company is performing. He asks the sales department how much income the company is projected to make. Then, he asks the marketing department how much money the company is projected to spend on advertisements.

Jane is a user of a FrogX product. She has an account for ToadO, a streaming service provided by FrogX. Jane watches shows on her tv, laptop, and phone. ToadO is a premium service so it has a recurring cost.

Mark works for CleanIt, a janitorial company. Mark is contracted by FrogX to clean their campuses. Mark cleans two of FrogX's campuses every night. Mark is not in the employee database and he does not belong to a department. However, he is allowed to use the campus parking lots.

Dylan is an employee for FrogX that works in the software department. Dylan has a team of software engineers that he works with. He is a team lead so he manages his fellow employees. He is told by the head of the department that Dylan's team will start working on a new project soon.

## Section III: Database Requirements (Business Rules)

1. Employee (strong)
  - 1.1. an employee shall belong to only one department
  - 1.2. an employee shall be managed by another employee
  - 1.3. an employee shall be in many teams
  - 1.4. an employee shall be assigned to many campuses
2. Teams (strong)
  - 2.1. teams shall have many employees
3. Department (strong)
  - 3.1. a department shall have only one head of department
  - 3.2. a department shall have many employees
4. Software (weak)
  - 4.1. software is a department
  - 4.2. software shall develop many products
5. Sales (weak)
  - 5.1. sales is a department
  - 5.2. sales shall sell many products
6. Marketing (weak)
  - 6.1. marketing is a department
  - 6.2. marketing shall advertise many products
7. products (strong)
  - 7.1. products shall be developed by the software department
  - 7.2. products shall be advertised by the marketing department

- 7.3. products shall be sold by the sale department
- 7.4. products shall be available on many platforms
- 7.5. products shall have many users
- 8. Platforms (strong)
  - 8.1. platforms will be used by many products
- 9. Users (strong)
  - 9.1. users shall use many products
- 10. CEO (strong)
  - 10.1. CEO shall manage many heads of department
  - 10.2. CEO shall communicate with only one board of directors
  - 10.3. CEO shall receive many shares
- 11. Board members(strong)
  - 11.1. board members shall communicate with only one CEO
  - 11.2. board members shall own many shares
- 12. Shares (strong)
  - 12.1. shares will be given to only one CEO
  - 12.2. shares will be owned by many board members
  - 12.3. shares will be owned by many shareholders
- 13. Shareholders (strong)
  - 13.1. shareholders shall own many shares
- 14. Campus (strong)
  - 14.1. campus shall be assigned many employees
  - 14.2. campus shall have many wellness centers

- 14.3. campus shall have many parking lots
- 14.4. campus shall have many dining halls
- 14.5. campus shall have many visitors
- 14.6. campus shall have many janitors
- 15. Parking lots (strong)
  - 15.1. parking lots shall belong to many campuses
- 16. Wellness centers (strong)
  - 16.1. wellness centers shall belong to many campuses
- 17. Dining halls (strong)
  - 17.1. dining halls shall belong to many campuses
- 18. Visitors (strong)
  - 18.1. visitors shall visit many campuses
- 19. Janitors (strong)
  - 19.1. janitors shall clean many campuses



## Section IV: Detailed List of Main Entities, Attributes and Keys

1. Employee (Strong)
  - a. ID #: key, numeric
  - b. name: composite, alphanumeric
  - c. manager: numeric (employee ID)
2. Teams (Strong)
  - a. team name: key, alphanumeric
  - b. number of members: derived, numeric
  - c. team lead: foreign key, numeric (employee ID)
3. Department (Strong)
  - a. Department ID: key, numeric
  - b. name: alphanumeric
  - c. number of employees: derived, numeric
4. Software (weak)
  - a. number of products: derived, numeric
  - b. projects in progress: derived, numeric
  - c. products: foreign key, numeric
5. Sales (weak)
  - a. annual income: numeric
  - b. taxes: numeric
  - c. number of products sold: derived, numeric
6. Marketing (weak)
  - a. advertisement costs: derived, numeric

- b. number of ads: derived, numeric
  - c. advertisement names: alphanumeric
- 7. Products (Strong)
  - a. product id: key, numeric
  - b. price: numeric
  - c. product name: alphanumeric
- 8. Platforms (Strong)
  - a. platform id: key, numeric
  - b. platform name: alphanumeric
  - c. version supported: numeric
- 9. Users (Strong)
  - a. username: key, alphanumeric
  - b. password: alphanumeric
  - c. subscription total: derived, numeric
- 10. CEO (Strong)
  - a. admin id: key, numeric
  - b. permissions: multivalue
  - c. name: alphanumeric
- 11. Board Members (Strong)
  - a. member id: key, numeric
  - b. name: alphanumeric
  - c. shares owned: derived, numeric
- 12. Shares (Strong)

- a. share id: key, numeric
- b. share value: derived, numeric
- c. dividend: numeric

### 13. Shareholders (Strong)

- a. ID #: key, numeric
- b. shares owned: numeric
- c. name: composite, alphanumeric

### 14. Campus (Strong)

- a. name: key, alphanumeric
- b. location: multivalued, alphanumeric
- c. square footage: numeric

### 15. Parking Lots (Strong)

- a. ID #: key, numeric
- b. parking capacity: numeric
- c. days open: numeric

### 16. Wellness Centers (Strong)

- a. ID #: key, numeric
- b. daily activity: multivalued
- c. name: alphanumeric

### 17. Dining Halls (Strong)

- a. ID #: key, numeric
- b. daily menu: multivalued
- c. name: alphanumeric

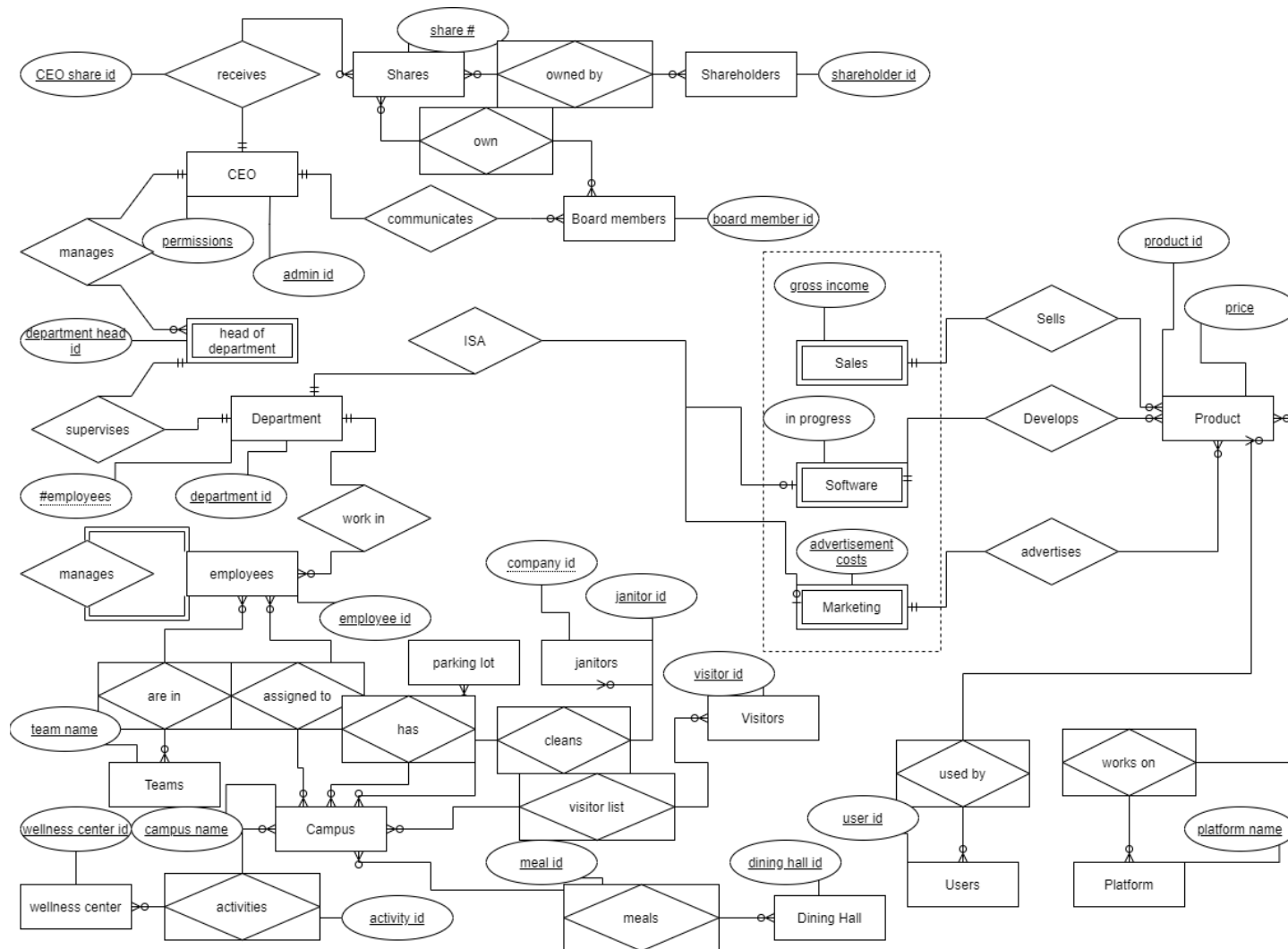
18. Visitors (Strong)

- a. ID #: key, numeric
- b. campus visiting: foreign key, alphanumeric
- c. date visiting: derived, date&time

19. Janitors (Strong)

- a. ID #: key, numeric
- b. Company: alphanumeric
- c. name: alphanumeric

## Section V: Entity Relationship Diagram



## Section VI: Testing Table

Rule	Entity A	Relation	Entity B	Cardinality	Pass/Fail	Error Description
1.	head of department	supervises	department	1 to 1	pass	
2.	shareholder	owns	shares	M to N	pass	
3.	CEO	receives	shares	1 to M	pass	
4.	Board members	own	shares	M to N	pass	
5.	Board members	communicate	CEO	1 to 1	fail	board members was changed to multiple people, not a single group
6.	Board members	communicate	CEO	M to 1	pass	
7.	CEO	manages	head of dep	1 to M	pass	
8.	Sales	sells	products	1 to M	pass	
9.	Software	develops	products	1 to M	pass	
10.	Marketing	advertises	products	1 to M	pass	
11.	Product	works on	Platform	M to N	pass	
12.	Product	used by	Users	M to N	pass	
13.	employees	work in	department	M to N	fail	employees can change departments but they only have one at a time
14.	employees	work in	department	M to 1	pass	
15.	employee	manages	employees	1 to M	pass	
16.	employees	are in	teams	M to 1	fail	employees can be in multiple teams

						simultaneously
17.	employees	are in	teams	M to N	pass	
18.	employees	assigned to	campus	M to 1	fail	employees can be assigned to multiple campuses, especially if temporarily visiting
19.	employees	assigned to	campus	M to N	pass	
20.	campus	has	wellness center	M to N	pass	
21.	campus	has	dining halls	M to N	pass	
22.	campus	has	parking lots	M to N	pass	
23.	visitors	visit	campus	M to 1	fail	visitors could theoretically visit multiple campuses within the same day
24.	visitors	visit	campus	M to N	pass	
25.	janitors	clean	campus	M to N	pass	

## Section VII: Database Model/EER

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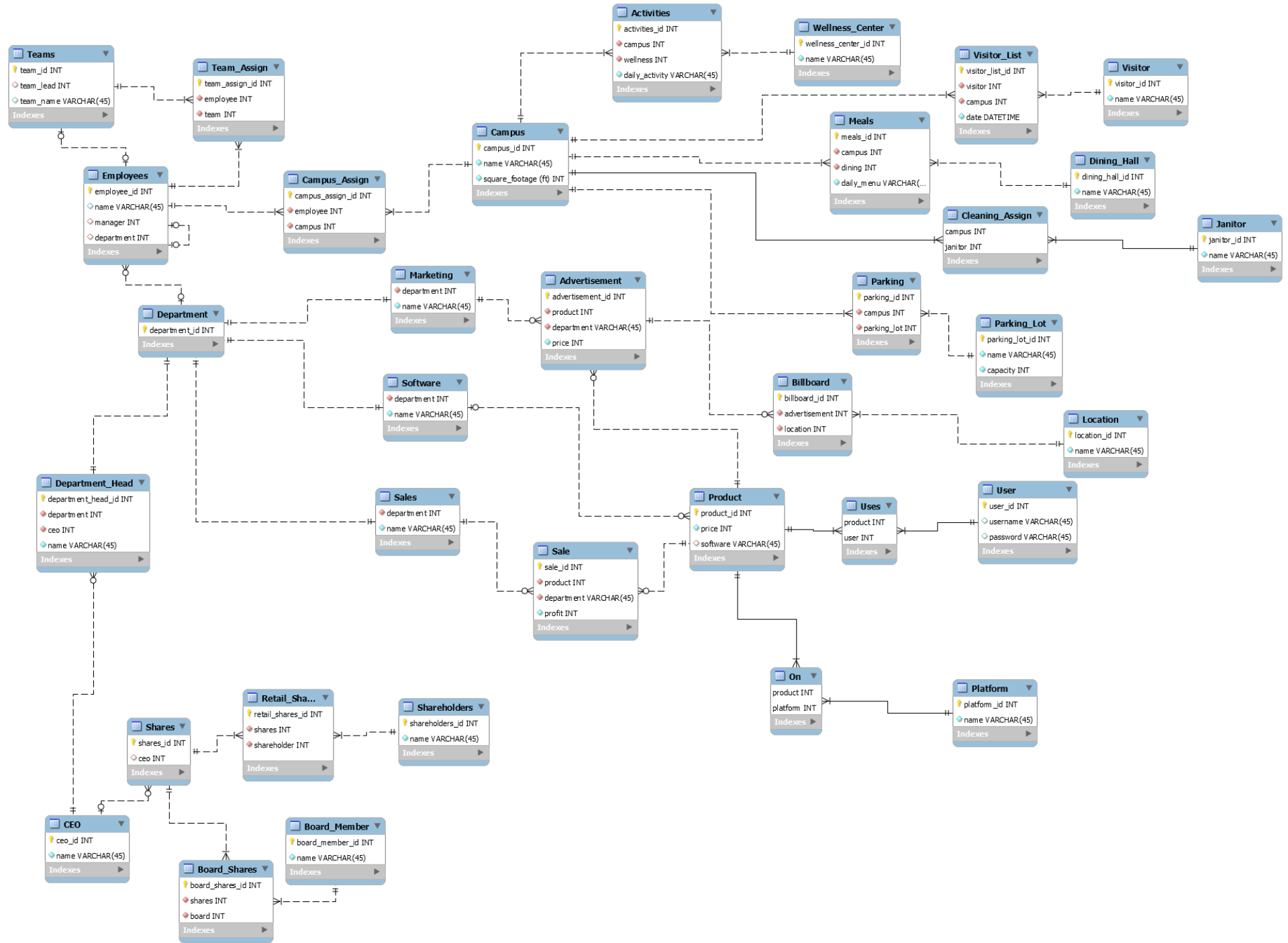


Table	FK	On Delete	On Update	Comment
Teams	team_lead	set null	cascade	team can exist without team lead
Team_Assign	employee	cascade	cascade	if anything is changed, cascade in assign
Team_Assign	team	cascade	cascade	if anything is changed, cascade in assign
Employees	manager	set null	cascade	employee can exist without manager
Employees	team	set null	cascade	employee can exist without team
Campus_Assign	employee	cascade	cascade	if anything is changed, cascade
Campus_Assign	campus	cascade	cascade	if anything is changed, cascade
Activities	campus	cascade	cascade	if anything is changed, cascade
Activities	wellness	cascade	cascade	if anything is changed, cascade
Visitor_List	visitor	cascade	cascade	if anything is changed, cascade
Visitor_List	campus	cascade	cascade	if anything is changed, cascade

Meals	campus	cascade	cascade	if anything is changed, cascade
Meals	dining	cascade	cascade	if anything is changed, cascade
Cleaning_Assign	campus	cascade	cascade	if anything is changed, cascade
Cleaning_Assign	janitor	cascade	cascade	if anything is changed, cascade
Parking	campus	cascade	cascade	if anything is changed, cascade
Parking	parking_lot	cascade	cascade	if anything is changed, cascade
Marketing	department	cascade	cascade	if anything is changed, cascade
Software	department	cascade	cascade	if anything is changed, cascade
Sales	department	cascade	cascade	if anything is changed, cascade
Advertisement	department	cascade	cascade	if anything is changed, cascade
Advertisement	product	cascade	cascade	if anything is changed, cascade
Billboard	advertisement	cascade	cascade	if anything is changed, cascade

Billboard	location	cascade	cascade	if anything is changed, cascade
Sale	product	cascade	cascade	if anything is changed, cascade
Sale	department	cascade	cascade	if anything is changed, cascade
Product	software	cascade	cascade	if anything is changed, cascade
Uses	product	cascade	cascade	if anything is changed, cascade
Uses	user	cascade	cascade	if anything is changed, cascade
On	product	cascade	cascade	if anything is changed, cascade
On	platform	cascade	cascade	if anything is changed, cascade
Department_Head	department	cascade	cascade	if anything is changed, cascade
Department_Head	ceo	cascade	cascade	if anything is changed, cascade
Shares	ceo	cascade	cascade	shares are not removed, even if ceo leaves the company
Retail_Shares	shares	cascade	cascade	if anything is changed, cascade

Retail_Shares	shareholder	cascade	cascade	if anything is changed, cascade
Board_Shares	shares	cascade	cascade	if anything is changed, cascade
Board_Shares	board	cascade	cascade	if anything is changed, cascade

## Section XI: Testing Table

Entity	SQL Query	Pass/Fail	Error Description	Possible Solution
Department	Delete	Pass	None	None
Department	Update	Pass	None	None
Employees	Delete	Pass	None	None
Employees	Update	Pass	None	None
Teams	Delete	Pass	None	None
Teams	Update	Pass	None	None
Team_Assign	Delete	Pass	None	None
Team_Assign	Update	Pass	None	None
Campus	Delete	Pass	None	None
Campus	Update	Pass	None	None
Campus_Assign	Delete	Pass	None	None
Campus_Assign	Update	Pass	None	None
Wellness_Center	Delete	Pass	None	None
Wellness_Center	Update	Pass	None	None
Activities	Delete	Pass	None	None
Activities	Update	Pass	None	None
Visitor	Delete	Pass	None	None
Visitor	Update	Pass	None	None
Visitor_List	Delete	Pass	None	None
Visitor_List	Update	Pass	None	None
Dining_Hall	Delete	Pass	None	None

Dining_Hall	Update	Pass	None	None
Meals	Delete	Pass	None	None
Meals	Update	Pass	None	None
Janitor	Delete	Pass	None	None
Janitor	Update	Pass	None	None
Cleaning_Assign	Delete	Pass	None	None
Cleaning_Assign	Update	Fail	Cannot add or update child row	do not update to a department number that doesn't exist
Cleaning_Assign	Update	Pass	None	None
Parking_Lot	Delete	Fail	Did not use PK	changed query to reference PK
Parking_Lot	Delete	Pass	None	None
Parking_Lot	Update	Pass	None	None
Parking	Delete	Pass	None	None
Parking	Update	Pass	None	None
Marketing	Delete	Pass	None	None
Marketing	Update	Fail	Cannot add or update child row	do not update to a department number that doesn't exist
Marketing	Update	Pass	None	None
Software	Delete	Pass	None	None
Software	Update	Pass	None	None
Sales	Delete	Pass	None	None
Sales	Update	Pass	None	None
Product	Delete	Pass	None	None
Product	Update	Pass	None	None
Advertisement	Delete	Pass	None	None

Advertisement	Update	Pass	None	None
Location	Delete	Pass	None	None
Location	Update	Pass	None	None
Billboard	Delete	Pass	None	None
Billboard	Update	Pass	None	None
Sale	Delete	Pass	None	None
Sale	Update	Pass	None	None
User	Delete	Pass	None	None
User	Update	Pass	None	None
Uses	Delete	Pass	None	None
Uses	Update	Pass	None	None
Platform	Delete	Pass	None	None
Platform	Update	Pass	None	None
On	Delete	Pass	None	None
On	Update	Fail	Duplicate Entry	changed inserts to allow for a non-duplicate update
On	Update	Pass	None	None
CEO	Delete	Pass	None	None
CEO	Update	Pass	None	None
Department_Head	Delete	Pass	None	None
Department_Head	Update	Pass	None	None
Shares	Delete	Pass	None	None
Shares	Update	Pass	None	None
Shareholders	Delete	Pass	None	None
Shareholders	Update	Pass	None	None



Retail_Shares	Delete	Pass	None	None
Retail_Shares	Update	Pass	None	None
Board_Member	Delete	Pass	None	None
Board_Member	Update	Pass	None	None
Board_Shares	Delete	Pass	None	None
Board_Shares	Update	Pass	None	None