

# TERM PROJECT

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DSCI 723 SPRING 2023

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DATA MANAGEMENT AND WAREHOUSING

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## Abstract:

In today's world, data has become one of the most valuable assets for businesses. The ability to collect, store, and analyze data has led to better decision-making and improved business outcomes. This has resulted in an increased demand for databases and data warehousing systems that can effectively manage large amounts of data.

This project involves the design and implementation of a database for a closet design and installation company, which includes tables for customer information, consultation, installation, company information, designer, installer, quote, unit, assigned, and includes. The project also includes the creation of a dimensional data warehouse model based on the relational design, which includes at least one fact table and three dimension tables.

While the project focuses on the technical aspects of database design and implementation, it is important to consider the potential ethical and privacy issues that could arise from the collection and storage of data. Data privacy, accuracy, bias, transparency, and compliance with data protection regulations are critical concerns that must be addressed to ensure that data is collected and used ethically and responsibly.

Overall, this project demonstrates the importance of effective database design and implementation in managing large amounts of data, improving decision-making, and driving business outcomes. However, it also highlights the need to consider the ethical and privacy implications of collecting and storing data to ensure that businesses are operating in an ethical and responsible manner.

## Business Problem:

The business problem is that C3, a closet design and installation company, is facing challenges in managing their customer information and sales processes. Without an effective system for tracking customer information, quotes, and installations, C3 risks losing potential business opportunities, creating confusion and inefficiencies among employees, and providing poor customer service. The lack of a comprehensive data management system is causing difficulties in

tracking the important information about the progress of each sale, which can lead to inefficiencies and mistakes ahead to missed sales opportunities and poor customer service.

Overall, the business problem is that C3 needs a better data management system to effectively track customer information, sales processes, and installation progress. This will help C3 streamline its operations, improve its customer service, and increase sales.

## Expected Benefits:

The expected benefits associated with the development of the system are:

1. Improved data management: The new system will help C3 manage information more efficiently, reducing data entry errors and improving data accuracy.
2. Increased sales: The new system will enable C3 to track potential customers referred by existing customers and follow up on those leads, increasing the number of sales.
3. Enhanced customer service: The new system will provide C3 with a centralized database of customer information, enabling the company to provide more personalized and responsive customer service.
4. Streamlined quoting process: The new system will enable C3 to create and manage quotes more efficiently, reducing the time required to generate quotes and increasing the accuracy of quotes.
5. Better inventory management: The new system will enable C3 to track inventory levels more effectively, ensuring that the company always has the necessary materials and products in stock.
6. Increased productivity: The new system will reduce the amount of time employees spend on manual data entry and paperwork, freeing up time for more productive tasks.
7. Improved reporting: The new system will provide C3 with better reporting capabilities, enabling the company to track key performance indicators and make data-driven decisions.
8. Increased profitability: The new system's benefits, including improved sales, streamlined processes, and better data management, are likely to result in increased profitability for C3.

9. Competitive advantage: The new system will give C3 a competitive advantage by enabling the company to provide more personalized and efficient customer service, make more accurate sales forecasts, and streamline business processes.

## Several Risks:

There are several risks associated with the development of a new system, including:

1. Technical Risks: There may be technical issues that arise during the development process, such as bugs, errors, or incompatibilities with existing systems.
2. Data Security Risks: The new system will likely store and manage sensitive customer data, so there is a risk of data breaches and cyber attacks.
3. Cost Risks: Developing a new system can be expensive, and there is a risk of going over budget.
4. Training Risks: Employees will need to be trained on how to use the new system, and there is a risk that the training will not be effective or that some employees may resist the change. This can lead to lower productivity and efficiency in the short term.

## ERD Diagram:

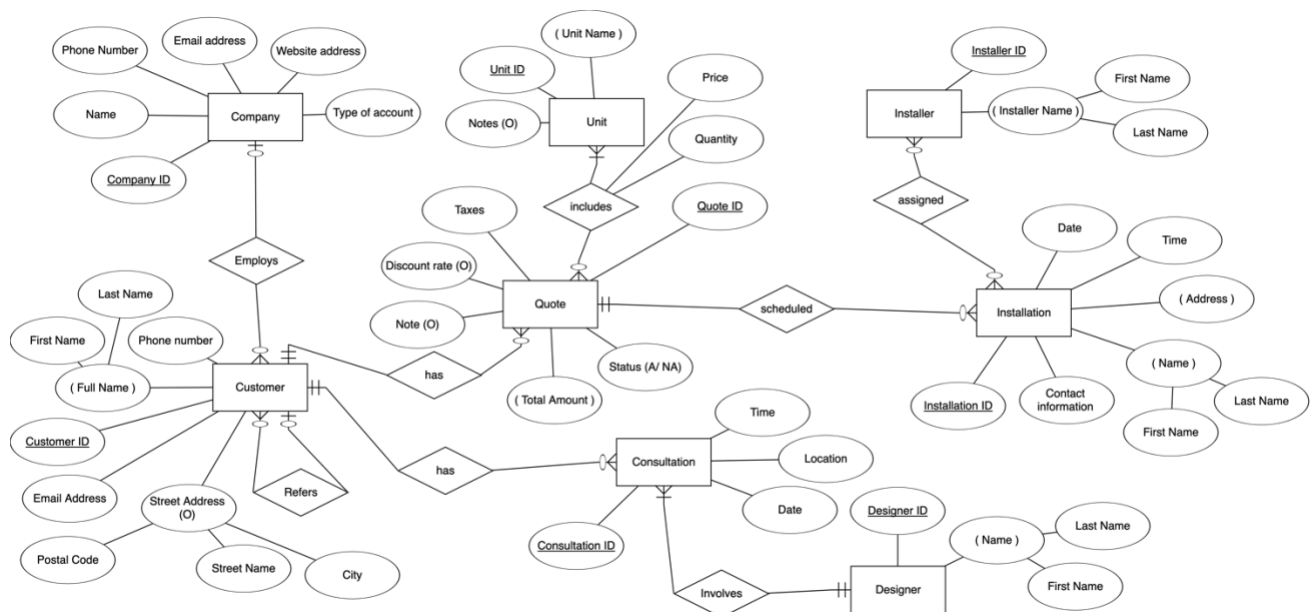


FIGURE 1: ERD DIAGRAM

## Relational Schema:

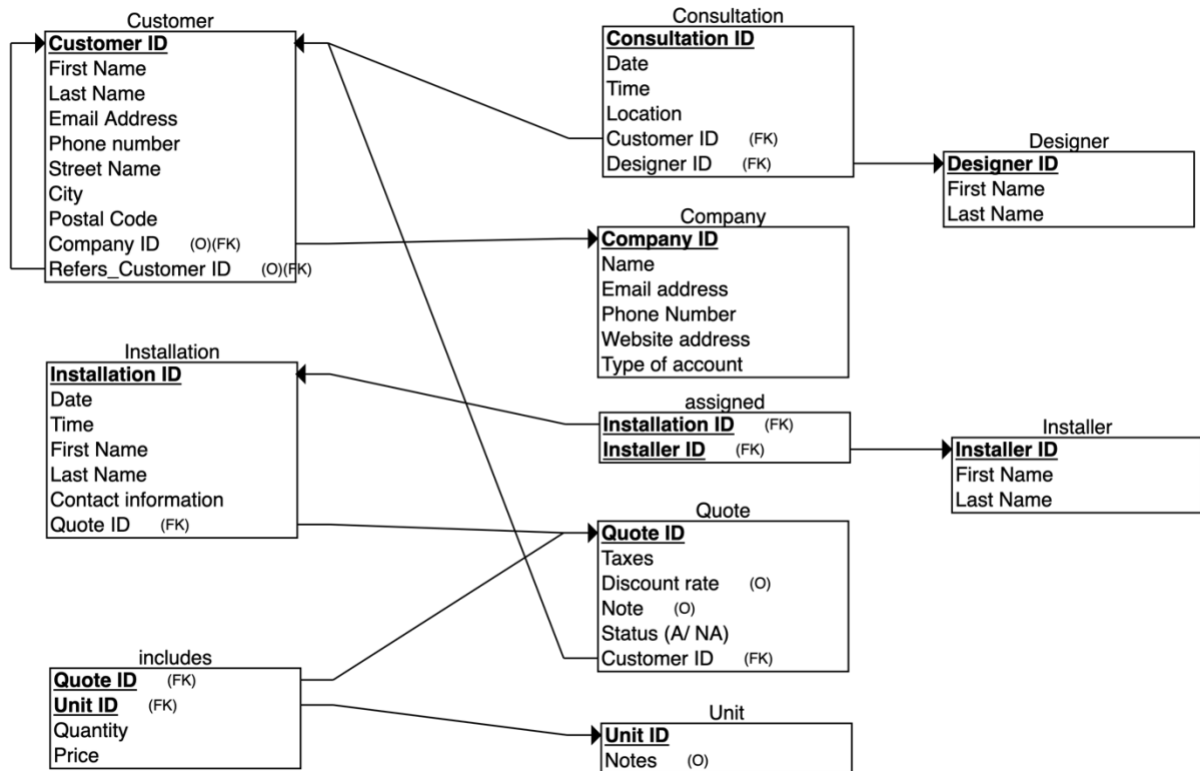


FIGURE 2: RELATIONAL SCHEMA

## Table and Attributes:

- Customer** { CustomerID (PK), FirstName, LastName, EmailAddress, Phone Number, StreetName, City, PostalCode, CompanyID (O,FK), Refers\_CompanyID (O,FK) }
- Consultation** { ConsultationID (PK), Date, Time, Location, CustomerID (FK), DesignerID (FK) }
- Installation** { InstallationID (PK), Date, Time, FirstName, LastName, ContactInfo, QuoteID (FK) }
- Company** { CompanyID (PK), Name, EmailAddress, PhoneNumber, Website, TypeofAccount }
- Designer** { DesignerID (PK), FirstName, LastName }
- Installer** { InstallerID (PK), FirstName, LastName }
- Quote** { QuoteID (PK), Taxes, Discount Rate (O), Notes (O), Status, CustomerID (FK) }
- Unit** { UnitID (PK), Notes (O) }
- assigned** { InstallationID (FK), InstallerID (FK) }

**10. includes** {QuoteID (FK), UnitID (FK), Price, Quantity}

### Full Functional Dependencies:

1. CustomerID -> {FirstName, LastName, EmailAddress, PhoneNumber, StreetName, City, PostalCode, CompanyID, Refers\_CompanyID}
2. ConsultationID -> {Date, Time, Location, CustomerID, DesignerID}
3. InstallationID -> {Date, Time, FirstName, LastName, ContactInformation, QuoteID}
4. CompanyID -> {Name, EmailAddress, PhoneNumber, Website, TypeofAccount}
5. DesignerID -> {FirstName, LastName}
6. InstallerID -> {FirstName, LastName}
7. QuoteID -> {Taxes, Discount Rate, Notes, Status, CustomerID}
8. UnitID -> Notes
9. InstallationID -> {InstallerID}
10. QuoteID -> {UnitID, Price, Quantity}

**Partial Functional Dependencies/ Transitive Functional Dependencies:** None

## Database Diagram:

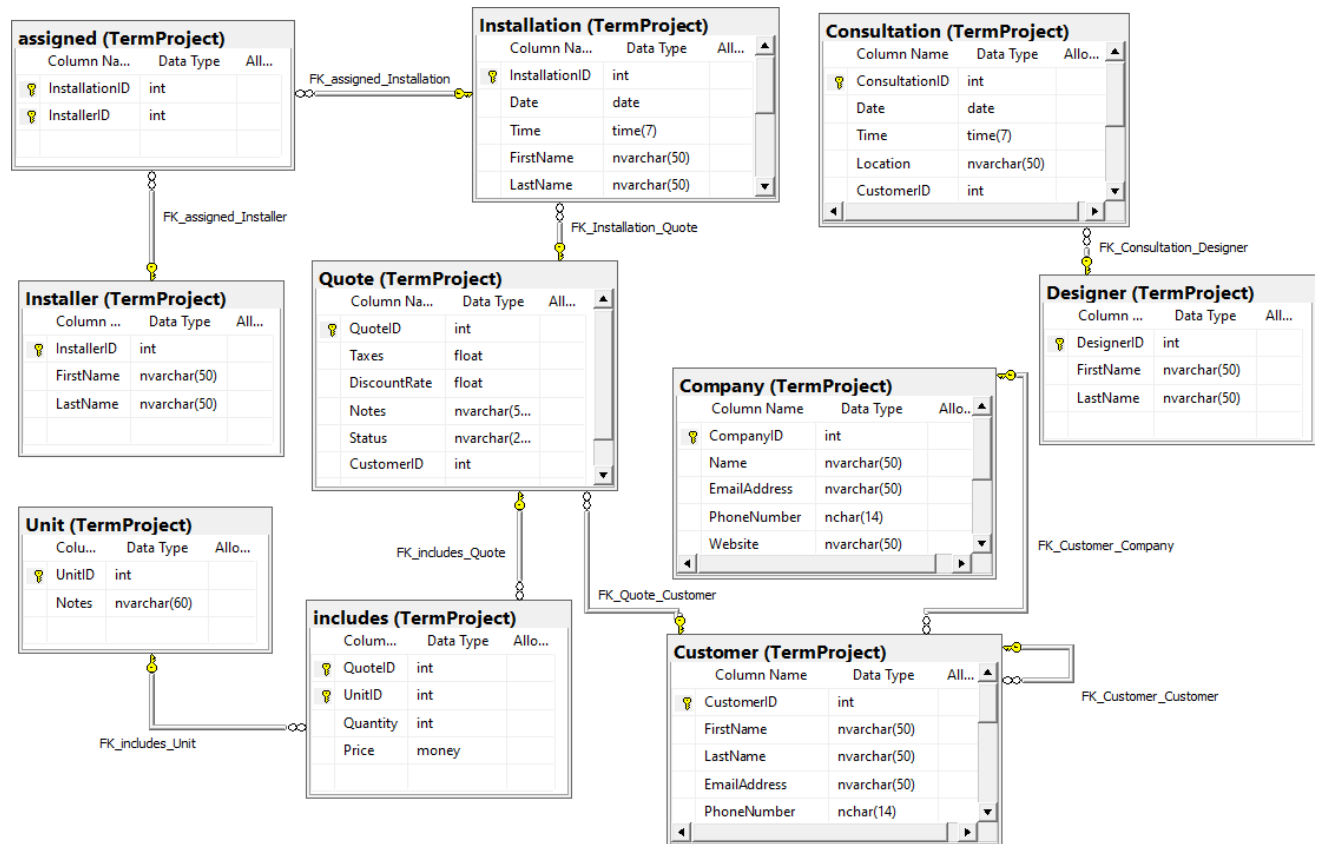


FIGURE 3: DATABASE DIAGRAM

## Tables Populated with Data:

FIGURE 4: CUSTOMER TABLE

	CustomerID	FirstName	LastName	EmailAddress	PhoneNumber	StreetName	City	PostalCode	CompanyID	Refers_CustomerID
1	1	Jackson	Bates	id.risus@protonmail.ca	(187) 108-5651	2037 Tristique Avenue	Inegöl	878743	1	2
2	2	Colette	Prince	proin.nisl@hotmail.net	(878) 637-3923	675-3524 A Rd.	Dnipro	3824	2	1
3	3	Thor	Dickson	tellus.eu.augue@google.org	1-119-261-3973	Ap #212-2707 Elit, Street	Juliacca	16374	3	4
4	4	Yvette	Rios	suspendisse@aol.edu	(621) 630-1424	Ap #404-3175 Convallis, Road	Alto Hospicio	07581	4	3
5	5	Aquila	Blair	nunc.sed.pede@hotmail.com	1-609-593-8641	405-1028 Nulla, St.	Vandoeuvre-lès-Nancy	47-74	5	6
6	6	Lenore	Buck	eu@outlook.com	(194) 483-6877	510-4846 Ligula, Road	Veere	B4N 5W8	6	5
7	7	Tyrone	Valdez	laoreet.posuere@protonmail.edu	(838) 752-5041	263-6425 Magna, Rd.	Weston-super-Mare	55-936	7	8
8	8	Coby	Randolph	ipsum.donec.sollicitudin@aol.couk	(661) 714-7621	4303 Ipsum, Avenue	Águas Lindas de Goiás	32107	8	7
9	9	Cruz	Leonard	nec.ante@google.couk	1-952-323-9314	354-5569 Blandit Avenue	Sichuan	108216	9	10
10	10	Jarrod	Sykes	nec.ante.blandit@google.ca	1-805-211-7271	Ap #756-9916 Nisi Road	Pontevedra	20607	10	9

FIGURE 5: ASSIGNED TABLE

	QuotID	UnitID	Quantity	Price
1	4	1	20	7300.00
2	4	4	70	851.00
3	5	2	55	7682.00
4	5	5	77	9870.00
5	6	3	94	7498.00
6	6	6	68	1144.00
7	7	7	50	3414.00
8	8	8	33	7489.00
9	9	9	22	5703.00
10	10	10	61	7838.00

FIGURE 6: DESIGNER TABLE

	DesignerID	FirstName	LastName
1	1	Arsenio	Freeman
2	2	Aimee	Watson
3	3	Dane	Mcconnell
4	4	Andrew	Strickland
5	5	Callum	Petty
6	6	Christen	Patrick
7	7	Colton	Alvarez
8	8	Colby	Horton
9	9	Vincent	Bailey
10	10	Aimee	Noel

FIGURE 7: INSTALLER TABLE

	InstallerID	FirstName	LastName
1	1	Ronan	Hernandez
2	2	Kiyada	Bradley
3	3	Garrett	Kent
4	4	Maxine	Potts
5	5	Alfonso	McKnight
6	6	Samuel	Dudley
7	7	Haviva	Cain
8	8	Calista	Barlow
9	9	Molly	Booth
10	10	Acton	Molina



FIGURE 8: QUOTE TABLE

	QuoteID	Taxes	DiscountRate	Notes	Status	CustomerID
1	4	0.03	0.05	enim. Nunc ut	Not Accepted	1
2	5	0.05	0.15	magna et ipsum cursus	Accepted	2
3	6	0.06	0	leo elementum	Not Accepted	3
4	7	0.04	0.45	tortor. Integer aliquam adipiscing lacus.	Accepted	4
5	8	0.06	0.25	nisl.	Not Accepted	5
6	9	0.03	0	posuere	Accepted	6
7	10	0.04	0.06	ipsum dolor	Not Accepted	7
8	11	0.06	0	sem. Nulla interdum.	Accepted	8
9	12	0.07	0.05	justo. Proin non	Not Accepted	9
10	13	0.07	0.25	amet ante. Vivamus non	Not Accepted	10

FIGURE 9: INCLUDES TABLE

	InstallationID	InstallerID
1	5	4
2	6	1
3	6	5
4	6	6
5	7	2
6	7	7
7	8	3
8	8	8
9	9	9
10	10	10

FIGURE 10: UNIT TABLE

	UnitID	Notes
1	1	aliquet diam. Sed diam
2	2	dui nec uma suscipit nonummy. Fusce fermentum
3	3	magnis
4	4	sit amet metus.
5	5	ultrices posuere cubilia Curae Phasellus omare....
6	6	nec, malesuada ut.
7	7	Quisque imperdiet, erat nonummy ultricies
8	8	nascetur ridiculus mus. Proin vel nisl. Quisque
9	9	magnis dis parturient montes, nascetur ridiculus
10	10	ullamcorper. Duis

FIGURE 11: INSTALLATION TABLE

	InstallationID	Date	Time	FirstName	LastName	ContactInfo	QuoteID
1	5	2023-03-20	01:57:00.0000000	Colton	Hines	(926) 304-6324	5
2	6	2022-12-31	04:58:00.0000000	Buffy	Fry	1-676-772-4011	6
3	7	2024-01-25	15:22:00.0000000	Alea	Buck	(210) 754-5615	7
4	8	2022-08-04	10:34:00.0000000	Norman	Mcdonald	1-531-796-6075	4
5	9	2023-06-16	11:21:00.0000000	Jenna	Webster	(706) 356-5133	5
6	10	2022-09-16	18:52:00.0000000	Ingrid	Mccormick	1-527-998-8224	6
7	11	2023-12-03	17:37:00.0000000	Madison	Gill	1-368-273-1825	7
8	12	2023-12-13	01:35:00.0000000	Callum	Crosby	(702) 324-6488	8
9	13	2022-09-20	10:21:00.0000000	Alexa	Lowery	1-868-684-1114	9
10	14	2023-10-26	06:40:00.0000000	Porter	Castro	1-475-472-9868	10

FIGURE 12: CONSULTATION TABLE

	ConsultationID	Date	Time	Location	CustomerID	DesignerID
1	1	2023-12-10	14:13:00.0000000	Kansas City	1	1
2	2	2023-11-27	04:52:00.0000000	Bridgeport	2	2
3	3	2023-11-29	10:51:00.0000000	Pittsburgh	3	3
4	4	2023-05-30	08:24:00.0000000	Chesapeake	4	4
5	5	2024-02-24	22:31:00.0000000	Phoenix	3	5
6	6	2023-09-25	17:29:00.0000000	Philadelphia	6	6
7	7	2023-05-28	15:13:00.0000000	Augusta	7	7
8	8	2022-04-07	17:06:00.0000000	Montpellier	8	8
9	9	2024-01-02	06:44:00.0000000	Portland	9	9
10	10	2022-07-13	10:25:00.0000000	Rockville	10	10

FIGURE 13: COMPANY TABLE

	CompanyID	Name	EmailAddress	PhoneNumber	Website	TypeofAccount
1	1	Evelyn Stafford	lectus.pede@icloud.net	(929) 364-7144	http://bbc.co.uk	Business
2	2	Tanisha Briggs	dui.nec@google.edu	1-543-216-6414	https://bbc.co.uk	Business
3	3	Fleur Holman	massa.quisque@aol.net	1-861-521-5271	http://naver.com	Personal
4	4	Damian Hudson	velit.eget@aol.couk	(455) 743-1317	https://cnn.com	Business
5	5	Gloria Avila	gravidanunc@aol.com	1-335-366-1283	http://twitter.com	Personal
6	6	Magee Rutledge	fusce.mollis.duis@aol.ca	(951) 612-1837	http://walmart.com	Personal
7	7	Abraham Hall	nec.malesuada@google.net	(689) 763-2681	http://reddit.com	Business
8	8	Danielle Parks	consequat.nec.mollis@aol.org	(647) 883-0658	http://instagram.com	Business
9	9	Daria Ingram	iaculis.quis.pede@yahoo.ca	(728) 737-4967	https://netflix.com	Personal
10	10	Uma Washington	amet.metus@icloud.com	1-609-692-5404	https://netflix.com	Business

## Data dictionary:

Schema Name	Table Name	Column Name	Data Type	Data Type Ext	Nullable	Primary Key	Foreign Key
TermProject	assigned	InstallationID	int	int	N	PK	FK
		InstallerID	int	int	N	PK	FK
	Company	CompanyID	int	int	N	PK	
		EmailAddress	nvarchar	nvarchar(50)	N		
		Name	nvarchar	nvarchar(50)	N		
		PhoneNumber	nchar	nchar(14)	N		
		TypeofAccount	nvarchar	nvarchar(50)	N		
		Website	nvarchar	nvarchar(50)	N		
	Consultation	ConsultationID	int	int	N	PK	
		CustomerID	int	int	N		
		Date	date	date	N		
		DesignerID	int	int	N		FK
		Location	nvarchar	nvarchar(50)	N		
		Time	time	time(7)	N		
	Customer	City	nvarchar	nvarchar(50)	N		
		CompanyID	int	int	Y		FK
		CustomerID	int	int	N	PK	
		EmailAddress	nvarchar	nvarchar(50)	N		
		FirstName	nvarchar	nvarchar(50)	N		
		LastName	nvarchar	nvarchar(50)	N		
		PhoneNumber	nchar	nchar(14)	N		
		PostalCode	nvarchar	nvarchar(10)	N		
	Designer	Refers_CustomerID	int	int	Y		FK
		StreetName	nvarchar	nvarchar(50)	N		
	includes	DesignerID	int	int	N	PK	
		FirstName	nvarchar	nvarchar(50)	N		
		LastName	nvarchar	nvarchar(50)	N		
	includes	Price	money	money	N		
		Quantity	int	int	N		
		QuoteID	int	int	N	PK	FK
	Installation	UnitID	int	int	N	PK	FK
		ContactInfo	nchar	nchar(14)	N		
		Date	date	date	N		
		FirstName	nvarchar	nvarchar(50)	N		
		InstallationID	int	int	N	PK	
		LastName	nvarchar	nvarchar(50)	N		
	Installer	QuoteID	int	int	N		FK
		Time	time	time(7)	N		
		Time	time	time(7)	N		
	Quote	FirstName	nvarchar	nvarchar(50)	N		
		InstallerID	int	int	N	PK	
		LastName	nvarchar	nvarchar(50)	N		
	Unit	CustomerID	int	int	N		FK
		DiscountRate	float	float	Y		
		Notes	nvarchar	nvarchar(50)	Y		
		QuoteID	int	int	N	PK	
		Status	nvarchar	nvarchar(20)	N		
	Unit	Taxes	float	float	N		
		Notes	nvarchar	nvarchar(60)	Y		
	Unit	UnitID	int	int	N	PK	

FIGURE 14: DATA DICTIONARY

## Dimensional data warehouse model:

ERD Diagram:

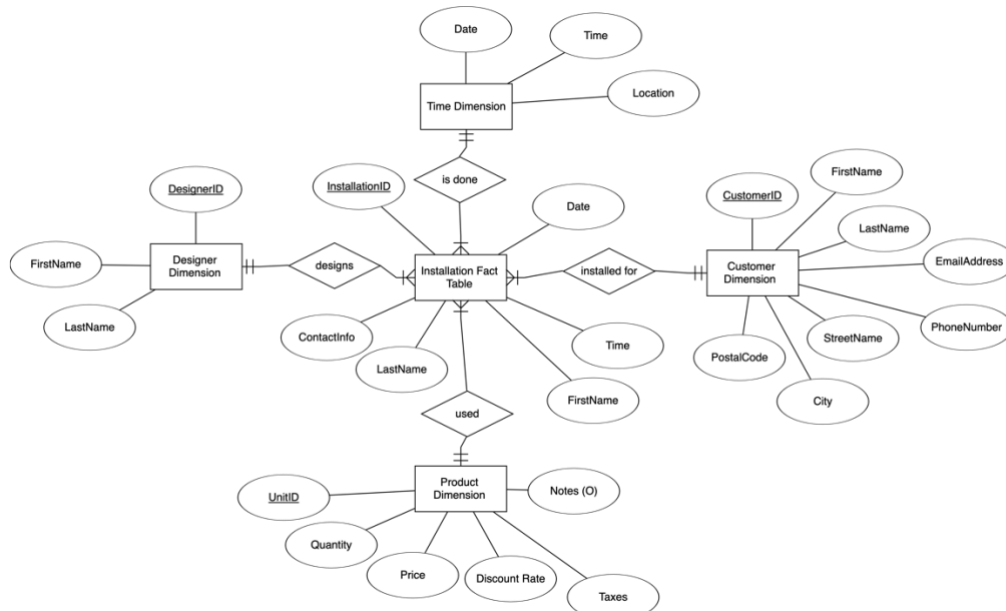


FIGURE 15: DATA WAREHOUSE: ERD DIAGRAM

Relational Schema:

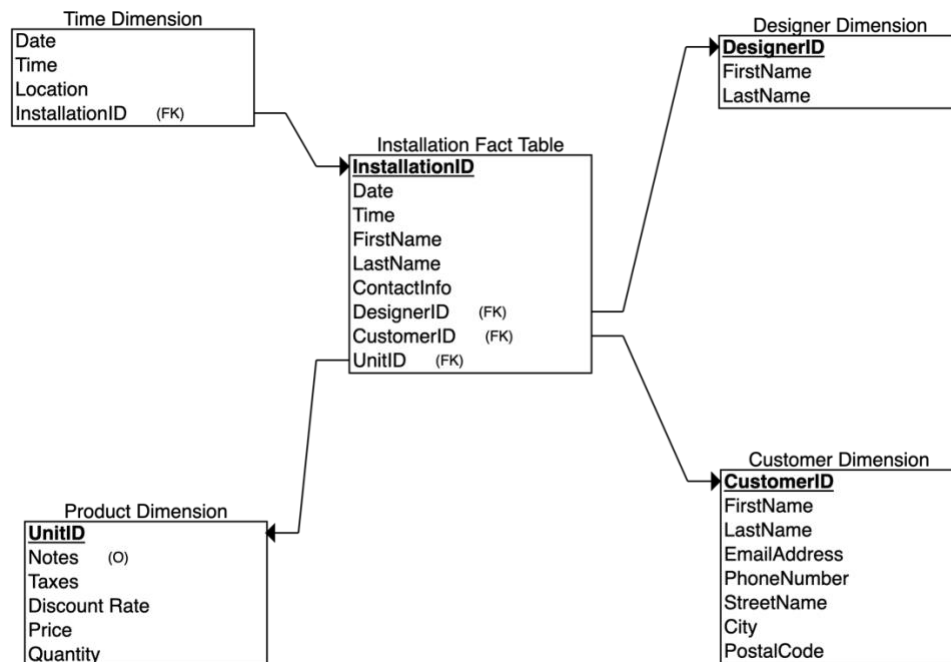


FIGURE 16: DATA WAREHOUSE: RELATIONAL SCHEMA

## Data Warehouse Database Diagram:

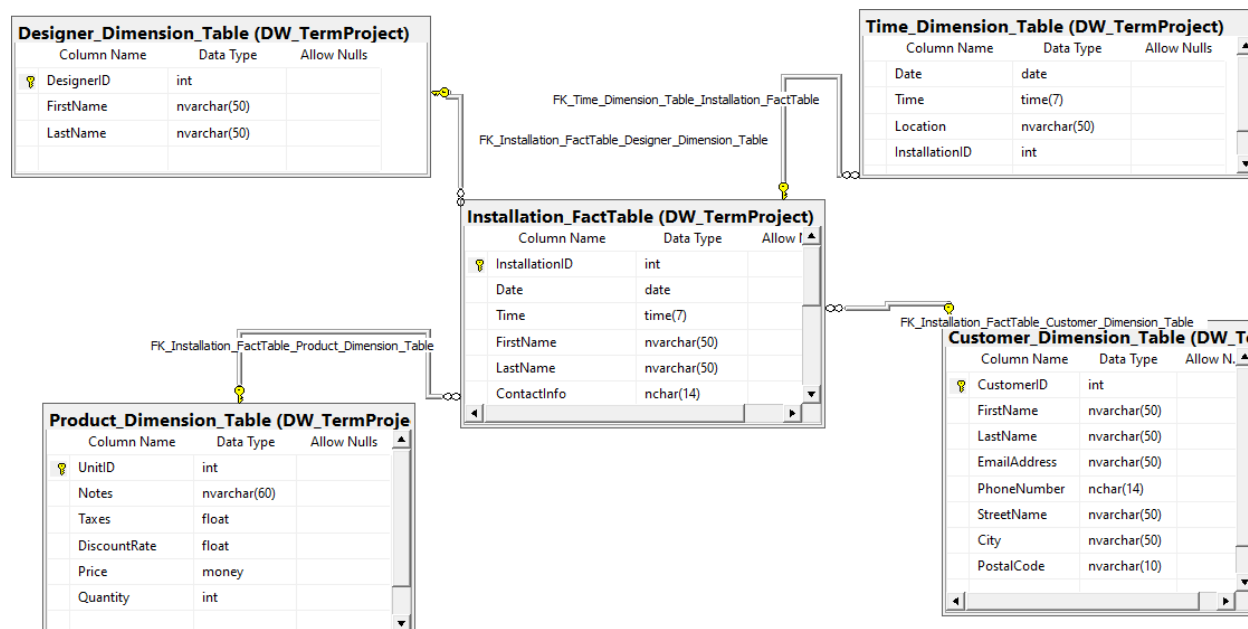


FIGURE 17: DATA WAREHOUSE: DATABASE DIAGRAM

## Date Warehouse Tables Populated:

FIGURE 18: TIME\_DIMENSION\_TABLE

	Date	Time	Location	InstallationID
1	2023-03-20	01:57:00.0000000	Inegöl	12
2	2023-04-10	02:57:00.0000000	Dnipro	13
3	2023-09-12	04:45:00.0000000	Juliaca	14
4	2023-03-21	04:57:00.0000000	Alto Hospicio	15
5	2023-04-14	06:57:00.0000000	Vandoeuvre-lès-Nancy	16
6	2023-04-12	10:45:00.0000000	Veere	17
7	2023-09-09	04:45:00.0000000	Weston-super-Mare	18
8	2023-03-07	03:57:00.0000000	Águas Lindas de Goiás	19
9	2023-04-04	04:57:00.0000000	Sichuan	20

FIGURE 19: PRODUCT\_DIMENSION\_TABLE

	UnitID	Notes	Taxes	DiscountRate	Price	Quantity
1	1	sds fsd	0.03	0.15	5000.00	25
2	3	aedf	0.45	0.1	2400.00	5
3	5	fsdsc	0.2	0.2	1500.00	40
4	6	NULL	0.4	0.45	1700.00	13
5	7	dafs	0.3	0.3	2000.00	10
6	8	fadf	0.3	0.5	6000.00	30
7	9	wed	0.5	0.3	400.00	30
8	10	fasd	0.3	0.6	250.00	100

FIGURE 20: DESIGNER\_DIMENSION\_TABLE

	DesignerID	FirstName	LastName
1	1	Arsenio	Freeman
2	2	Ameee	Watson
3	3	Dane	Mconnell
4	4	Andrew	Strickland
5	5	Callum	Petty
6	6	Christen	Patrick
7	7	Colton	Alvarez
8	8	Colby	Horton
9	9	Vincent	Bailey
10	10	Ameee	Noel

FIGURE 21: CUSTOMER\_DIMENSION\_TABLE

	CustomerID	FirstName	LastName	EmailAddress	PhoneNumber	StreetName	City	PostalCode
1	1	Jackson	Bates	id.risus@protonmail.ca	(187) 108-5651	2037 Tristique Avenue	Inegöl	878743
2	2	Colette	Prince	proin.nisl@hotmail.net	(878) 637-3923	675-3524 A Rd.	Dnipro	3824
3	4	Thor	Dickson	tellus.eu.augue@google.org	1-119-261-3973	Ap #212-2707 Elit, Street	Juliaca	16374
4	5	Yvette	Rios	suspendisse@aol.edu	(621) 630-1424	Ap #404-3175 Convalis, Road	Alto Hospicio	07581
5	6	Aquila	Blair	nunc.sed.pede@hotmail.com	1-609-593-8641	405-1028 Nulla, St.	Vandoeuvre-lès-Nancy	47-74
6	7	Lenore	Buck	eu@outlook.com	(194) 483-6877	510-4846 Ligula, Road	Veere	B4N 5W8
7	8	Tyrone	Valdez	laoreet.posuere@protonmail.edu	(838) 752-5041	263-6425 Magna, Rd.	Weston-super-Mare	55-936
8	9	Coby	Randolph	ipsum.donec.solicitudin@aol.couk	(661) 714-7621	4303 Ipsum, Avenue	Águas Lindas de Goiás	32107
9	10	Cruz	Leonard	nec.ante@google.couk	1-952-323-9314	354-5569 Blandit Avenue	Sichuan	108216
10	11	Jamod	Sykes	nec.ante.blandit@google.ca	1-805-211-7271	Ap #756-9916 Nisi Road	Pontevedra	20607

FIGURE 22: INSTALLATION\_FACT\_TABLE

	InstallationID	Date	Time	FirstName	LastName	ContactInfo	QuoteID	DesignerID	CustomerID	UnitID
1	12	2023-03-20	01:57:00.0000000	Colton	Hines	(926) 304-6324	5	1	1	1
2	13	2023-04-10	02:57:00.0000000	James	Bas	(926) 873-4524	2	3	2	3
3	14	2023-09-12	04:45:00.0000000	Holt	Sam	(617) 932-6564	3	2	4	5
4	15	2023-03-21	04:57:00.0000000	Ham	Galt	(216) 984-6335	7	5	5	6
5	16	2023-04-14	06:57:00.0000000	Cob	Ben	(617) 304-8924	8	6	7	7
6	17	2023-04-12	10:45:00.0000000	Austin	Strong	(251) 304-9473	9	7	6	8
7	18	2023-09-09	04:45:00.0000000	Jack	Cok	(617) 204-9485	6	7	8	6
8	19	2023-03-07	03:57:00.0000000	Kelly	Gir	(216) 675-9543	5	8	9	9
9	20	2023-04-04	04:57:00.0000000	Mary	Holt	(617) 786-8593	1	4	10	8
10	21	2023-04-05	10:35:00.0000000	Ken	Bur	(251) 495-8394	10	10	11	10

## Potential Ethical and Privacy Issues:

Collecting and storing data in a database can raise various ethical and privacy concerns, including:

1. **Data Privacy:** The collection of personal information, such as customer names, phone numbers, and email addresses, could raise concerns about data privacy. If this data is not properly secured, it could be exposed to unauthorized access, leading to potential breaches and data theft. It is important to ensure that data security measures are in place to prevent data breaches and ensure that sensitive information is protected.
2. **Data Accuracy:** The data stored in the database should be accurate and reliable. Inaccurate data can lead to incorrect decisions, which could have adverse consequences for the business and its customers. Therefore, data must be verified and validated before being stored in the database.
3. **Compliance:** Compliance with data protection laws is critical. Failure to comply with these regulations could lead to legal action, fines, and damage to the reputation of the business.